The Status of Rare, Threatened, and Endangered Plants and Animals of California 2000-2004

California Department of Fish and Game
2005

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State of California
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State of California

The Resources Agency

2005 ANNUAL REPORT SUMMARY

The Mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

California has the largest number of rare plants and animals of any state in the nation. Many of these species are at risk and are declining while others remain stable or are increasing. Loss of habitat, including habitat fragmentation, is the single, most important factor affecting the long-term survival of these species. Conservation of habitat and the natural processes that maintain habitat is central to protecting rare species now and into the future. The Department of Fish and Game (Department) mission statement underscores the responsibility to conserve and recover California's rare, threatened, and endangered species. Department activities today reflect a long history of conservation planning in California and are framed by California and federal law, including the California and Federal Endangered Species Acts (CESA, FESA), the Natural Community Conservation Planning Act, and the California Environmental Quality Act (CEQA).

Department staff carries out research, management and monitoring programs, participate in recovery planning, and work cooperatively with the federal government, other State and local agencies, landowners, conservation groups, and the public in various ways to further conservation. The Department also focuses on conserving assemblages of species and habitats on a landscape level through locally-based cooperative conservation planning. Department biologists maintain information on plants and animals of special concern, and plan for conservation of these species in cooperative conservation plans and other conservation programs.

CESA requires the Department to prepare a report summarizing the status of all State-listed endangered, threatened, and candidate species for the Commission, the Legislature, and the Governor. The 2005 report, "The Status of Rare, Threatened, and Endangered Plants and Animals of California 2000-2004" updates information provided in the 2000 report. When the 2000 report was prepared, 293 species were listed as Rare, Threatened, or Endangered, and landscape-level conservation planning had been initiated in Southern California. Today, 302 species are listed by the State and conservation planning is now statewide.

This current report describes California's listed and candidate species, currently at 79 animals and 223 plants. Seven species have been listed since the 2000 report:

- **Ventura Marsh milk-vetch** (*Astragalus pycnostachyus* var. *lanosissimus*). **SE – April 2000**. Thought to be extinct when rediscovered near Oxnard, Ventura County.

- **Baja California birdbush** (*Ornithostaphylos oppositifolia*). **SE – April 2001**. Found only in extreme southern San Diego County.

- **San Fernando Valley spineflower** (*Chorizanthe parryi* var. *fernandina*). **SE – August 2001**. Thought to be extinct when rediscovered on a ranch proposed for development in Ventura County. Now known from two populations, the second in Los Angeles County.

- **North Coast semaphore grass** (*Pleuropogon hooverianus*). **ST – August 2002**. Uplisted from Rare. Populations in Marin, Sonoma, and Mendocino Counties. None are protected.

- **Orcutt's hazardia** (*Hazardia orcuttii*). **ST – August 2002**. Restricted in one population in San Diego County.

- **Scotts Valley polygonum** (*Polygonum hickmanii*). SE – **October 2004**. First discovered in 1990. Found only in one site in Scotts Valley, Santa Cruz County.

- **Xantus's murrelet** (*Synthliboramphus hypoleucus*). ST – **December 2004**. Breeding populations on Channel Islands are declining, threatened largely by native and non-native predators.

Large-scale conservation planning under the Natural Community Conservation Planning Act has expanded significantly since 2000. NCCP planning continues in Los Angeles, Orange, Riverside, and San Diego counties. For the purposes of NCCP, the southern California coastal sage scrub ecosystem was divided into ecologically based subregions, and further divided into subareas that match local government jurisdictions. Each subregion and subarea is creating its own NCCP. Significant progress was made during 2000-2004 on the following plans:

- **City of Chula Vista Multiple Species Conservation Program (MSCP) Subarea Plan, San Diego County**. The subarea plan will preserve approximately 9,243 acres and provide for the conservation of 86 species.

- **Coachella Valley Multiple Species Habitat Conservation Plan, Riverside County.** The plan area covers 1.2 million acres, a diverse mixture of 27 desert and mountain natural communities, and proposes coverage for 27 species.

- **Orange County Southern Subregional Plan**. The plan encompasses 57,000 acres of natural habitat including coastal sage scrub, chaparral, grassland, riparian, and oak woodlands.

- **Palos Verdes Peninsula Subregional Plan**. The plan addresses one state and federally-listed species, Lyon's pentachaeta (*Pentachaeta lyonii*).

- **San Diego Joint Water Agencies Subregional Plan**. The NCCP describes how four water agencies in San Diego County will manage their lands to conserve natural habitats and species while continuing to provide their mandated water services.

- **San Diego Multiple Habitat Conservation Program.** The subregional plan for the northwestern portion of San Diego County was approved on March 28, 2003. It encompasses 29,962 acres of natural habitat, and provides conservation for 77 species.

- **San Diego North County MSCP Subarea Plan**. The subarea plan will include grassland and vernal pool species in addition to many of the 85 species covered in the existing Multiple Species Conservation Plan.

- **Western Riverside County Multi-Species Habitat Conservation Plan (MSHCP).** The Riverside County integrates creation of an NCCP with an update of the County General Plan and a transportation corridor plan. The project area is 1.2 million acres and the proposed conservation area, including public lands, is approximately 500,000 acres.

Over the last four years, the NCCP program has expanded into Northern California. Planning efforts have begun in Contra Costa and Placer Counties, as well as with the Mendocino Redwoods Company. Plans are being considered in other northern California areas including Santa Clara, Solano, and Yolo Counties. Significant accomplishments in northern California include the following plans.

- **East Contra Costa County Plan**. The plan area covers 190,000 acres. Natural communities present include oak woodland, oak savannah, chaparral/scrub, riparian scrub and woodland, and permanent and seasonal wetlands.

- **Mendocino Redwood Company Plan**. The proposed plan will cover approximately 232,000 acres of private lands within the timber harvest zones of Mendocino and Sonoma Counties that the company currently owns or in which it holds timber rights.

- **Placer County Legacy**. The County is preparing the NCCP in three phases. Phase 1 is underway now and covers the valley floor and low foothill portions of the County. A Biological Working Group made up of area stakeholders meets regularly to discuss planning options and draft species accounts have been completed.

The Merced County and University of California at Merced Plan represents an opportunity lost. After no progress since the late summer of 2002, the County of Merced stopped preparation of the Merced Plan in early 2004, indicating that the issues were too controversial. The plan would have covered the eastern portion of the county near the town of Merced. The County of Merced and the University of California worked together on the initial stages of an NCCP plan that would have addressed conservation of grassland and vernal pool ecosystems while accommodating a new UC campus and additional growth and development in the adjacent urban areas.

As NCCPs have been approved in southern California, the Department, in cooperation with other resource agencies and the local jurisdictions, has turned its attention and resources to implementation tasks. Such tasks include habitat acquisition in cooperation with the Wildlife Conservation Board (WCB) and administering a Local Assistance Grants program. More than 30 Local Assistance Grants have been dispersed since 2000.

The Department is also working with WCB to purchase property suitable for the preservation, protection and restoration of wildlife habitat, as well as for recreation purposes. Many projects, large and small, are approved annually by the WCB. These projects benefit listed and sensitive species of plants and animals, protect watersheds, provide critical linkages between habitat areas, and help maintain open space. The WCB employs a number of different funding sources to acquire such lands.

In 2001, a new source of funds was made available to the Department. The USFWS Endangered Species Act Section 6 Recovery Land Acquisition Program provides grants to acquire habitat for the recovery of endangered and threatened species in support of USFWS approved Recovery Plans. Since this program began, the Department has received more than $8,000,000 in Recovery Land Acquisition funds. Upon acquisition, these lands are held in perpetuity for the conservation, protection, and recovery of those species. Compatible recreational activities can be allowed on these Recovery Lands, as long as the recreational activities are not in conflict with the purposes for which the lands are acquired. Such activities can include wildlife viewing and nature walks.

Recent WCB acquisitions include:

- **Mill Creek Redwood Forest in Del Norte County.** The completed acquisition of 24,772 acres protects the watershed of Jedediah Smith Redwoods State Park and is strategically located between Redwood National and State Parks and the Smith River National Recreation Area. Mill Creek supports healthy runs of coho salmon, chinook salmon, steelhead, and coastal cutthroat trout.

- **Wetlands protection and restoration projects in the San Francisco Bay Area** in Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties. Funds will be used for technical studies and marsh restoration; projects to improve water quality for

anadromous fish; restoration of tidal flows; restoration of natural spring-fed channels and riparian habitat; and for public outreach.

- **Petaluma Marsh Wildlife Area, Bahia Wetlands Unit of Marin County.** The 645-acre acquisition supports blue oak woodland, salt marsh, and annual grasslands. The interface of blue oak woodland and salt marsh is unique. Numerous sensitive species are found on the property, including the federally-listed soft bird's-beak and endangered salt marsh harvest mouse, as well as the northern harrier, salt marsh yellowthroat, and San Pablo song sparrow.

- **Watsonville Slough Complex.** The WCB acquired 289 acres in Santa Cruz County in the upper watershed of Galighan Slough, one of the major sloughs and tributaries within the Watsonville Slough Complex. This acquisition provides habitat for a number of listed and sensitive species including the Santa Cruz long-toed salamander, California red-legged frog, California tiger salamander, and robust spineflower.

- **Morro Bay Dune Ecosystem in San Luis Obispo** The WCB has been instrumental in purchasing key parcels of property to protect portions of the dune ecosystem. These parcels total more than 400 acres and are key links in the Morro Bay Dunes Greenbelt, a community initiated effort to create a habitat and trail corridor connecting Montana de Oro State to Morro Bay State Park, as well as to other open space areas in the Morro Bay watershed.

DFG File Photo

- **Dressler Ranch in Mono County**. In 2003, the WCB completed acquisition of the Dressler Ranch which has been placed into a conservation easement that bars development and allows only normal cattle ranching operations. The property encompasses more than 6,000 acres that provides habitat for the sage grouse and protects more than 10 miles of riparian habitat.

- **Potrero Canyon in Riverside County.** Acquisition of Potrero Canyon represents an expansion of the Department's San Jacinto Wildlife Area by more than 8,500 acres and ensures connectivity between national forest land and other conserved areas in Riverside County's regional Multiple Species Habitat Conservation Plan (MSHCP) and Natural Communities Conservation Plan (NCCP). Thirty-one threatened and endangered species, and species of special concern, occur on the site.

Dan Marschalek, DFG File Photo

- **Rancho Jamul in San Diego County.** The acquisition of approximately 3,210 acres of land located in the Hollenbeck Canyon area of preserves critical habitat and wildlife corridors identified in the San Diego County Multiple Species Conservation Plan and provides a connection between the Department's Rancho Jamul Ecological Reserve and Hollenbeck Canyon. It will eventually connect other wildlands with the Cleveland National Forest.

Conservation of sensitive species and habitats is also an intrinsic component of the Central Valley Project Conservation Program (CVPCP), a joint project of the Bureau of Reclamation (USBR) and US Fish & Wildlife Service (USFWS). Numerous conservation and restoration projects have been funded through the CVPCP. Research projects and studies are also an intrinsic part of this ecosystem-based program. Project Conservation of sensitive species and habitats is also an intrinsic component of the Central Valley Project Conservation Program (CVPCP) is a joint project of the Bureau of Reclamation (USBR) and US Fish & Wildlife Service (USFWS).

Numerous conservation and restoration projects have been funded through the CVPCP. Research projects and studies are also an intrinsic part of this ecosystem-based program. Project partners include public and private entities such as the Department, Bureau of Land Management (BLM), the California Department of Transportation (Caltrans), the State Water Resources Control Board (SWRCB), the Trust for Public Lands, The Nature Conservancy (TNC), and the Shasta Land Conservancy. These projects benefit state and federally-listed species and their habitats. Species include the giant garter snake, riparian brush rabbit, Bakersfield cactus, and Keck's checkerbloom and such diverse habitats as vernal pools, Pine Hill chaparral, and native grasslands.

The Department has made significant progress in working with public and private entities to establish conservation banks throughout California. The established conservation banks protect numerous threatened and endangered animals and plants including the San Joaquin kit fox, California red-legged frog, valley elderberry long-horned beetle, coastal California gnatcatcher, Sebastopol meadowfoam, and slender Orcutt grass. More than 7,150 acres of habitat for threatened and endangered species have been conserved in conservation banks since 2000. The conservation banks range in size from as small as 28 acres to protect vernal pool plants and crustaceans to those as large as 3,200 acres for more wide-ranging species such as the San Joaquin kit fox. The approved conservation banks not only provide a viable alternative to the costly process of conventional project permitting and mitigation at a single site, but also contribute to large scale conservation planning efforts. Approved conservation banks include the Agua Fria Conservation Bank in western Merced County (San Joaquin kit fox, California red-legged frog, and burrowing owl); the Brushy Creek Conservation Bank in Alameda County (colonies of burrowing owl); and the Stillwater Plains Mitigation Bank in Shasta County (vernal pools and wetlands). Many more conservation banks, encompassing over 3,000 acres, are currently being reviewed as future conservation banks.

The 2005 report represents a new direction for the Department. Previous reports were disseminated as bound publications. The current report is being distributed on-line on the DFG website as well as by CD to increase public awareness of the status of sensitive species in California. Many dedicated biologists contributed information and text to this report and helped prepare the document in its electronic format. Many others kindly lent their images for use throughout the document or provided technical review. We wish to acknowledge their participation and thank them for their support and interest.

INTRODUCTION

The Mission of the Department of Fish and Game is to manage California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public.

Protection and Management of California Species

The Department of Fish and Game (DFG) has statewide responsibility for the conservation and recovery of California's listed rare, threatened, and endangered plants and animals. Department staff carry out research, management and monitoring programs, participate in recovery planning, and work cooperatively with the federal government, other State and local agencies, landowners, conservation groups, and the public in various ways to further conservation. The Department also focuses on conserving assemblages of species and habitats on a landscape level through locally-based cooperative conservation planning. Department activities today reflect a long history of conservation planning in California and are framed by California and federal law.

State Law

Management of California's wildlife and habitats predates California statehood. The State of California enacted its first law specifically dealing with fish and game in 1851, two years after statehood. This law concerned the right to take oysters and the protection of property rights of persons planting oysters. In the following year, California enacted the first law related to game species, protecting elk, antelope, deer, quail, mallard, and wood ducks for six months of each year. The State also passed a law protecting salmon runs, followed by laws creating closed seasons for trout and the State's first game refuge, Lake Merritt in the City of Oakland.

In 1870, the Board of Fish Commissioners, the forerunner of the Fish and Game Commission, was established "to provide for the restoration and preservation" of fish in California waters. The responsibilities of the Board of Fish Commissioners were expanded to include game species in 1878. In the late 1800s and early 1900s, the administration of fish and game laws was strengthened and expanded: hunting limits were set for deer, quail, ducks, and doves, and night hunting was banned. In 1907, the first hunting licenses were issued; proceeds from the license sale and from fines were credited to the Fish and Game Preservation Fund. Recognition of the importance of wildlife conservation continued to grow with passage of additional legislation such as a law to protect the sea otter, enacted in 1913.

In 1927, the Division of Fish and Game was created within the Department of Natural Resources.

Its legal mandates was codified in 1937 when the Legislature enacted the Fish and Game Code. During the 1930s and 1940s, the role of the Division of Fish and Game expanded to include restoration of wildlife habitat and fish restoration and management. These programs were funded in part through grants from the federal government. The Wildlife Conservation Board was established to administer the capital acquisition and development program for conservation and recreational uses of fish and wildlife. The Division of Fish and Game was elevated to Department status in 1951. With the passage of the federal Fish and Wildlife Coordination Act in 1958, full consideration of fish and wildlife resources and formal coordination between the Department and the federal government was required for federal projects planned in California. The first statewide master plan for fish and wildlife in the United States, the California Fish and Wildlife Plan, was completed in 1965. The report created an inventory of wildlife, inland fish, salmon and steelhead, and marine resources. The report described amount of habitat and status of species by county, described land and water resources, and human use of the resources.

The early laws and policies defined and strengthened the role of the Department in the conservation, protection, and management of wildlife and native plants and habitat necessary for their survival. The Department holds these resources in trust for the people of California. That legal framework has been further refined with revisions to the Fish and Game Code and the passage of several key pieces of legislation. Summarized below, these include the California Endangered Species Act (CESA), the Native Plant Protection Act (NPPA), the California Environmental Quality Act (CEQA), the Natural Community Conservation Planning Act (NCCPA), and the creation of the list of Fully Protected Species.

Endangered Species Act of 1970. With passage of the Endangered Species Act of 1970, California became the first state to prohibit the importation, take, possession, and sale of endangered and rare species. This act expressed the Legislature's concern over the decline of wildlife species in California, defined rare and endangered wildlife, and gave authority to the Fish and Game Commission to designate animals as either rare or endangered.

California Environmental Quality Act. The California Environmental Quality Act (CEQA) (Public Resources Code, Section 21000 *et seq.*) was enacted in 1970. It is California's broadest environmental law and was modeled after the National Environmental Policy Act (NEPA). The basic goal of CEQA is to develop and maintain a high-quality environment now and in the future. The specific goals of CEQA for public agencies are to document and consider the significant environmental effects of their actions and, where feasible, either avoid those significant environmental effects, or to reduce those significant environmental effects by implementing feasible alternatives or mitigation measures.

CEQA helps guide the Department in issuance of permits and approval of projects that may have a significant impact on the environment. In its role as a Trustee Agency, the DFG must be notified of projects involving fish and wildlife of the state, rare and endangered native plants, wildlife areas, and ecological reserves. Although the Department cannot approve or disapprove a project as a Trustee Agency, public agencies are required to consult with the DFG about project impacts and proposed mitigation measures. Changes to CEQA in 1983 added definitions for rare and endangered plants and animals along with language providing for their protection. CEQA can be found online at http://ceres.ca.gov/topic/env_law/ceqa/.

Native Plant Protection Act of 1977. In 1977, the Legislature formally recognized the status of rare or endangered plants with the passage of the Native Plant Protection Act (Fish and Game Code, Section 1900 *et seq.*). The NPPA directed the DFG to preserve, protect, and enhance rare and endangered plants in California. The NPPA also authorized the Fish and Game Commission to designate native plants as "rare" or "endangered" and to require permits for collecting, transporting, or selling such plants. The Commission listed 24 plants in 1978.

California Endangered Species Act of 1984 (Fish and Game Code, Section 2050 *et seq.*,). In 1984, two Assembly bills (AB 3309 and AB 3270) replaced the 1970 Endangered Species Act and became known as the California Endangered Species Act. The full text of CESA can be found at http://ceres.ca.gov/env_law/cesa/stat/. The definitions and procedures in CESA closely parallel those of the Federal Endangered Species Act. Highlights include:

- A policy that the State to conserve, protect, restore, and enhance any endangered or threatened species and its habitat.

- 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 the Department of Fish and Game whenever a project might impact a listed species. The DFG and State lead agencies are then required to develop reasonable and prudent alternatives consistent with conserving the species.

- A requirement that no person shall take listed species without express authorization from the DFG.

- A requirement that the Commission adopt guidelines for individuals seeking to petition the Commission to add a species to the state list of threatened and endangered species. CESA outlines a petition process; describes the information that must be provided in the petition; and describes the procedure DFG must follow to evaluate the petition and make its recommendation to the Commission whether the petitioned action may be warranted. The petition format and the criteria for listing are described in the California Code of Regulations, Title 14, Section 670.1. The California Code of Regulations is available online at http://ccr.oal.ca.gov/.

- 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. The timeline for the "annual report" has now been lengthened by the Legislature to three years.

CESA requires DFG to prepare a report summarizing the status of all State-listed endangered, threatened, and candidate species for the Commission, the Legislature, and the Governor. This current report describes California's listed and candidate species, currently at 79 animals and 221 plants. The State lists of rare plants and 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, Wildlife and Habitat Data

Analysis Branch, 1416 Ninth Street Sacramento, California 95814, or on the web at http://www.dfg.ca.gov/whdab/.

Three major bills were enacted in 1997 to amend CESA:

- Senate Bill 879 authorized the Department to issue permits for take of state-listed species that occurs during otherwise lawful activities, such as development projects. These permits are called incidental take permits, because the take is incidental to the activity. The Department adopted regulations effective December of 1998 addressing incidental take permits (California Code of Regulations Title 14, Div. 1, Sections 783.0-783.8).

- Senate Bill 231 allows the development of locally designed voluntary programs to avoid and minimize take of listed species during agricultural activities and to encourage retention of wildlife habitat on farms and ranches. Take of listed species occurring under the voluntary programs would not require a permit from the Department. This bill also authorized accidental take of listed species resulting from inadvertent or ordinary negligent acts that occur on a farm or ranch during routine and ongoing agricultural activities. The Department adopted regulations effective December 1998 addressing incidental and accidental take during agricultural activities (California Code of Regulations, Title 14, Div. 1, Sections 786.0-786.6).

- Assembly Bill 21 waived the requirement for an incidental take permit from the Department for projects consistent with CESA that have obtained federal incidental take authorization under Sections 7 or 10(a) of the Federal Endangered Species Act. This exemption applies only to species that are listed under both the state and federal endangered species acts.

- The sections of CESA that required state lead agencies to consult with the Department regarding projects that could result in incidental take were automatically repealed on January 1, 1999. The repeal means that state agencies can no longer obtain authorization to take listed species through consultations with the Department distinct from the incidental take process.

Natural Community Conservation Planning Act. (Fish and Game Code, Sections 2800-2835). Assembly Bill 2172, known as the Natural Community Conservation Planning Act, became effective in 1991. The Act recognized the significance of the conservation and management of entire natural communities. Natural community conservation planning has become an important tool in conserving natural diversity while permitting reasonable use of natural resources for economic development.

The focus of the initial Natural Community Conservation Planning effort was the coastal sage scrub habitat of Southern California, home to the California gnatcatcher and approximately 100 other sensitive species. This much-fragmented habitat is scattered over more than 6,000 square miles and encompasses large parts of Orange, San Diego, and Riverside Counties, and smaller portions of Los Angeles and San Bernardino Counties. Fifty-nine local government jurisdictions, scores of landowners from across these counties, federal wildlife authorities, and the environmental community are actively participating in the program. The planning effort has now expanded throughout the State. Working with landowners,

environmental organizations, and other interested parties, the local agency oversees the numerous activities that compose the development of a conservation plan. The DFG and the USFWS provide the necessary support, direction, and guidance to NCCP participants.

Fully Protected Species. The California Legislature took action as early as 1873 to give full protection to some species of wildlife. The bighorn sheep was the first animal to be protected from hunting and trapping and, over the years, the Legislature has periodically given full protection to other animals. The original Fully Protected Species list was established in 1933 as part of the Fish and Game Code to protect certain mammals against take by hunting. In 1957, marine mammals and some birds were listed as fully protected with the intent to manage the take of species that appeared in need of special protection under the law. In 1971, Sections 3511, 4700, and 5050 of the Fish and Game Code were amended to give the Department limited authority to issue permits to take fully protected species. The only activities permitted were the "collecting of such species for necessary scientific research," and for birds, "the live capture and relocation of such species pursuant to a permit for the protection of livestock." Permits for research on California condors, sea otters, and bighorn sheep may be prepared by the Department only after approval by the Commission (California Code of Regulations, Title 14, Section 670.7(f)). Nelson bighorn sheep may be taken for regulated sport hunting (Fish and Game Code, Section 4902).

Amendments to the Fish and Game Code took effect on January 1, 2004 and require a public review process before DFG may issue permits to take fully protected species. The public has 30 days after notification is published in the California Regulatory Notice Register to provide any relevant information and comments on the proposed authorization. The Code also allows DFG to authorize taking of species not only for necessary scientific research, but also for efforts to recover fully protected, threatened, or endangered species. The amendments include a clarification that scientific research does not include actions taken as part of specified mitigation for a project.

Species of Special Concern. Species in this report do not comprise all California species that are considered to be at risk. "Species of Special Concern" (SSC) are animals that are not listed under State law. The designation is intended to focus attention on the species that require special management consideration and to help avert the need for listing under federal and State endangered species laws. This designation is also intended to stimulate collection of additional information on the biology, distribution, and status of poorly known species, and focus research and management attention on them.

Species of Special Concern share one or more of the following criteria:

- They occur in small, isolated populations or in fragmented habitat, and are threatened by further isolation and population reduction.
- They are rare or uncommon species and show marked population declines.
- They depend on a habitat that has shown a substantial reduction in size over historic levels.
- They occur only in or adjacent to an area where habitat is being converted to land uses incompatible with the animal's survival.

- The species have few California records, or occurred here historically, but for which there are no recent records.
- They occur largely on public lands, but where current management practices are inconsistent with the animal's long-term survival.

Federal Law

The federal Endangered Species Act (ESA) represents the culmination of a long history of federal involvement in the management and protection of wildlife that began with passage of the Lacey Act in 1900. The Lacey Act authorized the federal government to intervene in states' management of wildlife species and was a direct response to the decimation of the passenger pigeon in the eastern U.S. (The passenger pigeon is now extinct.) The Lacey Act was followed by passage of the Migratory Bird Treaty Act of 1918, the Migratory Bird Conservation Act of 1929, and the Fish and Wildlife Conservation Act of 1934. The Migratory Bird Conservation Act established a commission to oversee acquisition of land necessary for the conservation of migratory birds. The Fish and Wildlife Conservation Act ensured that fish and wildlife resources receive consideration equal to that given other values while planning water development projects.

Increasing public awareness in endangered species protection led to establishment of the Committee on Rare and Endangered Wildlife Species in 1964. The committee published the "Redbook" later that year. The Redbook comprised the first federal list of fish and wildlife believed to be in danger of extinction. Congress subsequently passed the Endangered Species Preservation Act in 1966. This act directed federal agencies to preserve the habitats of native vertebrate species found to be threatened with extinction. The Act provided only limited protection of species so designated listed insofar as protection was consistent with the primary purposes for which an agency was established. One important outcome of this Act was the creation of the National Wildlife Refuge System. Habitat acquired to protect endangered species became part of the refuge system.

In 1969, the Endangered Species Conservation Act was passed to provide additional protection to species in danger of "worldwide extinction". This new law protected vertebrate, as well as invertebrate species. Congress also extended the prohibitions of the Lacey Act to cover interstate commerce involving reptiles, amphibians, and certain invertebrates. Import of such species was prohibited, as was their subsequent sale within the U.S. The Endangered Species Conservation Act also called for an international ministerial meeting to adopt a convention on the conservation of endangered species. A conference in Washington, D.C. in 1973 led to the signing of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), which restricted international commerce in plant and animal species threatened with extinction. Later that year, the Endangered Species Act of 1973 was passed.

The Endangered Species Act (ESA) combined and considerably strengthened the provisions of previous endangered species laws. The ESA eliminated distinctions between domestic and foreign species threatened with extinction. It also lowered the threshold of endangerment to include species that were

threatened in a significant portion of their range rather than only on a worldwide level. Several provisions of the ESA are intrinsically related to the protection and management of state-listed species in California.

- **Section 3.** Categories of "endangered" and "threatened" were defined. Plants and all classes of invertebrates became eligible for protection, as they are under CITES. The California Endangered Species Act designations of "threatened" and "endangered" largely follow those of the federal Act. Many species listed under the ESA are also listed by California. A complete list of federal threatened and endangered species that occur in California is also available at http://endangered.fws.gov/wildlife.html#Species.

- **Section 5.** Authority was provided to acquire land for listed animals and for plants listed under CITES. The Department is similarly authorized to acquire land for the protection and management of listed plants and animals. Federal funds often augment acquisition by the State.

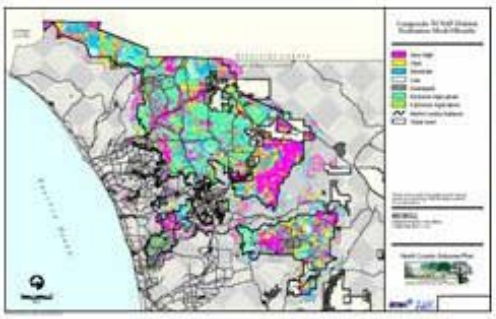
- **Section 6.** Matching federal funds became available for States with cooperative agreements. The Department uses these funds to conduct research and implement management activities that benefit listed species.

- **Section 7.** All federal agencies were required to undertake programs for the conservation of endangered and threatened species, and were prohibited from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or modify its "critical habitat." The Department works closely with its federal counterparts in the U.S. Fish and Wildlife Service to ensure that species listed under federal law are not adversely affected by research or management projects.

- **Section 9.** Prohibitions were applied to activities that could jeopardize any listed animal species. In 1982, the ESA was amended to prohibit removing listed plants from land under federal jurisdiction. And in 1988, protection for endangered plants was extended to include destruction on federal land and other activities if they violate State law. California law closely parallels the federal Act, and also prohibits activities that could impact state-listed threatened and endangered plants.

Ultimately, the federal ESA and the California Endangered Species Act attempt to bring populations of listed species to self-sustaining levels so that protection under the law is no longer needed.

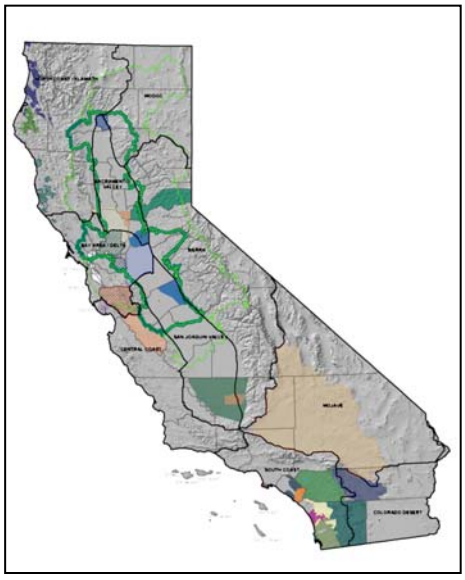
PLANNING FOR CONSERVATION AND RECOVERY



Statewide responsibilities for conservation and recovery of California's listed species of rare, threatened, and endangered plants and animals are spread among the Department's staff in headquarters and in regions (Appendix 2). Department biologists maintain information on plants and animals of special concern, and plan for conservation of these species in cooperative conservation plans and other conservation programs.

A variety of funding sources is available to the Department to promote recovery of threatened and endangered species. Funding sources include the California Endangered Species Tax Check-Off fund, Federal Endangered Species Act Section 6 Funds appropriated by Congress and administered by the USFWS, the Environmental License Plate Fund, the Tobacco Tax and Health Initiative (Proposition 99), mitigation funds, funding under the CALFED Bay-Delta Program, the Central Valley Project Improvement Act (CVPIA), and other grant sources, for example, the federal Partnerships for Wildlife Act funds.

Natural Community Conservation Planning (NCCP)



The Natural Community Conservation Planning Act was enacted in 1991. The purpose of natural community conservation planning is to provide for the conservation of biological diversity by protecting biological communities at the ecosystem and landscape scale. Conservation of biological diversity includes protecting threatened, endangered, sensitive, and more common species, natural communities, and the ecological processes necessary to sustain ecosystems over time. A natural community conservation plan (NCCP) identifies and provides for measures necessary to conserve and manage natural biological diversity within the geographic area of the plan, while allowing appropriate and compatible economic development, growth, and other human uses. Working with landowners, environmental organizations (for example, the California Native Plant Society and Endangered Habitats League), and other interested parties (for example, the Building Industry Association, outdoor enthusiasts such as horse riding groups, and local land trusts), a local agency or landowner oversees the numerous activities that compose the development of an NCCP. The DFG and USFWS (and NOAA Fisheries, where appropriate) provide the necessary support, direction, and guidance to NCCP participants. Additional information on NCCP planning is available on the web at www.dfg.ca.gov/nccp.

NCCP Act Revamped

Changes were made to the NCCP Act (Fish and Game Code Section 2800 *et.seq.*) in 2000, 2002, and 2003. The changes to the Act bolstered the standards for creation and approval of NCCPs and reflected the DFG's application of the NCCP Act through non-regulatory NCCP Guidelines. New emphasis and standards were added to address independent scientific input, planning agreements, public participation, species coverage, approval findings, statutory assurances, and grandfathering for plans underway prior to the enactment of the new legislation.

Status of NCCP Plans

Status of Southern California NCCP Plans

NCCP planning continues in Los Angeles, Orange, Riverside, and San Diego counties. For the purposes of NCCP, the southern California coastal sage scrub ecosystem was divided into ecologically based subregions, and further divided into subareas that match local government jurisdictions. Each subregion and subarea is creating its own NCCP. Significant progress was made during 2000-2003 on the following plans.

City of Chula Vista MSCP Subarea Plan. The City of Chula Vista has completed a subarea plan under the Multiple Species Conservation Program (MSCP) of San Diego County. The subarea plan will preserve approximately 9,243 total acres, 4,993 acres within the City limits and an additional 4,250 acres in the unincorporated area of San Diego County. The City approved and adopted the subarea plan on May 13, 2003, which provides for the conservation of 86 species including the state-listed salt marsh bird's-beak, Otay tarplant, light-footed clapper rail, California least tern, and least Bell's vireo. State and federal permits are anticipated in 2004.

Coachella Valley Multiple Species Habitat Conservation Plan (CVMSHCP). The CVMSHCP covers the central portion of Riverside County which is the westernmost edge of the Sonoran Desert. The plan area covers 1.2 million acres, a diverse mixture of 27 desert and mountain natural communities, and proposes coverage for 27 species. State-listed species include desert tortoise, Coachella Valley fringe-toed lizard, desert pupfish, least Bell's vireo, southwestern willow flycatcher, and Peninsular bighorn sheep. Independent scientific advisors were convened to provide additional scientific guidance on the plan, and their report was released in April, 2001. The Coachella Valley Association of Governments has prepared an Administrative Review Draft which reflects the work of the local Scientific Advisory Committee, the Implementation Subcommittee, and the Project Advisory Group. After receiving comments from the local, state and federal agencies, a Public Review Draft and Draft EIR/EIS are scheduled for release in early 2004.

Orange County Southern Subregional Plan. The County and major landowners are preparing a subregional NCCP, a special area management plan, and master streambed alteration agreement. The plan encompasses 91,000 acres, with 57,000 acres of natural habitat including coastal sage scrub, chaparral, grassland, riparian, and oak woodlands. State-listed species covered by the plan include least Bell's vireo, southwestern willow flycatcher, and thread-leaved brodiaea. An update to the County's General Plan and Zoning Ordinance is also underway. A series of public workshops were held in 2002 and 2003 to provide the opportunity for public input on alternatives for the three planning efforts in southern Orange County.

Palos Verdes Peninsula Subregional Plan. The City of Rancho Palos Verdes NCCP encompasses 8,661 acres of which only 2,368 acres support natural vegetation. The City has addressed conservation of most of the coastal sage scrub habitat on the Palos Verdes Peninsula. With additional conservation of other habitats such as southern cactus scrub, grassland, and riparian scrub, the plan intends to cover 20 species. The plan addresses one state-listed species, Lyon's pentachaeta. A final plan is anticipated to be completed in 2004.

San Diego Joint Water Agencies (JWA) Subregional Plan. The JWA NCCP describes how four water agencies in San Diego County will manage their lands to conserve natural habitats and species while continuing to provide their mandated water services. The plan addresses 5,673 acres of habitat. The subregional plan will serve as an umbrella document for the subarea plans of the water districts: Helix Water District, Padre Dam Municipal Water District, Sweetwater Authority, and Santa Fe Irrigation District. In July 2003, SB 572 was signed into law by the Governor, amending the NCCP Act to provide grandfathering coverage to the water agencies.

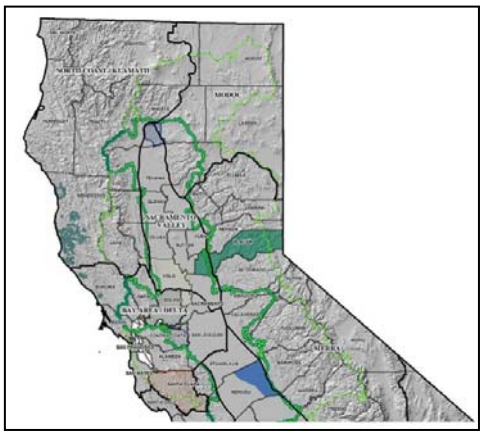
San Diego Multiple Habitat Conservation Program. The subregional plan for the northwestern portion of San Diego County (Cities of Carslbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach and Vista) was approved by the San Diego Association of Governments Board of Directors on March 28, 2003. The subregional plan encompasses 29,962 acres of natural habitat, and provides conservation for 77 species. State-listed species covered by the plan include San Diego thorn-mint, Encinitas baccharis, Orcutt's spineflower, Belding's savannah sparrow, and Stephen's kangaroo rat. NCCP permits will be issued to participating cities upon completion and DFG approval of their individual subarea plans.

San Diego North County MSCP Subarea Plan. The County of San Diego is preparing the North County Subarea of the San Diego MSCP which will be amended into the MSCP. The subarea plan will include many of the 85 species covered in the existing MSCP plan but also some additional species -- the most notable being the Stephen's kangaroo rat which lives in grasslands and the San Diego fairy shrimp which inhabits vernal pools. Recent progress includes collection of additional biological information, completion of the science advisory process, habitat evaluation, and reserve design modeling.

Western Riverside County Multi-Species Habitat Conservation Plan (MSHCP). Riverside County is taking a new approach to land use planning: simultaneously integrating creation of an NCCP with an update of the County General Plan and a transportation corridor plan. This approach allows for longer term development and transportation planning to be balanced with conservation of sensitive resources in a much more comprehensive way. The MSHCP builds upon a previously approved habitat conservation plan which only addressed Stephens' kangaroo rat. The MSHCP project area is 1.2 million acres and the proposed conservation area, including public lands, is approximately 500,000 acres. The core area reserves include habitats such as riparian, oak woodland, and 15,000 acres of coastal sage scrub. On June 17, 2003, the Riverside County Board of Supervisors certified the EIR and approved the Western Riverside MSHCP. The state and federal wildlife agencies approved the plan and permits were issued June 22, 2004.

NCCP in Northern California

Over the last four years, the NCCP program was expanded and made available throughout California. Planning efforts have begun in Contra Costa and Placer Counties, as well as with the Mendocino Redwoods Company. Plans are being considered in other northern California areas including Santa Clara, Solano, and Yolo Counties. Significant accomplishments in northern California include the following plans.



East Contra Costa County Plan. Contra Costa County and 6 other local area agencies have formed a Habitat Conservation Plan Association (HCPA) to develop a regional conservation plan for the eastern portion of the county. The plan area covers 190,000 acres. Grazed annual grasslands are the most common land cover in the undeveloped portions of the planning area. Other natural communities present include oak woodland, oak savannah, chaparral/scrub, riparian scrub and woodland, and permanent and seasonal wetlands. State-listed species being addressed in planning include San Joaquin kit fox, Swainson's hawk, Alameda whipsnake, and giant garter snake. Independent science advisors met four times in 2003. A compilation of their proceedings is pending. The NCCP planning agreement was signed by the HCPA and DFG and became effective in November 2003. A preliminary working draft of the plan was put out for public review in late 2003.

Mendocino Redwood Company Plan. Mendocino Redwood Company is transforming its landscape approach to sustainable yield timber harvesting into a Natural Community Conservation Plan intended to conserve listed and non-listed species and natural communities on its lands. State-listed species being evaluated for coverage include the marbled murrelet, coho salmon, and 16 plant species. A planning agreement was signed in August 2003. The proposed plan will cover approximately 232,000 acres of private lands within the timber harvest zones of Mendocino and Sonoma Counties that the company currently owns or holds timber rights to. The report of the independent scientific advisors was completed in 2003, and an administrative draft of the plan was produced.

Placer County Legacy. Placer County, DFG, and USFWS finalized an NCCP planning agreement in December 2001. The County is preparing the NCCP in three phases. Phase 1 is underway now and covers the valley floor and low foothill portions of the County. State-listed species included for analysis of coverage are Swainson's hawk, giant garter snake, and Bogg's Lake hedge-hyssop. A Biological Working Group made up of area stakeholders meets regularly to discuss planning options. Draft species accounts have been completed. The County is working to establish a process to review and evaluate interim projects so that during the planning process development projects can proceed without foreclosing conservation options.

An Opportunity Lost

Merced County and University of California at Merced Plan. After no progress since the late summer of 2002, the County of Merced stopped preparation of the Merced Plan in early 2004, indicating

that the issues were too controversial. The plan would have covered the eastern portion of the county near the town of Merced. The County of Merced and the University of California worked together on the initial stages of an NCCP plan that would have addressed conservation of grassland and vernal pool ecosystems while accommodating a new UC campus and additional growth and development in the adjacent urban areas. State-listed species that would have benefited from the plan include San Joaquin kit fox, Swainson's hawk, San Joaquin Valley Orcutt grass, and Colusa grass, as well as other sensitive species. An NCCP planning agreement was signed in the summer of 2001. Biological data were collected and are available in a report entitled "The Wildlife and Rare Plant Ecology of Eastern Merced County's Vernal Pool Grasslands". The team of independent scientific advisors completed their report in November 2002.

Implementation of Approved NCCPs

As NCCPs have been approved in southern California (seven to date), the DFG, in cooperation with other resource agencies and the local jurisdictions, has turned its attention and resources to implementation tasks. Such tasks include habitat acquisition, adaptive management, monitoring, seeking grants, and administering a Local Assistance Grants program.

Habitat Acquisition. The Wildlife Conservation Board (WCB) authorized funds for the acquisition of approximately 21,426 acres of habitat lands to contribute to the reserve systems of NCCPs during the period 2000 through 2003. WCB acquired 794 acres in Orange County, nine acres in San Bernardino County, 8,182 acres in San Diego County, and 12,441 acres in Riverside County.

Management and Monitoring. The approved NCCPs in San Diego County are in the earliest stages of reserve management and biological monitoring, while Orange County's management and monitoring program is fully operational. Activities in these counties include adaptive management and monitoring.

Adaptive management:

- development of area specific management plans and fire management plans;
- vegetation mapping;
- baseline surveys for sensitive insect, plant, and animal resources;
- restoration of coastal sage scrub;
- erosion control to protect willowy monardella;
- restoration of wetland and riparian habitats; and invasive weed control.

Monitoring:

- development of standardized monitoring protocols, data recording, and a centralized database;
- assessment of digital imagery techniques for monitoring habitat change over large reserve systems;
- habitat and population monitoring;
- tracking exotic ant invasions;

- vernal pool inventories;
- wildlife corridor monitoring.

Western Riverside County and the Coachella Valley NCCPs are just beginning implementation. Initial inventory and monitoring strategies and protocols are being developed under the lead of the DFG Resource Assessment Program. Frameworks for both NCCPs will emphasize an initial inventory and assessment phase, followed by long-term species, community, and landscape monitoring. Surveys for many taxa are underway, species niche models are being developed, community approaches are being derived, protocol field guides and training manuals have been compiled, data storage is being designed, and techniques for assessing wide-scale ecological change are being tested.

Local Assistance Grants Program. The Local Assistance Grants Program provides funding to implement a variety of tasks related to natural community conservation planning. Grant recipients and tasks associated with these grants are presented in the following tables.

Local Assistance Grants 2000	
Grant Recipient	**Task**
San Diego Association of Governments	Habitat tracking GIS support
The Nature Conservancy	Vegetation mapping for coastal Orange Co.
City of Poway	Wildlife corridor monitoring
San Diego State University	Index of biological integrity for coastal sage scrub
Orange County	Exotic species control
City of San Diego	Coastal sage scrub restoration
Various	Rare species monitoring

Local Assistance Grants 2001	
Grant Recipient	**Task**
Riverside County	Habitat tracking GIS support
The Nature Conservancy	Modeling to assess habitat connectivity
Coachella Valley Assoc. of Governments	Biological monitoring program development
City of Chula Vista	Baseline monitoring surveys
City of San Diego	Invasive species control
San Diego County	Habitat management plan development
Riverside County	Habitat restoration techniques testing
Various	Rare species monitoring

Local Assistance Grants 2002	
Grant Recipient	**Task**
The Nature Conservancy	Modeling to assess habitat connectivity
Coachella Valley Assoc. of Governments	Biological monitoring program development
City of Chula Vista	Baseline monitoring surveys
Wildlife Research Institute Inc.	Raptor monitoring
City of San Diego	Development of a GIS database for Management and monitoring information

Local Assistance Grants 2002	
City of San Diego	Reserve management plan development
City of San Diego	Burrowing owl habitat enhancement, management, and monitoring

Local Assistance Grants 2003	
Grant Recipient	**Task**
Riverside County	Habitat management on new reserves
City and County of San Diego	Monitoring the impacts of fire on the San Diego reserve system
San Diego County	Habitat enhancement for Quino checkerspot butterflies
City of San Diego	Fencing for vernal pool protection
Wildlife Research Institute Inc.	Training program for raptor monitoring
City of San Diego	Reserve management plan development

Local Assistance Grants 2004	
Grant Recipient	**Task**
Riverside County	Preparation of materials and training for cities in implementing the Riverside County MSHCP
San Diego State University	Revision of the San Diego County MSCP Biological Monitoring Plan
The Nature Reserve of Orange County	Management of reserve lands at the El Toro Marine Corps Air Station
Riverside County Park and Open Space District	Immediate management of newly acquired NCCP preserve lands

CONSERVATION BANKING

The Department has made significant progress in working with public and private entities to establish conservation banks throughout California from 1999 through 2002. The established conservation banks protect numerous state threatened and endangered animals and plants including the San Joaquin kit fox, giant garter snake, Least Bell's vireo, Alameda whipsnake, Sebastopol meadowfoam, Bogg's Lake hedge-hyssop, and slender Orcutt grass. Federal listed animals protected include the California red-legged frog, valley elderberry long horned beetle, coastal California gnatcatcher, Quino checkerspot, Conservancy fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp.

More than 7,150 acres of habitat for threatened and endangered species have been conserved in conservation banks. The conservation banks range in size from as small as 28 acres to protect vernal pool plants and crustaceans to those as large as 3,200 acres for more wide-ranging species such as the San Joaquin kit fox. The approved conservation banks not only provide a viable alternative to the costly process of conventional project permitting and mitigation at a single site, but also contribute to large scale conservation planning efforts such as the MSHCP and NCCP in southern San Diego County where banks provide habitat linkages for wildlife or contribute to recovery strategies for federally listed species.

Many more conservation banks are being proposed; over 3,023 acres are currently being reviewed as future conservation banks. The banks being proposed, such as a 1,300-acre site in Solano County, will go a long way toward conserving listed and special status species. The bank in Solano County, for example, will provide habitat for more than 10 state and federally listed and special status species. A few of the diverse conservation banks approved by the Department include:

Agua Fria Conservation Bank. The Agua Fria Conservation Bank is located in western Merced County and encompasses 3,300 acres. The bank provides habitat for the threatened San Joaquin kit fox and the burrowing owl, and is within the Designated Critical Habitat for the California red-legged frog.

Brushy Creek Conservation Bank. The Brushy Creek Conservation Bank is located on 120 acres in Alameda County. It conserves burrowing owl habitat and supports known colonies of burrowing owls.

Bryte Ranch Conservation Bank. The Bryte Ranch Conservation Bank protects protecting vernal pools and provides habitat for state listed plants on 573 acres in Sacramento County.

Pope Ranch Conservation Bank. This bank is located in Yolo County and provides habitat for the giant garter snake. 391 acres of freshwater marsh have been created or restored.

Stillwater Plains Mitigation Bank. The Stillwater Plains Mitigation Bank is located on the valley floor in Shasta County and encompasses 834 acres. The bank preserves vernal pools and vernal wetlands, and provides habitat listed species such as slender Orcutt grass, vernal pool fairy shrimp, and tadpole shrimp.

RECOVERY LAND ACQUISITION PROGRAM

It is the mission of the Department to maintain native fish, wildlife, plant species, and natural communities for their intrinsic and ecological value and their benefits to people of the State of California. Part of the Department's mission is to protect and maintain habitat in a sufficient amount and quality to ensure survival of all species and natural communities. One of the ways in which the Department carries out its mission to conserve and protect native species habitat is through land acquisition or through the use of conservation easements.

The Department, working in coordination with the Wildlife Conservation Board (WCB), selects, authorizes, and allocates funds for the purchase of land and waters suitable for the preservation, protection and restoration of wildlife habitat, as well as for recreation purposes. One of the funding sources used to acquire lands and easements for the protection of endangered and threatened species is the USFWS Endangered Species Act Section 6 Recovery Land Acquisition Program. WCB uses these federal grant funds, partnered with a minimum of 25% nonfederal matching funds, to acquire habitat for the recovery of endangered and threatened species in support of USFWS approved Recovery Plans. Since this program began in 2001, the Department has received more than $8,000,000 in Recovery Land Acquisition funds. Upon acquisition, these lands are held in perpetuity for the conservation, protection, and recovery of those species. Compatible recreational activities can be allowed on these Recovery Lands, as long as the recreational activities are not in conflict with the purposes for which the lands are acquired. Such activities can include wildlife viewing and nature walks. The table below summarizes the species and habitats that will benefit from these acquisitions.

If you are interested in finding about ecological reserves and preserve lands that are open for these activities, additional information can be found on the Department's web page at http://www.dfg.ca.gov/lands/lands.html.

Recovery Land Acquisition Projects

2001 Recovery Land Acquisition Projects	
Project and Location	**Species to be Recovered**
Kern primrose sphinx moth habitat (Kern County)	Kern primrose sphinx moth
Peninsular Bighorn Sheep (Riverside County)	Peninsular bighorn sheep
Purisima Hills (Santa Barbara County)	California tiger salamander
Coastal sand dunes (Monterey County)	Smith's blue butterfly, sand gilia, Monterey spineflower, Menzies' wallflower
Coast live oak and stabilized sand dunes (Elfin Forest) (San Luis Obispo county)	Morro shoulderband snail, Morro manzanita, Morro Bay kangaroo rat, Indian Knob mountainbalm, Morro blue butterfly
Larkin Valley wetlands (Santa Cruz County)	Santa Cruz long-toed salamander, California red-legged frog

2002 Recovery Land Acquisition Projects	
Project and Location	**Species to be Recovered**
Stabilized sand dunes (San Luis Obispo County)	Morro shoulderband snail, Morro manzanita, Morro Bay kangaroo rat, Indian Knob mountainbalm
Ramona Grasslands (San Diego County)	San Diego fairy shrimp, Stephen's kangaroo rat, arroyo toad, California gnatcatcher
Watsonville Slough wetlands (Santa Cruz County)	Robust spineflower, Santa Cruz long-toed salamander, California tiger salamander
Sandhill habitat (Santa Cruz County)	Mount Hermon june beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, Ben Lomond wallflower
Butte County vernal pools (Butte County)	Butte County meadowfoam, vernal pool tadpole shrimp, vernal pool fairy shrimp
Shay Meadow wetlands (San Bernardino County)	Unarmored threespine stickleback, bird-footed checkerbloom, slender petaled thelypodium, San Bernardino blue grass, California dandelion, southern mountain buckwheat, southern rubber boa

2003 Recovery Land Acquisition Projects	
Project Title	**Species to be Recovered**
La Sierra Canyon-Santa Monica Mountains (Los Angeles County)	Lyon's pentachaeta, Braunton's milkvetch, Santa Monica Mountains live-forever, Santa Monica Mountains dudleya, least Bell's vireo, California gnatcatcher, southwestern willow flycatcher, California red-legged frog, Wright's checkerspot butterfly
Watsonville Slough wetlands (Santa Cruz County)	Robust spineflower, Santa Cruz long-toed salamander, California tiger salamander
Gabbro Soil habitat (El Dorado County)	Stebbins' morning-glory, Pine Hill ceanothus, Pine Hill flannelbush, El Dorado bedstraw, Layne's butterweed
Colton Dune Ecosystem (San Bernardino & Riverside counties)	Delhi sands flower-loving fly, California gnatcatcher, Los Angeles pocket mouse, burrowing owl
China Hills (Siskiyou County)	Yreka phlox

2004 Recovery Land Acquisition Projects	
Project Title	**Species to be Recovered**
Dirty Socks Spring (Inyo County)	Owens tui chub, Owens pupfish
Gabbro soil plant habitat (El Dorado County)	Stebbins' morning-glory, Pine Hill ceanothus, Pine Hill flannelbush, El Dorado bedstraw, Layne's butterweed
Morro Bay shoreline (San Luis Obispo County)	California sea-blite, salt-marsh bird's-beak, western snowy plover, marsh sandwort, Morro shoulderband snail
Peninsular Ranges - Highway 74 (Riverside County	Peninsular bighorn sheep
Ramona Grasslands (San Diego County)	Stephen's kangaroo rat, arroyo toad, San Diego fairy shrimp, coastal California gnatcatcher
Soledad Canyon riparian properties (Los Angeles County)	Arroyo southwestern toad, unarmored threespine stickleback, least Bell's vireo, southwestern willow flycatcher, slenderhorned spineflower
Vernal pools, Millville Plains (Shasta County)	Vernal pool fairy shrimp, slender Orcutt grass

HIGHLIGHTS IN SPECIES CONSERVATION AND RECOVERY

The California and Federal Endangered Species Acts focus on the protection, preservation, and recovery of species whose numbers have declined significantly. Loss of habitat, including habitat fragmentation, is the single most important threat to the continuing survivorship of California's sensitive plants and animals. There are statewide efforts on the part of volunteers and resource professionals to reduce the downward trend experienced by many species. Species conservation projects and recovery activities are highlighted in this section.

Species Conservation

Invertebrate Species

California freshwater shrimp. The California freshwater shrimp is the State's only native, stream-dwelling shrimp. It is found in freshwater streams in Sonoma, Napa, and Marin Counties. Many agencies and private groups, including the NRCS, the WCB, the NPS, Marin County, Napa County, the California Coastal Conservancy, local schools, ranchers, and watershed groups, have contributed to the conservation of the California freshwater shrimp. Habitat restoration on Stemple Creek exemplifies this partnership. Stemple Creek rises near Petaluma and empties into the Pacific north of Dillon Beach in Marin County's Estero de San Antonio. A watershed approach to stream restoration began the late 1990s on the degraded stream. About 20 miles have been restored and ranchers have reconfigured pastures to protect the stream and reduce runoff from fields.

Restoration was also accomplished through a Center for Ecoliteracy project entitled "The STRAW Project" or "Students and Teachers Restoring a Watershed." The 4th Grade Brookside School students and their teacher worked alongside watershed restoration experts to map riparian habitat, monitor water quality, research native species, clear debris from creeks, and implement public awareness campaigns. Prior to the STRAW Project, it was estimated that 50 years would be needed to effect a change in the shrimp population levels in the degraded reaches of the Stemple Creek. However, the California freshwater shrimp could be found in the restored areas of Stemple Creek within three years. And, it is not only the shrimp that have benefited. Increased numbers of songbirds, frogs, and salamanders dependent on riparian habitat can now be found along the creek. For additional information about the Bay Institute and the STRAW Project, see http://www.bay.org/watershed_education.htm.

Reptiles and Amphibians

Giant garter snake. The USGS, Western Ecological Research Center (WERC), continues to provide science-based information for NCCP planning in the Sacramento Valley. Conservation strategies are being developed to recover populations of giant garter snakes. In addition, WERC continues to provide professional advice and information to the DFG. Ongoing research includes the use of morphological measurements and tissue samples for genetic determinations to improve the taxonomic description of this species which is inadequately treated in the current literature. Passive integrated transponder (PIT) tags are being used to permanently mark snakes for data collection. The telemetry information is being incorporated into a geographical information system, yielding statistically valid spatial analysis for estimating home range size and habitat preferences.

Numerous ongoing conservation efforts now focus on the giant garter snake. The California Rice Industry Association has developed stewardship practices for rice farming to protect giant garter snakes and the Bureau of Reclamation addresses potential impacts to endangered species caused by operations and maintenance of Central Valley Project (CVP) facilities through its Endangered Species Conservation Program. The U. S. Environmental Protection Agency and the California Department of Pesticide Regulation have produced rodenticide bulletins for Butte, Colusa, Fresno, Glenn, Kern, Madera, Merced, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba Counties. These bulletins identify use limitations that apply to areas where giant garter snakes have been reported. Regional habitat conservation planning efforts also provide for conservation of the giant garter snake. These plans include the Natomas Basin HCP for the city of Sacramento and Sutter County, the South Sacramento HCP, the San Joaquin County MSHCP and Open Space Plan, the Kern Water Bank HCP, Maxwell Irrigation District HCP, Natomas Basin Metro Air Park HCP, and the DFG Striped Bass Management Program HCP.

Birds

California Least Tern. The long-term increase in the number of nesting pairs in California is continuing. In 1970, there were about 600 nesting pairs statewide. Owing to intensive protection and enhancement efforts, the population has grown eleven-fold to nearly 7,000 pairs in 2003. Nesting was reported at 39 sites, nine of which exceeded 300 pairs. Several new colonies formed since the late 1990s, including those on nesting islands created at Batiquitos Lagoon and the Albany bay shore. Most of the population increase is accounted for by growth in colony size of 10 or 15 of the largest colonies. The tern colony at Alameda Island in San Francisco Bay, formerly part of a Naval Air Station, is now under National Wildlife Refuge management by USFWS and continues to be one of the largest least tern colonies in the state.

Habitat improvement projects at Mugu Lagoon, San Elijo Lagoon, DFG's San Dieguito and Batiquitos Lagoon Ecological Reserves, and the mouth of the Santa Ana River are benefiting many species, including the least

tern. The DFG is also expanding Venice and Huntington Beach protected areas and replacing worn fence at both sites. Habitat restoration efforts planned for Ballona Wetlands will enhance the nesting and foraging habitat of the tern. Future management of the San Diego and Sweetwater National Wildlife Refuges under a Comprehensive Conservation Plan will significantly improve habitat conditions for this species. Wetland restoration is also proposed at Bolsa Chica wetlands in Orange County. When implemented, this project will be one of the largest wetland projects in southern California. It will benefit numerous species and will enhance nesting and foraging habitat for least terns.

Belding's savannah sparrow. Habitat improvement projects at several coastal salt marshes in southern California have restored tidal flushing, eliminated exotic plants, and actively trapped and removed predators. As a result, the numbers of breeding pairs of Beldings savannah sparrows have increased. Restoration activities implemented by the Naval Air Weapons Station at Mugu Lagoon in Ventura County, for example, reestablished tidal flow to isolated patches of degraded salt marshes and substantially improved habitat for the sparrow. In 2001, twice as many pairs of sparrows were found when compared to the numbers of breeding birds found before restoration in 1996.

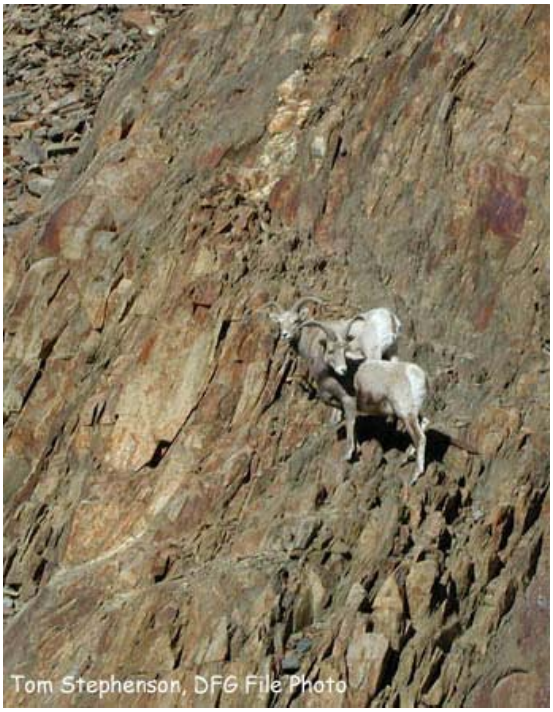
Restoration of tidal processes and creation of estuarine conditions at DFG's San Dieguito Ecological Reserve, San Diego County, also benefited breeding birds. Subsequently, about 75 pairs were reported in 2001, twice the breeding population recorded in surveys in the 1980s and 1990s before restoration commenced. Habitat protection and enhancement projects, such as those at Batiquitos Lagoon and the mouth of the Santa Ana River, have resulted in improvements in habitat conditions. Some wetlands, such as Goleta in Santa Barbara County, have been fenced to prevent human access. Eight state and federal agencies are proceeding with planning and environmental compliance requirements for the Bolsa Chica Wetlands Restoration Project, Orange County. When implemented, it will be one of the largest wetlands restoration projects in Southern California and will restore potentially hundreds of acres of Belding's Savannah sparrow pickleweed habitat.

California condor. More than 200 captive-bred condors were produced from 1988 to 2002 in three breeding facilities in southern California and Idaho. On the average, about 20 juveniles are being released to the wild annually. Three disjunct populations now exist in the condor's historic range in southern California, in Arizona/Utah, and in northern Baja California. The total condor population from January 1, 2000 to September 1, 2003 grew from 159 to 222 birds. During that time the wild population in California increased from 25 to 44 birds. The first hatchings in the wild of wild-laid eggs occurred in three California nests in 2002, but all three chicks died. The first wild chick to survive past fledging (first flight) was hatched last year in Arizona. That chick at 9 months is doing fine, and is the first to be fledged into the wild in 21 years. All captive and wild condors have been inoculated with a new avian vaccine for West Nile Virus. The DFG continues to monitor all California birds and is working with public agencies and the private sector to reduce lead contamination in these birds.

Mammals

Peninsular bighorn sheep. The Peninsular bighorn sheep are in danger of extinction throughout a significant portion of their range due a number of factors including disease, habitat degradation and fragmentation, and predation coinciding with low population numbers. Bighorn sheep at the urban interface are also threatened by domestic dogs, automobiles, and drowning. Since 1970, populations of bighorn sheep have experienced additional fragmentation as a result of the expansion of the interstate highway system in southeastern California. Critically important to the long term survival of the peninsular bighorn sheep is the maintenance of connectivity between areas occupied by subpopulations so that emigration and immigration and gene flow can occur, as well as to provide opportunities to colonize vacant habitat. A recovery team collaborated on the federal recovery plan and continues to work to implement goals of the plan. Ongoing surveys suggest an upward trend in the numbers of sheep.

Sierra Nevada bighorn sheep. The Sierra Nevada bighorn sheep is one of the most endangered subspecies of large mammals in North America. Population levels fell from an estimated 310 individuals in 1985 to an estimated 100 individuals in 1999. The specific causes of the decline have not been identified. However, because of the decline and high levels of public concern, the legislature provided funding to the DFG to implement a long-term, comprehensive population recovery program. Elements of the recovery program include intensive monitoring, establishing additional populations in historical range of the species, and possibly, captive breeding to ensure that animals will be available to increase populations and expand geographic distribution. Continued monitoring of all bighorn sheep populations in the Sierra Nevada remains a high priority, and recovery will be dependent upon continued availability of monies for this important conservation effort. Since the recovery effort was initiated, the number of Sierra Nevada bighorn sheep has increased to an estimated 300 individuals.



Riparian brush rabbit. The riparian brush rabbit is a small cottontail that is secretive by nature. Historically, riparian brush rabbits inhabited dense, brushy areas of Central Valley riparian forests. The dramatic decline of the riparian brush rabbit began in the 1940s with the construction of dams on the major rivers of the Central Valley for irrigation and flood control. As a result, floodplains were converted to agriculture and the remaining riparian communities were reduced in size and fragmented. This species is now restricted to two small areas in the San Joaquin Valley. It was known only from one small intact area of riparian forest until 2003 when a second population was discovered near Stockton.

Habitat restoration and a captive breeding program have now been implemented. The captive breeding program uses wild-caught rabbits in equal sex ratios. Genetic studies are ongoing to ensure the suitability of rabbits from different wild populations for captive breeding and translocation purposes. To date, well over 100 rabbits have been produced in the three captive breeding pens and over 70 have been released to the wild to establish a new population on the San Joaquin River National Wildlife Refuge. Successful breeding within the new population has already been documented. Further releases are scheduled and the search continues for additional wild populations.

Plants

Yreka phlox. Yreka phlox is known only from four small occurrences near the town of Yreka, Siskiyou County. The population on China Hill is isolated from the other populations and occurs in a vegetation type that is distinct from the other populations. Although largely undeveloped, the majority of China Hill was in private ownership and zoned for residential development. Protection of this population is essential to the conservation of the species. Using Section 6 Recovery Land Acquisition funds and State-matching funds, three properties on China Hill were purchased from willing sellers. Over 95% of China Hill is now in public ownership, effectively protecting the Yreka phlox. Fencing and the creation of interpretive trails at China Hill are now being considered.

Ventura Marsh milkvetch. Ventura Marsh milkvetch was presumed to be extinct before its rediscovery in 1997. It was found on contaminated soil at a closed waste oil site in degraded back dune habitat near the City of Oxnard. Continued survival of this species depends upon stabilizing the existing population and establishing additional populations in suitable protected coastal wetland sites. Experimental populations have now been established at two locations on lands managed by the California Department of

Parks and Recreation and the University of California Reserve System. Rabbit, gopher, and snail predation are ongoing problems at these sites. Survivorship and mortality in these habitat areas are being evaluated.

Research into germination and propagation efforts is being undertaken by the Santa Barbara and Rancho Santa Ana Botanic Gardens. Other research at the University of California, Santa Barbara is focused on soil habitat requirements for the milk-vetch. Work at the University of California's Coal Oil Point Reserve has been funded largely by the private landowner of the only existing wild population of Ventura Marsh milkvetch.

Mary Meyer, DFG File Photo

Planning for Recovery

Heather Bell, USFWS File Photo

Recovery is the process by which the decline of an endangered or threatened species is reversed and threats to its survival are eliminated. The goal of this process is to restore the species to the point where it is a secure, self-sustaining part of its ecosystem. Recovery involves protecting and often restoring the habitat in which the species can thrive.

Preparation of a formal recovery plan is not required under CESA. In 1996, however, CESA was amended and directed the DFG to develop and implement a recovery strategy pilot program for the greater sandhill crane. In 2003, an additional amendment added coho salmon to the Recovery Strategy Pilot Program. The goal of this pilot program, which ends in 2009, is the development of recovery strategies so that the regulations or other protections pertaining to listed species pursuant to CESA would not be necessary. The recovery strategies are developed by a recovery team, are based on the best available scientific information, and essentially parallel the requirements of a recovery plan under federal law. In addition, documents prepared in support of listing under CESA include a description of habitat necessary for the species survival, as well as management recommendations. Management recommendations outline steps to ensure long-term survivorship of the species and protection of its habitat. The DFG may also sponsor recovery workshops for State-listed species.

Under the Federal Endangered Species Act, the first step in recovering a federally-listed species is the preparation of a draft recovery plan. The plan is prepared by a team that includes FWS staff, species experts, and other interested parties. DFG staff often participate in the development of recovery plans, as

well as implementation of recovery activities. Many State-listed plants and animals are also listed under the federal Act and are, therefore, included in recovery plans. Multi-species federal recovery plans can also address species of concern in the hope that implementation of the plan will lessen or eliminate the need to list these species. The following plans, prepared within the last few years, also address State-listed species. A discussion of recovery planning under federal law and a complete list of recovery plans can be found at http://endangered.fws.gov/recovery/.

2004 Recovery Plan for Otay Tarplant. Otay tarplant (*Deinandra conjugens*) is federally listed as a threatened species and State-listed as endangered. The species occurs in southwest San Diego County, California, and in northern Baja California, Mexico. Primary threats to the species include the ongoing loss and degradation of suitable habitat, and fragmentation of remaining populations. Within San Diego County, the species occurs entirely within the Multiple Species Conservation Planning (MSCP) area, including three associated subarea plans: City of San Diego Subarea Plan (approved in 1996), County of San Diego Subarea Plan (approved in 1998), and the City of Chula Vista Subarea Plan (approved in 2003). These subarea plans provide for the conservation in perpetuity of Otay tarplant and many other listed and non-listed species by developing a reserve system, protecting key populations, and a monitoring and management framework. Critical habitat for the species was designated on December 10, 2002. Recovery focuses on protecting and managing existing populations and maintaining normal ecological conditions within the MSCP. The importance of small populations that occur between larger populations is also recognized. These smaller colonies can provide connectivity (gene flow) beneficial to the species as a whole. Future research will examine genetic variation within the species and pollination ecology.

2004 Recovery Plan for Five Plants from Monterey County, California. This recovery plan addresses five plants that occur along the coast of northern Monterey County: Hickman's cinquefoil (*Potentilla hickmanii*), coastal dunes milk-vetch (*Astragalus tener* var. *titi*), Yadon's piperia (*Piperia yadonii*), Monterey clover (*Trifolium trichocalyx*) and Gowen cypress (*Cupressus goveniana* ssp. *goveniana*). The species are threatened by alteration, destruction, and fragmentation of their habitat; recreational activities; competition from non-native plant species; and disruption of natural fire cycles. The recovery plan proposes to protect habitat, control non-native invasive plants, implement habitat management, and reestablish natural ecosystem processes.

2004 Draft Recovery Plan for Yreka Phlox. Yreka phlox (*Phlox hirsuta*) is a State and federally-listed endangered species. *Phlox hirsuta* is known from four populations and is a serpentine endemic. It is threatened primarily by alteration or destruction of its habitat due to residential development, logging, fire suppression activities, off-road vehicle use, and grazing. Because the primary threat is direct modification of habitat, protection of occupied sites is critical to the recovery of the species. Seed storage for conservation purposes and controlled propagation programs are also proposed in the Recovery Plan. Monitoring will provide information needed to determine population trends, habitat conditions, and the status of new or existing threats to the species. Ongoing research is examining pollination ecology of the species.

2004 Draft Recovery Plan for Vernal Pool Ecosystems of California and Southern Oregon. Vernal pools are renowned for their showy displays of spring wildflowers, blooming in concentric rings around the pools. In California, extensive areas of vernal pool habitat developed over a long period of geologic time. They support unique suites of plants and animals that have evolved with this unique type of wetland ecosystem. Vernal pools are ephemeral, filling with water in the winter and spring and drying by summer. More than 75 percent of vernal pools have been lost in the Central Valley of California. Losses on the California coast and in southern California exceed 90 percent. In Oregon, over 60 percent have been lost. Agricultural conversion, alteration of hydrology, and widespread urbanization constitute the primary threats to vernal pool ecosystems and the species they support.

The Vernal Pool Ecosystem Recovery Plan addresses threats and recovery actions for 33 species of plants and animals. Recovery and long-term conservation actions contributing to the recovery are (1) habitat protection, (2) adaptive habitat management and monitoring, (3) status surveys, (4) research, and (5) public participation and outreach. An ecosystem approach is used in the Recovery Plan, with emphasis on conservation strategies that benefit groups of species in each vernal pool system. Single-species

strategies are presented where species do not co-occur with other vernal pool species.

2003 Draft Recovery Plan for the Sierra Nevada Bighorn Sheep. The Sierra Nevada bighorn sheep (*Ovis canadensis californiana*) is listed as an endangered species. Listing was prompted in part by a significant decline in population numbers. The recovery strategy identifies three main conservation issues: population dynamics, genetic variation, and ecosystem integrity. Increasing the sizes of individual groups of sheep, increasing distribution within the species' historic range, maintaining genetic variation, and providing safe access to winter ranges will be beneficial to the long-term survival of the Sierra Nevada bighorn sheep.

2003 Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula. This recovery plan features San Francisco lessingia (*Lessingia germanorum*), an annual herb in the aster family, and Raven's manzanita (*Arctostaphylos hookeri* ssp. *ravenii*), an evergreen creeping shrub in the heath family. San Francisco lessingia is threatened by invasion of nonnative vegetation, habitat loss, and potential land use conflicts in limited restorable urban habitat. Raven's manzanita exists in the wild as one genetic individual although some clones of the original plant and some of its seedlings have been artificially propagated. The remaining wild plant and its clones are located in remnant coastal scrub and grassland in the Presidio. Threats to Raven's manzanita include a failure to reproduce naturally, habitat loss, potential land use conflicts in limited restorable urban habitat, and disease.

The plan proposes to continue to protect the remaining wild plant and ensure its long-term survival, to reestablish several of Raven's manzanita populations in association with native species on local serpentine outcrops, and to ultimately establish populations reproducing by seed. Recovery actions for San Francisco lessingia focus on the restoration and management of the coastal dune system

with which the species is associated. The recovery plan also addresses several other listed species that are already covered in previous recovery plans. These species include the bay checkerspot butterfly, Myrtle's silverspot butterfly, and Presidio clarkia (*Clarkia franciscana*). In addition, the recovery plan considers 16 plant species of concern that are associated with San Francisco lessingia and Raven's manzanita, as well as 17 plant species of local or regional conservation significance.

2003 Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, California. This recovery plan covers six species of plants and animals that occur in chaparral and scrub habitat, primarily in a four-county area east of San Francisco Bay. One animal, Alameda whipsnake (*Masticophis lateralis euryxanthus*) and one plant, pallid manzanita (*Arctostaphylos pallida*), are federally listed as threatened. In addition, the recovery plan includes three additional species of plants, Contra Costa manzanita (*Arctostaphylos manzanita* ssp. *laevigata*), State-listed Mt. Diablo bird's-beak *Cordylanthus nidularius*), and Mt. Diablo buckwheat (*Eriogonum truncatum*), and one animal the Berkeley kangaroo rat (*Dipodomys heermanni berkeleyensis*). The latter two species are presumed extinct. The loss, fragmentation, and degradation of habitat historically resulted in, and continues to cause, the decline of these species.

Management activities to forestall future declines at the urban interface in the East Bay Area presents a complex challenge to recovery of these species. The recovery plan presents a community-level strategy for recovery and conservation through implementation of long-term cooperative active management of the chaparral and scrub communities; protection of identified habitat from development, fragmentation, degradation, and incompatible uses; restoration of habitat through the ecological use of prescribed fire; and protection of populations representing the full range of genetic variation and geographic extent of the species.

2002 Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills. Six species of plants that occur on gabbro soils in chaparral and woodland in the central Sierra Nevada foothills are the focus of this recovery plan. The five federally-listed species include four endangered plants, Stebbins' morning-glory (*Calystegia stebbinsii*), Pine Hill ceanothus (*Ceanothus roderickii*), Pine Hill flannelbush (*Fremontodendron californicum* ssp. *decumbens*), and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*), and one threatened plant, Laynes' butterweed (*Senecio layneae*). In addition, El Dorado mule-ears (*Wyethia reticulata*), a species of concern, is addressed. Conversion of habitat to urban and industrial uses has extirpated populations of these species and has degraded their habitat. This recovery plan presents a community-level strategy for recovery and conservation of these species. Protection of entire communities of plants and habitat from development or other incompatible uses and conserving the full range of genetic and geographic variation of the species are proposed.

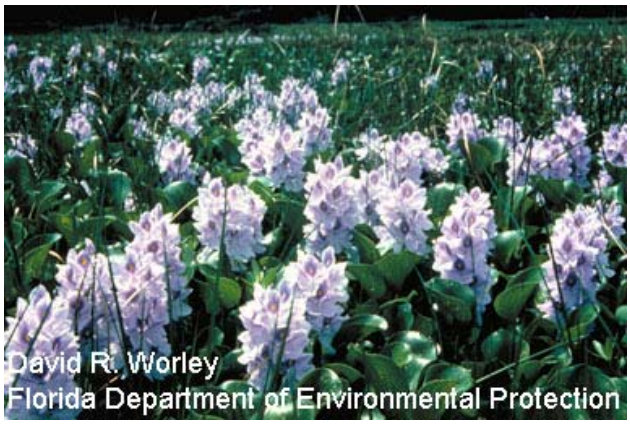
2002 Southwestern Willow Flycatcher Recovery Plan. The southwestern willow flycatcher (*Empidonax traillii extimus*) breeds in dense riparian habitats in southwestern North America, and winters in southern Mexico, Central America, northern South America, and southern California. The subspecies was listed as endangered effective March 29, 1995. Destruction and modification of riparian habitats are the principal threat to this species. Concurrent with habitat loss is brood parasitism by the brown-headed cowbird (*Molothrus ater*), which inhibits reproductive success and further reduces population levels. Recovery focuses on increasing the total known population and territories, as well as protecting riparian habitat or improving the quality of riparian habitat so that the flycatcher is no longer in danger of extinction.

2002 Colorado Pikeminnow, Bonytail Chub, and Razorback Sucker Recovery Goals. The USFWS prepared amendments and supplements to the recovery plans for the Colorado pikeminnow (*Ptychocheilus lucius*), bonytail chub (*Gila elegans*), and razorback sucker (*Xyrauchen texanus*). All species are endemic to the Colorado River Basin of the southwestern United States. All have been impacted by streamflow regulation, habitat modification, competition with and predation by nonnative fish species. The purpose of these documents is to describe site-specific management actions and tasks; provide objective, measurable recovery criteria; and provide an estimate of the time to achieve recovery of the three endangered fish. The recovery goals include maintaining genetically and demographically viable, self-sustaining populations in the historic range of the species.

INVASIVE SPECIES PROGRAM

The impacts of invasive species, which include a variety of organisms, from birds, mammals, fish, amphibians, and invertebrates, to plants and diseases, can be far-reaching both environmentally and economically. They can significantly disrupt the balance of natural ecosystems by consuming or competing with native plants and animals (including threatened and endangered species), altering biogeochemical cycles, and reducing diversity of native species. The introduction of invasive species is thought to be second only to habitat loss in contributing to declining biodiversity throughout the United States.

Aquatic invasive species pose unique challenges to resource managers. Unlike other sources of pollution, established populations of aquatic invaders can reproduce and spread. The introduction of only a few organisms or, in the case of aquatic plants and algae, a tiny portion of an organism, can result in the infestation of a water body, watershed, or entire biogeographic region.

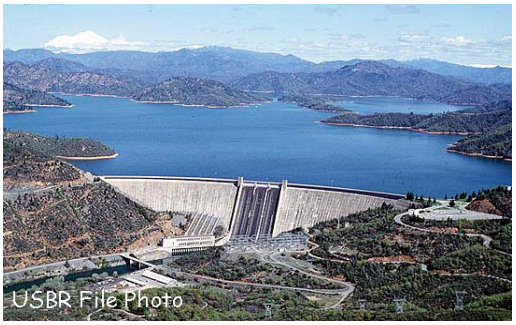


In 2002, the California Interagency Aquatic Invasive Species Council was established through legislation. When appointments are made by the Governor, the Council will consist of representatives from the Department of Food and Agriculture, the Department of Boating and Waterways, the Department of Parks and Recreation, the Department of Water Resources, the State Water Resources Control Board, the California Coastal Commission, the State Coastal Conservancy, the University of California, and the State Lands Commission. The bill also authorizes the Governor to appoint to the council persons representing certain interest groups. The Director of Fish and Game will serve as the chairperson of the council.

At the current time, the Department is in the process of finalizing the California Aquatic Invasive Species Plan. The plan will outline various state programs and authorities related to invasive species and establish a blueprint for addressing these issues in the future. The plan will emphasize prevention of new infestations through outreach and education as well as early detection and rapid response in the event of a new infestation. Invasive, exotic plant species have become a primary threat to natural lands across the State.

The Department and the Resources Agency are members of the California Interagency Noxious Weeds Coordinating Committee (CINWCC), a group formed to implement the Interagency Memorandum of Understanding (MOU) regarding weeds on State and federal lands in California. Members signatory to the MOU also include representatives of the U.S. Forest Service (USFS), Bureau of Land Management (BLM), Bureau of Indian Affairs, California Department of Food and Agriculture (CDFA), and California Department of Transportation (Caltrans), among others. Stakeholder groups such as the California Cattlemen's Association and the California Native Plant Society (CNPS) also attend CINWCC's quarterly meetings. CINWCC's goals are to: (1) reduce the impact of weeds on wildland habitats of State and federal lands; (2) seek funding for weed research; (3) educate the public about the impacts of weeds; and (4) simplify regulatory compliance for weed abatement projects.

CENTRAL VALLEY PROJECT CONSERVATION PROGRAM



The Central Valley Project Conservation Program (CVPCP) is a joint project of the Bureau of Reclamation (USBR) and US Fish & Wildlife Service to meet the biological needs of special status species in areas affected by the Central Valley Project. The CVPCP was mandated by Biological Opinions developed by the USFWS during implementation of the CVP; funding is dependent upon annual Congressional allocations. This conservation program started in 1991 to address endangered species in the San Joaquin Valley and was expanded in 1995 to include all areas impacted by the Central Valley Project.

The goal of the CVPCP is to implement an adaptive management program to protect, restore, and enhance special-status species and their habitats in areas directly or indirectly affected by the Central Valley Project (CVP). Objectives of the CVPCP are:

- Address biological needs of threatened & endangered species in an ecosystem manner;
- Assist in the conservation of biological diversity;
- Improve existing conditions for threatened and endangered species; and
- Reduce conflicts with future projects.

The CVPCP employs habitat acquisition, either through purchase or easements, restoration, adaptive management, and monitoring to achieve its goal. Research projects and studies are also an intrinsic part of this ecosystem-based program.

The CVP Habitat Restoration Program (CVPHRP) works in concert with the CVPCP. The CVPHRP was developed to protect, restore, and mitigate for past fish and wildlife impacts of the CVP not addressed through other CVPIA programs. The Central Valley Project Improvement Act (CVPIA) was passed in October 1992 to protect, restore, and enhance fish, wildlife, and associated habitats impacted by the CVP. A restoration fund was established, with fees paid by water and power users, for acquisition, habitat restoration, and enhancement.

Habitat in California's Central Valley, especially habitat areas along the rivers, has been affected by the development of water resources. The CVPCP seeks to improve the habitat of native species through identification, implementation of restoration management, and monitoring results. The CVPCP is guided by a technical team lead by the Bureau of Reclamation and the U.S. Fish and Wildlife Service and includes representatives from the California Department of Fish and Game. The same technical team oversees the solicitation, ranking, and implementation of projects funded by these two programs. The BOR oversees the budget for the CVPCP and the USFWS oversees the budget for the CVPHRP. The combined budget for the 2004 Fiscal Year is approximately 2.9 million dollars.

Numerous conservation and restoration projects have been funded through the CVPCP. Project partners include public and private entities such as the BLM, Caltrans, SWRCB, the Trust for Public Lands, TNC, and the Shasta Land Conservancy. These projects benefit state and federally-listed species and their habitats. Species include the giant garter snake, riparian brush rabbit, large-flowered fiddleneck, Bakersfield cactus, and Keck's checkerbloom. Please refer to http://www.usbr.gov/mp/mp150/cvpcp/ for additional information.

CVP Conservation Project Summary

Land Acquisition					
Year	**County**	**Acreage**	**Habitat**	**Focus Species**	**Partner**
2000	El Dorado	90	Gabbro chaparral	Layne's butterweed, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory	
2000	Fresno	90	Grassland	Keck's checkerbloom	Sierra Foothil Conservancy
2000	Kern		Alkali sink	Blunt-nose leopard lizard, San Joaquin kit fox	CDFG, WCB
2000	Merced	391	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp	TNC, Great Valley Center, Merced County Farmland and Open Space Trust
2000	Sacramento	1,246	Wetland Vineyard	Giant garter snake	CDFG, TNC, Packard Foundation, National Fish and Wildlife Foundation, City of Sacramento
2000	Sacramento		Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander	TNC, WCB
2000	Tehama	10,000	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp	TNC
2000	Tulare		Alkali sink	Blunt-nose leopard lizard, San Joaquin kit fox	CDFG, WCB
2000	Tulare	821	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander	CDFG, Four Creeks Land Trust, WCB, Packard Foundation, EPA, Wetland Development Program
2001	Colusa	467	Riparian	Valley elderberry longhorned beetle, yellow-billed cuckoo	TNC

Land Acquisition					
Year	**County**	**Acreage**	**Habitat**	**Focus Species**	**Partner**
2001	El Dorado	49	Gabbro chaparral	Layne's butterweed, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory	American River Conservancy, BLM
2001	Fresno	97	Grassland	Keck's checkerbloom	Sierra Foothill Conservancy
2001	Merced	3800	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander	TNC, WCB, California Rangeland Trust
2001	Sacramento	370	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander	TNC, private
2002	Contra Costa	3,650	Vernal pool Grassland Riparian	San Joaquin kit fox, California red-legged frog	Trust for Public Lands, WCB, California Department of Parks and Recreation, Caliornia Coastal Conservancy
2002	El Dorado	157	Gabbro chaparral	Layne's butterweed, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory	American River Conservancy
2002	Sacramento	370	Vernal pool Grassland	Vernal pool fairy shrimp	TNC, private
2002	Sacramento	2,054	Grassland Hardwood	Valley elderberry longhorned beetle	WCB, CalTrans, CalFed, Sacramento County Regional Parks, Sacramento Valley Open Space Council
2003	El Dorado	223	Gabbro chaparral	Layne's butterweed, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory	El Dorado Irrigation District, WCB, private
2003	San Joaquin	2865	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander	Packard Foundation, WCB, TNC, USFWS
2004	Fresno	40	Grassland	Keck's checkerbloom	Sierra Foothills Conservancy
2004	Kern	5,810	Vernal pool Grassland Alkali sink	San Joaquin kit fox, Tipton's kangaroo rat	TNC, BLM
2004	Madera	709	Riparian Hardwood	Valley elderberry longhorned beetle	CDFG, WCB, PG&E

Research, Restoration, and Management					
Year	**County**	**Project**	**Habitat**	**Focus Species**	**Partner**
2000	Colusa	Census	Wetland	Giant garter snake	Sacramento NWR
2000	Colusa	Riparian restoration	Wetland Riparian	Valley elderberry longhorned beetle, yellow-billed cuckoo	
2000	Colusa	Research	Riparian	Valley elderberry longhorned beetle	TNC
2000	Sacramento	Research	Wetland	Giant garter snake	CDFG, TNC
2000	Stanislaus	Genetic study Pen construction Habitat restoration	Riparian	Riparian brush rabbit	
2001	Colusa	Survey and monitoring	Wetland	Giant garter snake	USGS
2001	Colusa	Research	Riparian	Valley elderberry longhorned beetle	Sacramento River Partners
2001	Kern	Management	Alkali sink	Blunt-nose leopard lizard, San Joaquin kit fox, San Joaquin kangaroo rat	CDFG
2001	Merced	Research	Riparian	Valley elderberry longhorned beetle	TNC, USFWS, Grove Foundation, Lemmox Foundation
2001	Shasta	Research	Riparian	Valley elderberry longhorned beetle	TNC, USFWS, EPA, NRCS, Caltrans, Shasta Land Conservancy, National Fish and Wildlife Foundation
2001	Stanislaus	Survey	Riparian	Riparian woodrat	ESRP
2001	Stanislaus	Management	Riparian	Riparian brush rabbit	ESRP
2001	Statewide	GIS habitat trend analysis			CSU Chico
2001	Tulare	Restoration and management	Vernal pool Grassland	Vernal pool fairy shrimp, vernal pool tadpole shrimp, California tiger salamander	NRCS
2001	Tulare	Management	Alkali sink	Blunt-nose leopard lizard, San Joaquin kit fox, San Joaquin kangaroo rat	CDFG
2002	Butte	Research	Riparian	Valley elderberry longhorned beetle	TNC

Research, Restoration, and Management					
Year	**County**	**Project**	**Habitat**	**Focus Species**	**Partner**
2002	Central Valley	GIS habitat trend analysis			CSU Chico
2002	Colusa	Monitoring	Wetland	Giant garter snake	USGS
2002	Colusa	Research	Riparian	Valley elderberry longhorned beetle	Sacramento River Partners
2002	Kern	Management	Alkali sink	Bakersfield cactus	ESRP
2002	Kern	Grazing study	Grassland	San Joaquin kit fox	ESRP, USGS, CalTrans
2002	Merced	Survey	Wetland	Giant garter snake	USFWS, Grasslands Water District
2002	Sacramento	Restoration	Wetland Upland	Giant garter snake	WCB, California Waterfowl Association
2002	San Joaquin	Habitat study	Grassland	Large-flowered fiddleneck	Department of Energy
2002	Stanislaus	Research	Riparian	Riparian brush rabbit	ESRP, California Department of Parks and Recreation
2002	Tulare	Management	Wetland	Tricolored blackbird	CDFG, USFWS, Lower Tule River Irrigation District, Wetland Development Program
2003	Butte	Restoration	Riparian		
2003	Butte	Survey	Wetland Riparian	Giant garter snake	
2003	Colusa	Survey	Wetland Riparian	Giant garter snake	Colusa NWR
2003	El Dorado	Seed propagation	Gabbro chaparral	Layne's butterweed, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory	
2003	El Dorado	Survey	Wetland	Southern water snake	
2003	El Dorado	Pond construction	Wetland Riparian Coniferous forest	California red-legged frog	BLM
2003	Fresno	Demographic monitoring	Alkali sink	Palmate-bracted bird's-beak	CDFG, ESRP
2003	Fresno	Survey Genetic assessment	Riparian Wetland Upland	Buena Vista Lake shrew	USBR
2003	Glenn	Restoration	Riparian	Valley elderberry longhorned beetle	

Research, Restoration, and Management					
Year	**County**	**Project**	**Habitat**	**Focus Species**	**Partner**
2003	Kern	Study	Alkali sink Grassland	Blunt-nose leopard lizard, San Joaquin kit fox, San Joaquin kangaroo rat	
2003	Kern	Survey Genetic assessment	Riparian Wetland Upland	Buena Vista Lake shrew	USBR
2003	Kings	Survey Genetic assessment	Riparian Wetland Upland	Buena Vista Lake shrew	USBR
2003	Placer	Survey	Wetland	Southern water snake	
2003	Sacramento	Survey	Wetland	Southern water snake	
2003	Stanislaus	Captive breeding	Riparian	Riparian brush rabbit	
2003	Stanislaus	Survey and study	Riparian	Riparian brush rabbit	CDFG, USFWS, CalFed
2003	Tehama	Survey	Wetland Riparian	Giant garter snake	
2003	Tulare	Survey Genetic assessment	Riparian Wetland Upland	Buena Vista Lake shrew	USBR
2004		Reintroduction study	Alkali sink Grassland	San Joaquin kit fox	
2004	El Dorado	Preserve management	Gabbro chaparral	Layne's butterweed, Pine Hill ceanothus, Pine Hill flannelbush, Stebbins' morning-glory	El Dorado County, El Dorado Water District
2004	Glenn	Survey	Wetland Riparian	Giant garter snake	USFWS
2004	Glenn	Restoration	Riparian	Valley elderberry longhorned beetle	USFWS
2004	Kern	Grazing study	Alkali sink Grassland	San Joaquin kit fox	ESRP, USGS, CalTrans
2004	Merced	Survey	Wetland Riparian	Giant garter snake	USFWS
2004	Santa Clara	Management	Serpentine grassland	Bay checkerspot butterfly	
2004	Stanislaus	Captive breeding Reintroduction	Riparian	Riparian brush rabbit	ESRP

Research, Restoration, and Management					
Year	**County**	**Project**	**Habitat**	**Focus Species**	**Partner**
2004	Tehama	Restoration	Riparian	Valley elderberry longhorned beetle	USFWS

THE WILDLIFE CONSERVATION BOARD: ACQUISITION, ACCESS, and ENHANCEMENT

The Wildlife Conservation Board (WCB) was created by legislation in 1947 to administer a capital outlay program for wildlife conservation and related public recreation. The primary functions of the WCB are to acquire land for the preservation, protection, and restoration of wildlife habitat and the development of wildlife-oriented public access facilities. These activities are carried out under eight programs: Land Acquisition Program, Habitat Enhancement and Restoration Program, Natural Heritage Preservation Tax Credit Program, California Riparian Habitat Conservation Program, Inland Wetlands Conservation Program, Oak Woodlands Conservation Program, The Rangeland, Grazing Land and Grasslands Protection Program, and Public Access Program. Listed species benefit under these programs through conservation of open space, enhancement and restoration of habitat for listed species, protection of riparian habitat, and management of rangeland. Funding for these programs comes from several sources including the General Fund, bond monies, and legislation. Funds are used individually or in combination to implement land acquisition, habitat management, and the development of public facilities.

Land Acquisition Program. Land acquisition is a component of all WCB programs. Through the Land Acquisition Program, the WCB acquires real property or rights in real property, such as conservation easements, on behalf of the DFG. It can also grant funds to other governmental agencies or nonprofit organizations for the same purposes. All acquisitions are made on a "willing seller" basis following a "fair market value" appraisal approved by the Department of General Services (DGS).

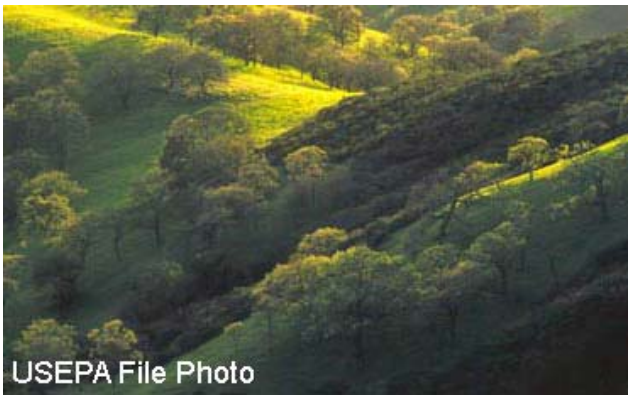
Habitat Enhancement and Restoration Program. The goal of the Habitat Enhancement and Restoration Program is to enhance and restore Threatened and Endangered species habitat, forest land habitat, and to implement Salton Sea restoration projects. Several fund sources are used to achieve this goal, including the Habitat Conservation Fund, the General Fund, the Wildlife Restoration Fund through the Safe Neighborhood Parks, Clean Water, Clean Air, and Coastal Protection Bond Act of 2000. Funds are made available to nonprofit conservation organizations and federal, state, or local governmental agencies. Projects implemented under the Habitat Enhancement and Restoration Program provide long-term maintenance of the restored and/or enhanced habitat.

Natural Heritage Preservation Tax Credit Program. Since its inception in 2000, the Natural Heritage Preservation Tax Credit Program has been highly successful in protecting open space, important agricultural land, and providing linkages essential to wildlife. This program allows private landowners to donate land or water rights to state and local agencies or designated nonprofit organizations for conservation purposes in exchange for a State tax credit. Properties donated under this program must 1) meet the goals of HCP, NCCP, MSCP, or similar program that will benefit habitat conservation and sensitive species; 2) provide linkages, corridors, or reserves that will help improve the recovery of listed species; 3) protect wetlands, riparian corridors, or waterfowl habitat; 4) promote the biological viability of important California species; or 5) constitute a perpetual Conservation Easement over agricultural land, or is a permanent contribution of agricultural land in an unincorporated area that is zoned for agricultural use but threatened by development. Only one of these criteria need be satisfied to qualify under this program.

The preservation, restoration, and enhancement of California wetlands are implemented through the **California Riparian Habitat Conservation Program** and the **Inland Wetlands Conservation Program.**

California Riparian Habitat Conservation Program. The California Riparian Habitat Conservation Program was created by legislation in 1991. The program is a cooperative effort of state and federal agencies, local government, nonprofit conservation groups, private landowners, and concerned citizens to develop coordinated conservation efforts aimed at protecting and restoring riparian ecosystems. Landowners monitor and manage project improvements for 25 years under a required management plan.

Inland Wetlands Conservation Program. The dramatic loss over time of interior wetlands was the impetus behind the establishment of the Central Valley Habitat Joint Venture (CVHJV). The CVHJV is a coalition of public, private, and nonprofit organizations dedicated to protecting and restoring wetlands and waterfowl populations in the Central Valley of California. The Inland Wetlands Conservation Program was created to carry out the mandates of the CVHJV. Its specific mission is to increase aquatic bird populations in the Central Valley through the protection, restoration, enhancement and maintenance of wetland habitat. Individual projects under this program develop breeding, migrating, and wintering habitat for waterfowl, as well as support waterfowl friendly agricultural practices.



Oak Woodlands Conservation Program. Under the Oak Woodlands Conservation Program, landowners, cities and counties, and conservation organizations are given an opportunity to obtain funding for projects designed to conserve and restore California's oak woodlands. Funding under this program is used primarily for the purchase of easements. Restoration and enhancement of oak woodlands can also be funded. In addition, a portion of the funding can be used for outreach and education, as well as to develop and implement oak conservation elements in local general plans.

Rangeland, Grazing Land and Grasslands Protection Program. The purpose of the Rangeland, Grazing Land and Grasslands Protection Program is to protect the integrity of rangelands, grazing lands, and grasslands in California to prevent their conversion to nonagricultural uses. The WCB encourages projects that address regional landscape issues such as watershed protection and open space conservation.

Public Access Program. Public access for hunting, fishing or other wildlife-oriented recreation is ensured through the WCB's Public Access Program. This program focuses on the development of recreation facilities in cooperation with local agencies. These facilities include fishing piers or floats, access roads, boat launching ramps, trails, boardwalks, interpretive facilities, and lake or stream improvements. Support facilities such as restrooms and parking areas are also eligible for funding under this program. The WCB also acquires lands for preservation of wildlife habitat.

Projects in the Spotlight

Many projects, large and small, are approved annually by the WCB. These projects benefit listed and sensitive species of plants and animals, protect watersheds, provide critical linkages between habitat areas, and help maintain open space. A small sample of projects is presented below. The WCB website (http://www.dfg.ca.gov/wcb/) contains many more such examples, as well as additional information about proposed acquisitions, funding sources, and grant application forms.

Mill Creek and Grizzly Creek, Del Norte and Humboldt Counties. Using funding provided by the from the Coastal Conservancy, the Department of Parks and Recreation, the Department of Fish and Game, the WCB, and numerous private donors, the Save the Redwoods League completed acquisition of acquired the 24,772-acre Mill Creek redwood forest in Del Norte County. The acquisition protects the watershed of Jedediah Smith Redwoods State Park and is strategically located between Redwood National and State Parks and the Smith River National Recreation Area. Mill Creek is the defining feature of the property, supporting healthy runs of coho salmon, chinook salmon, steelhead, and coastal cutthroat trout. The property also supports 23 listed animal species including the marbled murrelet and the northern spotted owl. The property will be managed by the DPR in consultation with the Save the Redwoods League and the Coastal Conservancy. A management plan being developed will promote the return of old growth forest features and habitat values, and provide for compatible recreation and educational opportunities.

In another project, the WCB approved acquisition of 691 acres in the Van Duzen River watershed. This parcel is in addition to 716 acres of the Grizzly Creek Forest acquired by the WCB in 1999. Both parcels protect old-growth redwood forest. The DFG has identified the current expansion as critical to the recovery of the marbled murrelet. The property also includes riparian corridors along Grizzly Creek and the Van Duzen River and will become part of the Grizzly Creek Redwoods State Park.

San Francisco Bay Area Wetlands Protection and Restoration, Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano and Sonoma Counties. This project provides funds to the California Coastal Conservancy to implement the highest priority wetlands protection and restoration projects in the San Francisco Bay Area. Projects will be located in the Napa-Sonoma Marshes; at Suisun Creek; Hamilton Airfield, Bel Marin Keys, and along the Petaluma River; in the South Bay salt ponds and Guadalupe Creek; Lake Merritt in the City of Oakland and Aquatic Park; East Shore State Park and Berkeley Meadows; and in shoreline wetlands in the City of San Francisco. Spartina control will be implemented in several counties where the non-native cordgrass, *Spartina alternifolia*, has become established.

Funds will be used for technical studies, detailed design and/or construction projects for marsh restoration; projects to improve water quality for anadromous fish; restoration of tidal flows; restoration of natural spring-fed channels and riparian habitat; and for public outreach. This long-term undertaking is a cooperative effort among many agencies including the USEPA, USFWS, RWQCB, the San Francisco Estuary Institute, San Francisco Bay and Development Commission, DFG, CalFed, the Santa Clara Water Agency, and local cities and counties. When completed, many thousands of acres of tidal wetlands and marshes will have been restored, creating lasting benefits to sensitive species and the populace of the Bay Area.

Petaluma Marsh Wildlife Area, Bahia Wetlands Unit, Marin County. Using a grant from the WCB, the Marin Audubon Society assisted in a project to purchase an estimated 645 acres located in the city of Novato. The property is located near the mouth of the Petaluma River and had been slated for development. With topography from near sea level to adjacent hillsides, the acquisition supports blue oak woodland, salt marsh, and annual grasslands. The interface of blue oak woodland and salt marsh is unique. Numerous sensitive species are found on the property, including the federally-listed soft bird's-beak and endangered salt marsh harvest mouse, as well as the northern harrier, salt marsh yellowthroat, and San Pablo song sparrow. The Bahia tract's shallow waters of diked baylands are important foraging and resting habitat for migratory shorebirds. It was the top acquisition priority of the North American Waterfowl Management Plan's San Francisco Bay Joint Venture. Other partners to the acquisition include the State Coastal Conservancy, Marin County Open Space District, Marin Community Foundation, Marin Baylands Advocates, CALFED, and Caltrans. Additional funding was provided by the Marin Baylands Fund and the North American Wetlands Conservation Act.

Watsonville Slough, Santa Cruz County. This property is located on the coastal plain west of Watsonville and represents one of the largest unfarmed and undeveloped areas along the coast in Santa Cruz County. The 289-acre parcel encompasses the majority of the upper watershed of Galighan Slough, one of the major sloughs and tributaries within the Watsonville Slough Complex. Habitat types found on the property include coastal live oak woodland, maritime chaparral, coastal scrub, conifers and wetlands. A number of listed and sensitive species are found on the property including the Santa Cruz long-toed salamander, California red-legged frog, California tiger salamander, and robust spineflower. Acquisition of this property represents a cooperative project involving the Trust for Public Land (TPL), Caltrans, the Coastal Conservancy, the USFWS, NPS, and DFG.

Morro Bay Area, San Luis Obispo County. The Morro Bay area includes Morro Bay and Montana de Oro State Parks and provides habitat for a suite of listed species found only within the Morro Bay watershed. Morro Bay, part of the National Estuary Program, is a bird santuary. The WCB has been instrumental in purchasing key parcels of property to protect portions of the Morro Bay dune ecosystem. These parcels total more than 400 acres and are key links in the Morro Bay Dunes Greenbelt, a community initiated effort to create a habitat and trail corridor connecting Montana de Oro State to Morro Bay State Park, as well as to other open space areas in the Morro Bay watershed. Partners in the project include The Trust for Public Lands, the Morro Estuary Greenbelt Alliance, the Morro Bay National Estuary Program, the USFWS, DPR, DFG, and State Coastal Conservancy.

Dressler Ranch, Mono County. In 2003, the WCB completed acquisition of the Dressler Ranch in Mono County. The WCB partnered with the DFG, Caltrans, and the American Land Conservancy to complete the project. The land has been put into a conservation easement that bars development and allows only normal cattle ranching operations. The Caliofrnia Rangeland Trust will hold the easement and monitor it in perpetuity. The effort is designed to protect wildlife habitat while encouraging compatible agricultural practices on property located immediately west of Bridgeport. The property lies along the eastern slope of the Sierra Nevada in Bridgeport Valley along National Scenic Highway 395. Encompassing more than 6000 acres, the ranch provides habitat for the sage grouse and protects more than 10 miles of riparian habitat.

Potrero Canyon, Riverside Canyon. This project represents an expansion of the DFG San Jacinto Wildlife Area by more than 8500 acres. The property comprises a flat, alluvial valley with unfragmented Riversidean sage scrub, riparian woodlands, oak woodland, and annual grasslands. Thirty-one threatened and endangered species, and species of special concern, including the California gnatcatcher and least Bell's vireo, occur on the site. The property is estimated to have approximately 2,380 acres of occupied Stephen's kangaroo rat habitat and also supports one of the densest populations of the kangaroo rat in western Riverside County. Conservation of the property ensures connectivity between national forest land and other conserved areas in Riverside County's regional Multiple Species Habitat Conservation Plan (MSHCP) and Natural Communities Conservation Plan (NCCP).

Rancho Jamul, San Diego County. The WCB recently acquired approximately 3,210 acres of land located in the Hollenbeck Canyon area known as the Daley Ranch Property. The acquisition project preserves critical habitat and wildlife corridors identified in the San Diego County MSCP and provides a connection between the DFG's Rancho Jamul Ecological Reserve and Hollenbeck Canyon. It will eventually connect other wildlands with the Cleveland National Forest. Habitat includes coastal sage scrub, chaparral, oak woodlands, riparian forests, freshwater marshes and grasslands. This property supports a large number of listed species, including the California gnatcatcher, San Diego thornmint, orange-throated whiptail, and Quino checkerspot; sensitive species such as the burrowing owl, golden eagle, and Hermes copper; and a diverse mammal fauna, including mountain lion, bobcat, coyote, and eleven species of bats.

Species Accounts - Invertebrates and Crustaceans

Trinity bristle snail

Monadenia infumata ssp. setosa (= Monadenia setosa)

State Threatened 1980
Federal None

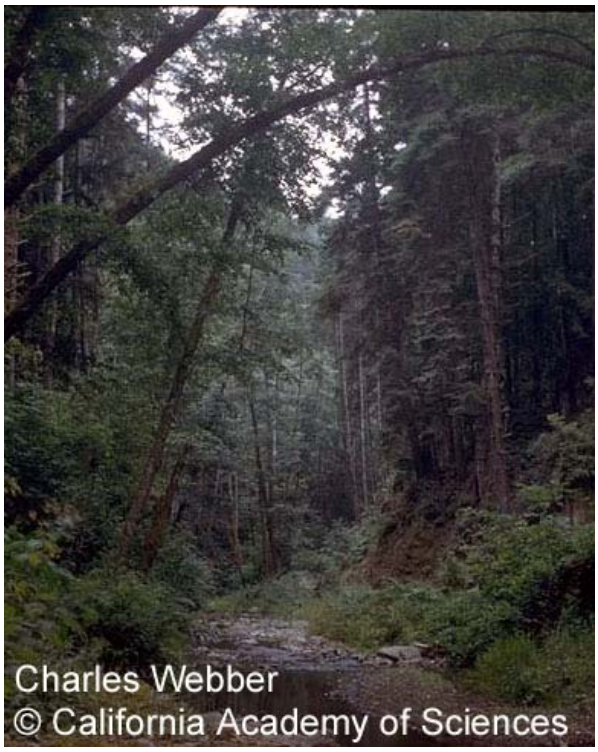
General Habitat:

The Trinity bristle snail lives along riparian corridors and uplands within Klamath mixed-conifer forests having a deciduous hardwood understory. The snail is primarily found in moist but well-drained, well-shaded canyons or streamside benches covered with a layer of leaf mold at least four inches deep. It has also been observed in dry sites not considered typical habitat.

Description:

The Trinity bristle snail is named for the short, fine bristles present on the exterior surface of the shell. The snail's body is dull-gray to black, and covered with brick-red to salmon colored tubercles. The relatively flattened and narrow-shouldered shell is brown to chestnut-colored, with a blackish-brown peripheral band and a lighter, more obscure band. The innermost whorls are usually lighter colored than the rest of the shell. In larger individuals, the shell is one to 1.5 inches in diameter, with 6 to 6.75 dextral (right-handed) whorls, and the body is about 1.5 inches long. Age at maturity is estimated to be 15 to 20 years. The snails undergo dormancy during the summer and winter, and can remain dormant for more than 10 years and revive.

Both adults and juveniles primarily live on the ground, feeding upon and living among the top layer (up to 3.5 inches depth) of leaf litter. They also climb to feed upon lichens growing on alder trees, petioles of violets, and stalks of other plants. Individuals have limited home ranges, and are usually sparsely distributed.



Status:

The Trinity bristle snail is thought to be a relict species of the Pleistocene epoch, when the climate was much cooler and moister than at present. This species is confined primarily to habitats where there is shade, fairly low temperature, and fairly high humidity. The snail is most active between May and October and is most likely to be

seen between dusk and dawn, when the air tends to be more humid.

The snail is vulnerable to activities that alter the character of its habitat: removal of leaf litter and cover, increased exposure, slope destabilization, or a decreased amount of large woody debris. Activities such as clear cutting, timber harvest, mining, and off-highway vehicle use can lead to these types of habitat changes. Large, intense fires, often a result of historic fire suppression activities, also threaten the snail. Snails can withstand fire if in deep ground fissures in rocky substrates. Extensive, high intensity fires, however, can eliminate the majority of individuals in local populations, as well as their habitat and food sources.

As a result of very recent genetics research, the Trinity bristle snail is now considered to be a subspecies of *Monadenia infumata*. (Please see Barry Roth, Checklist of the Land Snails and Slugs of California, Santa Barbara Museum of Natural History, Contributions in Science, Vol. 3 for additional information.) Research also shows that this snail is part of a large interbreeding complex, forming a continuum with other species of *Monadenia*. Apparent hybrids of Trinity bristle snail and *Monadenia fidelis* are found in the Eltapom Creek watershed (tributary to the South Fork Trinity River) between Underwood, Chaparral and Hyampom Mountains.

Prior to 1999, the Trinity bristle snail's range was believed to be limited to sections of the Trinity River and its tributaries (i.e., Swede, Big, French, Price, Bidden, Limestone, and Little Swede creeks; an unnamed creek south of Big Bar; and the south side of the Trinity River east of Price Creek). These areas are all located west of the town of Junction City, in the center of Trinity County. The Trinity bristle snail appears to be sparsely distributed within its limited range, which is entirely in the southern Klamath Mountains and within the Shasta-Trinity National Forest.

While conducting mollusk surveys as part of the Northwest Forest Plan during 1999-2002, staff from Shasta-Trinity National Forest found Trinity bristle snails at many new locations that have significantly increased the known range. The species is now known from about 75 locations. The known range includes the South Fork Mountain (Trinity-Humboldt county line) near Blake Mountain west of Hyampom, south to Norse Butte, and east to near Forest Glen. The known range also extends to the Trinity-Humboldt county line, which is also the division between the Shasta-Trinity and Six Rivers national forests. Knowledge of habitat utilization has also expanded as a result of these surveys. In addition to riparian forest, habitat is now known to include upland mixed conifer habitats with canopy cover that are generally suitable for other terrestrial mollusks. Further surveys of these sites and the surrounding areas are needed. Surveys within other national forests would greatly add to information about this species.

USFWS considers the Trinity bristle snail a Federal Special Concern Species. However, this designation does not afford the species any special protection under the law. During 1997, the International Union for Conservation of Nature (IUCN) included the Trinity bristle snail in their worldwide Red List of Threatened Species.

The status in 2002 of the Trinity bristle snail: *Unknown*.

Shasta crayfish

Pacifastacus fortis

State	Threatened	1980
	Endangered	1988
Federal	Endangered	1988

General Habitat:

The Shasta crayfish generally lives in cool, spring-fed headwaters characterized by clean, volcanic cobbles and boulders overlying sand or gravel substrates. These spring-fed habitats are stable year-round, with almost no change in flow, temperature, or turbidity. In a few areas, small numbers of Shasta crayfishes may be found in altered or degraded habitats, where water temperature and clarity may vary considerably. The Shasta crayfish is limited to the mid-sections of the Pit River drainage, primarily the Fall River and Hat Creek drainages in Shasta County.

Description:

The Shasta crayfish is mostly dark brown dorsally and bright orange red ventrally, especially on the underside of the claws. Adult Shasta crayfish are between two and four inches in total length, including the tail. When compared to other species of crayfish, the Shasta crayfish is medium-sized, and the body and claws are relatively robust. Like most species of crayfish, the Shasta crayfish is active at night and remains hidden during the day. Unlike other species, this crayfish is primarily herbivorous, feeding upon the periphyton (composed of benthic algae and diatoms, organic detritus, and small benthic invertebrates) which forms a surface film upon volcanic rock substrates. The Shasta crayfish is relatively sedentary and does not display aggressive behavior when disturbed.

Status:

The Shasta crayfish is the only extant species of crayfish native solely to California. It is a relatively long-lived species, but has limited reproductive potential; it matures slowly (at age five years) and produces relatively few eggs. Competition with, and predation by, signal crayfish, an invasive nonnative species, is one factor contributing to the decline of the Shasta crayfish. Although the species has been reported from seven populations, recent studies found Shasta crayfish at only three of the previous seven known locations, apparently due to invasion by signal crayfish. The remaining populations range in size from fewer than 50 to about 1000 individuals. Little or no genetic exchange occurs between these small, disjunct populations.

The largest population of Shasta crayfish is found in upper Spring Creek, a tributary to the Fall River. Until recently, this population has been protected from nonnative signal crayfish invasions via a series of four culverts that convey the creek waters under the road. The velocity of water passing through the culverts prevents signal crayfish from migrating upstream. When the Fall River flooded in January 1997, the road crossing was inundated for several hours, causing a temporary flow reversal in the culverts, which allowed signal crayfish to migrate through the culverts. Between June and August 1997, two collection efforts resulted in the capture of four adult and 18 juveniles. All of the signal crayfish were collected within 25 feet of the culverts on the upstream side. The DFG searched the area farther upstream of the culverts, but no additional signal crayfish were found. Using Cantara Chemical Spill Restoration funds, the DFG is currently funding a project that will replace the aging culverts and maintain them as a barrier to signal crayfish invasion.

In 1997, the DFG closed its Pit River Hatchery at Sucker Springs Creek to protect the Shasta crayfish. The DFG operated the trout-rearing facility for more than 30 years. The hatchery ponds supported the largest known population of Shasta crayfish in the mid-reaches of the Pit River. Fortunately, due to the design of the hatchery, the pond weirs function as barriers against signal crayfish. The DFG is currently restoring Sucker Springs Creek to a more natural state, incorporating improvements that would further protect the Sucker Springs Creek population from signal crayfish invasions. To date, the DFG has trapped and removed over a thousand signal crayfish from Sucker Springs. Continued trapping efforts at Sucker Springs during 2000, 2001, and 2002 have not been successful at eradicating the signal crayfish. Other methods and techniques are being considered in conjunction with a 2003 Section 6 Proposal that will assess existing populations of Shasta crayfish and search for potential refugia sites.

In August 1998, the USFWS completed the Recovery Plan for the Shasta crayfish. Recovery actions include: 1) protecting Shasta crayfish through eradication of, or preventing nonnative crayfish invasions, restoring habitat, and eliminating adverse impacts of land management practices; 2) determining the status, distribution, and relative abundance of Shasta crayfish in the mainstem of the Pit River; 3) conducting research on the ecology, behavior, and pathology (i.e., viral and bacterial infectious agents) of Shasta crayfish; 4) monitoring and assessing Shasta crayfish populations; 5) developing effective watershed and ecosystem management plans for all drainages supporting Shasta crayfish populations; and 6) providing public education on Shasta crayfish.

The status in 2002 of the Shasta crayfish: Declining.

California freshwater shrimp

Syncaris pacifica

State	Endangered	1980
Federal	Endangered	1988

General Habitat:

The California freshwater shrimp is found in shallow low-elevation, low-gradient streams 12 to 36 inches in depth with exposed live roots of trees such as alder and willow along undercut banks greater than six inches with overhanging woody debris or stream vegetation and vines such as stinging nettles, grasses, vine maple and mint.

Description:

The California freshwater shrimp is the State's only native, stream-dwelling shrimp. This species resembles its marine relatives but rarely attains a carapace length (measured from the eye socket to tip of the tail) of more than two inches. The shrimp feeds on decomposing plants and other detritus. Juveniles are nearly transparent, whereas adults are mostly translucent with small, diffuse, dark spots that camouflage the body outline. When disturbed, they can change their color, from translucent to entirely dark brown or purple, to blend in with their surroundings. Females can darken their bodies to a greater degree and are also generally larger and deeper bodied than males.

Status:

Historically, the shrimp was probably common in low elevation, perennial freshwater streams in Marin, Sonoma, and Napa counties. Today, it is found in 17 stream segments within these counties. The distribution can be separated into four general geographic regions: 1) tributary streams in the lower Russian River drainage, which flows westward into the Pacific Ocean; 2) coastal streams flowing westward directly into the Pacific Ocean; 3) streams draining into Tomales Bay; and 4) streams flowing southward into northern San Pablo Bay. All known occurrences are threatened by introduced fish, deterioration or loss of habitat resulting from water diversion, impoundments, livestock and dairy activities, agricultural activities and developments, flood control projects, gravel mining, timber harvesting, migration barriers, and water pollution. The USFWS completed its Recovery Plan for the California Freshwater Shrimp in August 1998. This plan developed the framework for habitat restoration, reintroduction of the shrimp to sites from which it had been extirpated, and an assessment of the effects of various conservation efforts on cohabiting native species.

USGS has recently implemented a research project in Olema and Lagunitas Creeks in Point Reyes National Seashore and Golden Gate National Recreation Area. The goals of this project are to 1) to determine if shrimp are homogenously distributed throughout Lagunitas and Olema creeks or if their distribution is concentrated in certain

localities; and 2) to determine if shrimp distribution is associated with selected habitat characteristics (e.g., stream morphometry, water quality, types and amounts of underwater cover, cohabiting fish species). The results from this study will be used to identify management actions that benefit the shrimp population in Olema Creek, but could also benefit shrimp in Lagunitas Creek and elsewhere. The ecological data will also contribute to contribute to recovery of this species. Data collected began in early 2003. Preliminary results on Lagunitas Creek show seasonal variation in numbers of juvenile and adult shrimp, with more juvenile shrimp in August and November and more adult shrimp in February and May. Approximately 1000 shrimp were captured during the four 2003 sampling periods. The majority of shrimp occur in "slides" rather than pools and riffles. Most were captured on the fine roots of blackberry in slow moving waters.

A number of agencies and private groups have contributed to the conservation of the California freshwater shrimp. Partners in this effort include the NRCS, the WCB, the NPS, Marin County, Napa County, the California Coastal Conservancy, local schools, ranchers, and watershed groups. Habitat restoration on Stemple Creek in Marin County exemplifies this partnership. A watershed approach to stream restoration was funded by a variety of means, including a grant from the WCB, a USFWS Partners for Wildlife grant, and funds from the Marin Community Foundation. Using a variety of land management tools and historic data, riparian restoration began the late 1990s. About 20 miles have been restored and ranchers have reconfigured pastures to protect the stream and reduce runoff from fields.

Restoration was also accomplished through a Center for Ecoliteracy project entitled "The STRAW Project" or "Students and Teachers Restoring a Watershed." Students involved in the project benefit from working alongside watershed restoration experts. The 4th Grade Brookside School students and their teacher worked cooperatively to map riparian habitat, monitor water quality, research native species, clear debris from creeks, and implement public awareness campaigns. Prior to the STRAW Project, it was estimated that 50 years would be needed to effect a change in the shrimp population levels in the degraded reaches of the Stemple Creek. However, the California freshwater shrimp could be found in the restored areas of Stemple Creek within three years.

Species Accounts - Fish

Sacramento River Winter-run Chinook salmon

Oncorhynchus tshawytscha

Chinook salmon. Courtesy of Hanford Reach National Monument.

State Endangered 1989
Federal Endangered 1994

General Habitat:

The Sacramento River winter-run Chinook salmon historically spawned in cold spring-fed tributaries of the upper Sacramento River Basin. The run is now restricted to the mainstem Sacramento River downstream of Keswick Dam.

Description:

Chinook salmon are easily distinguished from other *Oncorhynchus* species by their large size. Adults weighing over 120 pounds have been caught in North American waters. Chinook salmon are very similar to coho salmon (*O. kisutch*) in appearance while at sea (blue-green back with silver flanks), except for their large size, small black spots on both lobes of the tail, and black pigment along the base of the teeth.

Status:

The Sacramento River winter-run Chinook salmon is one of four runs of Chinook salmon occurring in the Sacramento River. Winter-run Chinook adults return to the mainstem Sacramento River downstream from Keswick Dam from December through July, peaking in March and April. Adults hold there until spawning in May through August. Juveniles spend five to nine months in the river and the Sacramento-San Joaquin Estuary before entering the ocean. Genetic studies have shown that the Sacramento River winter-run Chinook salmon is distinct from other Chinook salmon runs in the Central Valley. The population of winter-run Chinook salmon continues to be low, but has shown some recovery in recent years. Since 1967, run size estimates have been made based on counts at Red Bluff Diversion Dam. In 2000, 2001, and 2002, estimates based on dam counts were 1,352, 5,523, and 9,172 fish, respectively.

Beginning in 1996, the DFG and USFWS have conducted a mark-recapture carcass survey for winter-run Chinook in the upper Sacramento River. Since 2001, DFG has considered the population estimate from the carcass survey to be the best available estimate of winter-run instream spawner abundance. From the carcass survey data (Jolly-Seber model), the estimated number of spawning fish in 2001 and 2002 was 8,120 and 7,337 fish, respectively.

Population estimates in recent years are therefore higher than the average estimates from Red Bluff Diversion Dam counts in the early 1990's (fewer than 500 fish), but population levels remain well below observed population levels in the late 1960's and 1970's, and well below the proposed level defined for recovery of the run. Factors

contributing to the population increase in recent years include improved temperature control at Shasta Dam, habitat improvements, installation of fish ladders and screens at major water diversions, improved contaminant control at Iron Mountain Mine, more restrictive ocean harvest regulations, and relatively good conditions for ocean survival.

USFWS continues a propagation program for winter-run Chinook salmon at Livingston Stone National Fish Hatchery at the base of Shasta Dam. In January 2000, 2001, and 2002, approximately 166,000, 252,500, and 253,000 juvenile winter-run, respectively, were released into the upper Sacramento River. A captive rearing program for winter-run Chinook continues at the Livingston Stone National Fish Hatchery. The captive rearing program was established in 1991 when the run size was extremely small. The program was designed as a hedge against the possibility of extinction of the species by rearing fish in captivity until maturity. The program is currently being reevaluated in consideration of the increasing natural production of winter-run in recent years.

NMFS completed the *Proposed Recovery Plan for the Sacramento River Winter-run Chinook Salmon* in August 1997. In 2002, NMFS initiated comprehensive recovery planning for listed salmonid species in the Central Valley, including winter and spring-run Chinook salmon, and Central Valley steelhead.

The current status of the Sacramento River winter-run Chinook salmon is stable.

Sacramento River Spring-run Chinook Salmon *Oncorhynchus tshawytscha*

State	Threatened	1999
Federal	Threatened*	1999

*Central Valley Spring-Run includes populations spawning in the Sacramento River and its tributaries

General Habitat:

The spring-run Chinook salmon is native to the San Joaquin and Sacramento River systems. Large pools with cold water are essential over-summering habitat for this species.

Description:

Chinook salmon are easily distinguished from other *Oncorhynchus* species by their large size. Adults weighing over 120 pounds have been caught in North American waters. Chinook salmon are very similar to coho salmon (*O. kisutch*) in appearance while at sea (blue-green back with silver flanks), except for their large size, small black spots on both lobes of the tail, and black pigment along the base of the teeth.

Status:

Sacramento River spring-run Chinook salmon now spawn and rear primarily in three Sacramento River tributaries (Deer, Mill and Butte creeks). Small populations also occur sporadically in Antelope, Beegum, and Big Chico Creeks. Although spring-run occur in the mainstem Sacramento, Yuba, and Feather rivers, these populations are probably hybridized with fall-run Chinook. Following significant restoration, spring-run are now also returning in increasing numbers to lower Clear Creek.

Spring-run Chinook salmon enter the Sacramento River between February and June. They move upstream and enter tributary streams from February through July, peaking in May-June. These fish migrate into the headwaters, and hold in pools through the summer. Spawning can start as early as mid-August and last until mid-October, with peak occurrence in September. Juvenile life history is more variable. Some fish emerge starting in early November, continuing through the following April. These juveniles emigrate from the tributaries as fry from mid-November through June. Some fish remain in the stream until the following October and emigrate as "yearlings", usually with the onset of storms starting in October through the following March. Peak emigration of yearlings is in November-December.

Adult spring-run spawning population estimates in Butte Creek in 2000, 2001, and 2002 were 4,118, 9,605, and 8,785 respectively. These estimates were higher than estimates from the late 1960's through 1994, indicating some continuing recovery since 1994. Spawning population counts in Deer and Mill creeks in 2000 through 2002 also indicate some recovery of these populations in recent years.

Monitoring and management actions continue to play key roles in minimizing the impacts of state and federal water project operations on juvenile spring-run migrating through the Sacramento-San Joaquin Delta. A decision process based on information from various fisheries monitoring activities is used by biologists to make real-time changes in water project operations for the protection of spring-run and other listed stocks.

Recent genetic research has provided evidence that supports the distinction of spring-run Chinook salmon from the other Central Valley Chinook runs. . This evidence indicates that there are two discrete subpopulations: one inhabiting Butte Creek and the other inhabiting Mill and Deer creeks. Low population abundance over many generations, relatively isolated subpopulations, and restricted range remain high risk factors to Sacramento River spring-run Chinook because of the potential for reduced genetic diversity and increased inbreeding. The potential for hybridization of spring-run and fall-run Chinook in some tributaries such as Clear Creek or the Yuba River may be a threat to the genetic integrity of remaining Sacramento River spring-run populations. These genetic risks can have significant impacts on the survival and reproduction of Sacramento River spring-run Chinook populations.

The DFG's Status Review Report was submitted to the Fish and Game Commission (FGC) in June 1998 with a recommendation that the species warranted threatened status under the California Endangered Species Act and was formally listed as a State-threatened species in February 1999. In November 1999, Central Valley spring-run Chinook salmon was listed as threatened under the federal Endangered Species Act.

Overall, low population sizes, high population variability, the potential of reduced genetic diversity and altered genetic integrity, and restricted habitat are still great risk factors for Sacramento River spring-run Chinook. Continued conservation efforts are essential for their protection.

The current status of the Sacramento River spring-run Chinook salmon: Stable.

Coho salmon *Oncorhynchus kisutch*

State	Endangered south of San Francisco Bay	1995
	Candidate Endangered north of San Francisco to Punta Gorda	2002
	Candidate Threatened north of Punta Gorda	2002
Federal	Threatened San Lorenzo River north to Punta Gorda (Central California Coast ESU)	1996
	Threatened Punta Gorda north to Cape Blanco, Oregon (Southern Oregon Northern California Coast ESU)	1997

General Habitat:

In California, coho salmon are found in many of the coastal drainages from the Oregon border south to Monterey Bay. In the larger coastal drainages coho migrate high into the drainages, such as in the Klamath River where they migrate to Iron Gate Dam (~190 miles from the river mouth), and to many of the nearby major tributaries.

Description:

Coho salmon are medium to large salmon, with spawning adults typically 16 to 28 inches and weighing 6-13 lbs. Spawning adults are generally dark and drab. The head and back are a dark, drab blue-green; the sides are a dull maroon to brown with a bright red lateral streak; and the belly is gray to black. Females are paler than males, usually lacking the red streak. Characteristics of spawning males also include hooked jaw, enlarged and more exposed teeth, slightly humped back and a more compressed head and body. The snout is less deformed than in other salmon species.

Adult coho salmon in the ocean are steel-blue to slightly greenish on the back, silvery on the sides, and white on the belly. They have numerous small, irregular black spots on the back, upper sides above the lateral line, and base of the dorsal fin and upper lobe of the caudal fin. The adults have black mouths with white gums at the base of the teeth in the lower jaw. This is the most reliable physical feature that distinguishes them from chinook salmon (*O. tshawytscha*).

Juvenile coho salmon in inland waters are blue-green on the back, with silvery sides. The large eye and the characteristic sickle-shape of the anal and dorsal fins are characteristic of coho salmon juveniles and distinguish them from juveniles of other Pacific salmon species.

Status:

The coho salmon is one of seven species of Pacific salmon belonging to the genus *Oncorhynchus* and one of two native salmon species regularly occurring in California. The coho salmon life cycle is generally three years, spending their first year in fresh water and the next two years in salt water prior to returning to spawn in their natal streams (anadromous). Some males, called "jacks", return to spawn after only one season in the ocean. Adult coho salmon usually enter fresh water to spawn from September through January, peaking mid-November through mid-January. In many California coastal streams, spawning migrations do not begin until heavy rains have opened the sand bars that form at the mouth of the stream. In the larger rivers where the mouth remains open all year, coho have access earlier in the season and these early runs generally move higher in the watershed.

California coho salmon have experienced a significant decline in the past 40 to 50 years. Many of these populations have been individually and cumulatively depleted or extirpated and the natural linkages between them have been fragmented or severed. The severity of the decline and number of extirpated populations increases as one moves closer to the historical southern limit of the coho salmon range, indicating that freshwater habitat in these marginal environments is less able to support coho salmon populations than in the past. Freshwater habitat loss and degradation have been identified as leading factors in the decline of anadromous salmonids in California, and coho salmon do not appear to be an exception to this trend.

Timber harvest activities, especially past and present road construction, have had deleterious effects on coho salmon habitat. Diversion of water for agricultural and municipal purposes and dams that block access to former habitat have resulted in further reduction of habitat. Water quality in historical coho salmon streams has degraded substantially, as evidenced by the number of north- and central-coast streams that have been placed on the list of impaired water bodies. Even though unfavorable climate conditions have contributed to the continued decline of remnant populations of coho, these factors alone would have little impact on a healthy robust population. A team of individuals from several governmental and private organizations is assisting the Department in its efforts to develop a statewide recovery plan for California coho salmon. The Department has completed the Recovery Strategy for California Coho Salmon. This document is an update to the report presented to the DFG Commission on August 2003.

South of San Francisco Bay (southern portion of Central California Coast Coho ESU)

Nine coastal streams south of San Francisco Bay historically supported self-sustaining spawning runs of coho salmon. These streams (listed from north to south) are San Gregorio, Pescadero, Gazos, Waddell, Scott and San Vincente Creeks, the San Lorenzo River, and Soquel and Aptos Creeks in San Mateo and Santa Cruz counties. Presently, only Scott Creek is known to support all three brood-years (a brood-year is a group of fish that hatched during a given spawning season). The Scott Creek population has been supplemented in recent years by stocking coho juveniles from a small hatchery on Big Creek, a tributary of Scott Creek. Waddell Creek, five miles north of Scott Creek, is known to support two of the three brood-year lineages, although one of the two appears to total less than 20 returning adults.

Limited sampling for juvenile coho salmon has been recently conducted in the streams south of San Francisco. Juveniles have been found in Pescadero, Gazos, Waddell, Scott, and San Vicente Creeks. However, due to the difficulties in sampling, it has not been possible to estimate juvenile abundance. The few existing southern coho salmon populations are small and in danger of extirpation.

The Department, with the assistance of individuals from several governmental and private organizations, has

developed a draft recovery plan for coho salmon in the nine streams south of San Francisco Bay. Concepts from the draft plan will be incorporated into the statewide coho salmon recovery plan currently in development. At this time, the DFG considers the status of the coho salmon south of San Francisco Bay to be declining and in danger of extinction.

North of San Francisco to Punta Gorda (northern portion of Central California Coast Coho ESU)

Presence surveys done in 2001 and 2002 in the northern portion of the Central California Coast (CCC) Coho ESU show a level of occupancy of historical streams that is similar to the Southern Oregon Northern California Coast (SONCC) Coho ESU. However, stream systems south of Mendocino County show a much greater proportion of streams in which coho salmon were not found. These surveys and other recent monitoring data indicate that widespread extirpation or near-extinction have already occurred within some larger stream systems (e.g. the Gualala and Russian rivers) or over broad geographical areas (e.g. Sonoma County coast, San Francisco Bay tributaries, and streams south of San Francisco). Most abundance trend indicators for streams in the CCC Coho ESU indicate a decline since the late 1980s. However, some streams of the Mendocino County coast show an upward trend in 2000 and 2001. Time-series analysis for these streams show a declining trend and predict that this trend will continue, despite the recent increases.

There is anecdotal evidence that relatively large numbers of coho salmon adults returned to some Marin County streams in 2001, and some of these streams, such as Lagunitas Creek, appear to have relatively stable populations. However, these populations are more vulnerable to extinction due to their small size, and the spatial isolation of this region due to extirpation of coho salmon populations to the north and south.

Coho populations in streams in the northern portion of this ESU seem to be relatively stable or are not declining as rapidly as those to the south. There is fragmentation in all but the Marin, Bodega, and Russian River watersheds. Both persistence and numbers of fish are problematic. However, the southern portion, where widespread extirpation and near-extinctions have occurred, is a significant portion of the range of coho salmon in this ESU. Data suggest that coho salmon are extirpated from all the streams and watersheds that flow into the San Francisco Bay. Data also indicate that metapopulation structure may be severely compromised and remaining populations may face greatly increased threats of extinction because of this. Hence, in both north and south of the Bay, conservation hatcheries are being operated and are considered vital for any chance to recovery the CCC. Small population size along with large-scale fragmentation and collapse of range observed in data for this area. For this reason, the Department concludes that CCC coho salmon are in serious danger of extinction throughout all or a significant portion of their range.

North of Punta Gorda to the Oregon/California Border (California Portion of SONCC Coho ESU)

The analysis of presence-by-brood-year data indicates that coho salmon now occupy only about 61% of the SONCC Coho ESU streams that were previously identified as historical coho salmon streams. However, these declines appear to have occurred prior to the late 1980s and data do not support a significant decline in distribution between the late 1980s and the present. This analysis and the 2001 presence surveys indicate that some streams in this ESU may have lost one or more brood-year lineages.

The 2001 presence survey data also show a decline in reported distribution in this ESU. These data show a substantial reduction in the number of historical streams occupied by coho salmon, especially for the Mattole, Eel, and Smith River systems, where coho salmon appeared to be absent from 77%, 75%, and 62% of the streams surveyed, respectively. These data should be interpreted with caution, however, because they represent only one year of surveys, and 2001 was a drought year on the north coast. Nevertheless, the inability to detect coho salmon in streams where they were historically documented, and that are considered by biologists to contain suitable coho salmon habitat is significant, especially since coho salmon were not found in 64% of all the streams surveyed. Adult coho salmon counts at Benbow Dam on the South Fork Eel River show a substantial decline in coho

salmon abundance in this system starting in the mid-1940s. Most other trend indicators for streams in the area show declining or stable trends.

Although streams supporting coho salmon in the California portion of the SONCC Coho ESU now appear to be fewer in comparison to the 1985-1991 period, the available data suggest that population fragmentation within the larger river systems is not as severe as that within the CCC Coho ESU. The major stream systems within the California portion of the SONCC Coho ESU still contain coho salmon populations. Also, the presence-by-brood-year analysis indicates that the decline in the number of streams supporting coho salmon appears to have stabilized since the mid-1980s. For these reasons, the Department believes that the California portion of the SONCC Coho ESU is not presently threatened with extinction. However, because of the decline in distribution prior to the 1980s, the possibility of a severe reduction in distribution as indicated by the field surveys, and the downward trend of most abundance indicators, coho salmon populations in the California portion of this ESU will likely become endangered in the foreseeable future in the absence of the protection and management required by CESA. The Status in 2003 of the coho salmon from Punta Gorda north to the California-Oregon Border is declining, not presently in danger of extinction, but threatened.

Bull trout *Salvelinus confluentus*

USBR File Photo

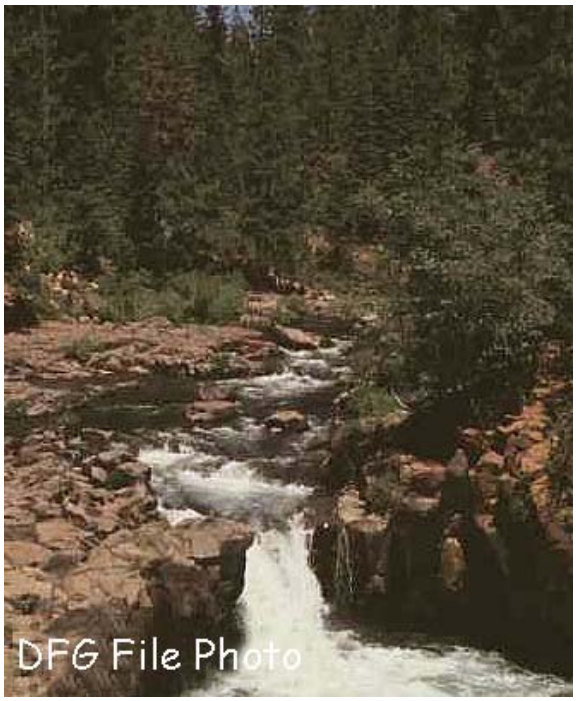
State	Endangered	1980
Federal	Threatened	1999

General Habitat:

Bull trout prefer deep pools of cold rivers and larger tributaries. Spawning requires a large volume of cold water. Although bull trout are fairly common throughout much of their range, in California, they were native only to the lower McCloud River of northern Shasta and southern Siskiyou counties.

Description:

The bull trout is a large (10-40 inches) non-anadromous species of char. Bull trout have a long, broad head that is flat above and sharply tapered through the snout. The eye is positioned near the dorsal margin. The coloration of the bull trout is olive green with small yellow or light spots on the back and small but conspicuous red spots on the sides.


DFG File Photo

Status:

The bull trout has been extirpated from the McCloud River; extirpation has been attributed primarily to the construction of McCloud Dam in 1965. The dam blocked annual spawning migrations and inundated prime spawning and juvenile rearing habitat. McCloud Dam also reduced downstream flows and increased water temperature (by about 10° F), and has significantly reduced flushing flow and gravel recruitment.
Reintroductions into the McCloud River of newly hatched bull trout from Oregon were attempted during the early 1990s, without success. There is concern that Oregon bull trout are not of the same genetic stock as those that occurred historically in the McCloud River and its tributaries. Therefore, even if introductions had been successful, they may not have contributed to the recovery of the same stock that was endemic to the McCloud. The DFG has determined that, due to dramatic changes in habitat that occurred as a result of the McCloud Dam, any bull trout reintroductions (from any genetic strain) would not be successful.

The status in 2002 of the bull trout: Extirpated.

Delta smelt *Hypomesus transpacificus*

State	Threatened	1993
Federal	Threatened	1993

General Habitat:

Delta smelt are found only from the Suisun Bay upstream through the Sacramento-San Joaquin River Delta in Contra Costa, Sacramento, San Joaquin, Solano and Yolo counties. They are widely dispersed throughout the river channel and spawn in backwater sloughs and along channels with tidal influence.

Description:

Delta smelt are slender-bodied fish, about 2 to 3 inches long. They have a steely blue sheen on the sides and seem almost translucent. Delta smelt live together in schools and feed on small fishes and invertebrates. They are tolerant of a wide salinity range. For a large part of their one-year life span, delta smelt live along the freshwater edge of the mixing zone between the saltwater and freshwater interface.

Status:

Historically, the delta smelt was one of the most common species in the estuary. However, the population declined dramatically in the early 1980s. Delta smelt are considered environmentally sensitive because they live only one year, have a limited diet, produce low numbers of eggs, are poor swimmers, are easily stressed, and reside primarily in the interface between saltwater and freshwater. The reasons for the delta smelt decline are multiple and are probably compounded by one another. These reasons include: 1) reductions in delta water outflow; 2) capture by water diversions and pumping; 3) high delta water outflows; 4) reduction in prey food organisms; 5) toxic substances; 6) disease, competition, and predation; and 7) loss of genetic integrity.

The size of the delta smelt population varies from year to year, with extremely low levels observed in the Fall Midwater Trawl (FMWT) survey for the years 1994, 1996, and most recently 2002, with moderate levels observed in 1993, 1995, and most recently 1999. Based on the FMWT 2002 survey results, the 2002 population was substantially lower than in previous years.

The DFG, in response to Fish and Game Commission directives, initiated an intensive, multi-disciplinary study program in 1992. The study program was designed to monitor the population and investigate all aspects of delta smelt biology in order to protect sufficient numbers to ensure their long-term survival and make better informed water management decisions. The current research program is under the auspices of the Interagency Ecological Program and is funded by Department of Water Resources and Bureau of Reclamation. Recent findings indicate that the delta smelt population is affected by the amount of outflow from the estuary, which varies from year to year due to precipitation and water management. It appears that delta smelt populations do better when water outflow is allowed to flow downstream and create nursery habitat in Suisun Bay. Nearly continuous monitoring of delta smelt distribution and abundance throughout the estuary has been used to make informed water management

decisions and to reduce "take" of species at the State and federal water diversion projects in the south delta.

In December 1994, a three-year agreement was reached between representatives of the State and federal governments, water users, and the environmental community on how water is managed in the Estuary. This agreement, the Water Accord, provided for new water quality standards, predictable water management, endangered species protection, mitigation programs, and other Bay-Delta programs. Attainment of the standards proposed in the Water Accord will provide better rearing habitat conditions in the estuary.

A five-year recovery review period established under the USFWS Recovery Plan had to be restarted in 1998 because abundance and distribution criteria were not achieved in 1997. By 2003, all of these criteria were met by a slim margin. However, although delta smelt have fulfilled the criteria of the Federal Recovery Plan, FMWT data have shown a decreasing trend in the past three years with an extremely low index in 2002.

The status in 2003 of the delta smelt:Stable to Declining.

Mohave tui chub

Gila bicolor mohavensis

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1970

General Habitat:

Formerly found in deep pools and slough-like areas of the Mojave River, this species now only occurs in highly modified refuge sites in San Bernardino County.

Description:

The Mohave tui chub is a chunky, large-scaled fish with a small, terminal, slightly oblique mouth. This subspecies has a bright brassy-brown to dark olive back with a bluish-white to silver belly. The average size for adults is four to six inches, while some fish may be as large as nine inches. Mohave tui chub typically spawn from February to October. Females lay approximately 4,000 to 50,000 adhesive eggs over aquatic vegetation. Once hatched, the fry will school in the shallows, while medium-sized tui chub (1 to 3 inches) school in water one to two inches deep. Large chub are typically solitary and found in deeper water. Mohave tui chub feed on insect larvae and detritus.

Status:

The Mohave tui chub is the only fish native to the Mojave River. They were historically restricted to the Mojave River, from the confluence of the east and west forks at the base of the San Bernardino Mountains to its terminus at Soda Dry Lake. Habitat modifications, including damming of the headwaters and withdrawals of the river's underflow, were major causes of the decline of the species. In the 1930's, non-native arroyo chub were illegally introduced into the headwater reservoirs of the Mojave River as a baitfish. Arroyo chub are better able to withstand warmer and shallower habitat conditions that prevail in the Mojave river today. As the new species quickly spread throughout the drainage, it replaced native Mohave tui chubs through competition and hybridization. By 1979, Mohave tui chubs no longer lived in the Mojave River. Other threats include genetic contamination, introduction of other exotic species, habitat alteration, water diversion and pollution.

In 1997, a genetics study by UC Davis confirmed that the Mohave tui chub is a distinct subspecies and recommended that it continue to receive protection as an endangered, unique subspecies. The existing, genetically-pure Mohave tui chub populations occur at three sites: Soda Springs (Zzyzx Springs), the Department's Camp Cady Wildlife Area, and China Lake Naval Air Weapons Station (NAWS). At Camp Cady, the population is thriving in two ponds, one of which is threatened by encroaching vegetation. Mosquito fish and Asian tapeworm were discovered at Soda Lake in 2001, with unknown consequences for the chubs. Perhaps the most secure population exists at China Lake, where the US Navy monitors and protects a population numbering in the thousands. China Lake was chosen as a refuge site and the Mohave tui chub were introduced into Lark Seep in 1971.

Since 1995, NAWS has conducted annual mark-recapture surveys to estimate the chub population at China Lake. From 1995 through 2000 the project was conducted in late May or early June, but encountered spawning fish. To reduce inadvertent capture of spawning fish or damage to their eggs, the survey date was changed to November in 2001. No spawning fish were encountered at that time.

In 2002, two 24-hour water quality meters were installed in the Lark Seep system. Both meters monitor pH, dissolved oxygen, temperature and conductivity. Cattail and tamarisk were also removed. To obtain more reliable population estimates, the Lark Seep System was divided into various habitat types. The defining features used for determination of habitat types were depth and width of the channels, as well as the existence of contiguous habitat. Channel banks support pickleweed, cattail, rush, saltgrass, and some tamarisk.

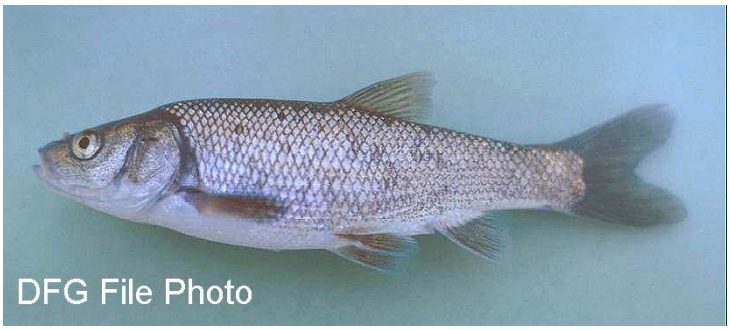
The 2002 survey captured 530 fish although few of those fish represented recapture of fish marked in previous sampling. Using statistical methods, NAWS estimated that population size to be about 6000 fish. A number of dead fish were found in the North Channel of the seep system. Mortality was attributed to low dissolved oxygen in the water. No spawning fish were noted during this mark-recapture survey. A study has been proposed for 2003 to characterize the dissolved oxygen levels at different depths within the water column along the North Channel. The results will also dictate where and when fish traps are placed into the channel for future mark-recapture surveys. No trapping would occur in 2003 until this study is completed and dissolved oxygen level changes are better understood and modifications to trapping locations are addressed as appropriate. These modifications may include changes such as suspension of traps in the upper part of the water column or relocation to shallower sites.

Recapture rates were low again for the 2002 census. NAWS concluded that the low number of recaptured fish indicated that additional trapping days should be added to future mark-recapture surveys. Additional trapping time within each habitat may increase the number of individuals captured and recaptured; data needed to gain a more precise population estimate. Recommendations for future projects include placement of additional 24-hour water meters the Lark Seep System; continuation of tamarisk removal; a complete dissolved oxygen study of the North Channel habitat; a complete topographical study of channel depths; and implementation of a bullfrog eradication program.

The Mohave Tui Chub Advisory Committee meets periodically, and will continue to investigate future refuge and reintroduction sites, provide recommendations to USFWS, and update USFWS's Recovery Plan.

The status in 2002 of the Mohave tui chub: *Declining*.

Owens tui chub *Gila bicolor snyderi*



State	Endangered	1974
	Fully Protected	
Federal	Endangered	1985

General Habitat:

The historic distribution of the Owens tui chub was throughout the standing waters and low gradient reaches of the Owens River and its larger tributaries extending from the River's source springs to its terminus at Owens Lake.

Description:

The Owens tui chub is similar in appearance to the closely related Mohave tui chub. Owens tui chub are large-scaled, small, chunky fish. They are olive-colored on the dorsal surface and bluish or creamy-white below. To distinguish the Owens tui chub from other tui chub requires microscopic examination of scales and cranial bones, although DNA techniques are under development. The maximum body length is approximately eight inches. Owens tui chub spawn from March through September. Females lay adhesive eggs on vegetation or other available substrates, such as rocks and gravel. Owens tui chub eat insect larvae and, to a lesser degree, algae and detritus.

Status:

There are three existing natural Owens tui chub populations. These are at the Owens River Gorge, source springs of the Department's Hot Creek Hatchery, and a pond and ditches at Cabin Bar Ranch near Owens Dry Lake. Additional populations of Owens tui chub have been established in cooperation with land owners at BLM's Mule Spring, Little Hot Creek in Inyo National Forest, and at the University of California White Mountain Research Station owned by LADWP.

The major threats to the Owens tui chub are the presence of numerous, introduced Lahontan tui chubs with which the natives readily hybridize, and the introduction of predatory fish species, and lack of suitable habitats for reestablishment. The New Zealand mud snail is a tiny, alien species that is invading some California waters and threatening wild trout populations. The snail has already been found in both the upper and lower portions of the Owens River. Its potential impacts on the Owens tui chub are not known. Competition with and predation by trout in the Owens Gorge, geothermal and water supply development in the Hot Creek watershed, and vegetation encroachment at Cabin Bar potentially threaten existing populations. The Department has contracted with UC Davis to verify the genetic purity of tui chub populations in the Owens Valley and make genetic management recommendations.

The Department is a signatory to the USFWS *Recovery Plan for Owens Basin Wetland and Aquatic Species*. The intent of the plan is to maximize benefits by preserving remnants of functioning ecosystems for many species

rather than just one. Restoration activities for tui chub called for in the plan include genetic assessment, vegetation management, fencing, water control structure maintenance, and removal of exotic fishes, identification of additional refuge sites, and reestablishment in restored habitats. Progress toward recovery has been hampered by limited funds and private lands issues.

The status in 2002 of the Owens tui chub: *Stable to Declining*.

Bonytail chub *Gila elegans*

State	Endangered	1974
Federal	Endangered	1980

General Habitat:

Historically, the bonytail chub occurred in the mainstream of the Colorado River and the lower-gradient portions of its major tributaries and in the Salton Sea Basin. However, bonytail chub have not been documented in the Salton Sea since the early 1900's. The natural habitat of the bonytail was characterized by highly fluctuating seasonal and annual flows, distinctly different habitat types (i.e., whitewater, lower gradient and meandering main channels, off-channel backwaters, and others) and varying water quality (i.e., sediment load, temperature, salinity, etc.). The bonytail chub is adapted to mainstream rivers, where it has been observed in pools and eddies. In reservoirs, the fish occupies a variety of habitat types. In Lake Mohave, the fish was observed in eddy habitats.

Description:

The bonytail chub is the rarest of the endemic big river fishes in the Colorado River Basin. It is a large chub, commonly eight to 14 inches, with a gray to olive back and white, silvery sides and belly. It has an extremely narrow caudal peduncle, where the tail fin joins the body, with a deeply forked caudal fin, fine, embedded scales and a short, flattened head with a broad snout and small elliptical eyes. There is a conspicuous hump behind the head. Bonytail are long lived fish. Individual fish have been aged up to 49 years. During breeding, males turn red-orange on the belly and paired fins.

Status:

Habitat alteration caused by flow depletion from irrigation and other water uses, construction of dams, hybridization with other *Gila* species, and the introduction of non-native species have resulted in the bonytail's endangered status. Bonytail are becoming increasingly rare in their California habitat and very few bonytail have been found during monitoring in recent years. In the Lower Colorado Basin, a few large, old adults are still found in Lake Mojave, but successful recruitment has not been documented. A few bonytail still occur in Lake Havasu. Bonytail have not been found or stocked south of the Parker Dam in recent years.

In 1994, USFWS designated critical habitat for four fish species found in the Colorado River, including the bonytail. This designation included seven reaches of the Colorado River system. These reaches total 312 miles with 50 miles on the California-Arizona border. As with the endangered razorback sucker, the USFWS has

determined that the bonytail chub is in jeopardy of becoming extinct in the near future if recovery activities are not implemented and successful. There are currently 15 species-specific management actions and 15 general habitat enhancement/restoration actions being carried out for the bonytail along the Lower Colorado River.

Concern over the status of the bonytail chub, one of four listed Lower Colorado River fish species, helped initiate the development of the Lower Colorado River Multi Species Conservation Program (LCRMSCP). The LCRMSCP is a multi-species habitat conservation plan that covers both aquatic and terrestrial species. The area covered by the LCRMSCP includes the 100-year flood plain of the Colorado River from Lee's Ferry, AZ south to the southern International Border with Mexico. It involves the planning efforts of the Department, USBR, BLM, USFWS, Arizona Game and Fish, Nevada Division of Wildlife, various water, power and irrigation agencies, Native American tribes, and environmental groups. The USFWS is directing stocking efforts in the Lower Colorado River Basin through the Lake Havasu Fisheries Improvement Project (LHFIP). The only current effort to reintroduce bonytail into California waters is through the LHFIP. One component of the partnership was to stock 30,000 bonytail, of ten inches or longer, into Lake Havasu over a five-year period. This goal was accomplished in November of 2004. Because bonytail chub proved to be more difficult to raise than razorback sucker, an additional three years was needed by the LHFIP to reach its goal.

Small isolated grow out-ponds (ponds used to receive fish from another hatchery and grown to a larger size) on Lake Havasu were initially used but quickly discontinued due to lack of success. Achii Hanyo Hatchery, on Colorado River Indian Reservation land in Arizona was used as the primary grow-out location for bonytail. The survival rate for bonytail at Achii Hanyo increased with gained experience and at project completion was better than 80 percent.

USFWS recovery goals for the bonytail chub were released in 2002. Recovery of the Colorado bonytail is being considered in two recovery units: the upper Colorado River basin upstream of Glen Canyon Dam, Arizona and the lower basin.

The Status in 2005 of the bonytail chub: Declining. Bonytail chub are significantly threatened with extinction in the wild in California and nationwide.

Colorado pikeminnow (squawfish)

Ptychocheilus lucius

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1967

General Habitat:

The natural habitat of the Colorado pikeminnow was characterized by slow, deep water in the Colorado River and its major tributaries.

Description:

The Colorado pikeminnow (renamed from squawfish) is one of the largest species of the minnow family (Cyprinidae) in the world and historically was the top carnivore of the Colorado River system. It was reported to reach lengths of more than 71 inches, and weights of 79 pounds. Specimens weighing over 15 pounds are now rare. 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. The Colorado pikeminnow's coloration is dusky green above, silver on the sides, and yellow to white on the belly.

Status:

Although once abundant throughout the Colorado River and major tributaries in slow, deep water, the Colorado pikeminnow has not been seen below Arizona's Glen Canyon Dam since 1968. In California, the species was known from the U.S.-Mexico Border north to the Nevada State line and the Salton Sink. Extirpation in the lower Colorado River basin was caused by habitat alteration, including changes in water temperature and sediment regimes, following construction of dams.

In 1994, USFWS designated critical habitat for four Colorado River fish species, including the Colorado pikeminnow. This designation included a total of 1,148 miles of the Colorado River system as critical habitat for the Colorado pikeminnow. None of the proposed critical habitat is in California. USFWS recovery goals for the pikeminnow were released in 2002. Recovery of the Colorado pikeminnow is considered only in the upper basin recovery unit outside of California.

Colorado pikeminnow are considered extirpated from waters in California.

Lost River sucker *Deltistes luxatus*

State	Endangered	1974
	Fully Protected	
Federal	Endangered	1988

General Habitat:

The Lost River sucker is native to the upper Klamath River basin and Lost River basin. The Lost River sucker primarily inhabits lakes and typically migrates to spawn in springs or large rivers. Lost River suckers are present in Copco Lake, Iron Gate Reservoir, and other areas of the Klamath River Basin in California and in Clear Lake and its tributaries, the Lost River, and Boles and Willow creeks in Modoc County.

Description:

The Lost River sucker is a monotypic species, meaning it is the only species in the genus *Deltistes*. This fish reaches lengths more than three feet and is characterized by along, slender head with a subterminal mouth and a long, rounded snout. The coloring is dark on the back and sides, fading to white or yellow on the belly.

Status:

The Lost River sucker inhabits lakes and typically migrates to spawn in springs or large rivers. They are present in Clear Lake and its tributaries, the Lost River, and Boles and Willow creeks in Modoc County. Populations of Lost River suckers in Copco Lake, Iron Gate Reservoir, and other areas of the Klamath River Basin in California are small and habitat conditions are poor, resulting in limited reproductive success in these waters. Clear Lake is a comparatively pristine environment and probably has the greatest potential for maintaining viable populations of this species and the shortnose sucker. Water quality conditions in Clear Lake are generally good, and the surrounding watershed is relatively undeveloped compared with conditions elsewhere. Since 1992, however, USBR activities have resulted in reduction of much of the lake's habitat and the loss of many suckers. Water quality and supply problems seriously threaten populations in Oregon.

The predominant threats to the Lost River sucker are: 1) lack of spawning habitat, 2) water diversions, 3) predation by introduced fish species (largemouth bass and yellow perch), and 4) potential hybridization with other sucker species. Preliminary results of electrophoretic analysis of Klamath River Basin suckers by UCD suggest that phenotypic variation, rather than hybridization, may explain the differences in appearance between populations of suckers from different locations. Morphological analysis confirmed that Lost River suckers from California are similar to those from upper Klamath Lake, Oregon. A 1992 directive required USBR to construct a spawning channel below Anderson Rose Dam on the Lost River and provide spawning flows of 50 cubic feet per second from April 1 to June 15. In 1995, high flows destroyed part of the spawning channel. As of 1997, there were no documented significant increases in recruitment, and that restoration effort has been abandoned.

USFWS adopted a recovery plan for the Lost River and shortnose suckers in April 1993. The primary goals of this plan are to downlist or delist the species. USFWS have not developed detailed criteria for accomplishing downlisting or delisting, and the current objective is to establish at least one stable refuge population with a

minimum of 500 adults for each species.

Currently, the DFG is proposing that DFG and USBR develop a multiple species and basin-wide Klamath Project Operations Plan and MOU to address: 1) the listed suckers and listed downstream species (including listed salmonids), 2) the need for screening on many project diversions, and 3) the development of a water conservation plan. The DFG is working in coordination with the USBR, USFWS and other agencies on the development of a new Environmental Impact Statement for the Klamath Project Operations. A new Biological Opinion will be issued by the USFWS after the completion of the Environmental Impact Statement.

The status of the Lost River sucker is unknown.

Modoc sucker *Catostomus microps*

State	Endangered	1980
	Fully Protected	
Federal	Endangered	1985

General Habitat:

Preferred habitat of the Modoc sucker consists of small streams characterized by large shallow pools with cover, soft sediments, and clear water. The species is currently known from California only in two drainages of the upper Pit River drainage in Modoc and Lassen counties.

Description:

This fine-scaled sucker is small, rarely exceeding seven to eight inches. Body coloration varies from dark above and white below with no markings to black above with highly mottled sides and white below. Food of the Modoc sucker consists of benthic invertebrates, algae, and detritus.

Status:

Major threats to the Modoc sucker at the time of listing included degradation of its stream habitat by overgrazing, possible hybridization with the Sacramento sucker, limited population size, and introduced predatory fishes. Drought conditions also have had a significant impact on this species. The overall condition of Modoc sucker habitat has improved substantially since listing.

In 1991, the WCB bought 160 acres on Dutch Flat Creek, adding a significant reach of stream habitat. In 1993, the DFG established this area as a State Wildlife Area. In 1995, US Forest Service fenced the area to protect stream habitat by restricting grazing activities. In addition, SWRCB took action to ensure sufficient flows in Dutch Flat Creek upstream of the Wildlife Area and to provide stability to dams within the Dutch Flat Creek drainage. Habitat assessment in 1995 suggested that adequate portions of Modoc sucker habitat within designated critical habitat and other occupied streams have been protected. Habitat improvements on public lands can be attributed to land acquisitions, fencing, and changes in USFS grazing standards. Predatory exotic species have been essentially eliminated in the Turner Creek drainage, and only the non-native brown trout remain in occupied portions of the Ash Creek drainage. Predation by native species is at a natural level and does not impact the species. New populations of Modoc suckers were recently found by USFWS in Garden Gulch and in a tributary to Goose Lake in Oregon. The genetic character of several additional populations is under review.

Currently, the Department and USFWS are evaluating new information concerning population status, distribution, habitat conditions, and hybridization with the Sacramento sucker. As funding becomes available, the Department will conduct additional studies to evaluate the effectiveness of past recovery projects, including habitat restoration, chemical treatments, and exotic fish barriers, and will use this information for planning future recovery projects intended to extend the range of the species. The current status of the Modoc sucker is stable to increasing.

Shortnose sucker *Chasmistes brevirostris*

State	Endangered	1974
	Fully Protected	
Federal	Endangered	1988

General Habitat:

The shortnose sucker is native to the upper Klamath River and Lost River basins in California and Oregon. During most of the year, this species inhabits the open water of large, shallow lakes and river channels.

Description:

The shortnose sucker is a heavy bodied, nearly cylindrical, lake species that grows to 20 inches in length. It has a large head with a blunt snout. The mouth is terminal, and the lips are thin with few papillae, which are small skin projections used for feeling. Coloration is dark above and white to cream colored below. Spawning occurs in tributary streams during April and May.

Status:

The distribution of the shortnose sucker and the Lost River sucker is very similar except that the shortnose sucker may be more widely distributed in the Lost River system. A large, viable population of shortnose suckers exists in Clear Lake and its tributaries in Modoc County. The Clear Lake population is reproductively isolated and is different from shortnose suckers elsewhere in the Klamath Basin.

The decline of this species is primarily due to habitat alteration associated with water diversions. A 1992 directive required USBR to construct a spawning channel below Anderson Rose Dam on the Lost River and provide spawning flows of 50 cubic feet per second from April 1 to June 15. In 1995, high flows destroyed part of the spawning channel. As of 1997, there were no documented significant increases in recruitment, and that restoration effort has been abandoned.

USFWS adopted a recovery plan for the Lost River and shortnose suckers in April 1993. The primary goals of this plan are to downlist or delist the species. As of 2002, the USFWS has not developed detailed criteria for accomplishing downlisting or delisting, and the current objective is to establish at least one stable refuge population with a minimum of 500 adults for each species. Currently, the DFG is proposing that DFG and USBR develop a multiple species and basin-wide Klamath Project Operations Plan and MOU to address: 1) the listed suckers and listed downstream species (including listed salmonids), 2) the need for screening on many project diversions, and 3) the development of a water conservation plan. The DFG is working in coordination with the USBR, USFWS and other agencies on the development of a new Environmental Impact Statement for the Klamath Project Operations. A new Biological Opinion will be issued by the USFWS after the completion of the Environmental Impact Statement. PacifiCorp is currently in the process of collecting environmental data pursuant to the relicensing of their Klamath Hydroelectric Project located on the Upper Klamath River between Iron Gate

Reservoir (CA) and Upper Klamath Lake (OR). A major component of the relicensing studies includes an Instream Flow Study using the Instream Flow Incremental Methodology (IFIM) to assess the effects of alternative flow releases on both the shortnose sucker and the Klamath large scale sucker (*Catostomus snyderi)*.

The species is considered *Stable.*

Razorback sucker *Xyrauchen texanus*

State	Endangered	1974
Federal	Endangered	1991

General Habitat:

In nonreproductive periods, adult razorback suckers, occupy a variety of habitat types, including impounded and riverine areas, eddies, backwaters, gravel pits, flooded bottoms, wash fans, runs, and riffles. Summer habitats include deeper eddies, backwaters, holes, and mid-channel sandbars. During winter, adult razorback suckers use main channel habitats that are similar to those used during other times of the year, including eddies, slow runs, riffles, and slackwaters.

Description:

The razorback sucker is easily distinguished by a sharp-edged hump on the back which elevates the dorsal region of the body above the head. Coloration of adults is dusky brown to olive on the back and yellowish on the belly. Razorback suckers are long lived fish. Individual fish have been aged up to 44 years.

Status:

The razorback sucker is on the verge of extinction in California as well as nationwide. The decline of the razorback sucker is due to habitat alteration and destruction, dam building, decline in water quality, and predation by non-native fishes. Researchers believe that the species was once widespread and common in both the upper and lower Colorado River basins, including the Salton Sea. However, the razorback sucker has not been documented in the Salton Sea since the early 1900's. In the lower basin, a population of large adults exists in Lake Mohave. Collections downstream of Lake Powell have yielded only a very few large adults and some juveniles. There are few, if any, naturally spawned razorback suckers in California waters at present. Their numbers are declining throughout the range of their original habitat, and the USFWS has declared the razorback sucker to be in jeopardy of becoming extinct in the near future if steps are not taken to ensure their continued existence.

Current surveys confirm the presence of approximately 200 adult fish in Senator Wash Reservoir, Imperial County. This is the only known remnant population of adult razorback suckers within California. Other surveys confirm the presence of razorback suckers in Cibola National Wildlife Refuge's High Levee Pond, Emerald Canyon

Golf Course Ponds, and Imperial National Wildlife Refuge's Duck Ponds. These populations resulted from stocking efforts and are not naturally recruited fish. In 1996, 30 large adult razorback suckers were captured, pit-tagged and released from Senator Wash Reservoir into the mainstem Colorado River.

In 1994, USFWS designated critical habitat for the razorback sucker in 15 reaches of the Colorado River system. These reaches total 1,724 miles, with 133 miles on the California-Arizona border. Limited stocking efforts are currently underway in the Lower Colorado River Basin by USFWS. USFWS is releasing razorback suckers that are 12 inches or greater in length in the federally designated "critical habitat" reaches of the Colorado River.

The razorback sucker is one of the "recommended priority and planning species" under the Lower Colorado River Multi Species Conservation Program (LCRMSCP). The LCRMSCP is a multi-species habitat conservation plan that covers both aquatic and terrestrial species. The area covered by the LCRMSCP includes the 100-year flood plain of the Colorado River from Lee's Ferry, AZ south to the southern International border with Mexico. The LCRMSCP involves the planning efforts of the Department, USBR, BLM, USFWS, Arizona Game and Fish, Nevada Division of Wildlife, various water, power and irrigation agencies, Native American tribes, and environmental groups. The current listed status of the razorback sucker, bonytail chub, and willow flycatcher is partially why the LCRMSCP was created. The razorback sucker is fully protected in California under Fish and Game Code Section 5515 and its protection is a major component of the LCRMSCP. Currently, there are 22 species-specific management actions and 13 general habitat enhancement/restoration actions being carried out along the Lower Colorado River which directly benefit the razorback sucker.

One effort to reintroduce razorback suckers into the Colorado River occurred in Lake Havasu. This effort was conducted through the Lake Havasu Fisheries Improvement Partnership (LHFIP). The LHFIP is a partnership between the Department, Arizona Game and Fish, Anglers United, USFWS, BLM, and the USBR. Originally, the LHFIP was set up as a partnership to improve sport fishing opportunities; it was later revised to include reintroduction of razorback sucker and bonytail chub into the lake. The USFWS determined that by increasing the number of sport fish in the lake, the natives would be put at a greater risk of extinction. One goal of the LHFIP was to stock a total of 30,000 razorback suckers into Lake Havasu over the life of the partnership. This goal was accomplished in July of 2001. Most of these fish were reared at Bubbling Ponds, AZ. Razorback suckers have been increasingly contacted during recent trammel net surveys on Lake Havasu.

Other significant augmentation has been conducted by the Arizona Department of Game and Fish (AZGF). Between November 20, 1997 and April 4,2005, AZGF has stocked 51,957 razorback suckers greater than 10 inches into the lower river below Parker Dam. Razorback suckers are also being stocked into Lake Mohave in Arizona and Nevada. Recruitment has not been documented and only larger adults are being found. Spawning has been observed, but the eggs and juveniles are quickly consumed by the non-native sport fish. In past decades, biologists stocked hundreds of thousands of fingerling razorbacks into the Colorado River annually. Due to predation, only larger fish are currently being stocked.

Desert pupfish *Cyprinodon macularis*

State	Endangered	1980
Federal	Endangered	1986

General Habitat:

In California, this species historically occurred 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. Desert pupfish are now relegated to remnants of their former habitats, which are too harsh for most introduced species to exist. Naturally-occurring populations of desert pupfish have been extirpated in Arizona.

Description:

The desert pupfish is a small, robust fish, usually less than three inches in length. During the breeding season, males turn bright blue with a lemon yellow tail. Females are tan to olive in coloration with irregular, darker vertical bars on their sides. The diet of the desert pupfish varies seasonally. They often eat insect larvae, detritus, aquatic vegetation, snails, and occasionally their own eggs and young.

The desert pupfish tolerates an extreme range of environmental conditions: salinities from freshwater to nearly twice that of seawater, water temperatures ranging from 36°F to 113°F, and oxygen levels down to 0.1 parts per million (ppm). Desert pupfish can also survive rapid changes in salinity and daily water temperature fluctuations of 72°F to 80°F.

Status:

Dams, channelization, water diversions, and groundwater pumping, combined with the introduction of exotic fish species have now reduced the wild populations of the desert pupfish to only a few saline pools along the edge of the Salton Sea, some irrigation drains flowing into the Salton Sea, and portions of two creeks (Salt and San Felipe Creeks) tributary to the Salton Sea. San Sebastian Marsh on San Felipe Creek also supports desert pupfish. Ten habitat refuges have been established for this species in various springs and artificial ponds. A refugium was established at Dos Palmas in the early 1990s with fish that came from the Thousand Palms refugium. Those fish

were originally from Salt Creek.

The desert pupfish does not tolerate large numbers of introduced predatory or competing fishes. Numerous exotic fishes, particularly mosquito fish and tilapia, restrict desert pupfish numbers and distribution in Salt Creek, Riverside County. Periodic natural flooding in Salt Creek helps remove some of the exotic fishes there. In 1998, a series of events occurred in the upstream areas of Salt Creek that may have extirpated the species from those reaches. During late-winter flooding, largemouth bass were accidentally released into Salt Creek. A few days later, all upstream water was diverted from Salt Creek and some sections were dewatered. DFG surveys of these reaches in 1998 and 1999 did not yield any desert pupfish. However, desert pupfish were found in the lower reaches of Salt Creek in 1999. Desert pupfish in San Felipe Creek, Imperial County, remain strong despite periodic invasions of non-native tilapia and sailfin mollies. The proposed construction of a barrier to block continued migration of tilapia into San Felipe Creek has been postponed because such a barrier may impede any pupfish gene flow provided by the Salton Sea corridor. In addition, portions of the creek are intermittently dry, isolating tilapia from pupfish habitat, and periodic flooding and scouring of the stream channel washes tilapia back into the Salton Sea.

Additional threats to the desert pupfish are dense stands of tamarisk (salt cedar) in Salt Creek, lack of a reliable water supply at the refuge ponds, and off-highway vehicles (OHVs). Over the next two years, the DFG will be conducting a salt cedar removal program. In spring of 2002, the DFG with the assistance of CDF fire crews were able to clear tamarisk from approximately one half mile of pupfish habitat along Salt Creek. Construction on a new artesian well for the refuge ponds at Oasis Springs Ecological Reserve began in 1999 when water flows from the old well had decreased so dramatically that pupfish were being stranded in shallow water areas during summer. In August 1999, the flow situation was so dire that DFG hired a contractor to truck water from a nearby well to the ponds. Then, using Section 6 funding, DFG contracted the drilling of a new artesian well. The increased water flows from the new well have expanded the areas inhabited by desert pupfish and the population in the ponds is thriving. The DFG is considering expanding the refuge areas as funding and staff becomes available. The newest threat to the Salt Creek population is OHV activity, which has increased in the last two years.

The draft Coachella Valley Multiple Species Habitat Conservation Plan (MSHCP) conserves 100 percent of the 31 known localities for the desert pupfish. Specific conservation goals in the MSHCP are protection of occupied habitat and ecological processes essential to the conservation of the species and its habitat, and implementation of monitoring and adaptive management. The majority of known locations for the desert pupfish within the MSHCP boundaries are within agricultural drains (24 occurrences). The remaining seven occurrences are primarily east of the Salton Sea within the BLM's 20,000-acre Dos Palmas Area of Critical Environmental Concern (ACEC), which includes the existing BLM Dos Palmas Preserve, the existing DFG Oasis Springs Ecological Reserve, and a portion of the existing Salton Sea State Recreation Area. These existing refugia, in the proposed Dos Palmas and Thousand Palms Conservation Areas, are designated as Core Habitat. Under the MSHCP, approximately 25 acres of occupied habitat in the Whitewater River and agricultural drains as they enter the Salton Sea are also delineated as Core Habitat in the Coachella Valley Stormwater Channel and Delta Conservation Area.

When implemented, the MSHCP will protect and manage habitat for this species in Conservation Areas, refugia, and agricultural drains. In addition, the MSHCP calls for management and monitoring programs to ensure conservation of desert pupfish through conservation ownership and management. Management will include control of activities that degrade desert pupfish habitat, control of invasive species where necessary, and restoration and enhancement of degraded habitat as necessary according to monitoring results. The MSHCP also provides for a monitoring program that would assess the distribution, abundance, and habitat parameters of the desert pupfish throughout the MSHCP Reserve System. Implementation of the MSHCP is expected to maintain and enhance populations of the desert pupfish consistent with the 1993 Desert Pupfish Recovery Plan.

The status in 2002 of the desert pupfish: Declining (in the wild) to Stable (in refuge sites).

Cottonball Marsh pupfish

Cyprinodon salinus milleri

State Threatened 1974
Federal None

General Habitat:

The Cottonball Marsh pupfish is found only in the 640-acre Cottonball Marsh in the northwest portion of Death Valley National Park. The marsh is a component of the Salt Creek drainage lying within the saltpan on the floor of Death Valley. The marsh is an extreme habitat. Salinity ranges from 14 ppt (parts per thousand) to 160 ppt, about 4.6 times that of seawater. Water temperatures range from near freezing in winter to almost 104°F in summer. In shallower waters, the temperatures may fluctuate daily as much as 59°F. Cottonball Marsh also supports the endemic Badwater snail (*Assiminea infima*).

Description:

The Cottonball Marsh pupfish is a small (less than 1.5 inches), slender pupfish. Breeding males become deep blue on the sides with dark gray lateral bars and have an iridescent purple sheen on the back and silvery sheen on the sides. Females have a more elongate shape with an overall silvery brown coloration and lateral vertical bars. Little is known about either the reproductive biology or food habitats of Cottonball Marsh pupfish.

Status:

Cottonball Marsh is part of the Salt Creek system and located in a designated Wilderness Area. The limited habitat and restricted distribution of the pupfish makes it vulnerable to stochastic events such as droughts or earthquakes, which could disrupt the species' sources of groundwater. Threats to its survival include direct and indirect habitat alteration through regional water diversion, as well as from changes to water levels, water quality, and/or chemistry.

To assess possible effects of groundwater withdrawal on the wetland-dependent species, Death Valley National Park began a three-year study in 1998 to quantify the evapotranspiration rate for the Death Valley saltpan/playa. These data will greatly increase current understanding of the water budget for the Death Valley ground water system and allow the NPS to better represent the ground water interests of the park. Results of this study are not yet available.

In the fall of 1993, a GPS was used to accurately map the distribution of the Cottonball Marsh pupfish for the first time. Habitats occupied by the pupfish were found to occur along a linear line which measured approximately two miles in length. This distribution suggests that the spatial extent of pupfish habitat is probably a function of a geological structural control which results from the contact of permeable alluvial material and the denser playa mud. Although pupfish habitats were found to consist of a variety of pool and stream habitats, it is likely that pupfish occupy less than a hundred discrete water bodies during the summer and fall.

The genetic relationships among the Death Valley pupfish populations and their evolutionary histories have been inferred primarily from morphological similarities of the fishes and the hydrological relationships of their habitats. However, the underlying genetic and historical basis for morphological features had remained unknown. A recent study analyzed the genetic structure and divergence within and among populations using mitochondrial and nuclear DNA markers. The findings of these studies illustrated that the divergence of the small, fragmented pupfish populations from remnant aquatic systems in Death Valley was largely by genetic drift.

Genetic diversity within populations from the Salt Creek drainage (*Cyprinodon salinus salinus* at McLean Spring and in Salt Creek), and the Cottonball Marsh pupfish, was generally low, with most variation distributed among populations. This lack of genetic variation may point to one or more historical bottleneck events and indicate that the McLean Spring/Salt Creek and Cottonball Marsh populations were the same (monomorphic) prior to their separation about 2000 years ago. The findings also confirmed that many of the isolated populations of pupfish are demographically independent and should be managed as separate units to conserve the species.

The status of the Cottonball Marsh pupfish is considered to be stable.

Owens pupfish *Cyprinodon radiosus*

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1967

DFG File Photo

General Habitat:

Habitat for the Owens pupfish consists of spring pools, sloughs, irrigation ditches, swamps, and flooded pastures in the Owens Valley from Fish Slough in Mono County to Lone Pine in Inyo County. Currently, this fish is confined to five populations in the Owens Valley.

DFG File Photo

Description:

Less than 2.5 inches in length, the Owens pupfish is a small, deep-bodied, laterally compressed fish. Males are larger and deeper bodied than females. Breeding males are bright blue with broad vertical bars on the side. Females are generally brownish above and silvery below, with several irregular brownish vertical bars. Non-breeding males resemble females. Owens pupfish congregate in small schools and feed mostly on aquatic insects. Reproduction occurs from January through September. Spawning occurs in male-defended territories. Females may spawn daily, laying a few eggs at a time.

Betsy Bolster, DFG File Photo

Status:

Historically, Owens pupfish occurred in the Owens River and spring pools, sloughs, irrigation ditches, swamps, and flooded pastures in the Owens Valley from Fish Slough in Mono County to Lone Pine in Inyo County. Habitat alteration associated with the introduction of non-native trout and bass, along with historic water resources development reduced the distribution and abundance of this species. Currently, this fish is confined to five populations in the Owens Valley.

The Fish Slough ACEC is a system of springs and marshes cooperatively managed by the Department, BLM, Los Angeles Department of Water and Power (LADWP), University of California Natural Reserve System, and USFWS. Two sites within Fish Slough, "BLM Spring" and the Owens Valley Native Fishes Sanctuary, have lost pupfish populations following illegal introductions of largemouth bass. BLM Spring was restored in cooperation

with BLM in 2002, and reintroduction of pupfish occurred in 2003. This project included dam reconstruction, fabrication/installation of a new type of fish migration barrier, vegetation control, and exotic fish removal. Two additional populations tenuously persist in marshy areas of Fish Slough. Pupfish also occur in Inyo County at Mule Spring on BLM land, at Warm Springs and below an artesian well on LADWP land.

The Department is a signatory to the USFWS *Recovery Plan for Owens Basin Wetland and Aquatic Species*. The intent of the plan is to maximize benefits by preserving remnants of functioning ecosystems for many species rather than just one. Restoration activities for Owens pupfish called for in the plan include vegetation management, fencing, water control structure maintenance, and removal of exotic fishes, identification of additional refuge sites, and reestablishment in restored habitats. Progress toward recovery has been hampered by limited funds and private lands issues.

The status in 2002 of the Owens pupfish: *Stable*.

Unarmored threespine stickleback

Gasterosteus aculeatus williamsoni

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1970

General Habitat:

The unarmored threespine stickleback (UTS) is currently restricted to the upper Santa Clara River drainage in Los Angeles and Ventura counties, San Antonio Creek on Vandenburg Air Force Base, San Luis Obispo County, and an isolated population in San Felipe Creek in San Diego County. The San Felipe Creek population is both introduced and outside the historic range of this species. A remnant population of stickleback exists in Shay Creek and Sugarloaf Pond, San Bernardino County. UTS are found in shallow pools and riffles with abundant cover including aquatic vegetation.

Description:

The unarmored threespine stickleback is a small (less than 2.4 inches), scaleless fish. These small fish are territorial. The males build and defend their nests and care for the eggs and young.

Status:

The unarmored threespine stickleback appears to be seasonally abundant where found, but is threatened by continuing habitat degradation and the introduction of other stickleback subspecies. Major threats include stream channelization, urbanization, agricultural development, water diversions, groundwater pumping, introduction of predators (e.g., bullhead, sunfish, bullfrogs, and African clawed frogs) and competitors (e.g., fathead minnows and mosquito fish), OHV use, and chemical/oil spills.

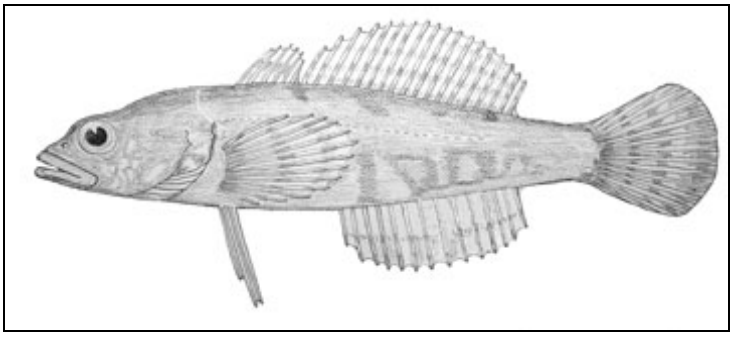
In 1993, a 40,000 barrel oil spill occurred on the Santa Clara River in Los Angeles County. The spill affected approximately 17 river miles of critical stickleback habitat. Cleanup took approximately six weeks and required bulldozing much of the river bed to free oil trapped in the sediments. In 1997, a settlement was reached with about $7 million to be used for restoration activities on the Santa Clara River. To date, no projects specifically directed toward the recovery of the UTS have been conducted.

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. In 2001 a study was initiated by the United State Geological Survey for the Angeles National Forest to assess the status and distribution of UTS in the Forest. The primary study location was in San Francisquito Canyon. The report states that the status of the UTS throughout southern California to be highly imperiled, however the report also

concluded that the UTS population locally in San Francisquito Canyon appears to be maintaining a stable distribution, although population densities appear to fluctuating.

In September of 1994, the American Fisheries Society petitioned USFWS to list the Shay Creek population of UTS as a distinct subspecies based on morphological and genetic differences. USFWS declined to accept the petition, stating that the Shay Creek UTS remains a population of the federally endangered UTS. The DFG is very concerned about the long-term viability of the Shay Creek population of sticklebacks due to the limited habitat, possible genetic inbreeding, and the continuing threats to the species. A top priority for DFG is to establish refuge populations and to acquire/purchase the property at Shay Pond. In 2001, a Federal Section 6 grant was awarded to establish a refugia site near Baldwin Lake, San Bernardino County, CA. This work is currently ongoing and site assessment is being conducted. In 2002, non-traditional Federal Section 6 grant money was allocated to purchase a significant portion of Shay Meadow which would help secure the habitat surrounding Shay Pond. Genetic work conducted in 2002 proposed that the Shay Creek UTS is more closely related to British Columbia UTS when compared with other populations of UTS in southern California. This analysis is yet to be published and or peer reviewed; however, it may have significant implications for listing status and managing these populations in the future.

Rough sculpin *Cottus asperrimus*



State Threatened 1974
Fully Protected
Federal None

General Habitat:

The rough sculpin occurs only in Shasta County in the Pit River, in the Burney area, including Hat Creek and Fall River and its tributaries. Rough sculpin have also been found in the upper reaches of Lake Britton near Hat Creek and in Crystal Lake. This sculpin usually occurs in vegetated runs and riffles of creeks and small to medium rivers, usually over mud in clear, fairly deep water (3-6 feet).

Description:

The rough sculpin is the smallest member of the family Cottidae in California, approximately 3-4 inches in length. It is identified by its relatively narrow body shape and extremely rough skin.

Status:

Management of streams in which the sculpin occurs for wild trout and efforts to protect the Shasta crayfish probably benefit rough sculpin populations in lower Hat Creek and the Fall River. Due to the limited range of the rough sculpin, any impact to their habitat is significant. Siltation from dredging and bank erosion caused by livestock grazing are some of the primary threats to this species. Streambank restoration projects may ameliorate some of these impacts.

No management or recovery actions are planned at this time. Delisting of this species was considered during 1993 and 1994. However, complete status surveys must be completed before such action is proposed. In 2002, a Technical Advisory Committee was formed to assess impacts to aquatic species by small hydro projects on Hat Creek during the Hat Creek relicensing process. As part of the assessment, life history and habitat suitability of rough sculpin within the project area are scheduled to be studied.

The status in 2002 of the rough sculpin: Stable.

Species Accounts - Amphibians

Santa Cruz long-toed salamander

Ambystoma macrodactylum croceum

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1967

General Habitat:

The Santa Cruz long-toed salamander occurs in coastal woodlands and upland chaparral near the ponds and freshwater marshes in which it breeds. This salamander spends a significant portion of its life underground in the burrows of small mammals such as mice, gophers, and moles. It can also be found among the roots of plants in upland and wooded areas. At the onset of the rainy season (November or December), adults begin their annual nocturnal migration from upland habitat to the breeding ponds. As the ponds dry (May-August), young salamanders move at night away from the ponds to subterranean or vegetative cover.

Description:

The Santa Cruz long toed salamander is a relatively small (four to 12 inches), black salamander with yellow orange blotches. Preliminary data from a Doctoral study by Wes Savage at U. C. Davis appears to indicate that the Santa Cruz long-toed salamander is a distinct species.

Status:

The Santa Cruz long-toed salamander is a relict form of a species that was more widespread in California during the last glacial period, 10,000 to 20,000 years ago. It became isolated along the coast as a result of climatic changes. Much of its habitat has been lost to urbanization, agriculture, and highway construction. Currently known from 14 sites in coastal areas of Monterey and Santa Cruz Counties, these populations comprise three metapopulations that inhabit ponds or sloughs and the surrounding uplands. Today, the metapopulations are separated by the Pajaro River and Elkhorn Slough and extensive areas of agriculture. The subpopulations are located around individual breeding ponds or clusters of ponds and adjacent upland habitat.

The northern or Santa Cruz County metapopulation appears to be restricted to the area bounded by Valencia Creek on the north, Corralitos Creek on the east, the Pajaro River on the south, and the Pacific Ocean on the west. The northern metapopulation is extremely fractured and it is unlikely that there is exchange between the ponds, further isolating this metapopulation and increasing the threat of random extinction at one or more ponds. The central or McClusky Slough metapopulation is found in the region between the Pajaro River and Elkhorn Slough, and the southern or Moro Cojo metapopulation located between Elkhorn Slough and the Salinas River. In the central and southern metapopulations, the known breeding sites are very close to each other.

The natural patchy distribution of this salamander renders it especially susceptible to random extinction events resulting from habitat loss and degradation, predation by introduced fishes, bullfrogs, and tiger salamanders, and parasite infection. Other threats include pollution, siltation, and declining water quality in breeding ponds due to nearby development and agricultural activities. Improvements associated with the proposed widening of Highway 1 by Caltrans are intended to encroach only an additional 12 feet beyond the edge of the highway. These improvements, including an off-ramp, will be located within an existing mow strip with no cover or habitat value for the salamander. Previous highway construction near Aptos included breeding pond habitat that is now bordered by housing and may not function adequately for the species. Ellicott Pond was dry during 2002 and 2003, probably destroying each year's cohort. The pond is currently managed to ensure an adequate water supply. Surveys of the pond in 2004 found Santa Cruz long-toed salamanders, as well as California tiger salamanders.

The USFWS released a Draft Revised Recovery Plan in 1999. This plan describes a five-part recovery strategy with specific tasks necessary to maintain healthy aquatic, riparian, and adjacent upland ecosystems that provide habitat for Santa Cruz long-toed salamanders. The plan is currently being revised to incorporate new information on metapopulation models.

In 2002, the Trust for Public Lands (TPL) signed an option agreement to purchase the 289-acre Buena Vista property located between Aptos and Watsonville along Highway 1 in Santa Cruz County. The acquisition was funded by a $540,215 grant. The grant was awarded through the Cooperative Endangered Species Conservation Fund Recovery Land Acquisition Section 6 Program, which is part of the Federal Endangered Species Act. The grant will help project partners, including the DFG and the Trust for Public Lands, acquire and protect the Buena Vista Property, which includes one of only 11 remaining breeding sites of the Santa Cruz long-toed salamander. The property will be managed by the USFWS as an addition to the Ellicott Slough National Wildlife Refuge upon its completion. The acquisition will also help connect habitat the Ellicott Slough National Wildlife Refuge and Santa Cruz Long-toed Salamander State Ecological Reserve. The Buena Vista property also provides habitat for one of the larger of only seven populations of the robust spineflower (*Chorizanthe robusta*), a federally-listed, endangered species, and for the California tiger salamander, a candidate.

Recovery activities have been implemented at the Ellicott Slough National Wildlife Refuge, which was established for the salamander. Dense stands of eucalyptus are being cleared. The Santa Cruz long-toed salamander does not use eucalyptus groves as habitat, and in general eucalyptus provide poor quality habitat for native wildlife. The project area will eventually be planted with native species such as coast live oak, coffeeberry, California blackberry, and sticky monkeyflower.

The status in 2004 of the Santa Cruz long toed salamander: Stable to Declining.

Siskiyou Mountains salamander *Plethodon stormi*

State: Threatened 1971
Federal: None

General Habitat:

The Siskiyou salamander is found Klamath Mixed Conifer Montane Hardwood-Conifer habitat types in north-central Siskiyou County. Habitat includes rock outcrops, talus (rock on rock substrates) and forested rocky soils. This species is known to occur from 1,200 to 6,000 feet in elevation.

Description:

The Siskiyou Mountains salamander has a slender body and short limbs. Its coloration is chocolate-brown to purplish-brown on the back (dorsal side) with varying amounts of light flecking on the head, sides, and limbs. Adults may have a faint brown dorsal stripe, and the lower body (ventral side) color is grayish-purple. Juveniles tend to be black or very dark brown with flecking, often exhibiting a light brown or tan dorsal stripe, and are gray ventrally. Adults reach 5.5 inches in total length.

Status:

Lands administered by the USDA Forest Service (USFS) encompass the majority of the known range of the species. The Siskiyou Mountains salamander is identified as a Survey and Manage species in the USFS Northwest Forest Plan. South of the Siskiyou Crest, the USFS requires buffer zones around occupied habitat and surveys to determine occupancy prior to any habitat disturbance. The survey requirement has been eliminated north of the Siskiyou Crest with management of high priority sites. Timber harvests disturb more ground than any other land use in the known range of the Siskiyou Mountains salamander, and are thought to be the primary threat to the species. However, extant populations are found at sites where disturbances including timber harvest, road and skid trail construction and fire have occurred.

This species was previously thought to primarily inhabit stabilized talus in old-growth forest stands with northern exposures, but recent information indicates that it occupies a wider range of forest types under various overstory canopy densities on all exposures. Surveys conducted by DFG for the current Siskiyou Mountains salamander status review also indicate that the Siskiyou Mountains salamander occupy diverse habitats. The current documented range is approximately 420 square miles, significantly larger than the known range (6 square miles) at the time of listing in 1971.

The USFS has collected tissue samples for genetic analyses, but the results have not been published. However, preliminary results indicate substantial divergence within this group of Plethodontid salamanders.

The status in 2002 of the Siskiyou Mountains salamander: *Increasing*.

Tehachapi slender salamander

Batrachoseps stebbinsi

State Threatened 1971
Federal None

General Habitat:

The Tehachapi slender salamander is restricted to the Caliente Creek drainage in the Tehachapi Mountains in northern Kern County and to sites in southern Kern County in the vicinity of Fort Tejon. It is found in moist drainages and ravines in blue oak and gray pine-oak woodland, usually in rock talus and under logs where leaf litter is deep.

Description:

This relatively large and robust slender salamander grows to about four inches in length. It is distinguished by its relatively broad head, long legs, and broad toes. Its dorsal color is light to dark brown, reddish or with light beige patches.

Status:

The Tehachapi slender salamander is reported from 14 sites, primarily within the Caliente Creek drainage. It also occurs at Fort Tejon State Historic Park and within the Tejon Ranch. The salamander has been observed in 2002 and 2003 at the Tejon Ranch during sensitive species surveys although it is not included as a covered species at this time. The limited number of sites occupied by this species makes it extremely vulnerable to changes in its habitat including trampling by grazing cattle and road construction. Information on the life history of this species is largely lacking. There is no information on population structure and dynamics, or demography, or status of the salamander at this time.

Kern Canyon slender salamander

Batrachoseps simatus

State Threatened 1971
Federal None

General Habitat:

This salamander is found only in the Kern River Canyon from the vicinity of Democrat Hot Springs downstream to Live Oak Picnic Area in Kern County. Most known localities for this species are within Sequoia National Forest. Individuals occur beneath rocks, rotting logs, and other surface material, as well as large rock slides and talus on rather steep north-facing slopes. It has been observed in all successional stages of blue oak savannah.

Description:

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 four to five inches.

Status:

The Kern Canyon slender salamander is reported from 12 occurrences. The major threats to this species are construction and highway maintenance along Highway 178. Other potential threats include mining, dam construction, small hydropower development, logging in the lower Kern River Canyon, impacts to habitat by collectors.

No comprehensive surveys for this species have been done since 1979. In-depth surveys and quantitative monitoring may not be feasible since moving rocks or litter to uncover salamanders may damage the salamander's habitat.

The status of the Kern Canyon slender salamander is not known.

Desert slender salamander ***Batrachoseps aridus (=Batrachoseps major aridus)***

State	Endangered	1971
Federal	Endangered	1973

General Habitat:

The desert slender salamander is found only in the Santa Rosa Mountains of Riverside County. It occurs in crevices of limestone and under limestone slabs and other rocks along the base of cliffs with continuous water seepage. During the late winter and early spring, these salamanders may occasionally be found beneath rocks and other objects on the floor of the canyon. Perennial plants in the canyons from which the species is known include desert fan palm, southern maidenhair fern, narrow-leaved willow, honey mesquite, and sugarbush.

Description:

The desert slender salamander is a moderately small, slender salamander with a short tail. The dorsal surface is blackish, overlaid with an indistinct lighter band. The underside of the body is blackish-maroon and the underside of the tail is flesh-colored. Adults grow to about four inches. The desert slender salamander lacks an aquatic larval stage; instead, eggs are laid in moist soil and hatch as fully developed young.

Status:

The desert slender salamander has been reported in Riverside County from Hidden Palm Canyon, a tributary of Deep Canyon, about 10 miles south of Palm Desert, and in the vicinity of Guadalupe Creek, in a canyon separated from Hidden Palms by 4.5 miles of continuous desert. The species is a relict of cooler, moister climatic regimes. Comparative genetic analysis of the two populations has not been completed but preliminary results have confirmed that the Guadalupe Creek population is a disjunct population of *B. aridus*. Phylogenetic analyses using mitochondrial DNA showed that the desert slender salamander is a subspecies of the garden slender salamander (*Batrachoseps major)*. However, it is morphologically and ecologically distinct from other species of *Batrachoseps* and is isolated geographically from them (allopatric).

The major threats to this species are from degradation of habitat and illegal collection. For example, Hidden Palms is very near Highway 74 and is susceptible to vandals. The spring that feeds Hidden Palms is located near Asbestos Mountain. This recharge area includes undeveloped BLM, USFWS and CDFG land, as well as portions of the communities of Pinyon Crest, Royal Carrizo, and Chapman Ranch. Water use by these communities may significantly decrease water available to the salamander and degrade water quality due to septic systems. Invasion of the habitat by exotic plants such as tamarisk is another threat. DFG surveys in 2002 found no salamanders at Hidden Palms; Guadalupe Creek was dry. DFG staff cleared tamarisk from Hidden Palms in 2003. A subsequent survey also

did not locate any salamanders.

The Santa Rosa Mountains also provide habitat for the Peninsular bighorn sheep. Since the desert slender salamander and bighorn rely on springs and seeps, protection of habitat for the sheep would also afford some protection for the salamander. In addition, the Santa Rosa and San Jacinto Mountains were designated a National Monument in 2000 by President Clinton. Mining and off-highway vehicle use are banned under this designation and will further protect habitat for the desert slender salamander. The two populations are entirely within the Coachella Valley MSHCP/NCCP planning area and are covered species in the plan.

Surveys for the desert slender salamander will continue under provisions of the MSHCP/NCCP. Quantitative monitoring may not be feasible since moving rocks or litter to uncover salamanders may damage microhabitat features favored by the salamander. A monitoring well will also be installed to monitor both water quality and quantity on an annual basis.

The current status of the desert slender salamander is unknown.

Shasta salamander *Hydromantes shastae*

State: Threatened 1971
Federal: None

General Habitat:

The Shasta salamander is found in Cismontane Woodland and Lower Montane Conifer Forest in Shasta and Siskiyou Counties. Habitat includes moist limestone fissures and caves, volcanic and other rock outcroppings, and under woody debris and duff in mixed pine-hardwood stands.

Description:

The Shasta salamander has webbed toes and a flattened body. The back (dorsal side) is gray-green, beige, tan or reddish, and usually with yellow on the tail. The lower side (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 from three to four inches.

Status:

Once thought to primarily inhabit isolated limestone formations in the Shasta Lake area of Shasta County, recent surveys have confirmed that it also inhabits non-limestone habitats with new sites as far north as the McCloud Reservoir. Although this species can be found at any time of year if conditions are wet and mild, it is usually found from November through April. There are currently 61 sites representing 16 to 17 population centers, mostly on USFS land. The Shasta-Trinity National Forest has developed a management plan for this species and has prepared a survey protocol. This species is regularly surveyed for as part of the assessment process for Timber Harvest Plans. Primary threats are timber harvest, due to moisture loss via canopy reduction and ground disturbance, highways that can act as barriers to dispersal, and rock quarries that can remove or disrupt habitat.

The status in 2002 of the Shasta salamander: *Stable.*

Limestone salamander

Hydromantes brunus

State	Threatened	1971
	Fully Protected	
Federal	None	

General Habitat:

The limestone salamander inhabits mossy limestone crevices and talus in the gray pine-oak woodland and chaparral of the lower Merced Canyon, Mariposa County.

Description:

This salamander has webbed toes and a flattened head and body. Adults are brownish above and pale beneath. Juveniles are yellowish green above and darken with age. Adults grow to three or four inches in length.

Status:

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. Little is known about population structure and dynamics, or demography of the limestone salamander.

The DFG's Limestone Salamander Ecological Reserve in Mariposa County protects 120 acres of limestone salamander habitat and BLM has designated an additional 1,600 acres as the Limestone Salamander ACEC. The ACEC encompasses both confirmed and potential limestone salamander habitat. Potential threats include gold mining operations, water development, highway construction, and quarrying for limestone. The South Fork Merced River is also a proposed wilderness area and would provide additional protection to the habitat of this salamander.

Black toad *Bufo exsul*

State: Threatened 1971
Fully Protected
Federal: None

General Habitat:
The black toad is restricted to spring systems and associated wetland habitat in the Deep Springs area and in the Saline Valley, Inyo County.

Description:
The back (dorsal surface) of the black 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 three inches in body length. Adults are more aquatic and diurnal than other toad species in California.

Status:
The range of this species is extremely restricted. It is found only in and around 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. This species occurs in a very limited area and is therefore vulnerable to any habitat change. A population of this species, likely introduced, was discovered in 1998 in the Saline Valley area of Death Valley National Park, Inyo County.

Genetic studies on both the Deep Springs and Death Valley NP populations have been conducted by Eric Simandle, Ph.D. candidate, at the University of Nevada, Reno (UNR). His work revealed that Saline Valley toads came from the Buckhorn/Corral springs complex and exhibit significant evidence of genetic bottleneck. A genetic bottleneck refers to a drastic reduction in the size of the original population, usually due to a catastrophic event. The resulting new population will be much less genetically diverse and is often very vulnerable to changes in the environment. Toads from Buckhorn and Corral springs are not genetically distinguishable. However, all other combinations are distinct: Buckhorn/Corral can be differentiated from Bog Mound and Antelope; Antelope is different from Bog Mound and Buckhorn/Corral. None of these populations shows a bottleneck, suggesting that they have been fairly stable and also that the Antelope Springs population is likely natural, as opposed to introduced, which had been speculated.

DFG initiated a population monitoring program in 1999, in cooperation with UNR and Deep Springs College (DSC), the owner of most black toad habitat in the Deep Springs area. The results of this study are in press. Management actions proposed for 2003 by DSC and DFG included partial removal of an exclosure fence at Antelope Springs to allow some grazing activity in the spring area where toad use has declined due to dense vegetation; construction of a culvert or other bridge to prevent vehicle trampling of the remaining black toad breeding area downstream of Antelope Spring on BLM land; fence maintenance along the lake pasture at Corral Springs to prevent future trespass of cattle; and mechanical vegetation removal from currently dry irrigation ditches to allow flow and potentially more open breeding habitat prior to black toad hibernation.

The status in 2002 of the black toad: *Stable.*

Species Accounts - Reptiles

Desert tortoise *Gopherus agassizii*

State:	Threatened	1989
Federal:	Threatened	1990

General Habitat:

The desert tortoise inhabits river 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 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.

Description:

The desert tortoise is a medium-sized tortoise with an adult shell (carapace) length of about eight to 14 inches. Males, on average, are larger than females and are distinguished by having a concave lower shell, longer shell segments under the chin, larger chin glands on each side of the lower jaw, and a longer tail. Shell color varies from light yellow-brown (horn color) to dark grey-brown. A composite of features 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.

Status:

The desert tortoise is severely threatened by population losses due to disease, human-caused impacts, and the cumulative effects of habitat loss, degradation, and fragmentation from construction, urbanization, and development. An upper respiratory tract disease (URTD) has appeared in many parts of the desert tortoise's range; the most severe outbreaks have occurred in California's west Mojave Desert where long-term study plots have found population declines of up to 90 percent. URTD is of the greatest immediate concern because of its potential to harm tortoise populations on a global scale. The DFG, DOD, USFWS, BRD, and BLM are coordinating research on this disease. Veterinarians from the DFG, UCD, the University of Florida, and private practitioners

are also involved in the effort. People who release sick captive tortoises back into the wild may actually facilitate the spread of this disease. Other tortoise diseases have shown up in several parts of the Southern California deserts. Shell diseases, first found in tortoise populations in the Chuckwalla Bench area of the Colorado Desert, have been found in tortoise populations in other parts of the desert. The specific causes have not been identified but appear to have resulted in population declines of more than 50 percent.

Habitat degradation has occurred, due to a combination of human-related activities including livestock grazing, introduction of exotic plant species, energy and mineral development, and OHV use. In addition, illegal shooting and collecting has further reduced the tortoise population. Desert tortoise populations are extremely low in some areas and may no longer be viable. When population size is low, inbreeding becomes a potential problem. Smaller populations also are at an increased risk of extinction from catastrophic events such as fire and flooding, as well as from random variation in population parameters, for example, sex ratio and age class structure. Populations can also reach non-recoverable levels through fragmentation into smaller populations and increased mortality within these fragmented populations.

Cattle have been observed to step on burrows and cause their collapse, including burrows occupied by tortoises or used as nest sites. Certain key tortoise food plants may comprise over 40% of the cattle diet, and since cattle are larger and more mobile than tortoises, these plants may be severely depleted with heavy grazing. Research conducted by the USGS in the Whitewater Grazing Allotment in the Coachella Valley demonstrates that cattle can outcompete tortoises for key forage species. Cattle grazing in the Whitewater Hills tortoise habitat has also led to visible increases in soil destruction and increased erosion in some areas.

Urbanization and development of desert habitat poses a significant and increasing threat to the desert tortoise. The increase in housing, industrial, and commercial developments and corresponding transportation corridors has altered the quality of desert tortoise habitat and led to its fragmentation. Many tortoises fall victim to road kills. One survey found 115 tortoise carcasses along 18 miles of highway in the west Mojave Desert. This figure represented a conservative estimate of tortoise mortality per mile per year and could not be applied to all roads and highways due to variation in traffic volume, speed, and sizes of tortoise populations near roads. An increase in the number of roads exposes a larger portion of the desert tortoise population to routine traffic and illegal OHV activity. The numbers of common raven, which prey on juvenile tortoises, have increased with expanding human development and the proliferation of roads in the region. According to the USGS, the common raven has increased in numbers by 1,500 percent in the western Mojave Desert over the last several decades. However, a long-term assessment of raven predation throughout the entire range of the desert tortoise has not been conducted.

Another threat related to human development in the desert is the proliferation of non-native grasses, such as red brome, cheatgrass, and Mediterranean grass. Grazing, OHV use, and other types of ground disturbance facilitate the spread of these grasses, which are adapted to disturbance and outcompete the native grasses and forbs that constitute food plants of the desert tortoise. Non-native plants often do not provide the levels of protein and nutrients needed by the desert tortoise, thereby adversely affecting tortoise health and reproduction. The decrease in the availability of nutritionally-important and preferred foods for the tortoise has likely decreased its ability to combat diseases and, very possibly, its immune responses to disease pathogens. The increase in grass cover between desert shrubs has been linked to increased fire frequency and fire intensity in the desert. Fires cause direct mortality when tortoises are burned or inhale lethal amounts of smoke, which can occur both in and out of burrows. Fire changes the composition of vegetation by facilitating the establishment of non-native grasses and removing forage plants. Fires also fragment tortoise habitat by creating patches of unsuitable habitat.

Desert tortoise populations are also threatened by military activities in the desert. Four major, active military installations occur within the West Mojave and comprise a total of 4,165 square miles: the Naval Air Weapons Station at China Lake, the Fort Irwin National Training Center, Edwards Air Force Base, and Marine Corp Air

Ground Combat Center near Twentynine Palms. Tank maneuvers damage vegetation, compact soil, create fugitive dust, and run over tortoise burrows and tortoises. The results are largely denuded habitat, and altered vegetation composition, abundance, and distribution. One study reported a significant reduction in tortoise densities (62-81 percent over six years) in active training areas of Fort Irwin and no change or increases in tortoise densities in areas with light and no military activity. The greatest adverse impact from military maneuvers at Fort Irwin was found in valley bottoms. A 250-square mile expansion of Fort Irwin has been proposed; 182 square miles of this proposed expansion are designated by the USFWS as desert tortoise critical habitat and could be subject to military field maneuvers.

A federal Recovery Plan, which is currently being updated, was completed in 1994, and USFWS has designated about six million acres as critical habitat, most of which is in California. The Recovery Plan will be implemented in California by a series of large-scale ecosystem management plans such as the Northern and Eastern Colorado Desert Coordinated Management Plan. The DFG is participating in multi-agency teams that are drafting these plans. The desert tortoise is addressed in several NCCPs and HCPs in California and other states, including the West Mojave Plan, the Coachella Valley MSHCP, and the California Energy Commission's Habitat and Species Protection Research Project.

The loss of habitat, mortality from increased traffic, reduced quality of habitat altered by human presence and activity, and fragmentation of populations pose a significant and increasing problem for the viability of tortoise populations within the Western Mojave Plan Area. For example, there are 13 county solid-waste landfills in the West Mojave Desert in addition to numerous unauthorized dumpsites. The greatest potential impact from landfills is their probable role in facilitating the increase in populations of predators such as common ravens, and perhaps coyotes. Ravens make extensive use of landfills for food and landfills probably support raven populations during the summer and winter when natural resources are low in abundance. As a result, large numbers of ravens are present during the tortoise breeding season from February to June. Predation on tortoises by ravens may increase as ravens disperse to nesting sites farther from landfills.

The Coachella Valley MSHCP Plan area supports a small, but significant population of desert tortoise. They are found along the northern, eastern and western rim of the Coachella Valley in the foothills of the Little San Bernardino Mountains, the Painted and Whitewater Hills, and in the San Jacinto and northern Santa Rosa Mountains. Tortoises in the foothills of the southeastern San Bernardino Mountains represent the westernmost reproductively active population of tortoises in the Colorado Desert ecosystem. Except for the northeastern most portion of the Plan area, the Coachella Valley was not included in the recovery plan for the desert tortoise. The MSHCP includes, however, all federally-designated critical habitat within the plan area as part of the Desert Tortoise and Linkage Conservation Area. Almost 500,000 acres of habitat (97%) will be conserved under the MSHCP. Threats to the desert tortoise in the Coachella Valley are similar to those found in the Mojave Desert: urbanization, OHV activity, road construction, and grazing. Cattle grazing in the Whitewater Hills has resulted in visible increases in soil destruction and erosion in some areas. A proliferation of non-native plants, including Saharan mustard, as a result of development and overgrazing could increase fire frequency and intensity. Respiratory and shell diseases have not been observed in tortoises in the Whitewater Hills or Painted Hills.

DFG is a member of the Desert Tortoise Management Oversight Group, which provides management guidance related to tortoise recovery throughout the Southwest and the Desert Managers Group (DMG). The DMG includes representatives of all of the major state and federal land management and wildlife regulatory agencies in the California Desert. It serves as a forum for these agencies to address and discuss issues of common concern. Through cooperative management each participating agency is contributing to the protection and recovery of the desert tortoise. The DFG also works closely with the Desert Tortoise Preserve Committee, a non-profit organization whose activities include acquisition of habitat for the desert tortoise and Mohave ground squirrel, creation and management of desert tortoise preserves, and education and outreach. DFG law enforcement activities continue to result in the seizure of tortoises possessed illegally and the removal of feral dogs from desert tortoise habitat.

The DFG acquired over 22,000 acres of desert tortoise habitat in 1986. Additional lands have subsequently been acquired through mitigation for projects within desert tortoise habitat. The DPR has also provided OHV Green Sticker funds to the DFG to solve the raven problem and provide public education.

The current status of the desert tortoise is *Declining*.

Barefoot banded gecko *Coleonyx switaki*

State Threatened 1980
Federal None

General Habitat:
The barefoot banded gecko is known only from eastern San Diego County and western Imperial County. 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 where humidity is relatively higher then above ground.

Description:
The barefoot banded gecko is a medium-sized lizard, 2 to 3 inches long, with soft skin and fine, granular scales. Its large eyes have vertical pupils, and the grey-brown body has various black and white spots and bands that give it a striking appearance. These lizards store water in fatty tissues in their tails.

Status:
The barefoot banded gecko is reported from San Diego County to as far south as central Baja California, Mexico, and on San Marcos Island in the Gulf of California. The species has been identified in the desert foothills of the Peninsular Ranges in San Diego and Imperial Counties, and its range in southern California may be more extensive. The rarity of this species makes it susceptible to illegal collection by reptile hobbyists and commercial collectors. Habitat destruction by collectors is one of the principal threats to this species.

Anza-Borrego Desert State Park affords protection for some gecko habitat, and the DFG is involved with a federal habitat management plan for BLM land on which the gecko occurs. In November 2002, Anza-Borrego Foundation obtained an 18-month option to acquire 3,339 acres of pristine desert scrub, riparian woodland, and desert freshwater marsh habitat along Vallecito Creek adjacent to Anza-Borrego Desert State Park. Known as the Vallecito Ranch, the property includes portions of Vallecito Creek and Vallecito Cienaga and will protect habitat in Vallecito Valley for approximately 55 sensitive species, including the federally-listed Peninsular bighorn sheep and least Bell's vireo, and the barefoot banded gecko.

The most recent information on the barefoot banded gecko in the NDDB is from the 1970s. The current status the gecko is *Unknown*.

Coachella Valley fringe-toed lizard

Uma inornata

State	Endangered	1980
Federal	Threatened	1980

General Habitat:

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.

Description:

The Coachella Valley fringe-toed lizard is three to twelve inches long 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.

Status:

Historically, the Coachella Valley fringe-toed lizard inhabited about 270 square miles of sand dune habitat in Coachella Valley, California. The sand dunes, often referred to as "blowsand" habitat, consist of fine sand that accumulates at the bottom of drainages during flood events and is transported across the Coachella Valley by high winds that continually blow through the area. Today, habitat for the lizard has been reduced to about 50 square miles, and only about 19 square miles of this land continues to receive the naturally occurring "blowsand" that is essential to the long-term survival of the lizard.

The Coachella Valley fringe-toed lizard is threatened by a continual loss of habitat from human activities and development that have eliminated the majority of its historic habitat. Invasive plants that stabilize the moving sand deposits, agricultural development, housing construction, mining activities, OHV use, and feral pets have had deleterious effects on the lizard and its habitat. The Coachella Valley fringe-toed lizard has also undergone genetic isolation from the closely-related Colorado Desert fringe-toed lizard. In 2001, researchers analyzed nine populations of the Coachella Valley lizards using mitochondrial DNA and found them to be nearly identical.

One of the largest remaining populations of the lizard is found within the Coachella Valley National Wildlife Refuge and Coachella Valley Fringe-toed Lizard Preserve. The 13,000-acre Coachella Valley National Wildlife Refuge was established by the USFWS in 1985 to protect the lizard. The Coachella Valley Fringe-toed Lizard Preserve (>20,000 acres), cooperatively managed by The Nature Conservancy, BLM, DPR, DFG, USFWS, and the Center for Natural Lands Management, encompasses additional of fringe-toed lizard habitat adjacent to the refuge. The Coachella Valley Preserve is a preserve system comprised of three separate dune systems, Thousand Palms, Willow Hole, and Whitewater River, each with separate sand sources, to ensure that adequate habitat is protected in the

event that one or two of the dune systems was destroyed. The largest of these units, at roughly 17,000 acres, is centered on Thousand Palms Canyon in the northern Coachella Valley between Palm Springs and Indio. This preserve ranges from near sea level at its southern extreme to over 1000 feet in the Indio Hills. Collectively, the preserves protect about 2% of the lizards' original range.

The Coachella Valley fringe-toed lizard is a covered species under the draft Coachella Valley MSHCP. Under the plan, the conservation strategy focuses on preserving existing populations of the lizard, maintaining habitat cores, monitoring, and adaptive management. The Proposed Conservation Areas include the most viable habitat known for the Coachella Valley fringe-toed lizard. In addition to preserving core habitat, habitat supporting smaller populations is protected in sand-source areas. Selection of core habitat was based on four criteria: 1) an area of sufficient size to support a viable population of lizards (selected as 5,000 to 10,000 individuals) independent of other cores; 2) an area not fragmented by development; 3) intact processes including a source of sand and a sand delivery system; and 4) a discrete source of sand. Implementation of the Coachella Valley MSHCP is expected to maintain and enhance population viability of the Coachella Valley fringe-toed lizard through preservation of unprotected portions of its habitat, potential habitat, and ecosystem processes for the aeolian sand system. A total of 13,806 acres of habitat will be conserved under the Coachella Valley MSHCP.

Core areas selected under the MSHCP include the Snow Creek-Windy Point Conservation Area, the Whitewater Floodplain Preserve, Willow Hole Preserve area, and Thousand Palms Preserve. Snow Creek-Windy Point will conserve approximately 1,243 acres of suitable habitat. Habitat includes aeolian sand sources from the Whitewater and San Gorgonia Rivers and their tributaries. The Whitewater Floodplain Preserve contains 5,586 acres of habitat and will conserve 5,278 acres. Sand for this area originates in the Whitewater River and its tributary, the San Gorgonio River. Sand is deposited in the floodplain west of the preserve and then blown onto and across the Conservation Area. Secondary sources are Mission Creek and Garnet Wash which augment sand in the eastern half of the Conservation Area.

The Coachella Valley fringe-toed lizard has been studied extensively at the 1,230-acre Whitewater Floodplain Preserve. Researchers initiated a long-term demographic study of the species in 1985. They constructed a 5.56 acre plot approximately midway along the east-west axis of the preserve and counted all lizards on the site between 1985 and 2000. From their data, they calculated a density of approximately 23 lizards per acre for the reserve. The population size at the study site dropped to 38 individuals (approximately 7 per acre; 8,400 for the reserve) during the severe drought from 1985-1990. A conservative estimate of lizards at the Preserve is approximately 12 individuals per acre or 14,342 lizards at the Preserve.

The Willow Hole Conservation Area will protect approximately 1, 754 acres of habitat, some of which is fragmented by roads including Palm Drive. This Conservation Area provides numerous habitat patches for the lizard and is supplied by three separate sand sources. The discrete patches offer safe sites for the lizard in the event that a population crashes at one or more patches although ultimately connecting these patches would benefit the species. The Thousand Palms Preserve and additional habitat within the Conservation Area encompass approximately 3,948 acres; 3,857 acres will be conserved within this area. The majority of sand in the Preserve originates in the Indio Hills and from floodwaters flowing through Thousand Palms Canyon. The preserve design protects both sand sources. The Indio Hills sand source is also enhanced by a flood control project that delivers sediment-laden materials to a settling area upwind of the Preserve.

There are no long-term demographic studies within the Thousand Palms Preserve. However, a series of strip transects give relative abundance of the lizard. Data from these transects allowed for habitat quality distinctions with the best habitat labeled as primary (1°), lower quality habitat as secondary (2°), and all other areas as non-habitat. However, an earlier density estimate at the Preserve was nearly identical to the estimate of lizard density in primary habitat at the Preserve. Combining these calculations, the population size for primary habitat at the Preserve was estimated at 8,150 – 10,483 lizards and that of the secondary habitat at 2,333 – 14,400 lizards. The total size was estimated at 10,483 – 24,883 lizards.

Other conserved areas include Edom Hill, the East Indio Hills, and the Santa Rosa and San Jacinto Mountains. The Edom Hill area protects sand habitat between Willow Hole and Thousand Palms. The MSHCP will conserve 98 acres of habitat as a linkage between the two Core Areas. The East Indio Hills area protects approximately 839 acres of habitat. The sand source for this area from the west has been fragmented by intervening development. There is uncertainty about the long-term suitability of this area for the lizard in the absence of a viable sand source. The Santa Rosa and San Jacinto Mountains Conservation Area provide little suitable habitat for the Coachella Valley fringe-toed lizard except in sandy substrates at the toe of the San Jacinto Mountains adjacent to the Snow Creek-Willow Hole area. The MSHCP will conserve approximately 112 acres of habitat in this area.

The current status of the Coachella Valley fringe-toed lizard is *Stable.*

Blunt-nosed leopard lizard

Gambelia sila (formerly G. silus)

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1967

General Habitat:

The blunt-nosed leopard lizard occurs in the San Joaquin Valley region in arid areas with scattered vegetation at elevations ranging from about 100 feet to 2,600 feet above sea level. They inhabit non-native grassland and alkali sink scrub communities characterized by poorly drained, alkaline, and saline soils. They are also found in the chenopod community associated with non-alkaline, sandy soils in the foothills of the southern San Joaquin Valley and Carrizo Plain. The blunt-nosed leopard lizard is absent from areas of steep slopes and dense vegetation, and areas subject to seasonal flooding.

Description:

The blunt-nosed leopard lizard is a large lizard with a long, round tail. This lizard is grey or brown dorsally, 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 the sides. Length from snout to vent in adults is three to five inches. The blunt-nosed leopard lizard can hybridize with the long-nosed leopard lizard where their ranges overlap.

Status:

The blunt-nosed leopard lizard formerly occurred throughout the floor of the San Joaquin Valley and Sierra Nevada foothills from Stanislaus County southward to the Tehachapi Mountains in Kern County. West of the San Joaquin Valley, the species occurred on the Kettleman and Carrizo Plains, and in southeastern Cuyama Valley in San Luis Obispo, Santa Barbara, and Ventura counties. Based on information presented in the 1998 Recovery Plan for Upland Species of the San Joaquin Valley, California, the currently known occupied range of the blunt-nosed leopard lizard is in scattered parcels of undeveloped land on the San Joaquin Valley floor, and in the foothills of the Coast Range. The species is still presumed to be present in the upper Cuyama Valley although there are no recent records for that area.

Urbanization and agricultural development have eliminated more than 70 percent of blunt-nosed leopard lizard habitat in the San Joaquin Valley. OHV use, mineral extraction, petroleum and gas field development, construction of transportation corridors, and water transport systems have further impacted the habitat of

this species. Habitat disturbance and destruction has resulted in the fragmentation and isolation of lizard populations.

Livestock grazing can result in removal of herbaceous vegetation and shrub cover and destruction of rodent burrows used by lizards for shelter. However, light or moderate grazing may be beneficial, unlike cultivation of row crops, which precludes use by leopard lizards. Direct mortality occurs when animals are killed in their burrows during construction, killed by vehicle traffic, drowned in oil, or fall into excavated areas from which they are unable to escape. Displaced lizards may be unable to survive in adjacent habitat if it is already occupied or unsuitable for colonization. The use of pesticides may directly and indirectly affect blunt-nosed leopard lizards. The insecticide Malathion has been used since 1969 to control the beet leafhopper, and its use may reduce insect prey populations. Fumigants, such as methyl bromide, are used to control ground squirrels. Because leopard lizards often inhabit ground squirrel burrows, they may be inadvertently poisoned.

Conservation efforts have included habitat and population surveys, studies of population demography and habitat management, land acquisition, and development of management plans for public lands that have benefited blunt-nosed leopard lizards as well as other listed species. The California Energy Commission conducted two important large-scale natural community and species surveys in the 1990s. The first was The Southern San Joaquin Valley Ecosystem Protection Program for which quarter-section surveys of natural lands in most of the Tulare Basin were made. Later, the California Energy Commission conducted quarter-section surveys on the Carrizo Plain Natural Area with funding provided by the U.S. Bureau of Land Management. The 1992 California Energy Commission's Southern San Joaquin Ecosystem Protection Plan has provided the framework on which the resource management agencies have developed their mitigation and conservation strategies.

A number of large-scale habitat conservation plans, such as the Metropolitan Bakersfield HCP and Caliente Resource Area Interim Grazing Plan, have been or are being prepared in the San Joaquin Valley. The majority of these plans include the blunt-nosed leopard lizard as a target species. Other conservation efforts that benefit the blunt-nosed leopard lizard include the TNC and DFG Carrizo Natural Heritage Program, California Energy Commission mitigation programs, land acquisition at the Alkali Sink, Allensworth, and Panoche Hills Ecological Reserves, and the endangered species habitat protection programs in the Elk Hills (Department of Energy) and the Kern and Pixley National Wildlife Refuges.

Although habitat for the blunt-nosed leopard lizard has been acquired or is being protected by various conservation instruments, appropriate habitat management prescriptions have not been identified. The recovery plan identifies several factors in recovering the lizard. These factors include identifying compatible land uses in habitat occupied by the lizard; identifying and implementing management prescriptions to preserve and enhance populations on existing habitat; protecting additional habitat and connectors in key portions of their range; surveying in unsurveyed portions of the range of the lizard; and analyzing lizard responses to environmental variation within their range. This information can be used to prioritize protection and acquisition of additional parcels of land to enhance survivorship of the lizard.

The recovery plan also identifies another important factor: the analysis of extinction patterns on blocks of natural land on the San Joaquin Valley floor. The effects of habitat size and diversity on population viability is not known. There are no current overall population size estimates for the species. Ultimately, determining a viable population size, preserving genetic variation, and creating connectors between geographically isolated populations, are needed to ensure recovery.

Southern rubber boa *Charina umbratica (=Charina bottae umbratica*

State: Threatened 1971
Federal: None

General Habitat:

The southern rubber boa is found in montane coniferous forests near streams and meadows. Habitat is dominated by Jeffrey pine, ponderosa pine, sugar pine, white fire, incense cedar, and black oak. Riparian corridors become important during warmer weather. Areas with rock outcrops and a southern exposure are a particularly significant habitat feature. The outcrops serve as hibernation sites snags, logs, and other surface debris provide cover. The southern rubber boa is known from several localities in the San Bernardino Mountains in San Bernardino County, near Idyllwild in Riverside County, and on Mount Pinos in Kern County.

Description:

The southern rubber boa is a stout-bodied snake 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. Coloration is olive or pale yellowish-brown dorsally and light yellow ventrally, and there may be a few dusky flecks on the lower sides. Adults grow to about two feet.

Status:

Few studies exist that specifically examine the southern rubber boa. Important information that is lacking includes movement, dispersal, home range, migration, and microhabitat requirements. Although the species occurs in relatively isolated populations, unoccupied habitat between metapopulations is likely important for gene flow. Intervening areas may also have seasonal importance to the species. Although there is little or no information about movement patterns and dispersal, it is likely that the intervening areas between metapopulations are important for gene flow. Recent genetic studies support separation of the southern rubber boa from all other populations of rubber boa. The subspecies appears to have diverged from the more widespread rubber boa between 12.3 and 4.4 million years ago. Possible intergrades between the southern rubber boa and the rubber boa found in the Tehachapi Mountains and on Mt. Pinos warrant further study.

Habitat loss and fragmentation due to resort and housing development, OHV activities, logging, fern harvesting, and wood gathering are the principal threats to this species. Fern picking in the spring occurs at the same time that boas are coming out of hibernation. OHV use has been documented to occur in areas occupied by the southern rubber boa, resulting in the destruction of ground cover and riparian areas, and compaction of soils. Firewood harvesting, fire management, and collection of fallen wood remove the ground debris that provides habitat for this species. Poaching is also a threat. Immediate threats include large-scale timber salvage operations following tree die-off and the possibility of catastrophic fire in the San Bernardino Mountains.

Because much of southern rubber boa habitat is within national forest lands, management of the southern rubber boa by the USFS will be critical to the survivorship of this species.

The southern rubber boa is a covered species in the Western Riverside MSHCP where it occurs in the San Jacinto Mountains. The population in Riverside County is geographically isolated and occurs mostly in designated wilderness. For conservation analysis, suitable habitat for this species includes all montane wooded habitats and interspersed chaparral and grassland habitats above 5000 feet in the San Jacinto Mountains (San Jacinto Mountains Bioregion). An estimated 2,500 acres of suitable habitat will be conserved for this species within the planning area. To date, the only land specifically set aside for conservation of this taxon within the planning area is a 40-acre site, the Heaps Peak Arboretum, in San Bernardino County.

The status in 2002 of the southern rubber boa: *Unknown*.

Alameda striped racer (=Alameda whipsnake) ***Macsticophis lateralis euryxanthus***

State	Threatened	1971
Federal	Threatened	1997

General Habitat:

The Alameda whipsnake is restricted to Contra Costa and Alameda Counties where it occurs primarily in open and partially open, low-growing shrub communities such as coastal scrub and chaparral communities. Recent telemetry data indicate that, although home ranges of Alameda whipsnakes are centered on shrub communities, they venture up to 500 feet into adjacent habitats, including grassland, oak savanna, and occasionally oak-bay woodland. Rock outcrops with deep crevices or abundant rodent burrows are important habitat components for overnight dens, refuges from predators and excessive heat, and foraging. According to USFWS, suitable habitat for this species includes communities that support mixed chaparral, coastal scrub, and annual grassland and oak woodlands that are adjacent to scrub habitats. Grassland areas that are linked to scrub by rock outcrops or river corridors are also considered to provide habitat for this species.

Description:

The Alameda whipsnake is a subspecies of the California whipsnake (*Masticophis lateralis*). It is a slender, fast-moving, diurnal snake that has a narrow neck and a relatively broad head with large eyes. Adults may reach a length of five feet. The dorsal surface is colored sooty black or dark brown with a distinct yellow-orange stripe down each side. The anterior portions of the ventral surface are orange-rufous colored, the midsection is cream colored, and the posterior and tail are pinkish. The Alameda subspecies is distinguished from the more common chaparral whipsnake by the wide orange stripes on its sides. Snakes of intermediate appearance are also known.

Status:

The primary cause of the decline of the Alameda whipsnake is the loss of habitat from human activities. Also contributing to the decline of this species is the alteration of suitable habitat as a result of fire suppression and

the increased likelihood of catastrophic wildfires. Current threats to the Alameda whipsnake include (1) potential destruction, modification, or fragmentation of habitat or range due to urban development, inappropriate grazing practices, or habitat alteration from fire suppression; (2) overcollection for commercial, recreational, scientific, or education purposes; (3) disease or increased predation from native and nonnative predators; and (4) the difficulty of habitat management at the urban/wildland interface.

The Alameda whipsnake is reported from 53 occurrences although many of those represent historic collections. All populations are threatened by more than one factor, including habitat loss, fire suppression, habitat fragmentation, grazing practices, and mining. Habitat fragmentation from urban development and associated highway and road development has led to genetic isolation of most populations. Extant populations are found in five areas. Each of these populations potentially consists of several to numerous subpopulations with varying degrees of connectivity among them. Two principal corridors connect these population areas.

- The Tilden-Briones population, in the western portion of the Alameda whipsnake's range, is threatened by habitat loss and fragmentation due to urbanization and rural development, the potential for catastrophic wildfire, and the displacement of native vegetation by non-native invasive plants such as eucalyptus and broom. Portions of this population area overlap with regional parklands and municipal watersheds. Regional preservation and land management within the framework of public lands could be implemented.
- The Oakland-Las Trampas population is threatened by the decline in habitat quality as chaparral/scrub stands form a closed canopy and become decadent, a high potential for catastrophic wildfire, and the effects of habitat loss and fragmentation as a result of urban development.
- The Hayward-Pleasanton Ridge population is the most susceptible to extirpation; it is most isolated from other population centers to the north and south. This isolation increases the susceptibility of this population to genetic drift and random catastrophic events. This population has lost significant areas of occupied habitat to urban development, and pressure to develop continues to be intense.
- The Mount Diablo-Black Hills population is located in the eastern portion of the whipsnakes' range. Similar to other population areas, the Mount Diablo-Black Hills population is threatened by a high potential for catastrophic wildfire, suburban/rural development and its associated impacts, and incompatible land uses such as mining. Because of the location of public lands, the actions of private nonprofit organizations to protect wildlife corridors, and the potential for improved fire and grazing management on these lands, this population is a good candidate for recovery.
- The Sunol-Cedar Mountain population is threatened by catastrophic wildfire and incompatible land uses including mining and off-road vehicle use. Although fairly free of habitat loss or fragmentation due to suburban development, the pressure for housing is increasing. This southern population attracts reptile enthusiasts and collectors and may have the highest probability of unauthorized collection due to its remote roads and abundant assemblage of native reptiles, this area.

The two corridors have differing threats. The Caldecott Tunnel corridor is already highly developed and fragmented. Much of this area burned during the firestorm of October 1991. As a result, vegetation with low volatility is being promoted, including nonnative species while native chaparral and scrub species are being discouraged. Consequently, vegetation within the corridor may not be suitable for the whipsnake. The Niles Canyon-Sunol corridor has physical barriers that impede or prohibit the movement of individual whipsnakes. These barriers include Alameda Creek, a concrete barrier that lies south of Niles Canyon Road and north of Alameda Creek, railroad tracks that run along both sides of Alameda Creek, and heavy vehicular traffic along Niles Canyon Road. The degree to which these barriers discourage or halt the movement of whipsnakes is unclear. Appropriate vegetation is also limited in this corridor, much of the land being under cultivation or mined for gravel.

The Alameda whipsnake is threatened directly and indirectly by the effects of fire suppression policies common in urban areas. Fire suppression activities directly affect the Alameda whipsnake by allowing the buildup of fuel (underbrush and woody debris), which exacerbates the intensity of wildfires if they occur. Although most snakes are likely to retreat into burrows or rock crevices or to move from the fire's path, there is still the potential for

individual snakes to be burned. Natural fires occur in the late summer and early fall when accumulated fuel is abundant and dry. The intensity of these fires is likely to be higher than in prescribed burns, which typically are scheduled during wetter months. During the late summer and early fall, hatchling and adult Alameda whipsnakes are above ground, and populations may sustain direct losses from fires. Burns during wetter months, however, may indirectly affect the Alameda whipsnake, as burning the chaparral and scrub habitats during this time may be detrimental to the health of the chaparral/scrub community. Prescribed burns are only one form of vegetation management used to reduce fuel loads; others include discing and bulldozing fire breaks, moderate to heavy grazing to limit vegetative growth, and replacing chaparral/scrub habitat with grassland through mechanical or chemical means. The timing and extent of these activities will determine their effects on the Alameda whipsnake.

To date approximately 570 acres of Alameda whipsnake habitat have been protected in perpetuity as conservation lands. This level of protection is a result of mitigation of lawful take of the Alameda whipsnake. In addition, 35 acres have been protected in perpetuity within a conservation bank. Save Mt. Diablo, a local lands protection organization, has been instrumental in the protection of over 2,000 acres in the Black Hills area of Mt. Diablo, more than half of which is confirmed occupied Alameda whipsnake habitat. This protection was a condition of development of the lower elevation acres, and the land has been dedicated to Mt. Diablo State Park. Save Mt. Diablo has also been active in protecting a wildlife corridor from Mt. Diablo to Black Diamond Mines Regional Preserve. Within this corridor the organization has purchased "Chaparral Springs", 333-acre parcel with approximately 40 acres of high quality chaparral, and (in conjunction with East Bay Regional Park District) a portion of "Clayton Ranch". Future plans may include protection of adjacent properties. The Pleasanton Ridge Conservation Bank in Alameda County is the first mitigation bank where "credits" can be purchased to offset the lawful "taking" of the Alameda whipsnake. The 654-acre site will protect approximately 35 acres of Alameda whipsnake habitat, as well as functioning as a preserve area for the threatened California red-legged frog. Lands protected within Regional Parks, watersheds, Federal facilities, State Parks, and local parks contain approximately 20 percent of the remaining Alameda whipsnake habitat. Although not always specifically managed for the whipsnake, the quasi-protected status of these open lands has established the foundation for the recovery strategy for the Alameda whipsnake.

The recovery strategy for the Alameda whipsnake combines long-term protection of large blocks of habitat; protection in perpetuity of strategic areas such as habitat harboring population centers or areas needed for connectivity of populations; special management considerations such as fire management, grazing regimes, and control of destructive nonnative species; and research that focuses on management objectives and recovery of the species.

As of 2003, there had been no approved HCPs that cover the Alameda whipsnake or its habitat. At least three HCPs that cover the species are in development: Alameda Watershed HCP (San Francisco Public Utilities Commission); Mount Diablo State Park HCP (California Department of Parks and Recreation); and East Bay Watershed Lands HCP (East Bay Municipal Utilities District). The Alameda whipsnake will be one of the special status species covered in the East Contra Costa County Habitat Conservation Plan and Natural Community Conservation Plan. Of the known occurrences of the Alameda whipsnake, 19 are found within the East Contra Costa plan inventory area. A large portion of the Mount Diablo–Black Hills population of the Alameda whipsnake occurs within this inventory area.

The status in 2004 of the Alameda whipsnake is *Declining.*

San Francisco garter snake

Thamnophis sirtalis tetrataenia

State	Endangered	1971
Federal	Endangered	1967

General Habitat:

All known populations of this species occur in San Mateo County from Sharp Park to Año Nuevo and east into the Santa Cruz Mountains where suitable habitat occurs. Preferred habitat is a densely vegetated pond near an open hillside where they can sun themselves. Emergent and bank-side vegetation such as cattails, bulrushes, and spike rushes apparently are preferred and used for cover. The area between stream and pond habitats and grasslands or bank sides is used for basking, while nearby dense vegetation or water often provide escape cover. Snakes also use floating algal or rush mats, if available. They are most often found around ponds and marshes that support large populations of frogs.

Description:

The San Francisco garter snake is recognized by its mid-dorsal stripe of greenish-yellow bordered by 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.

Status:

The San Francisco garter snakes occurs in scattered wetland areas from the San Francisco Peninsula south to Santa Cruz County. The existing populations occur are now mostly small and fragmented and lack connectivity to other populations.

Commercial and urban development has destroyed the majority of the prime habitat for this snake, and continues to fragment remaining habitat and eliminate habitat linkage corridors. Many of the threats, including loss of habitat and collection by reptile fanciers and breeders, that led to the listing of the San Francisco garter snake in 1967 continue to impact the species. Additional threats to the species include the documented decline of the California red-legged frog, an essential prey species, and the introduction of bullfrogs into San Francisco garter snake habitat. Although the San Francisco garter snake preys on juvenile bullfrogs, it does not eat adult bullfrogs. Bullfrog predation of other species of garter snake is known and it may similarly prey on the San Francisco garter snake. Bullfrogs prey on other species of frogs, further limiting prey species of the San Francisco garter snake.

Expansion of BART to the San Francisco Airport bisected the only known population of the snake on the bay side of the San Mateo Peninsula. DFG staff worked with BART officials to minimize impacts to the snake. Before

construction could begin, snakes were trapped and special fences were erected to keep snakes out of the construction area. Snakes were removed from the site until construction ended. A biological monitor was present during construction and workers received special instruction about the snake. Following construction, the ponds and wetlands were restored and snakes were placed back in their habitat. Six snakes were lost during construction, all due to human activities. Snakes are still extant at the West of Bayshore population on the Peninsula. Trapping last fall caught significantly fewer snakes than five years previously. The populations at Waddell Creek and Año Nuevo are also still present.

The San Francisco garter snake co-occurs with other species of garter snake. On or west of the crest of the Santa Cruz Mountains, they can be found with the Santa Cruz aquatic garter snake (*T. atratus atratus*), which has only a bright yellow dorsal stripe. and the coast (terrestrial) garter snake (*T. elegans terrestris*), which lacks the red head, but has faint broad red flecks or broad orange-red lateral bands. East of the crest, the San Francisco garter snake is usually replaced by, and may intergrade with, the red-sided garter snake (*T. sirtalis infernalis*), which has red lateral spots. Overlapping ranges and intergradation of *T. sirtalis* subspecies makes identification of subspecies based on range difficult.

The status in 1999 of the San Francisco garter snake: Declining.

Giant garter snake *Thamnophis couchi gigas*

State	Threatened	1971
Federal	Threatened	1993

General Habitat:

The giant garter snake is usually found in marshes, sloughs, ponds, small lakes, low gradient streams, irrigation and drainage canals, and rice fields. Upland habitat is used for cover and retreat sites during the snake's active season and for refuge from flood waters during its dormant season. Giant garter snakes are typically absent from larger rivers because of lack of suitable habitat, and from wetlands with sand, gravel, or rock substrates. Some riparian woodlands may not provide suitable habitat because of excessive shade, lack of basking sites, and absence of giant garter snake prey.

Description:

The giant garter snake is one of the larger species of garter snakes and can exceed five 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 present. The head is elongated with a pointed snout. The giant garter snake can be distinguished from the common garter snake (*T. sirtalis*) and the western terrestrial garter snake by its color pattern, scale numbers, and head shape. The giant garter snake lacks the red lateral markings of the common garter snake. The western terrestrial garter snake has well defined stripes and a black to dark gray ground color.

Status:

Based on historic records, the giant garter snake probably ranged throughout the central valley from Buena Vista Lake in Kern County north to near Gridley in Butte County. Loss, degradation, and fragmentation of habitat are the primary threats to the giant garter snake. Conversion of wetlands for agricultural, urban, and industrial development has resulted in the loss of more than 90% of suitable habitat for this species in the Central Valley. Conversion of rice farms to other types of agriculture, such as orchard or vineyard, is similarly deleterious. Maintenance of flood control and agricultural waterways, weed abatement, vector and rodent control, discharge of contaminants into wetlands and waterways, and overgrazing in wetland or streamside habitats may also cumulatively threaten the survival of some giant garter snake populations. Another potential threat to the giant garter snake is

the export of water by rice growers to other areas of the state. Fallowing of rice fields following such sales immediately eliminates the rice field as habitat for the garter snake.

Land management at DFG Wildlife Areas and private duck clubs also affects the suitability of wetland habitat for giant garter snake. In the 1970s, for example, wetlands management in the Grasslands, a mosaic of federal, state, and privately owned wetlands, representing a third of California's remaining Central Valley wetlands, in Fresno and Merced Counties changed from watergrass (*Echinochloa* sp.) to moist-soil management for swamp timothy and smartweed. This practice resulted in earlier spring irrigation and decreases in summer water, which provides the giant garter snake with foraging habitat. Although CVPIA has provided the Grasslands wetlands with sufficient water for optimum habitat development for wintering migratory waterfowl, current management allows large areas to dry up during the summer.

Studies conducted by DFG in the 1990s found a possible correlation between such wetland management practices and the observed decline of the giant garter snakes in the Grasslands. New studies have been proposed to CALFED by the Grassland Water District, USFWS, USGS Western Ecological Research Center (WERC), USBR, and DFG. The objective of this study to develop to characterize habitat for the giant garter snake in the northern San Joaquin Valley so that management of this habitat can be improved, restoration projects can begin, and populations can be re-established. The studies will evaluate past and present water management practices and impacts to the giant garter snake, assess water quality, and examine the effects of bull frog predation. One hypothesis is that the limited availability of water in summer in the Grasslands may concentrate bullfrogs and newly-born giant garter snakes in a few waterways where predation on juvenile giant garter snakes by bullfrogs is intense.

Other factors contribute to the decline of the giant garter snake. Road kills of giant garter snake have been documented when garter snake habitat is in proximity to paved roads. Nematode infection of giant garter snakes has also been documented in the American Basin. A potential threat to the giant garter snake is the southern water snake (*Nerodia fasciata*), which has established on Willow Creek and Humbug Creek, tributaries into the American River above Lake Natoma. Perennial pepperweed (*Lepidium latifolium*), an invasive weed, is widespread in the Central Valley. It outcompetes native vegetation and forms dense stands on the banks of sloughs and canals. It may eliminate basking sites and inhibit snake use during the active season. Toxic contamination, particularly from selenium, and impaired water quality have also been identified as threats to some populations of the giant garter snake. Preliminary studies have documented potential bioaccumulation effects on giant garter snakes or their prey species caused by contaminants derived from agricultural products.

Prior to 1970, the giant garter snake was known from 17 populations. By 1993, 13 of these populations were extant and only three of these populations were considered stable and safe from threats. All populations are distributed discontinuously in small isolated patches without protected dispersal corridors and are vulnerable to extirpation by random, naturally occurring environmental events; population dynamics; and genetic processes. Each population represents a cluster of discrete occurrences and coincides primarily with historical riverine flood basins and tributary streams throughout the Central Valley: Butte Basin (Butte County); Colusa Basin (Colusa County); Sutter Basin (Sutter County); American Basin (Sacramento and Sutter Counties); Yolo Basin/Willow Slough and Yolo Basin/Liberty Farms (Solano County); Sacramento Basin and Badger Creek area of the Cosumnes River Preserve (Sacramento County); Caldoni Marsh at the White Slough WA, the East Stockton Diverting Canal, and Duck Creek (San Joaquin County); North and South Grasslands (Fresno and Merced Counties), Mendota WA (Fresno County); and in the vicinity of the Burrel and Lanare railroad sidings southwest of Fresno (Fresno County).

Prior to the 1990s, there had been few population size estimates for giant garter snakes. In 1994, WERC entered into a partnership with the State of California to provide information for NCCP planning in the Sacramento Valley. The Giant Garter Snake Habitat Ecosystem Initiative was developed to plan, execute, and evaluate research and related activities necessary for conservation of the garter snake and its ecosystem. Passive integrated transponder (PIT) tags are being used in the study to permanently mark and establish a data base for giant garter snakes sampled during the study. Morphological measurements and tissue samples for genetic determinations are

being taken to improve the taxonomic description of this species, which is inadequately treated in the current literature. Surgical techniques and design of radio transmitters have been modified to successfully use radio telemetry for this species.

Radio telemetry is showing aspects of habitat use and movements that were previously poorly understood for this species. For example, the USGS found that snakes remained motionless to avoid detection rather than readily fleeing from disturbance, a trait previously thought to be characteristic of this species. Because of their motionless behavior and cryptic coloration, the USGS determined visual surveys to be of little use in detecting this species. They also found snakes to be active far later into the fall than was previously believed, an observation which will change suggested timing of road, ditch, and levee maintenance in the rice fields these snakes inhabit. The telemetry information is incorporated into a geographical information system, yielding statistically valid spatial analysis for estimating home range size and habitat preferences.

In addition to continuing projects at Colusa National Wildlife Refuge and the Natomas Basin, WERC scientists will begin surveying for giant garter snakes on private lands for the FWS Partners for Fish and Wildlife program. They will also provide science support to the Corps of Engineers by assessing the effects of bank stabilization methods on giant garter snakes in the Colusa Drain. Other projects include habitat restoration at Colusa National Wildlife Refuge (NWR) and Sacramento River NWR. These projects were funded by the U.S. Bureau of Reclamation (USBR) through the Central Valley Project Improvement Act (CVPIA).

In 1998, the Sacramento NWR Complex was awarded a grant to purchase agricultural lands adjacent to the Colusa NWR and create wetland habitat that would specifically benefit the population of giant garter snakes on the refuge. The restoration project is being funded, in part, by a North American Wetlands Conservation Act grant. Construction of these wetlands was completed in fall 1999. The habitat has responded favorably to restoration efforts. Preliminary monitoring results have indicated that additional permanent wetland habitat restored at Colusa NWR has been actively used by giant garter snakes since spring 2000. WERC scientists caught 128 individual giant garter snakes in 2002 (53 male; 75 female). Of the snakes caught in 2002, 31 were recaptures mostly from the previous two years. The total number of snakes caught has increased each since monitoring began in 2000. The size distributions of snakes caught reflect a healthy population of giant garter snakes with successful recruitment of the young.

Numerous ongoing conservation efforts target the giant garter snake. The California Rice Industry Association has developed stewardship practices for rice farming to protect giant garter snakes and the Bureau of Reclamation addresses potential impacts to endangered species caused by operations and maintenance of Central Valley Project (CVP) facilities through its Endangered Species Conservation Program. Conservation efforts for the giant garter snake have also been undertaken on several occasions using sources of funds targeted for the Central Valley Habitat Joint Venture Implementation Plan. The goals of the Central Valley Project Habitat Restoration Program are integrated with those of the CALFED Ecosystem Restoration Program (ERP). The U. S. Environmental Protection Agency and the California Department of Pesticide Regulation have produced rodenticide bulletins for Butte, Colusa, Fresno, Glenn, Kern, Madera, Merced, Sacramento, San Joaquin, Solano, Sutter, Yolo, and Yuba Counties. These bulletins identify use limitations that apply to areas where giant garter snakes have been reported.

A number of regional habitat conservation planning efforts are underway that allow for development, while setting aside, enhancing, and protecting habitat for the giant garter snake and other sensitive species found in the region. The Natomas Basin HCP, originally prepared by the City of Sacramento in the 1990s, was approved by the USFWS in December 1997. That plan was overturned in 2001 following a court challenge. In the original plan, funding derived from development fees was inadequate to acquire the most important habitat lands and to ensure that these habitat areas would be protected in perpetuity. The settlement allowed some development to go forward in the Natomas Basin during the one to two-year period in which a new regional HCP. The revised plan was approved by the USFWS in 2003. The new HCP allows development in the Natomas Basin area of the city of Sacramento and Sutter County. Development will be allowed in specified areas totaling 15,517 acres, or about 29% of the basin.

Other regional HCPs that include the giant garter snake are the South Sacramento HCP, Yolo County HCP, San Joaquin County MSHCP and Open Space Plan, the Kern Water Bank HCP, Maxwell Irrigation District HCP, Natomas Basin Metro Air Park HCP, and the DFG Striped Bass Management Program HCP.

The Natomas Basin Conservancy began operation in 1998 to oversee the mitigation goals of the Natomas Basin HCP. Mitigation fees paid by developers are used to acquire, restore, and manage mitigation lands to provide habitat for protected species and maintain agriculture in the Natomas Basin. Since the program inception, Natomas Basin Conservancy has acquired approximately 2,800 acres. Land owned by the conservancy is designed to provide marsh, riparian, and grassland habitats. Over 50-yr life of HCP, 8750 acres will be set aside as a preserve. The Dixon Field Station of the USGS Biological Resources Division entered into an agreement with the Natomas Basin Conservancy to study giant garter snakes in the Natomas Basin area of northern Sacramento County during the 2002 field season. The purpose of the study was to develop information on distribution and abundance, habitat use, and demography of giant garter snakes in the Natomas Basin and to help develop strategies to properly manage and conserve giant garter snakes in this part of Sacramento County. From late April into September, the USGS captured 76 female giant garter snakes and 64 male snakes, for a total of 140 individual captures; 58 snakes were captured multiple times. A giant garter snake was found at the Conservancy's first constructed managed marsh in August 2003. The snake was found in a trap set by USGS scientists on the Conservancy's Kismat tract, approximately four miles north of ARCO Arena. The Kismat tract was purchased by the Conservancy on April 16, 1999. Marsh construction took place in 2001 and 2002.

Conservation banks have been established to mitigate impacts to giant garter snake habitat. The Dolan Ranch Conservation Bank is located on 252 acres of private land near the Colusa NWR. Managed by Wildlands, Inc., habitat will be preserved and created at the conservation bank. The Pope Ranch in Yolo County encompasses 391 acres. The Wildlife Heritage Foundation holds the conservation easement for site. This project is designed to create a combination of aquatic and upland habitats and to provide habitat for the giant garter snake. Ecological restoration efforts will create approximately 40 acres of open water and channels, 108 acres of perennial marsh, and 243 acres of seasonal wetland and upland habitat. The site will be managed to promote giant garter snake habitat, while also supporting waterfowl and upland game birds.

The USFWS prepared a draft Recovery Plan for this species in 1999. The plan identified four recovery units within the range of the giant garter snake (Sacramento Valley, Mid-Valley, San Joaquin Valley, and South Valley) and proposes recovery criteria. The recovery criteria include adaptive management and monitoring, successful reintroduction within the historic range of the species, documentation of successful breeding and survivorship in 90 percent of the subpopulations in the recovery units, and maintenance of connectivity between subpopulations.

As of 2003, the giant garter is stable in some portions of the state while declining in other areas.

Species Accounts - Birds

California brown pelican

Pelecanus occidentalis californicus

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1970

General Habitat:

The California brown pelican uses a variety of natural and human-created sites, including offshore islands and rocks, sand spits, sand bars, jetties, and piers, for daytime loafing and nocturnal roosting. Preferred nesting sites provide protection from mammalian predators and sufficient elevation to prevent flooding of nests. The pelican builds a nest of sticks on the ground, typically on islands or offshore rocks. Their nesting range extends from West Anacapa Island and Santa Barbara Island in Channel Islands National Park to Islas Los Coronados, immediately south of and offshore from San Diego, and Isla San Martín in Baja California Norte, Mexico.

Description:

The brown pelican is one of two species of pelican in North America; the other is the white pelican. The California brown pelican is a large, grayish-brown bird with a long, pouched bill. The adult has a white head and dark body, but immature birds are dark with a white belly. The brown pelican weighs up to eight pounds and may have a wingspan of seven feet. Brown pelicans dive from flight to capture surface-schooling marine fishes.

Status:

The California brown pelican currently nests on West Anacapa Island and Santa Barbara Island in Channel Islands National Park. West Anacapa Island is the largest breeding population of California. In Mexico, the pelicans nest on Islas Los Coronados and Isla San Martín. Historically, the brown pelican colony on Islas Los Coronados was as large as, or larger than, that of recent years on Anacapa Island. Continued human disturbance and possible fishery overexploitation caused near-abandonment of this colony in the 1980s. Breeding still occurs on Islas Los Coronados, but it has been inconsistent and the colony size is much reduced from historical numbers. After

breeding, the pelicans disperse northward along the coast of California to Oregon and Washington and occasionally as far north as British Columbia. Pelicans from the Mexico nesting colonies mix with the California birds during this period, resulting in large numbers of pelicans along the California coast in late summer and fall. During post-breeding dispersal, it is particularly important for the pelicans to have safe resting areas by day, and night roost locations free from predators and human disturbance.

Reproductive success of the brown pelican colony on Anacapa Island has been monitored each year since 1970 (with the exception of 1995). Pelicans breeding in southern California and northern Mexico suffered near total reproductive failure in the late 1960s and early 1970s. The lack of nesting success was caused primarily by egg breakage due to excessive shell thinning associated with high levels of DDE, the primary metabolic derivative of the pesticide DDT. The influence of DDE was so great in the decade of the mid-1960s and 1970s that it masked all other potential limiting factors. As the levels of DDE in the southern California coastal ecosystem declined, pelican breeding success gradually improved, and researchers began to measure other factors, especially food availability, that potentially affected pelican breeding success. By the mid-1980s, the number of pairs breeding had dramatically increased to levels that exceeded reported mean historical numbers. Pelican nesting is also monitored on Santa Barbara Island by the National Park Service. Currently, DDE concentration in pelican eggs is at a level that appears to have little to no effect on breeding success.

Pelicans have a somewhat protracted breeding season, and the initiation dates for nesting can vary considerably from year to year. The average onset of nesting during the period of 1970-2002 was mid to late February. The earliest date for nest initiation was in late December 1985, while the latest was in early May in both 1972 and 1975. Pelicans have a 30-day incubation period, and chicks usually fledge when 13-14 weeks old. Although uncommon, fledging can occur as young as 10 weeks. The last chicks to fledge in 2003 left West Anacapa Island by mid-September. The total breeding effort (i.e., number of pairs nesting) on West Anacapa in 2003 was about 2,700; considerably less than the 6,440 nests reported for 2002 (the 2002 breeding effort was the largest on record). The 2003 colony size was 29 percent smaller than the long-term 1979-2002 mean of 3,778 pairs. In 2003, pelicans had above-average productivity of 0.71 young fledged per nest attempt, and an estimated 1,910 chicks fledged from Anacapa. Thus, despite the relatively small breeding effort, overall productivity was about 8 percent higher than the 1979-2002 mean of 0.65. The smaller 2003 colony size is probably due to limited local food supplies resulting from low level El Niño conditions early in the breeding season.

Natural cycles in the marine environment, both short and long term, affect prey abundance and pelican reproductive success relative to food availability is currently under investigation. The ongoing studies of pelican diet are needed to help explain why pelicans in California have been unable to meet recovery plan levels for productivity. Pelican productivity (the number of chicks fledged per adult pair) has been well correlated to anchovy fluctuations; in years when anchovies are abundant, pelicans almost always have higher reproductive rates. Dietary components are determined by examining regurgitations of pre-fledged chicks at Anacapa Island. Previous studies (1972-1980) documented an extremely high dependence on northern anchovies. At that time, anchovies were the primary surface-occurring, schooling prey species available in the breeding range of the species. During the 1980s, Pacific mackerel populations began increasing and were observed more frequently in pelican diet. At the same time, Pacific sardine populations along the California coast were depressed and not found in pelican food samples. Sardines in the region began recovering in the mid-1980s, but were not observed in pelican food samples until 1993. Recent preliminary data indicate that sardines have now become a major food source, along with anchovies.

Other factors affecting pelican population size include oil spill mortality, human disturbance, domoic acid poisoning, fish hook/line mortality, and direct shooting or maiming. For example, more than 100 pelicans were accidentally hooked by recreational fishermen in the Santa Cruz area when anchovies swarmed near the Santa Cruz pier in August 2001. An additional 50 birds had been found injured earlier in the summer. Other pelicans were observed with fishing line or hooks, but could not be captured. Because pelicans can mistake fishing lures for their natural food, this problem is most intense at fishing piers where pier fishing is very popular and where

pelicans often roost. A cooperative public education effort was undertaken after this large mortality event to better inform fishermen of ways to avoid pelican injury and mortality. In 2003, over 20 pelicans were found shot or maimed, primarily in the southern California area, and additional birds were found wounded in the San Francisco Bay Area. The International Bird Rescue Research Center and the International Fund for Animal Welfare stepped in to rehabilitate the injured birds.

The brown pelican nesting population in California appears stable at this time, though low productivity relative to pelican populations elsewhere is still a cause for concern and in need of further investigation. Protection of daytime and nocturnal roost sites is a high management priority, and opportunities for roost site enhancement and expansion should be pursued. Additional public education efforts are also necessary to reduce injury and mortality to pelicans from fish hooks and fishing line, and to reduce human disturbance of pelicans at nest and roost sites.

California condor *Gymnogyps californianus*

State:	Endangered	1971
	Fully Protected	
Federal:	Endangered	1967

General Habitat:

Mountain and foothill rangeland and forest habitats in a U-shaped range north from northern Los Angeles County to San Luis Obispo County in the Coast Range and to Tulare County in the western Sierra Nevada comprise habitat for the California condor. Nesting sites have been mainly on cliffs in the southern part of this range. Foraging areas are primarily in grasslands and open woodlands in the foothills, where the condors feed on carrion.

Description:

The California condor, a large vulture, has the greatest wingspread of any North American land bird. Its wingspan exceeds nine feet and it may weigh more than 20 pounds. 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.

Status:

Historically, condors were widespread in western North America from British Columbia to Baja California. The species has been fully protected under state statute since 1953. By the early 1980s, they were restricted to mountains and foothills around the San Joaquin Valley, and the population dipped to about 22 birds. A major effort was begun in 1980 to determine causes for the decline and to attempt to reverse it, but that help came too late. In a last-ditch effort to avert extinction, the wild condors were captured. All 27 remaining birds were in captivity by 1987.

More than 200 captive-bred condors were produced from 1988 to 2002 in three breeding facilities in southern California and Idaho. Releases began in southern California in 1992, central coastal California and northern Arizona in winter 1996-97, and northern Baja California in 2002. On average, about 20 juveniles are being released to the wild annually. Three disjunct populations exist: southern California's historical range, Arizona/Utah, and northern Baja California.

The total condor population from January 1, 2000 to September 1, 2003 grew from 159 to 222 birds; total wild population grew from 54 to 85. The wild population in California in that time span increased from 25 to 44 birds. The first eggs were laid in the wild in 1991 in California and Arizona but failed to hatch; first hatchings in the wild of wild-laid eggs occurred in three California nests in 2002, but all three chicks died. In 2003, one chick in

California and one in Arizona were being raised and may be the first to be fledged into the wild in 21 years.

Mortality of condors released to the wild continues to slow recovery progress, but mortality rate in has declined in recent years. Less than 9% of birds in the wild through August 2003 died or had to be removed from the wild population during those two years. The loss was about 20% for 1999-2000 and about 15% for 1997-98. Unusually high losses in the Arizona population in 2000 (11 deaths and 2 removals) was followed by relatively low losses (5 deaths and 1 removal) from 2001 through August 2003, combined.

In California, deaths totaled six in 1999, five in 2000, four in 2001, and three in 2002 and nine in 2003. Also, about one bird per year is removed from the wild, usually for behavioral reasons, but the rate of removal in the past three years is lower than for previous ones. From 2000 through August 2003, causes of death of wild birds were determined for nine individuals: four - power line collision or electrocution; one - lead poisoning; one - shooting; one - predation; one - malnutrition; and one additional possible lead poisoning. The shooting case ended in a conviction.

Activities during 2003 included the following:

- all captive and wild condors were inoculated with a new avian vaccine for West Nile Virus;
- the DFG contracted for radio tracking and other monitoring of all condors in California (late 2002 and early 2003);
- an independent review of exposure of lead to condors in California was competed by University of California, Davis, under Department contract;
- the DFG continued to participate on the interagency Condor Recovery Team;
- the DFG participated in a subcommittee of the team comprising representatives of the firearms industry, shooting sports groups, conservation organizations, State wildlife agencies of California and Arizona, experts in the social science fields, and selected members of the recovery team in preparing a report and establishing mechanisms to reduce lead exposure to condors;
- the Fish and Game Commission in August approved the Department's recommendations for revision and renewal of Memoranda of Understanding for condor research and captive breeding by U.S. Fish and Wildlife Service and the captive breeding facilities.

Bald eagle *Haliaeetus leucocephalus*

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1967
	Threatened	1995
	Proposed Delisted	1999

General Habitat:

Bald eagles occupy various woodland, forest, grassland, and wetland habitats. They winter throughout most of California at lakes, reservoirs, rivers, and some rangelands and coastal wetlands. The breeding range is mainly in mountainous habitats near reservoirs, lakes and rivers. Nesting territories are found mostly in the northern half of the State, and also in the southern Sierra Nevada, Central Coast Range, inland southern California south to Riverside County, and on Santa Catalina Island. Large nests are normally built in the upper canopy of large trees, typically conifers. The birds are opportunistic foragers, usually feeding on fish or waterfowl, but they also prey on other small animals and eat carrion.

Description:

The bald eagle is a large, dark brown bird of prey, which, as an adult, has a white head and tail. Eyes, beak, and feet are yellow. Adult plumage is developed at about five years of age. Wingspan may reach 7 or 8 feet, and weight is 8 to 14 pounds. Females are larger than males.

Status:

The DFG has coordinated annual, statewide breeding surveys since 1973. The breeding population continues its long-term increase in numbers and in range, although adequate documentation of these changes has not been made since 1999. Efforts by DFG to obtain statewide data declined after 1997, and have been replaced mainly with voluntary reporting by local observers. The number of breeding pairs occupying territories was 32 in 1977, 94 in 1990, 105 in 1995, and 151 in 1999. Data from most of these territories, plus a new one, have been received in at least one year from 2000 through 2003. Productivity continues to be good, with the annual number of "young produced per occupied territory of known success" averaging about 1.0 throughout the 1990s. Based on reports received, representing 30-45% of known territories each year, the ratio was 1.05 in 2001, 1.05 in 2002, and 0.86 in 2003, averaging 0.99.

In 1999, DFG had data on 190 bald eagle breeding territories that were occupied in California sometime in the 1990s. From 2001 through 2003, at least 14 new territories were discovered. The southernmost successful breeding on the mainland was documented in 2003 at Lake Hemet, Riverside County. The breeding range has expanded from portions of eight counties in 1981 to at least 32 of the California's 58 counties by 2003.

Territory data are used in pre-harvest timber planning and other local management planning to minimize disturbance and other conflicts in eagle nesting areas. The bald eagle is included in several HCPs, 2081 agreements, and other planning documents across the State.

Santa Cruz Predatory Bird Research Group (SCPBRG) has been coordinating the long-term California Midwinter Bald Eagle Survey since 2000. Winter totals vary greatly; sometimes exceeding 1,000 birds, depending on climate conditions in the western U.S., on areas surveyed, and weather conditions on the count days. In the mid-January 2003 count, 527 bald eagles were reported. SCPBRG, in cooperation with U.S. Forest Service, California Department of Parks and Recreation, and California Department of Water Resources, is tracking bald eagles by satellite telemetry to study international movements and local ecology of birds that fledge in California and of migrating birds that visit the state during the winter. In 2000, the bald eagle reintroduction program by Ventana Wilderness Society ended, after 70 bald eagles were released since 1986 to the central coast of California. Most of the breeding territories in Central Coastal California formed as a result of those releases.

On December 19, 2000, the California and federal governments settled the final remaining legal claims brought in 1990 against the Montrose Chemical Corporation and others for DDT poisoning. Settlements totaling $140 million to the state and federal governments are available for reducing exposure of people and wildlife to contaminants, e.g., DDT, and for natural resource restoration projects. Under the Montrose Settlement Restoration Program, Institute for Wildlife Studies (IWS) began releasing the first of dozens of young eagles on Santa Cruz Island in 2002, in an effort to restore a breeding population of the species on the northern Channel Islands. Bald eagles continue to be released by IWS on Santa Catalina Island, which by 2003 supported five nesting pairs.

Pacific Gas and Electric Company surveys a large proportion of California's bald eagle nests and monitors potential impacts to nesting and foraging areas in various project areas in the state, including studies required as part of Federal Energy Regulatory Commission relicensing.

Status: Increasing number of territories and an expansion in the range in the state.

Swainson's hawk *Buteo swainsoni*

State: Threatened 1983
Federal: None

General Habitat:

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. The majority of Swainson's hawk territories in the Central Valley are in riparian systems adjacent to suitable foraging habitats. Swainson's hawks often nest in proximity to riparian systems as well as utilizing lone trees or groves of trees in agricultural fields. 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 where suitable nesting and foraging habitat is still available.

Description:

The Swainson's hawk is a medium-sized hawk, slightly smaller than the more common red-tailed hawk. Adult females weigh 28 to 34 ounces and males 25 to 31 ounces. There are two distinct color phases (morphs) of Swainson's hawks, light and dark, with variations in between. Hawks of the light color phase are the easiest to distinguish. They have a whitish forehead and white patch on the throat below the bill. The rest of the head, sides of the throat, patch on its chest (resembling a baby's bib), and all other upper body parts are dark brown. The belly is white, barred with brown. In flight, their wings have dark trailing edges that contrast with the light-colored leading edges and the belly. Dark color-phase individuals are entirely dark brown, except for a patch under the tail. When overhead, the trailing edges of their wings might be slightly lighter in color than the leading edges. Throughout their geographic range, hawks of the dark morph comprise only one to ten percent of the population; however, within northern California, the dark morph constitutes 35% of the population.

Status:

The loss and conversion of native grasslands and agricultural lands to various residential and commercial developments is the primary threat to Swainson's hawk populations throughout California. Additional threats are habitat loss caused by riverbank protection projects; conversion from agricultural crops that provide abundant

foraging opportunities to crops such as vineyards and orchards, which provide fewer foraging opportunities; shooting; pesticide poisoning of prey animals and hawks on foraging and wintering grounds; competition from other raptors; and human disturbance at nest sites.

Over 85 percent of Swainson's hawk territories in the Central Valley are in riparian systems adjacent to suitable foraging habitats such as native grasslands or lightly grazed pastures, alfalfa and other hay crops, and certain grain and row croplands. Unsuitable foraging habitat includes vineyards, orchards, certain row crops, rice fields, corn, and cotton fields. Nest sites may be found in mature riparian forest, lone trees or groves of oaks, other trees in agricultural fields, and mature roadside trees. Some mature landscape trees in residential areas can provide nest sites although foraging areas must occur in proximity to the nest trees. Valley oak, Fremont cottonwood, walnut, and large willow with an average height of about 58 feet, and ranging from 41 to 82 feet, are the most commonly used nest trees in the Central Valley.

About 80 percent of Central Valley population is located in Sacramento, San Joaquin, and Yolo Counties. During historical times (ca. 1900), Swainson's hawks may have maintained a population of more than 17,000 pairs. Based on a study conducted in 1994, the statewide population was estimated to be approximately 800 pairs. Additional surveys are needed to document current population levels. Surveys from 1998 to 2003 in the Owens Valley revealed a population of about 20 pairs, larger than had been documented in the 1970's and 80's. This small population is primarily centered on alfalfa fields that have suitable nest trees nearby.

The habitat conservation and management needs of the Central Valley breeding population are fairly well known. These requirements include preservation of riparian systems and groves of tall trees; preservation of lone mature trees within agricultural fields for nesting; conservation of foraging sites, such as grasslands, pastures, and croplands, within about 10 miles of nest areas; and, maintenance of agricultural practices compatible with the Swainson's hawk's foraging requirements. Nest abandonment and loss of young birds as a result of disturbance could be minimized by eliminating noise-generating construction and development activities within a 0.5 mile radius of active nests during the nesting season (March 1 to September 15). Maintaining a buffer zone, or avoidance of nest sites, is essential to the conservation of Swainson's hawk populations. Implementation of these measures can contribute substantially to the recovery of the Swainson's hawk.

Research on this species includes radio telemetry of Central Valley and Owens Valley birds by DFG and the Swainson's Hawk Technical Advisory Committee (TAC), and analysis of the genetics of the species. The TAC is an ad-hoc group composed of researchers and managers experienced with the biology and habitat requirements of the Swainson's hawk. The Wildlife Ecology Unit of the Veterinary Genetics Laboratory at the University of California, Davis is analyzing blood samples to determine genetic diversity, population structure, and taxonomic distinctiveness of Swainson's hawks in California. A portion of blood samples will be analyzed by researchers at the University of California, Davis, to determine the exposure rate to West Nile Virus of Swainson's hawks breeding in California. Another research project, funded through the State's CalFed program, assessed Swainson's hawk habitat use in a vineyard landscape in the lower Mokelumne River watershed.

In 1997, the first six Swainson's hawks from the Central Valley were fitted with satellite transmitters and tracked to determine routes of migration and the locations of wintering areas. Central Valley birds appear to winter in Mexico and Columbia, although a hawk from northeastern California was tracked to Argentina during the winter of 1996. The Central Valley birds were located wintering in a region north of Mexico City, Mexico, and near Bogota, Columbia. No birds from the Central Valley have been tracked further south. Die-offs of several thousand Swainson's hawks and other raptors from 1996 to 1998 were attributed to pesticide use at agricultural fields in Argentina. Farmer education programs and restrictions on use of highly toxic organophosphate pesticides implemented by government and industry appear to have dramatically reduced the impacts of these compounds on wintering Swainson's hawks. Continued monitoring will be required, however, to assess the long-term effectiveness of these measures.

Additional satellite transmitters were subsequently affixed in 1998 to 2001. A sample of 17 birds confirmed that the Swainson's hawks of the Central Valley migrate to a wintering area in Mexico. To date, results from this study suggest that the Swainson's hawks that winter in Mexico tend to use large, multi-site areas, and appear more nomadic in nature than migratory in the traditional sense. In addition, the birds seem to stage and roost in the same locations as they move south along the western Mexican coast; they take a great deal longer to get to their southern-most wintering areas than do individuals in other populations of North America.

Breeding habitat and population studies are ongoing in Yolo County, in the Central Valley, and in Owen's Valley. In 2002, a total of forty-nine adult Swainson's hawks and 140 young birds from Yolo County were banded with aluminum and colored leg bands. The goal of the Yolo County study is to obtain information on habitat use and nest site fidelity, as well as provide additional information on local movements and migration. The study of the population of Swainson's hawks in the Owen's Valley is currently in its fifth year. In 2003, four hawks were fitted with satellite transmitters to determine the migration route and wintering ground of this population. The DFG provided funding for the satellite transmitters used in this research; the TAC is involved in tracking the birds. The Owens Valley research presents an opportunity to track a small number of territories that are almost completely dependent on intensively managed agriculture, irrigated alfalfa fields, for foraging habitat. Findings on the habitat use and other factors from this research will assist in habitat conservation and management as well as recovery of the species elsewhere within the State.

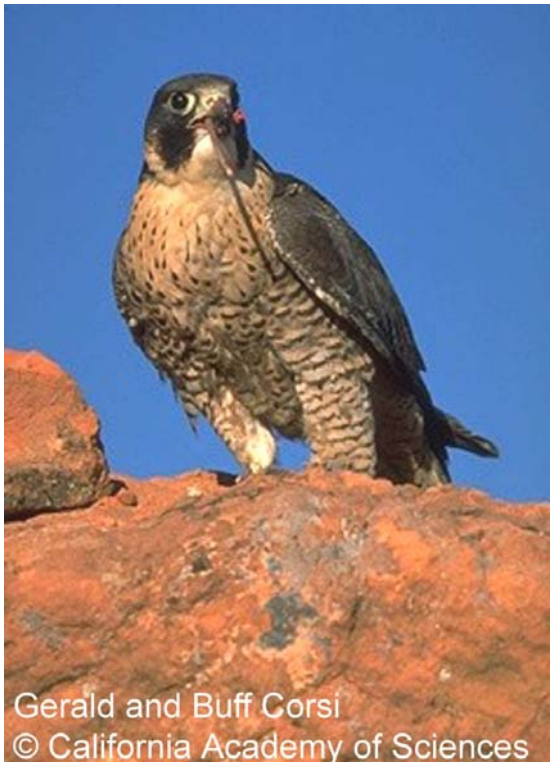
The CalFed study focused on the lower Mokelumne River watershed where vineyards have increased over the past 15 years. Preliminary surveys of hawks indicated that the Swainson's hawk might be declining in the area. In 2002 and 2003, systematic surveys of Swainson's hawk nests were conducted in the lower watershed, along with road surveys to record foraging-habitat associations. After the breeding season, nest tree variables were measured at nest sites and at random sites. Habitat selection was determined for nesting and foraging, and comparisons between use of vineyards and other available habitats were made. The analysis concluded that Swainson's hawks forage and nest in vineyard habitat less than expected by random choice, forage more in irrigated hayfields, and nest more in rural habitat. Nest sites were distinguished from random sites by larger and taller trees that were located closer to paved roads, hayfields, and to habitat edges. The area surrounding the nest tree exhibited higher habitat diversity, and a higher perimeter density than random trees. This study reinforced the importance of maintaining landscapes conducive to the Swainson's hawk in the Central Valley and also defines features that increase nest presence.

The DFG is currently engaged in Swainson's hawk recovery planning. DFG staff are updating existing nest site data bases from various sources into a data base that will provide information on the locations of Swainson's hawk nesting territories statewide. This information can form the basis for a variety of conservation and recovery actions for the species. A recovery strategy for the Swainson's hawk has long been planned by the DFG and the TAC. A mitigation policy to address impacts to the species and its habitat has been also developed but needs revision. An effective DFG mitigation policy is needed to address the continued loss of habitat and disturbance of nests sites, particularly in the Central Valley where most of the population still exists.

The current status of the Swainson's hawk in California is declining.

American Peregrine falcon *Falco peregrinus anatum*

State	Endangered	1971
	Fully Protected	
Federal	Delisted	1999



General Habitat:

The range of the American Peregrine Falcon includes most of California during migrations and in winter. The California breeding range, which has been expanding, now includes the Channel Islands, the coast of southern and central California, inland north coastal mountains, the Klamath Mountains and Cascade Range, and the Sierra Nevada. Nesting sites are typically on ledges of large cliff faces. Many pairs are nesting on city buildings and bridges, and some pairs nest in tree cavities of coastal redwoods. Nesting and wintering habitats are varied, including wetlands, woodlands, other forested habitats, cities, agricultural areas and coastal habitats. Peregrine Falcons feed on birds that are caught in flight.

Description:

This bird is a medium-sized raptor with long, pointed wings and a long tail. The adult is slate gray; its wing, tail feathers, and flanks are barred with black. The dark cap of the head extends to the cheeks and its throat is white. Coloring for the lower part of the body is nearly white, and is extensively spotted and barred with black. The legs and feet are yellow. Immature birds are brown above, streaked below. The wingspan exceeds three feet.

Status:

Beginning in the late 1970s, intensive efforts were made annually by federal and state agencies and cooperators to assess breeding population size and locations, and to collect information on breeding success. Comprehensiveness of statewide surveys of breeding status diminished since the late 1990s. A DFG-contracted statewide breeding survey was conducted during 1997 by the University of California, Santa Cruz Predatory Bird Research Group (SCPBRG), when observers checked nearly 150 known and suspected nesting areas and obtained data on at least 111 active territories (i.e., two courting adults present); productivity averaged about 1.5 young per pair. Owing to reduced availability of funding, only about half of the 193 known territories in the State could be

adequately monitored by the SCPBRG in 1998 and 1999. The Department ceased recommending projects for funding under ESA Section 6 after this species was delisted in 1999, in anticipation of post-delisting monitoring by USFWS. A 2003 national survey was supported financially by USFWS as part of its post-delisting monitoring plan.

Partial statewide surveys were made by SCPBRG from 1999 through 2003. From 1999 to 2002, 96 of the state's known territories were found to have been occupied at least one of the years; 20 percent of the territories were on man-made structures. The cumulative total of sites known to have been active at some time since 1975 increased from 202 in 1999 to 222 in 2002. Undoubtedly, many other relatively new sites have not been found. Number of active sites monitored has generally declined since 1997, ranging from 39 to 66 during 1999-2002. Reproductive outcomes were determined from most of those active sites each year, and number of young produced per active site of known outcome ranged from 1.58 to 2.72. These rates, which appear to show that reproductive success is higher than prior years, are not directly comparable to data gathered before the late 1990s, when most sites were checked annually. In those partial surveys, no attempted was made to be obtain a representative sample of the state, and site selections were biased toward easily accessible sites, especially urban sites.

The USFWS is now coordinating national monitoring efforts. When federal delisting of the Peregrine occurred in 1999, USFWS was mandated by the Federal Endangered Species act to develop a plan--in cooperation with State wildlife or natural resource agencies, recovery team members, and other cooperators--to monitor the national Peregrine population for not less than five years after delisting. The plan is designed to examine trends nationwide and to detect declines in territory occupancy, nest success, and productivity in six regions across the U.S. Data are being collected from a randomly selected subset of Peregrine territories for five sampling periods, at three-year intervals. The monitoring started in 2003 and will end in 2015. Monitoring efforts include collecting samples of addled eggs and of feather for contaminant analyses.

After a trial monitoring effort in the Pacific states region in 2002, 96 randomly chosen Peregrine nest sites in Washington, California, Oregon, Idaho, and Nevada were monitored in 2003. Under the USFWS-funded effort, 30 territories were sampled in California. The Pacific region's overall occupancy was 86% (93% in California), the overall nest success was 64% (75% in California), and the overall productivity was 1.4 young per occupied site (1.5 in California). In these five states, approximately 43 new territories were discovered in 2003, including 9 in California.

As part of the federal delisting process, USFWS, with advice from western states, developed criteria for allowing a harvest of Peregrine Falcons for falconry purposes under revised national falconry regulations. Beginning in 2001, USFWS authorized 11 western states to coordinate the take of Peregrine nestlings within their jurisdictions and allowed a take of up to 5% of the state's productivity, at the discretion of each state. CDFG agreed that the proposed take would have extremely limited effects on the population of this species. However, Peregrine Falcons may not be taken in California for use in falconry. The American Peregrine Falcon is classified in California Fish and Game Code Section 3511 as a "fully protected bird." This law prohibits the take of Peregrine nestlings in the wild for uses such as falconry. Before the Commission could consider allowing such take, new legislation must be enacted to remove this subspecies from the fully protected bird list, or amended to allow such take; the Commission must approve removal of the Peregrine Falcon from State endangered and threatened species classification under CAC, Title 14, Section 670.5; and the Commission must add this species to the list of birds of prey that may be taken for use in falconry under CAC, Title 14, Section 670.

The increasing population of Peregrines has presented new risks to other endangered or sensitive birds, such as California Least Terns and Marbled Murrelets. Monitors of such species must assess the threat Peregrines pose and recommend actions, such as harassment or live-capture and relocation of individual Peregrines. At Least Tern colonies, predation by Peregrines and other rare native predatory birds normally is tolerated and monitored, but if immediate action is necessary to avoid major impacts to a colony, monitors would contact experienced Peregrine

biologists or wildlife control agents to arrange for live capture of the Peregrine.

Urban-nesting Peregrine Falcons present special protection and management challenges. About 20 percent of breeding pairs in the state nest on buildings and bridges. Often, nesting ledges selected by adult birds are suitable for egg-laying, but productivity of such sites is poor without intensive human intervention. Such sites are at risk from human disturbance, lack of good substrate for supporting eggs or young birds, and lack of wind protection. Commonly, management of this species in urban sites includes installation of special nesting platforms, rescuing of at-risk eggs and chicks, and implementation of restrictions on human actions during nesting periods. In coastal areas where an urban Peregrine nest is near endangered bird nesting sites, removal and relocation of the Peregrine chicks to wild nests or hack sites elsewhere in the state has been necessary at times to avoid subjecting the endangered prey to predation by the fledged Peregrines.

The status in 2003 of the American Peregrine Falcon: *Increasing*.

California black rail

Laterallus jamaicensis coturniculus

State	Threatened	1971
	Fully Protected	
Federal	None	

General Habitat:

The California black rail inhabits saltwater, brackish, and freshwater marshes. Nesting habitat is characterized by water depths of about one inch that do not fluctuate during the year, and by dense vegetation providing adequate cover. Larger wetlands are more likely to support populations that will exist over time. Black rails prefer vegetation dominated by pickleweed over other short species and taller vegetation in San Francisco Bay wetlands while those on the lower Colorado River preferentially selected habitat dominated by California bulrush and three-square.

Description:

The California black rail is tiny, about the size of a sparrow, and is blackish in color with a small black bill, a back speckled with white. The area around the neck of deep chestnut brown. California black rails lay three to eight eggs.

Status:

Historically, the California black rail occurred along the coast from Baja California, Mexico north to San Francisco. Inland, these rails occurred from the delta of the Colorado River north through the San Joaquin and Sacramento Valleys to eastern Oregon wetlands. Today, the California black rail is found at several locations in the Sacramento-San Joaquin River delta, the San Francisco Bay area, Bolinas Lagoon and Tomales Bay in Marin County, Morro Bay in San Luis Obispo County, White Slough in San Joaquin County, the Salton Sea area, and the Lower Colorado River Valley. Populations have also been found in Yuba, Butte, and Nevada Counties. An additional population was discovered in April 2003 in Placer County. The Placer County birds are thought to be non-migratory based on observations made throughout the year. A desert stronghold for this species appears to be along the lower Colorado River where over a hundred birds have been observed repeatedly during censuses in recent years.

Threats to black rail populations fall into three main categories: habitat loss, predation, and contamination. The loss of coastal and interior wetlands has greatly reduced the range of this species and is the principal threat to the California black rail. Impacts to the species include flooding of suitable habitat due to El Niño events, levee and road construction, filling of wetlands, and land subsidence due to groundwater pumping; cattle grazing in Sierra Nevada wetlands inhabited by the rail; habitat loss from invasive non-native plants such as perennial pepperweed and non-native cordgrass; predation by native and non-native animals; and contamination of wetlands by oil refineries, chemical plants, manufacturing, and urban runoff. Documented predators of California black rails include great blue heron, great egret, northern harrier, and owls. The red fox and rats are believed to prey on nests around San Francisco Bay. Predation of black rails can be intense in marshes that lack the transitional vegetation between the high marsh and upland cover.

A report prepared in 2000 by the San Francisco Bay Area Wetlands Ecosystem Goals Project, a project of the San Francisco Bay Regional Water Quality Control Board, identified characteristics of habitats that would support the California black rail. Specific features include fully-tidal (undiked) wetlands or habitat adjacent to such wetlands, marshes with dense stands of pickleweed or other salt-tolerant plants, safe sites at or above the mean high water level, and the control of non-native predators. Because black rails are able to colonize isolated marsh sites, including created wetlands, protection of all suitable marsh habitat is essential to the survival of this species.

California black rail studies in the San Francisco Bay region have been ongoing for more than 20 years. During surveys conducted in the San Francisco Bay Estuary in the late 1980s, researchers from the Point Reyes Bird Observatory (PRBO) found that the majority of breeding black rails were in the San Pablo Bay system in the North Bay. Breeding birds were also found in Suisun Marsh but were very uncommon in the Central and South Bays. One exception was in the South Bay at the Don Edwards San Francisco Bay National Wildlife Refuge's large Dumbarton marsh. The low numbers of breeding birds was attributed to the lack of suitable habitat above the high tide level in the South Bay.

Point Reyes Bird Observatory conducted a subsequent survey in 1996 to determine the stability of the California black rail in several marshes. Suisun Marsh and marshes in San Pablo Bay retained populations of breeding birds. However, there was no indication that the rails had expanded their range to marshes that had been unoccupied in the 1980s. Some of the isolated, outlying marshes showed declines in numbers since the prior survey. Based on these data, PRBO concluded that the California black rail was stable at some core sites, but was possibly declining at the marshes situated on the margin of the Estuary.

In a follow-up study in 2000 and 2001, PRBO conducted surveys at 34 tidal marshes in San Pablo Bay, Suisun Bay, the north San Francisco Bay, and western Marin County. Their goal was to develop up to date information on the distribution and abundance of the rails; to develop a predictive tool based on vegetation, habitat, and landscape features; and to summarize information on nesting and nest site characteristics. Measures of abundance showed an increase at eight marshes when compared to earlier surveys, lower numbers at four marshes, and two marshes with no change. Black rails were also detected at seven of 13 marshes surveyed for the first time. PRBO also found 26 nests at five study sites between 1998 and 2001. An estimated 23 percent of young fledged. Black rails preferred short vegetation dominated by pickleweed over other short species and taller vegetation. Taller vegetation was used only when shorter material was not available. The majority of nesting activity occurred from early April to May.

The data from the PRBO study showed that factors affecting rail distribution were the size of marsh, distance to water, the size of the core area of the marsh, the amount of surrounding urban land, and vegetation height and species composition. The data indicated that the California black rail prefers large marshes that are close to water, away from urban areas, with saline to brackish water, and with a high proportion of pickleweed, three square, rush, and cattail.

The San Francisco Estuary Wetlands Regional Monitoring Program (WRMP) Plan was released in 2002. The mission of the WRMP, which is a product of the San Francisco Estuary Institute and wetland managers representing a variety of agencies including the DFG, "is to provide the scientific understanding necessary to protect, create, restore, and enhance wetlands of the San Francisco Bay Region, through objective and cost-effective monitoring, research, and communication." A survey protocol developed by PRBO for the California black rail is included in the WRMP planning document. This protocol is designed to collect the following kinds of information about California clapper rails and black rails: an estimate of breeding population size, population trends, health and stability of populations, and rates of colonization at restoration sites.

The California black rail is also addressed in several large habitat conservation planning efforts, for example, the Coachella Valley MSHCP, the Lower Colorado River MSCP, the U.S. Bureau of Reclamation (USBR) Salton Sea Restoration Plan, and the Solano County Water Agency HCP. Existing populations of black rails in the Coachella Valley are within the MSHCP Dos Palmas Conservation Area and Coachella Valley Stormwater Channel and Delta Conservation Area. The Dos Palmas Conservation Area includes the existing Dos Palmas Area of Critical Environmental Concern (ACEC), Oasis Springs Ecological Reserve, and a portion of the Salton Sea State Recreation Area. California black rail are known to occur within the Salt Creek watershed of the Dos Palmas region and have been reported from the Whitewater River area at the north end of the Salton Sea. Management of these wetlands could expand suitable habitat for the rail in this area.

Radio telemetry studies of the black rail on the Lower Colorado River found that preferred habitat was dominated by California bulrush and three-square, water depth of less than one inch, and 25% of the substrate covered with water. Birds were found closer to the shoreline than would have been expected in random distribution. Home range was approximately 1.0 to 1.5 acres. Habitat modeling was used to delineate black rail habitat within the Coachella Valley MSHCP area where 643 acres (91%) of the modeled habitat are conserved. The conserved acreage includes the four known locations of black rail within the Plan area.

Threats to the black rails' continued occurrence within the Coachella Valley Plan area include water diversions that reduce marsh habitat; lining of the All American canal; lining of the earthen Coachella canal above Dos Palmas; habitat modification for flood control at the Whitewater River delta; tamarisk infestations that degrade and dry up marsh habitat; and predation from exotic bullfrogs. Although accurate population numbers are not available, researchers have concluded that the population in the Plan area is small and may require immigration of birds from areas outside of the Coachella Valley Plan area to maintain a viable rail population. A Draft Monitoring and Adaptive Management Plan has been prepared for the MSHCP and A Dos Palmas Mitigation Strategy & Long Term Monitoring plan is in preparation. Habitat protection and improvement at the Dos Palmas area would also benefit other listed species such as the Yuma clapper rail and the desert pupfish. In analyzing restoration alternatives for the Salton Sea, USBR concluded that under the No Project Alternative, more than 300 acres of wetland habitat suitable for the black rail, Yuma rail, and desert pupfish would be lost due to dramatic increases in salinity.

California clapper rail *Rallus longirostris obsoletus*

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1970

General Habitat:

The California clapper rail is now restricted almost entirely to the tidal marshes of San Francisco estuary, where the only known breeding populations occur. Some individuals use brackish marshes during the spring breeding season. The rail formerly occurred at Humboldt Bay in Humboldt County, Elkhorn Slough in Monterey County, and Morro Bay in San Luis Obispo County.

Description:

The California clapper rail is the size of a coot and is slightly larger and grayer than the two southern California subspecies of the clapper rail. It is characterized by a long, slightly downward-curving bill, olive-brown upper parts, a cinnamon-buff colored breast, dark flanks crossed by white bars and white undertail feathers that are often exposed when the bird is agitated. Male and female rails differ only in size. In general, males are slightly larger. Juveniles have a paler bill and darker plumage, with a gray body, black flanks and sides, and indistinct light streaking on flanks and undertail feathers. The breeding season of California clapper rails begins by February. Nesting starts in mid-March and extends into August. Both parents share in incubation and rearing.

Status:

Clapper rails are secretive and difficult to observe in dense vegetation. They are most active in early morning and late evening, when they forage in marsh vegetation in and along creeks and mudflat edges. They often roost at high tide during the day. The rail is threatened by destruction and degradation of its habitat due to conversion of salt marshes to brackish marshes by freshwater discharges from sewage treatment plants, invasion of non-native cordgrass (*Spartina alternifolia*), and pollution from urban runoff, industrial discharges, mercury poisoning, and sewage effluent. The rail itself is subject to predation by the non-native red fox, feral cat, and the Norway rat, and various native mammals.

Of the 193,800 acres of tidal marsh that bordered San Francisco Bay in 1850, only about 30,000 acres remain, a reduction of 84 percent. The remaining habitat is degraded. Industrialization and development of bay tidelands has resulted in linear remnant wetlands on the bay fringe. Many of these linear marshes are completely submerged during high tides and lack sufficient escape habitat. These wetlands also do not provide suitable nesting, foraging, or escape sites for the California clapper rail, and are highly susceptible to environmental perturbations. The East Bay shoreline is eroding from San Leandro to Calaveras Point. Habitat in the North Bay is fragmented, degraded,

and discontinuous. The once extensive salt marsh along Coyote Creek, Alviso Slough, and Guadalupe Slough has been converted to freshwater or brackish water marsh due to freshwater discharges from South Bay water treatment facilities. Mercury levels are high in the South Bay; its accumulation results in embryo mortality. Although small populations are found throughout San Pablo Bay, their occurrence is sporadic and in low numbers in Suisun Marsh. USFWS currently estimates about 600 birds in the South Bay.

The San Francisco Bay National Wildlife Refuge Complex is involved in an integrated predator management program to reduce effects of non-native predators on native wildlife species. Efforts include predator barriers, removal of predators, and habitat management to reduce suitability for these predators. It is also actively involved in restoration of tidal marshes throughout the bay, such as in the Napa Marsh and in the Alviso area. East Bay Regional Parks is working cooperatively with the Refuge to restore tidal action to a 300-acre diked wetland along the shore of Hayward.

The DFG, Refuge, and RWQCB are working with the City of San Jose to develop mitigation for impacts to tidal marsh from freshwater discharge from the Santa Clara and San Jose Water Pollution Control Plants. Tidelands in this area support the salt marsh harvest mouse in addition to the California clapper rail. Part of this mitigation has been the purchase of 835 acres of inactive Cargill salt ponds and additional acreage north of the Dumbarton Bridge. These areas will be restored to tidal marsh and seasonal wetlands. The City of San Jose is also diverting some of its treated effluent and using it for landscape irrigation, agricultural irrigation, and industrial use, thereby lessening freshwater flow to the tidal marsh. The DFG is also working with USFWS and the Refuge to acquire a 1673-acre tract of diked wetlands in Redwood City. This parcel could be especially important to the recovery of rail populations due to its large size and location adjacent to a fairly large existing population of rails on Greco Island.

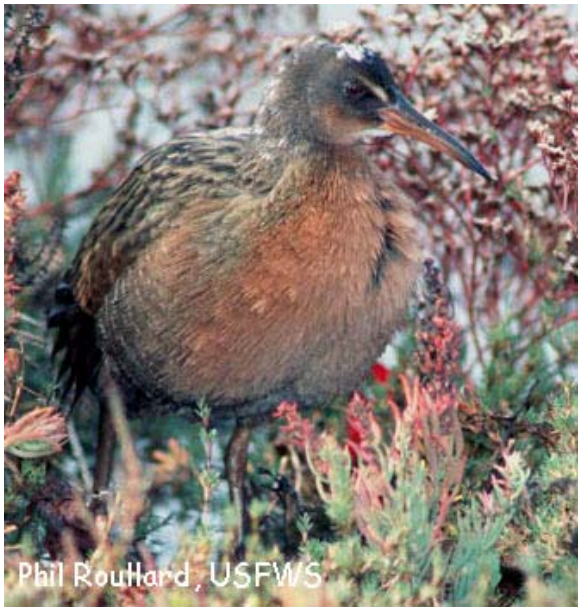
In another major undertaking to benefit the California clapper rail, the COE and the California Coastal Conservancy are working with a number of agencies and environmental groups to restore the abandoned Hamilton Army Airfield in San Pablo Bay to approximately 1000 acres of tidal marsh and seasonal wetlands adjacent to existing wetland and rail habitat. Wetland creation will entail beneficial reuse of sediments dredged from shipping channels in San Francisco Bay. A specially-designed elevated pipeline will carry the material needed for the wetlands while avoiding rail habitat within the wetland.

The USFWS is preparing a recovery plan for tidal-marsh species in the San Francisco Bay, including the rail. Determining the distribution and abundance of the rail is one of the management goals of the San Francisco Estuary Wetlands Regional Monitoring Program (WRMP) Plan, the first version of which was released in June 2002. The WRMP is a cooperative effort of the San Francisco Estuary Institute and wetland managers representing a variety of agencies including the DFG. The mission of the WRMP "is to provide the scientific understanding necessary to protect, create, restore, and enhance wetlands of the San Francisco Bay Region, through objective and cost-effective monitoring, research, and communication." A survey protocol for the California clapper rail is included in the WRMP planning document. This protocol is in conformance the USFWS survey protocol and is designed to collect the following kinds of information about California clapper rails and black rails: an estimate of breeding population size, population trends, health and stability of populations, and rates of colonization at restoration sites.

At the end of 2002, the DFG considered the population trend and status for the California clapper rail to be *Unknown*.

Light-footed clapper rail

Rallus longirostris levipes



State	Endangered	1971
	Fully Protected	
Federal	Endangered	1970

General Habitat:

Disjunct populations breed in marsh vegetation of coastal wetlands from Santa Barbara County to San Diego County and northern Baja California. These populations inhabit cordgrass-pickleweed salt marsh year-round, feeding primarily on crabs, snails, and other intertidal invertebrates. The amount of suitable habitat available to this subspecies across its entire range is about one-third of that which existed historically.

Description:

The light-footed clapper rail is slightly smaller than the California clapper rail. It is characterized by its hen-like appearance, a long, slightly downward-curving bill, gray-brown back, a cinnamon-colored breast, and vertical dusky and white bars on the flanks. The stripe over the eye is whitish. Male and female rails differ only in size. In general, males are slightly larger. Juveniles have a paler bill and darker plumage, with a gray body, black flanks and sides, and indistinct light streaking on flanks and undertail coverts.

Status:

The 2003 light-footed clapper rail census resulted in the detection of 286 pairs. The total number of pairs detected in 2004 was 350 and part of a recent upward trend. Captive-reared birds have been released in California and may have contributed to the above total. However, the number of occupied marshes in 2004 is 15, down from 16 recorded in 2003. The species is responding to major habitat restoration projects in its range, as well as increased predator management at key locations. Annually, the United States population fluctuates dramatically, and the species clearly remains critically endangered. The total population of the subspecies, both in its entire range and in its range in California, represents one of the smallest known populations of any bird subspecies on the west coast of North America. The San Quintin population in Baja California is under threat from human disturbance, grazing animals, agriculture, egg collecting and dogs.

Light-footed clapper rails were detected in up to 19 marshlands in the early 1980s, up to 14 in the late 1980s, up to 13 in the early 1990s, and from 11 to 17 in the past decade. The 1980-1992 population totals fluctuated from 142 to 277 pairs annually. Up to 300 breeding pairs were detected in annual surveys from 1993 to 1995, 325 pairs in 1996, and 307 pairs in 1997. In 1998 and 1999, populations numbered 222 pairs and 233 pairs respectively, some of the lowest populations counted since 1990, representing a significant decline from 1996. Only 217 pairs

were detected in 2001.

Most of these rails are found in only three locations, Upper Newport Bay, Tijuana Marsh, and Anaheim Bay, with the rest of the 16 occupied breeding sites harboring few pairs of rails. However, primarily because of recently instituted captive propagation and translocation programs, the future of the species looks more assured now than at any time since the Federal and State listings of this species as endangered in the 1970s. A substantial volunteer force has donated hundreds of hours of effort to conserve this exceedingly rare species. In addition, Section 6 funding was obtained to complete monitoring and predator control in 2003. A positive response from clapper rail populations is expected so long as current monitoring and management programs remain in place and receive adequate funding.

Monitoring and management activities are conducted annually, in accordance with Recovery Plan guidance to protect, manage, and maintain breeding sites and to monitor population status. Breeding biology, food habits, inter-marsh movements, and predation are examined. Data on distribution, population, and breeding biology are collected annually. Interagency censuses of light-footed clapper rails are made in all coastal wetlands (known or suspected to have suitable habitat) twice annually using standard survey techniques (winter high tide counts and broadcasted tape-recorded calls during breeding). Population trends are critically important in assessing progress in protection efforts and in directing future management.

Nest platforms are refurbished and new ones constructed, in selected marshes, and breeding success is monitored. Rails are trapped, marked and tracked to determine movements and habitat use patterns. Predator control, through deterrents or control by trapping or shooting, is implemented wherever necessary to protect existing populations or to improve chances of success of reintroduction efforts, including at Carpinteria Marsh (the northernmost marshland habitat of this subspecies) and Kendall-Frost Marsh, which have experienced significant depredation or predator pressures.

The increasingly isolated light-footed clapper rail populations have low genetic variability and a low rate of dispersal, except to nearby marshes. Translocating eggs and young clapper rails to aid genetic mixing and to restore declining or extirpated populations in some marshes is being implemented. Habitats that are suitable for light-footed clapper rail population reintroduction or augmentation efforts are identified and enhanced. Captive propagation efforts have been under way in the San Diego Bay area at the Chula Vista Nature Center since December 1998, and at Sea World since 2001, and relocation of captive-raised rails is being implemented.

Protection of the clapper rail through site management and predator control also aids in recovery efforts for the Western snowy plover (Federally-listed as threatened), California least tern (State and Federally-listed as endangered), Belding's Savannah sparrow (State-endangered), possibly the black rail (State-listed as threatened) and other rare coastal wetland wildlife species (e.g., gull-billed, elegant, and royal terns; black skimmer) that share the same coastal ecosystems with clapper rails. Proper management of the clapper rails entails ensuring sensitive, appropriate control of predation by predators that are themselves specially protected or rare in the coastal zone, such as the endangered peregrine falcon and the northern harrier.

Reports of statewide efforts by the Department and all other cooperating agencies and individuals are prepared and disseminated to the public annually. Current status: This species is considered stable.

Yuma clapper rail *Rallus longirostris yumanensis*

State	Threatened	1971
	Fully Protected	
Federal	Endangered	1967

General Habitat:

The Yuma clapper rail is generally a resident of shallow, freshwater marshes containing stands of cattails and bulrushes in the Coachella Valley. It is found along habitat edges in less dense vegetation to facilitate mobility and access. An average water depth between three and eight inches is preferred, with mats of decaying vegetation providing access in deeper water. In habitats found along and adjacent to the lower Colorado River, these rails selected some combination of cattails and bulrush for breeding sites.

Description:

This rail closely resembles the other two clapper rail subspecies found in California. It is gray-brown above and buffy-cinnamon below and has brownish-gray cheeks and flanks barred with black and white. Its somewhat orange bill is long and slightly down-curved. The Yuma clapper rail is the most slender and pale of the three subspecies.

Status:

The Yuma clapper rail is included in several large habitat conservation planning efforts, the Coachella Valley MSHCP, the Lower Colorado River MSCP, and the U.S. Bureau of Reclamation (USBR) Salton Sea Restoration Plan. Within the Coachella Valley MSHCP, Yuma clapper rails are known to occur within the Salt Creek watershed of the Dos Palmas region in the Coachella Valley and have been reported from the Whitewater River area at the north end of the Salton Sea. The Dos Palmas area may have particular importance in that it may be one of the few occupied sites throughout this bird's entire range that is relatively free of chemical contaminants. Both Dos Palmas and the Whitewater River delta/Salton Sea could, if managed appropriately, provide additional habitat to what already exists there. The population size of Yuma clapper rails within this area is not known, nor are the trends in its population numbers. Immigration for occupied habitat to the south may be necessary to maintain long-term viability of this populaiton.

Habitat modeling was used to delineate suitable Yuma clapper rail habitat within the Coachella Valley Plan Area. Habitat consists of marshes dominated by cattail and California bulrush; along the Lower Colorado River, rails selected some combination of cattails and bulrush for breeding. Higher elevation sites provided post-breeding habitat at some locations. These areas were dominated by willow, arrowweed, common reed, and tamarisk. Water depth was an important habitat characteristic and optimal water depths varied between six and eight inches. In deeper water, vegetation mats provided access throughout the occupied habitat. Under the MSHCP, 643 acres (91%) of modeled habitat will be conserved although it is not known if this amount of Yuma clapper rail habitat is

large enough to sustain a viable population. Additional surveys are needed as part of Coachella Valley Plan implementation to determine patch sizes and whether they are adequate to sustain a viable population. There are opportunities for habitat restoration and enhancement in the Plan area, and management of existing wetlands could expand suitable habitat for the rail in this area.

Threats to the rail's continued occurrence within the Coachella Valley Plan area include water diversions that reduce marsh habitat; lining of the All American canal; lining of the earthen Coachella canal above Dos Palmas; habitat modification for flood control at the Whitewater River delta; chemical contamination in the Whitewater area; tamarisk infestations that degrade and dry up marsh habitat; and predation from exotic bullfrogs. Leakage from the Coachella Canal currently provides a portion of the water supply to rail habitat at the Dos Palmas Preserve/ACEC. The canal lining may also be a threat to the water supply in Salt Creek.

A Draft Monitoring and Adaptive Management Plan has been prepared for the MSHCP and A Dos Palmas Mitigation Strategy & Long Term Monitoring is in preparation. Habitat protection and improvement at the Dos Palmas area would also benefit other listed species such as the black rail and the desert pupfish. In analyzing restoration alternatives for the Salton Sea, USBR concluded that under the No Project Alternative, more than 300 acres of wetland habitat suitable for the black rail, Yuma rail, and desert pupfish would be lost due to dramatic increases in salinity.

The DFG Imperial Wildlife Area staff have been assessing the effects of waterfowl habitat management on Yuma clapper rail nesting areas. Careful control of flooding regimes have improved habitat for nesting birds. Adult rails are commonly seen in these managed areas. The DFG participates in the federal Yuma Clapper Rail Recovery Team, which meets periodically to coordinate research, management, and planning. One of the team's tasks is to coordinate biennial surveys of each known and likely site during the nesting season.

Greater sandhill crane *Grus canadensis tabida*

State: Threatened 1983
Fully Protected
Federal: None

General Habitat:

Sandhill cranes use large and small tracts of open habitat where visibility is good from all vantage points. Wet meadows, marshes, shallow ponds, hayfields, and grain fields are all favored for nesting, feeding, and roosting. Emergent wetland vegetation is a key component of nesting territories, and nests are typically placed on piles of emergent vegetation, grass, and mud. Pairs return to the same territory and even the same approximate nest location every year. Based on the survey data recorded to date, areas of suitable wetland and meadow habitat on private and public lands in Lassen, Modoc, Plumas, Shasta, Sierra, and Siskiyou counties constitute the current breeding grounds of greater sandhill cranes in California.

Description:

Greater sandhill cranes are the largest of the six subspecies of sandhill cranes. Average adult males weigh 10.5 pounds while females average 8.4 pounds. Except for these size differences, sexes are similar in appearance. General coloration is pale gray with darker primary feathers. The cheeks, ear coverts, and chin are white, and all but juveniles have bare, reddish foreheads. Fledglings are similar in size to adults but can be distinguished by rust-brown feathers on the nape of the neck. Greater sandhill cranes eat a variety of foods, but, on the wintering ground, they primarily feed on grains such as corn and rice left over after harvest of agricultural fields.

Status:

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 and bur-reed. Favorable roost sites and an abundance of cereal grain crops characterize the 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 wintering areas, particularly in the Sacramento-San Joaquin Delta near Lodi, San Joaquin County. Irrigated pastures are chosen for resting sites throughout the wintering ground. A communal roost site consisting of an open expanse of shallow water is a key feature of wintering habitat.

When the greater sandhill crane was designated a threatened bird species in 1983, all populations of the threatened species breeding or wintering in the State were placed under the protections of CESA. This action represented the first step in the recovery of the species. The provisions of CESA ensure that a variety of activities that benefit or impact the species are scrutinized by the State to guard against harm to crane populations and their habitats. This species continues to experience threats on both wintering and breeding grounds due to agricultural and residential conversion of habitat, predation, human disturbance, and collisions with power lines. Greater demand for agricultural crops such as alfalfa could lead to private land conversions in the primary crane breeding areas of the State. Wintering sandhill cranes in the Central Valley currently are dependent on certain agricultural practices and cropping patterns that are compatible with their foraging and non-foraging activity needs. Cranes concentrate primarily on private lands and are therefore potentially vulnerable to land-use changes that alter their feeding, loafing, and roosting habitat.

Historically, California's breeding population of greater sandhill cranes was documented nesting in eastern Siskiyou County, northeastern Shasta County, and south to Honey Lake, Lassen County. Early research estimated that three to four pairs had territories in California in 1944. However, no range wide searches for active crane territories were conducted during these earlier times. Breeding records tended to be from incidental sightings rather than systematic surveys, so it is difficult to develop population trend data from past to present times. Recent surveys have been much more intensive and comprehensive compared to historic records. Baseline population estimates have been developed from results of increasingly intensive surveys in 1971, 1981, 1988, and 2000. These six northeastern counties have been the sites of documented breeding territories since 1981. During the last breeding ground survey in 2000, the following estimates of breeding crane pairs were made in these northern California counties: Modoc (252), Lassen (122), Siskiyou (51), Plumas (20), Shasta (10), and Sierra (10). Population estimates indicate the role that survey effort has played in determining the "accurate number" of breeding cranes in California. These estimates ranged from a low of 112 breeding pairs in 1971 (in 3 of the above 6 counties) to a high of 465 pairs in 2000.

After young fledge, cranes concentrate on grain fields near favorable roost sites. They confine most of their activities within these habitats until migration time in the fall. Food consists of a variety of cereal grains, including barley, rye, wheat, and oats. Fields used consistently by cranes are usually within a few miles of a shallow water body that serves as a communal roost site. Once cranes leave pre-migratory staging areas, they fly southwest to wintering grounds in the Central Valley from near Chico, Butte County, south to Delano, Kern County. Large flocks of lesser sandhill cranes (*G. c. canadensis*) and Canadian sandhill cranes (*G. c. rowani*) also spend the winter in the Central Valley. Favorable roost sites and an abundance of cereal grain crops characterize winter concentration areas. Rice is the primary food source for cranes near Gray Lodge Wildlife Area, Butte County, and corn is the most important food at the majority of other concentration areas in the Central Valley particularly in the Sacramento - San Joaquin Delta. Irrigated pastures are used extensively as loafing sites in some wintering areas. Greater sandhill cranes of the Lower Colorado River Valley Population winter in California in small numbers (less than 1000 individuals) in Imperial County. These birds breed in Utah and Nevada and most of the population winters in Arizona.

Attempts to estimate the wintering population of greater sandhill cranes have been complicated by the fact that there are a total of three subspecies inhabiting the Central Valley from about mid September to early March each year. However a few researchers made sandhill crane population estimates at different locations during winters in the 1960's to early 1990's in an attempt to document local habitat use patterns. Currently, the estimate for greater sandhill cranes within their Pacific Flyway range is between 5,000 and 6,000 individuals. There are about 25,000 lesser sandhill cranes wintering in California each year. In addition about 6,000 Canadian sandhill cranes also mix with the other two subspecies on the wintering ground. The latter subspecies is thought to be a relatively new arrival in the State and is midway in size between the others and tends to be quite brownish in coloration.

Since 1978, the Department has participated, with other states within the Pacific Flyway, in the development of

planning that could be modified as a recovery plan. Specific management recommendations are contained in the Pacific Flyway Management Plans on all breeding and wintering California populations of greater sandhill cranes. The Pacific Flyway Plans contained several recommended research and management task categories that would also be necessary to effect recovery of the greater sandhill crane in California. In 1997, amendments to CESA directed the DFG to develop and implement a recovery strategy pilot program for the greater sandhill crane. Several years before the 1997 amendments of CESA called for a formal recovery planning strategy, the Department had taken some important initial steps toward the recovery of the greater sandhill crane by acquiring key habitats that studies had identified as important for nesting and wintering populations. Two winter roost sites were purchased by the WCB in 1985-87 based upon Department recommendations and the results of wintering ground studies in San Joaquin County. On the breeding ground, State WA's are to consider the needs of the crane population in management of those lands. The Ash Creek WA, Lassen and Modoc counties, was identified as a key breeding area and it is currently the largest State-owned facility supporting greater sandhill crane breeding populations.

A DFG led Recovery Strategy Team consisting of representatives from State and federal agencies, local landowners, environmental groups, and persons with scientific expertise, has produced a draft of the recovery strategy. Existing scientific information serves as the basis for the strategy, which will include interim and long-term recovery goals, and a range of alternative management goals and activities. The ultimate goal of the greater sandhill crane recovery strategy in the State is to improve the status of the species through a variety of specific habitat protection and other actions so the protections of CESA are no longer necessary and therefore de-listing can be proposed.

The recovery of the species is dependent upon specific actions in the areas of habitat protection, habitat management, habitat enhancement, predator management, interpretative programs, and scientific research. For example, wetland management in wildlife areas should provide sandhill crane wintering habitat, as is being done at DFG's Los Banos Wildlife Area, as well as continue to provide traditional and hunting opportunities. Similarly, recreation in traditional crane use areas needs to be designed to avoid, or at least minimize, potential conflict directly with sandhill cranes wintering in the same areas. Wildlife viewing at Cosumnes River Preserve, for example, is restricted when sandhill cranes winter at the preserve. Periodic monitoring of crane reproductive performance is necessary to determine if persistently low recruitment rates occur in particular regions of the State and to trigger more intensive studies. Similarly, the effects of predators on crane survivorship should be determined so that control measures can be implemented as necessary. Because cranes collide with utility lines near some wintering areas, crane mortality could be reduced by marking lines to increase visibility.

The status in 2003 of the greater sandhill crane: *Stable*

California least tern *Sterna antillarum browni*

State	Endangered	1971
	Fully Protected	
Federal	Endangered	1970

General Habitat:

California least terns nest in colonies on bare or sparsely vegetated flat substrates near the coast. Their nesting range is along the Pacific coast from southern Baja California to San Francisco Bay. Nest sites are typically near estuaries, bays, or harbors where small fish are abundant. Development and recreational use have largely eliminated the natural nesting habitats of this species. Typical nesting sites are now on isolated or specially protected sand beaches or on natural or artificial open areas in remnant coastal wetlands.

Least terns usually arrive in California in April and depart in August. This migratory bird winters in Latin America, but the winter range and habitats are largely unknown.

Nest, at arrow.

Description:

The California least tern is a small tern, about nine inches long with a 20-inch wingspan. It is mostly white and pale gray, and wingtips are black. The head of the adult has a black cap and white forehead, and the yellow beak is black-tipped. Birds nest in colonies ranging in size from only a few pairs to hundreds. Largest colonies in recent years in California have exceeded 500 pairs, and colony size has exceeded 1,000 at Camp Pendleton.

Status:

The long-term increase in the number of nesting pairs in California is continuing. In 1970, there were about 600 nesting pairs statewide. Owing to intensive protection and enhancement efforts, the population has grown eleven-fold to nearly 7,000 pairs in 2003. Statewide surveys of all nesting sites are conducted annually to identify nest site locations and threats, to document annual nesting success, and to track population trends. Coordination of survey efforts and preparation of statewide annual reports are undertaken by a statewide coordinator, under contract by DFG. On-site monitoring and protection efforts at nesting sites are funded by land-owning agencies, cooperating organizations, and volunteers.

Predation is the primary limiting factor to reproductive success. Other mortality causes included a heat wave in part of the state, nest abandonment, and human activity. Many human, wildlife, and environmental sources of

mortality and disturbance limit breeding use and reproductive success. Most colonies are located in fragmented wild lands adjacent to residential, commercial, and recreational areas, and highways. Human activities and human-enhanced populations of scavengers and predators (i.e., crows, ravens, kestrels, other birds of prey, domestic cats, and non-native red foxes) place nesting colonies at risk. Most tern colonies are perennially at risk of significant predation. Some colonies are in areas under continuous threat of abrupt, and often catastrophic, predation by locally abundant native predators, mainly birds, as well as domestic cats and red foxes. At some sites, the presence of large populations of predators precludes nesting. Human disturbance continues to disrupt some colonies.

Each year from 2000 to 2003, a private consultant was contracted by DFG, under Section 6 ESA funds, to coordinate the statewide survey. In 2000, a minimum of 4,521 breeding pairs of terns nested at 37 locations. At least 3,710 fledglings were produced (0.77 fledglings per pair--average productivity during the 1980s and 1990s was about 0.7 fledglings per pair.). Ten colonies comprised more than 200 nests each. The only inland nesting area, the Tulare Lake bed evaporation ponds, first documented in 1998, was used again in 2000, and Caltrans mitigation islands, newly created in Albany, Alameda County, were colonized.

In 2001, a minimum of 4,712 breeding pairs of terns nested at 38 locations. At least 1,773 fledglings were produced, slightly more pairs nesting, but half the production, compared with the prior year. Colony sizes were similar to those reported in 2000, but no nesting was found at the Tulare Lake bed evaporation ponds site. The number of nesting pairs declined in 2002; a minimum of 3,511 breeding pairs nested at 38 locations. About at least 450 fledglings were produced, one of the lowest totals of the past decade. A slight increase in totals from 2001 to 2002 occurred in the northern part of the range, but that was overshadowed by significant decreases in many colonies in the southern counties. Fledglings only increased slightly at Oceano Dunes. All other sites failed.

In 2003, a major increase in nesting pairs was documented. A minimum of 6,687 pairs were found--2,000 more than the previous high count in 2001 and about twice the average breeding population size during the late 1990s. More than 2,100 fledglings were produced, for a low productivity of at least 0.34 fledged per pair. Nesting was reported at 39 sites, nine of which exceeded 300 pairs.

Terns continue to use most of the 40 to 50 sites occasionally or regularly used by nesting terns in the same wetland areas and beaches during the past decade. Several new colonies formed since the late 1990s, including those on nesting islands created at Batiquitos Lagoon and Albany bay shore. Most of the population increase is accounted for by growth in colony size of 10 or 15 of the largest colonies. The tern colony at Alameda Island, San Francisco Bay, formerly part of a Naval Air Station, is now under National Wildlife Refuge management by USFWS and continues to be one of the largest least tern colonies in the state.

Habitat improvement projects at Mugu Lagoon, DFG's San Dieguito and Batiquitos Lagoon Ecological Reserves, and the mouth of the Santa Ana River are benefiting many species, including the least tern. Habitat restoration efforts planned for Ballona Wetlands will enhance the nesting and foraging habitat of the tern. Future management of the South San Diego Bay Unit of the San Diego National Wildlife Refuge and the Sweetwater Marsh National Wildlife Refuge under a Comprehensive Conservation Plan will significantly improve habitat conditions for this species. Eight state and federal agencies are proceeding with planning and environmental compliance requirements for one of the largest wetlands restoration projects in Southern California, the Bolsa Chica Wetlands Restoration Project, in Orange County. The project will enhance nesting and foraging habitat for least terns. USFWS is working to enhance and restore San Elijo Lagoon, San Diego County, under its Coastal Program. The DFG is also expanding Venice and Huntington Beach protected areas and replacing worn fence at both sites.

Protection of the least tern through site management and predator control also aids in recovery efforts for the Western snowy plover (Federally-listed as threatened), light-footed clapper rail (State and Federally listed endangered), Belding's Savannah sparrow (State-endangered), and other rare coastal wetland wildlife species (e.g.,

gull-billed, elegant, and royal terns; black skimmer) that share the same coastal ecosystems with least terns. Proper management of the terns entails ensuring sensitive, appropriate control of predation by species such as the endangered peregrine falcon and the northern harrier that are also specially protected or rare in the coastal zone.

Reports of statewide efforts by the Department and all other cooperating agencies and individuals are prepared and disseminated to the public annually. The 2000 survey report is the latest one completed.

Marbled murrelet

Brachyramphus marmoratus

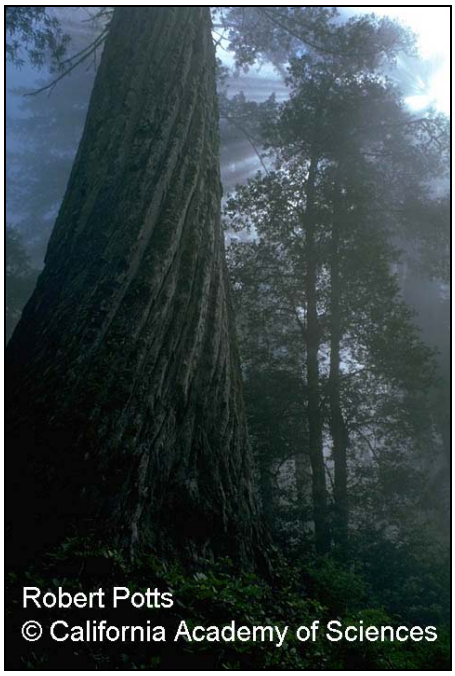
State	Endangered	1992
Federal	Threatened	1992

General Habitat:

Marbled murrelets occupy the nearshore areas, estuaries, and sounds, and feed mostly on fish and invertebrates. They nest primarily in large intact stands of old growth forest, but some nest sites have been found in smaller stands of large trees, or in areas where a few old growth trees still exist in a second-growth landscape. In California, marbled murrelets are found from Eureka north to the Oregon border and from Half Moon Bay south to Santa Cruz.

Description:

The marbled murrelet is a small seabird of the puffin, or alcid family (Alcidae). Murrelets are approximately eight inches in length and weigh about seven ounces. Like most alcids, they are chunky in appearance with a short neck and thick body. Breeding plumage is camouflaged, dark brown-black above with some cinnamon and some white in the shoulder area. The underside is mostly a dark brown and white marbled pattern. The birds go through a flightless molt in late summer, changing into a winter, or basic plumage, which is mostly blackish gray above and white below. Then, they partially molt again, back into the cryptic breeding plumage beginning in late March. Their nesting season runs from late March through mid September. Murrelets lay a single egg high in old-growth trees on large horizontal limbs. This tree nesting habit is unique among the alcids.



Status:

The 1997 USFWS Marbled Murrelet Recovery Plan recognized three conservation zones for California, roughly corresponding to populations or aggregations of birds at sea during the breeding season: 1) Northern California (Zone 4) extends from southern Oregon to the Mendocino county line; 2) North-Central California (Zone 5) extends from the Mendocino county line to the Golden Gate; and 3) Central California (Zone 6) extends from the Golden Gate to just south of Carmel, California (Point Sur, Monterey County).

Marbled murrelets are very secretive in their nesting behavior, usually flying inland in the dark before sunrise, and not vocalizing when accessing their nest site. Since they nest relatively high in large trees, have camouflaged

plumage, and fly quickly through the forest canopy, their nests generally remain hidden from view and are exceedingly difficult to find. Their nesting habits remained an ornithological mystery until 1974 when a tree trimmer found a nestling high in an old-growth Douglas fir tree in Big Basin Redwoods State Park in the Santa Cruz Mountains of central California. For this reason, traditional nest finding methods used for population monitoring of other bird species are not practical for murrelets.

A standardized population monitoring protocol for murrelets at sea was developed as a result of President Clinton's Northwest Forest Plan. The murrelet was one of the species selected for effectiveness monitoring under the forest plan. Surveys for murrelets at sea during the breeding season provide one of the best, most cost-effective methods for estimating population size and trend on a broad scale. From 2000 through 2003, this at-sea survey protocol was utilized in Zones 4 and 5 in California and southern Oregon. A similar protocol was used in the Santa Cruz Mountains population of murrelets (Zone 6).

Results from 2003 are not yet available in Northern California (Zone 4), but for 2002 the murrelet population was estimated at approximately 4,900 birds (3,500-6,400). The North-Central (Zone 5) population was estimated at only 300 birds. The 2003 preliminary estimate for the Santa Cruz Mountains population (Zone 6) is 615 birds (463-815). These estimates put the total population size for California, including southern Oregon, at approximately 5,815 birds. High variability in murrelet detection rates within a year, and between years, makes it difficult to detect changes in overall population size. Additional years of monitoring will be necessary to more fully describe population trend, and other studies as described below will also have to be factored in to population assessments.

Inland surveys using the established Pacific Seabird Group protocol also provide a method for population monitoring. The inland surveys rely on "detections" of murrelets over a two hour period near dawn when the birds are actively flying inland and vocalizing, circling over the forest canopy, flying below canopy, and occasionally even landing in trees for up to 30 minutes or more. This behavior is probably associated with non-breeding birds, but could also represent birds prospecting for nesting sites or failed nesters. Dawn flight behavior is considered to be biologically significant behavior, and additional information such as the presence of murrelet predators can be gathered simultaneously with the dawn survey.

As with the at-sea surveys, high variability in murrelet detection rates make it difficult to detect changes in overall population size. Inland surveys at Big Basin Redwoods State Park in the Santa Cruz Mountains have documented a steady decline in murrelet detections from 1991 to 2003. Average detections in 1991 were greater than 180, but by 2003, the average had declined to fewer than 50. A less drastic decline has also been noted for Portola Redwoods State Park, also in the Santa Cruz Mountains. At Portola Redwoods State Park, average detections ranged from 32-167 during 1992-2002, but averaged only 21 in 2003. Researchers have also radio-marked murrelets in Zones 4 and 6 in order to find nest sites, document nest site characteristics and nest success, describe at-sea distribution, determine home range size, and study effects of human disturbance. The results of these efforts from 1997-2003 have greatly increased the knowledge of murrelet biology in California. Telemetry studies in Zone 4 have been very successful, with a total of 102 murrelets radio-marked, and 29 nest sites located. One nest site was utilized in three sequential years with the birds nesting at the same location on the same limb. At least two other nest locations were used in two sequential years, involving just three different trees. These results match some earlier studies at Big Basin Redwoods State Park and indicate high nest site fidelity for marbled murrelets, a trait observed in other alcids. A camera placed at one nest site documented a Steller's jay displacing an incubating adult murrelet, after which the jay punctured the egg and consumed some of the contents, and then flew off with the whole egg. At another nest site, the camera documented a murrelet chick having to fight off an attack by a Steller's jay. At-sea surveys for juvenile murrelets in Zone 4 have also revealed low reproduction, though some researchers question the value of such surveys and maintain that juvenile murrelets occur in different locales from the adults. This theory has not been tested and needs further study.

In Zone 6, all the nests found via radio telemetry failed. A number of other nests found in Zone 6 without the aid

of telemetry have also failed. This data would appear to corroborate the decline in the inland detections at Big Basin Redwoods State Park as evidence of population decline. However, the at-sea surveys have yet to detect a population decline although the at-sea surveys have detected very few murrelet juveniles on the water, which is also indicative of population decline. For these reasons, the Zone 6 population is considered to be in decline and in serious need of recovery actions.

Past studies have documented a high nest failure rate in marbled murrelets; only 28 percent of eggs laid have produced fledglings. This observation generally matches the low number of juveniles seen at sea. Using this information and information from other alcids to estimate murrelet breeding age, reproduction, and survival, modeling has indicated that murrelet populations are declining from 2-4 percent per year, and possibly at even higher rates. Lack of definitive data on murrelet reproduction, survival, and longevity present problems in developing a more definitive population model.

Murrelets are vulnerable to oil spill impacts, and two damaging spills that occurred in Zone 4 years ago have yet to be settled. While negotiations about the impacts and restoration obligation from these spills were underway, the State of California purchased some murrelet habitat in the Grizzly Creek complex near Grizzly Creek State Park in southern Humboldt county. This complex was one of the marbled murrelet reserves originally set aside under the Pacific Lumber Company (Palco) Habitat Conservation Plan (HCP) in 1999. The area will be managed by the California Department of Parks and Recreation and should greatly assist in murrelet recovery.

In 2004, oil spill restoration funds (from past oil spills in Zone 6 where murrelets were killed) will be available to assist in murrelet recovery in Zone 6. A park visitor/park management education campaign will be initiated at key nesting areas in the Santa Cruz Mountains in an attempt to reduce corvid predators (Steller's jay and common Raven) that are easily attracted to human food sources. Corvids are known predators at murrelet nest sites, taking both chicks and eggs. Corvids are opportunistic foragers, and have been demonstrated to occur in higher numbers when associated with recreational park settings. Inadequate garbage management practices and intentional and unintentional feeding contribute to their elevated population numbers. The ultimate goal of the visitor/park management education campaign is to increase murrelet nest success, decrease corvid populations, and engage park visitors and park employees in the murrelet conservation effort.

Xantus's murrelet *Synthliboramphus hypoleucus*

State Threatened 2002
Federal None

General Habitat:

Xantus's murrelets spend most of their lives at sea, foraging for small fish and zooplankton, and only come ashore for breeding purposes. Though they are occasionally found in the nearshore marine environment, they are usually found about 10-100 miles from shore. In California, Xantus's murrelet nests on six of the Channel Islands in southern California. Their nests are generally well-concealed, and located in natural cavities and under shrubs, especially along or near cliffs. Sea caves are also used for nesting.

Description:

The Xantus's murrelet is a small seabird of the puffin or alcid family (Alcidae), measuring about 9-10 inches from tip of bill to tip of tail. An adult bird fits easily into the outstretched hand of an adult human. They weigh approximately 6 ounces. Adult and juvenile birds are marked cleanly, black above and white below. The winter plumage of adult birds is not distinct from breeding coloration except by close inspection. The Xantus's murrelet lays only 1-2 eggs per clutch and is nocturnal when attending to nest sites. A replacement clutch can be laid if the first clutch is lost. They usually return to the same island for breeding each year. Xantus's murrelets have been documented to live up to 15 years in the wild. Two subspecies are recognized: *S.h. scrippsi* and *S.h. hypoleucus*. The subspecies differ in facial plumage, bill size, and range.

Status:

The worldwide breeding range of the Xantus's murrelet is restricted to the Channel Islands of southern California and small islands along the west coast of Baja California, Mexico. Post breeding and winter distribution is offshore from British Columbia south to Baja California. Approximately 8,310 breeding birds are known currently, with only 3,460 breeding birds in California. Historical accounts and literature from the 1940s indicate that murrelets were more abundant at that time than today.

Research from the 1970s to 1991 documented a decline in murrelet numbers of approximately 30% on Santa Barbara Island. Santa Barbara Island, the smallest of the Channel Islands at one square mile in size, currently supports 51% of the murrelet population in California. Data collected over the past 15 years at National Park

Service (NPS) nest monitoring plots on Santa Barbara Island indicate that this decline is continuing. During this study, nest site occupancy rates for identified potential nest sites declined from approximately 35-70% to less than 30%. Another (larger) nest plot monitoring study outside of, but also including part of one of the NPS Santa Barbara Island nest plots, showed a decline of 14% in the number of active nests when comparing 1991 to 2001.

The Xantus's Murrelet is threatened due to 1) its small breeding population size in California; 2) low productivity; 3) the documented population decline on Santa Barbara Island; 4) near extirpation from previously known nesting sites; 5) its vulnerability to oil spills; 6) predation by native and non-native predators; 7) and human disturbance including impacts from military operations, bycatch in fisheries, and artificial light pollution. Of these threats, predation by native and non-native predators appears to be exerting the greatest influence on the species.

In an effort to help restore murrelet populations, rat eradication efforts at Anacapa Island were initiated in 2001 and 2002 as part of the American Trader Oil Spill Restoration Plan. Murrelets had been limited from occupying suitable habitat on this island because of rat presence and predation. Initial monitoring efforts indicate that rats have been eradicated, and that more murrelets are now occupying the waters around Anacapa Island. The number of known nests has increased slightly and nesting success has increased. However, due to the low reproductive rate, low juvenile survival, and high colony fidelity, it may take 10 years or more to see substantial increases in nesting effort and reproductive success at Anacapa Island.

Xantus's Murrelet populations in California are currently considered to be in decline, although the rat eradication effort on Anacapa Island and other conservation measures being implemented may help reverse the trend in the future. Interagency coordination is currently underway with the goal of stopping, and then reversing the population decline of the murrelet.

Western yellow-billed cuckoo

Coccyzus americanus occidentalis

State Endangered 1971
Federal None

General Habitat:

The western yellow-billed cuckoo requires dense, large tracts of riparian woodlands with well-developed understories for breeding (gallery forests). It occurs in deciduous trees and shrubs, especially willows which are required for roost and nest sites. During the breeding season, the cuckoo is restricted to river bottoms and other moist habitats along slow-moving watercourses where humidity is high. Willows are almost always a dominant component of the vegetation in southern California. The western yellow-billed cuckoo also utilizes orchards adjacent to streams in the Sacramento Valley. Mesquite thickets are sometimes used along the Colorado River where willow is absent.

Description:

The cuckoo is a slender brown bird with white underparts. In flight, its wings show rufous or cinnamon color, and its tail shows black with white spots.

Status:

The western yellow-billed cuckoo is threatened by loss and degradation of its habitat due to land clearing, fire, flood control projects, surface water diversions and groundwater pumping, and overgrazing by livestock. Such disturbances often foster the establishment of invasive non-native plants such as tamarisk and Arundo. The resulting fragmentation reduces the size and quality of habitat for the cuckoo, potentially leading to local extinctions. Migration routes can also be lost or fragmented, thus affecting the ability of the cuckoo to recolonize habitat areas. One study showed that cuckoos were excluded from suitable habitat when the riparian stand was less than seven acres in size.

Two habitat models for the western yellow-billed cuckoo were developed by researchers at the Point Reyes Bird Observatory (PRBO). The models concluded that willow-cottonwood riparian habitat at least 325 feet wide with high humidity provided suitable habitat. Age classes of the vegetation did not appear to affect suitability. Additional research refined the original models and found that optimal sites for the cuckoo were larger than 200 acres and wider than 1950 feet. Habitat less than 38 acres in size and narrower than 325 to 650 feet wide were not suitable. Other studies found that the extent of habitat along a river, as well as the presence of low woody vegetation, were important factors in determining yellow-billed cuckoo distribution. Research at the South Fork Kern River characterized nesting habitat as having a high level of canopy closure, denser foliage, and intermediate tree heights.

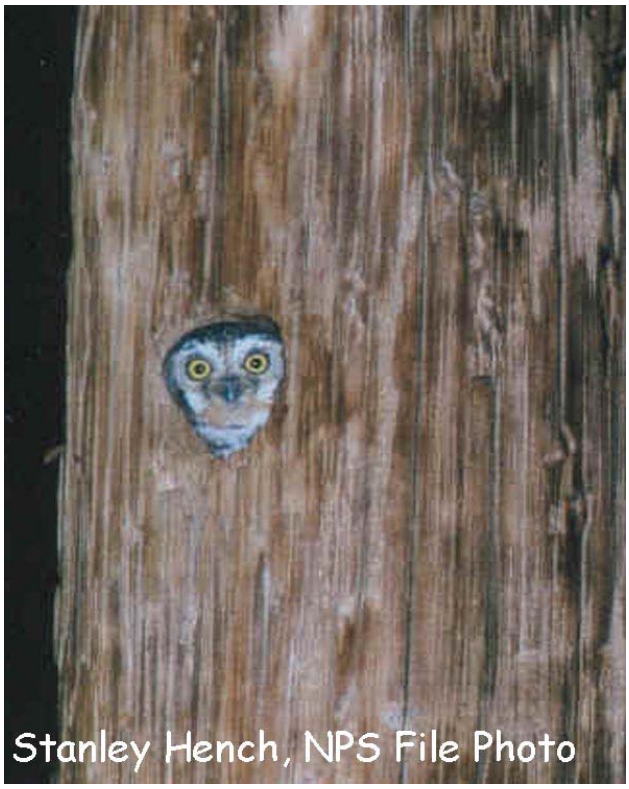
In 2001, the USFWS commissioned a genetics study to help determine whether the yellow-billed cuckoo in the western United States should be added to the Federal List of Threatened and Endangered Species. The USFWS also reopened the comment period for the 12-month finding on a petition to list this species as endangered. Prior to that, USFWS announced that a petition seeking Endangered Species Act protection for the western yellow-billed cuckoo presented sufficient information to warrant a review of the bird's current status. The Service initiated a comprehensive review to determine whether to list the western yellow-billed cuckoo as a distinct population segment, one that is separated from other populations by physical, physiological, ecological or behavioral factors. The genetics study, "Taxonomic and Evolutionary Significant Unit (ESU) Status of Western Yellow-billed Cuckoos (*Coccyzus americanus*)," was prepared by Robert Fleischer of the Smithsonian Institute's National Zoological Park under contract with the USFWS and the U.S. Geological Survey. The study did not confirm the existence of an eastern and western subspecies of the western yellow-billed cuckoo. Later in 2001, the administration issued a decision to again delay listing the species despite a population decline of over 95% due to habitat loss. Instead, the cuckoo was placed on the "warranted but precluded" list.

The western yellow-billed cuckoo is included in habitat conservation and multiple species planning efforts in southern California. These plans include the Western Riverside MSHCP and Lower Colorado River MSCP. Western yellow-billed cuckoo territories have been documented in the Western Riverside Plan Area. Up to seven territories, including three pairs, were found in the Prado Basin during the 2001 breeding season. Breeding was not confirmed in 2001 and has been confirmed only once during 14 years of observations in the Prado Basin. The low numbers of observations may reflect the difficulty in finding nests in the dense salt cedar-willow stands such as are found in the Prado Basin. The limited availability of large tracts of suitable riparian habitat within the Plan Area may restrict breeding by the birds. Habitat conservation under the MSHCP will focus on specific locations where the species has been observed or has been documented to breed in the past so that the cuckoo can expand its range if suitable habitat develops over time. Several objectives relating to the western yellow-billed cuckoo are included in the MSHCP: 1) conserve at least 8,970 acres of suitable habitat including southern cottonwood/willow riparian, riparian scrub, riparian forest, and southern willow scrub; 2) conserve at least five core population areas, connecting habitat, and buffer lands; 3) maintain and/or improve riparian habitat, and the hydrologic conditions that support them, where cuckoos have been observed recently; 4) conserve 100 percent of any occupied habitat identified during project reviews; and 5) maintain the continued use of and reproduction in a minimum of 75 percent of occupied habitat.

A major component of the species goals in the Lower Colorado River MSCP is the proposed restoration of thousands of acres of riparian habitat to support new breeding centers for species such as the southwestern willow flycatcher, western yellow-billed cuckoo, and other riparian associated wildlife. The DPR is restoring riparian habitat at Picacho State Recreation Area. To date, approximately 60 acres have been planted with willow, cottonwood, mesquite, and palo verde. A single yellow-billed cuckoo has been seen recently in the restoration area. The relatively small size of the restoration area and lack of a developed riparian forest will likely preclude colonization of this habitat by the yellow-billed cuckoo in the immediate future.

Elf owl *Micrathene whitneyi*

State: Endangered 1980
Federal:


Stanley Hench, NPS File Photo

General Habitat:
The elf owl is primarily limited to the riparian corridor along the lower Colorado River in California. It can be found during summer months in some areas of south and southwest Texas, southern New Mexico, Arizona, and parts of southern California. It also occurs in many parts of western Mexico. Good quality habitat consists of mature dense vegetation with large trees and an understory of mesquite, willow, or tamarisk. Elsewhere within their range, habitat consists of dense mesquite, dry oak woodlands, wooded canyons, and sycamores at elevations up to 7000 feet. It is a cavity nester and will occupy an old woodpecker hole or cavity in a large cactus or dead tree. Successful nests require larger trees with thick walls next to the cavity to provide the needed insulation from high daytime temperatures.

BLM File Photo

Description:
The elf owl is the smallest owl in North America, only five to six inches tall, has a short tail and yellow eyes. 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 and white 'eyebrows' are obvious. The male selects a deserted woodpecker hole or tree cavity as a nest site and also assists in the incubation of eggs. A clutch is usually three eggs, laid at two-day intervals. Incubation takes 14 days and young are ready to leave the nest by late June or early July.

The elf owl's diet consists almost entirely of large insects, centipedes, and scorpions. Using their superb hearing to locate prey, elf owls usually hunt from a low perch and capture most victims in their talons while flying. The elf owl is migratory and only spends the breeding season in California. It probably arrives in March and leaves in October. Almost 70 percent of the records of elf owls in California come from April and May. This is the height of the breeding season, and during this period, males are very territorial.

Status:
The elf owl is restricted to the scattered, mature, native riparian forest along the lower Colorado River. This habitat type has been reduced to less than four percent of its original acreage as a result of hydrologic changes on

the Colorado River, the historical use of riparian trees for firewood, loss of mature forest to wildfire, and introduction of the exotic salt cedar. Remaining habitat is threatened by recreational use (camping, hunting, OHVs). The elf owl was probably never a common or widespread species along the lower Colorado River where it is at the northern extent of its range. The reason for the scarcity of elf owls in California is unknown although the population status of the elf owl depends directly on available nesting holes and on sufficient rainfall and warmer temperatures that increase arthropod prey populations during the breeding season.

Historically, elf owls have been recorded at six sites in California. Two of these sites were near the Colorado River, one about four miles and the other about 16 miles north of Yuma. Since 1978, elf owls have been seen or heard at 12 locations along the Colorado River, from Picacho State Recreation Area north to nine miles north of Needles. Two sites have comprised the major portion of the recent population: one site is about ten miles north of Needles, and the other, about 22 miles north of Blythe. A maximum of nine pairs have been estimated at the site north of Needles and two to four pairs at the site north of Blythe. The other sites were at desert oases west and southwest of Blythe; one was as far from the Colorado River as Joshua Tree National Monument. None of the other sites was believed to support more than two pairs at the time that they were located due to the lack of suitable habitat. No elf owls were found at these sites during DFG surveys in 1978 and 1987.

In 1998, DFG conducted surveys in the remaining remnant patches of riparian and mesquite bosque habitat along the Colorado River. However, no elf owls were found in any of the 51 sites surveyed, including all of the sites where elf owls had been previously located. Again in 1999, no elf owls were heard during DFG surveys of the major sites where elf owls had been located in 1978 and 1987. The DFG conducted a survey at selected sites in 2000, again with no detections. However, the call of an elf owl was heard near Needles in the summer of 2002. The only reports from the California side of the lower Colorado River during 2000–2002 were of a confirmed breeding pair at Picacho State Park in 2000 and one to two birds at the Soto Ranch in 2002, according to information presented in the Lower Colorado River MSCP.

The DFG is participating in a planning process anticipated to improve the conservation of the species. The owl is one of the covered species addressed in the Draft Northern and Eastern Colorado Desert Coordinated Management Plan. At the end of 2002, this plan still was in a draft stage.

Great gray owl *Strix nebulosa*

State: Endangered 1980
Federal: None

General Habitat:
Nearly all great gray owls are found in or near meadows within forest habitats. Forests surrounding meadows require a high density of large diameter snags for nests and a high canopy closure to provide cover and a cooler sub-canopy microclimate. Great gray owls are mainly distributed in the scattered meadow-mature forest zone on the west slope of the central Sierra Nevada.

Description:
Although it does not weigh quite as much as either the great horned or snowy owl, the great gray owl has the longest body and the largest wingspan, five feet, of any species of owl in North America. In addition, great gray owls have a large head with a large, circular facial disk. Plumage is thick and provides insulation for wintering at high elevations and in northern latitudes. The gray and gray-brown feathers are streaked with light and darker grays. This owl exhibits no regular seasonal migration. However, food availability causes movement to higher elevations after the breeding season and to lower elevations in the winter.

Status:
There has been no recent change in the impacts to great gray owls. The loss of mature forest habitat for nesting and the degradation of montane meadows by livestock grazing remain the major sources of habitat loss. There are no conservation management plans addressing the great gray owl. The majority of currently known nesting sites is in Yosemite National Park and thus is protected through the natural resource management of the park. USFS monitors sites on or near their lands during planning for timber harvest or other projects.

All 15 of the known breeding sites and 71 percent of the sites with multiple observations come from Mariposa and Tuolumne counties in the Yosemite area. Sites with multiple observations also come from Alpine, Calaveras, Fresno, Plumas, Sierra, and Tulare counties. This pattern indicates that great gray owls are mainly distributed in the scattered meadow-mature forest zone on the west slope of the central Sierra Nevada. Great gray owls also have been observed in 13 other counties, from the southern Sierra Nevada to Del Norte, Humboldt, Siskiyou, Shasta, and Modoc counties across the northern portion of the State. Owls seen in this part of the

State are probably vagrants from populations in Oregon. With few exceptions, those in other Sierran counties are probably individuals wandering from the main population. The DFG Resource Assessment Program has initiated a statewide survey for great gray owls. The focus of this survey is currently along the Sierra Nevada-Cascade Range axis in Tahoe, Plumas, and Sierra National Forests.

During the breeding season, great gray owls are found in Sierra Nevada mixed conifer and red fir forests. Except for birds dispersing, nearly all great gray owls are found in or near meadows within these forest habitats. Important meadow characteristics include meadow size, the height of grass, the portion of the meadow covered by nongrass-forb vegetation, and the livestock grazing pressure. Forests surrounding meadows require a high density of large diameter snags for nests and a high canopy closure to provide cover and a cooler sub-canopy microclimate.

Owls attempting to nest probably return to the same nesting area each year. Nests usually are placed in the broken tops of snags or large conifer trees, 35 feet or more from the ground. Nest trees must be large enough to provide a nest for a 30-inch long owl. Normally, two or three eggs are laid. Incubation lasts about 30 days, nestlings remain in the nest about three weeks, and the flightless young remain in the vicinity of the nest for another three to five weeks. These fledglings then stay in the nesting territory for several more months until they can fend for themselves.

The current status of the great gray owl is unknown.

Gila woodpecker *Melanerpes uropygialis*

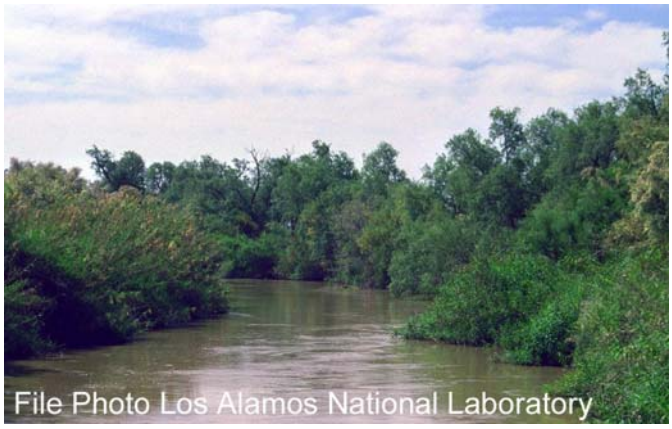
State Endangered 1988
Federal None

General Habitat:

The Gila woodpecker is a permanent resident of mature cottonwood-tree willow riparian forest, mesquite riparian woodland, and saguaro forest. It is resident from southeastern California and central Arizona south into Mexico. In California, it was formerly found along the lower Colorado River and in the cottonwood groves of the Imperial Valley south of the Salton Sea. It is now known only at scattered locations along the Colorado River between Needles and Yuma and at Brawley in the Imperial Valley.

Description:

This woodpecker is 8-10 inches, grayish-brown on the head, neck, and underparts and is barred with black and white on the back. In flight, the bird has a white patch on the wing at the base of the primaries and conspicuous black and white barring on the mantle and tail feathers. The male has a red crown patch. This species excavates its own nest cavities in the trunks of trees.



Status:

This bird is threatened by loss and degradation of its habitat. Adverse impacts to woodpecker habitat are from water projects, severe flooding due to water releases from dams, clearing of land for urban and suburban development and for agriculture (e.g., row crops), human disturbance (e.g., illegal camping and firewood cutting), fire in riparian habitat, OHVs, livestock trampling and grazing, and invasion of non-native plants (e.g., tamarisk).

The DFG is participating in planning processes anticipated to improve conservation of the species. The woodpecker is one of the covered species in the Draft Northern and Eastern Colorado Desert Coordinated Management Plan, and the Lower Colorado River MSCP. At the end of 2002, these plans were still in a draft stage. There have been no field surveys to determine the status of the woodpecker since the FGC listed the species.

DFG considers the population trend and status for the Gila woodpecker to be *Unknown*.

Gilded flicker

Colaptes chrysoides
(= Colaptes auratus chrysoides)

State Endangered 1988
Federal None

General Habitat:

Historically, the species was associated with saguaro cacti near Laguna Dam in Imperial County, the extensive cottonwood-tree willow habitat along the length of the lower Colorado River in both California and adjacent Arizona, and Joshua tree woodland at Cima Dome in San Bernardino County. Today, the bird is found at a few sites on the California side of the Colorado River north of Blythe in Riverside County. Vegetation consists primarily of screwbean mesquite, honey mesquite, quailbush, Goodings willow, and cottonwood snags.

Description:

The gilded flicker has a brown-barred back, white rump, yellow wing and tail linings, brown crown, gray cheeks and throat, and spotted underparts with black crescent bib. The male has a red whisker stripe. The flicker excavates its own nest cavities in the trunks of trees in mature cottonwood-willow riparian forests along the lower Colorado River.

Status:

The gilded flicker is a resident of the Sonoran Desert, an area that extends from southeastern California into southwest Arizona and into Mexico. When listed, the species was considered to be a subspecies of the more widespread northern flicker (gilded northern flicker). It is now treated as a full species, the gilded flicker.

This bird is threatened by loss and degradation of its habitat. Adverse impacts to flicker habitat include land clearing for urban and suburban development and for agriculture, human disturbance (e.g., illegal camping), fire in riparian habitat, OHVs, livestock impacts to tree saplings, invasion of non-native plants (e.g. tamarisk and giant reed), flood control projects, groundwater pumping, and severe flooding due to water releases from dams.

The DFG is participating in a planning process anticipated to improve conservation of the species. The flicker is one of the covered species addressed in the Lower Colorado River MSCP. At the end of 2002, the plan was still in a draft stage. The gilded flicker populations along the California-Arizona border are considered regionally significant in the MSCP. The alternatives analysis presented in the MSCP indicate that a reduction in flows in three reaches of the Colorado River could degrade approximately half of the habitat suitable for the gilded

flicker. The plan looks to habitat enhancement or restoration to offset these impacts.

There have been no field surveys to determine the status of the gilded flicker since FGC listed the species. The DFG considers the population trend and status for the gilded flicker to be *Unknown*.

Willow flycatcher *Empidonax traillii*

State: Endangered 1990
Federal: Endangered* 1995
*Southwestern willow flycatcher (*E. traillii extimus*)

General Habitat:

The habitat of the willow flycatcher is extensive willow thickets. Breeding populations are found only in isolated meadows of the Sierra Nevada, and along the Kern, Santa Margarita, San Luis Rey, and Santa Ynez Rivers in southern California.

Description:

The willow flycatcher measures about 5.75 inches in length, and weighs only about 0.4 ounces. Overall, it is roughly the size of a small sparrow. Both sexes look alike. The flycatcher's appearance is overall greenish or brownish gray above, with a white throat that contrasts with a pale olive breast. The belly is pale yellow. Two white wing bars are visible, but the eye ring is faint or absent. The upper mandible is dark, and the lower mandible light. Both male and female willow flycatchers sing. The willow flycatcher is insectivorous and catches insects on the wing.

The willow flycatcher closely resembles several other species of the *Empidonax* genus, particularly the closely-related Alder Flycatcher (*Empidonax alnorum*). The *Empidonax* flycatchers are renowned as one of the most difficult groups of birds to distinguish by sight alone. The only reliable method of identifying willow flycatchers in the field is by their songs.

Status:

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 small, scattered populations 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 populations consists of about five pairs and the largest of about 50 pairs.

Loss and degradation of riparian habitat is the principal reason for the decline of willow flycatcher population and the decrease in geographic range of the species. Impacts of livestock grazing to both the habitat and nests of breeding birds have also been implicated in the decline of the species. Nest parasitism by brown-headed cowbirds has contributed to population reductions. Livestock grazing the meadow systems of the Sierra Nevada have contributed to many detrimental impacts including loss of willow habitat, compaction and drying of meadows, and an increase in cow bird populations.

The USFWS listed a subspecies, the southwestern willow flycatcher with small populations in riparian scrub in southern California and other western states, as a federal endangered species in 1995. The southwestern form in California is found as a breeding species at the South Fork of the Kern River in Kern County, Santa Ynez River in Santa Barbara County, Santa Margarita and San Luis Rey Rivers in San Diego County, and several other locations in Southern California. It also is found in Arizona, Nevada, New Mexico, Utah, and Colorado.

Since 1991, annual surveys conducted by the DFG and other researchers on livestock-free land at Red Lake in Alpine County continue to indicate that a moderate-sized population of willow flycatcher persists at this locality. DFG and USFS developed a survey protocol for use in montane meadow and willow riparian habitats in the northern ranges of the species. Recent population surveys conducted by USFS personnel and researchers under contract to that agency have documented that willow flycatcher numbers are low in many areas of the Sierra Nevada and that habitat conditions have deteriorated due to the impact of livestock, especially on National Forest lands. Studies at 20 locations on National Forest lands in the Sierra Nevada during 1997-99 have resulted in documentation of 28, 65, and 56 active nesting territories respectively. In 1997, a population of about 60 pairs was documented in the McCloud river drainage area on the Shasta-Trinity National Forest in Siskiyou County. Computer modeling has been used to begin investigating habitat suitability that will aid in further population monitoring. The DFG's Resource Assessment Program has been active in willow flycatcher survey work recently as well as habitat modeling and GIS.

USFS habitat management plans are being developed to survey the entire range of the willow flycatcher before the end of the year 2001. Based on declines documented by researchers working on Sierra Nevada National Forests during 1999, where only a small number (28) of formerly active (since 1982) territories were found to have singing male birds (a population index), there have been recent discussions by the Willow Flycatcher Working Group (an ad hoc group of agency biologists, researchers, and land managers) to consider proposing federal listing of the remaining subspecies of willow flycatcher in the Pacific States. Contacts with biologists in Oregon and Washington indicate that the status of the species is either presumed to be not a problem or that it is (mostly) unknown at this time.

To benefit the southwestern subspecies, the DFG obtained federal Section 6 grant funding to continue cowbird-control programs along the South Fork of the Kern River from 1996 through 1999. In 1997 the DFG obtained additional Section 6 grant funding for an investigation of the status of both the southwestern willow flycatcher and the State and federally listed least Bell's vireo at several locations in Southern California.

In 1997, several independent groups were formed to work on various aspects of conservation and recovery of the southwestern willow flycatcher. USFS's Rocky Mountain Research Station in Albuquerque organized a group to develop a conservation plan that includes a complete list of research needs. The COE established a group to offer advice on mitigation for the loss of flycatcher habitat at Lake Isabella, a reservoir on the Kern River. In early 1998, the USFWS established a recovery team for the southwestern willow flycatcher.

The DFG and USFWS jointly conduct an annual meeting of an interest group for the southwestern willow flycatcher. This is an informal gathering of agency biologists, private researchers, consulting biologists, and university scientists who share information and advise the DFG and USFWS on conservation matters relating to the flycatcher.

Bank swallow *Riparia riparia*

State: Threatened 1989
Federal: None

General Habitat:
Bank swallows are restricted to portions of California where sandy, vertical bluffs or riverbanks are available for the birds to dig their burrows and nest in colonies. The birds build nests within two to three-foot deep burrows that are dug perpendicularly into near vertical earthen banks along streams, coastal bluffs, and sand and gravel pits.

Description:
The bank swallow is the smallest North American swallow species, with a body length of about 4.75 inches. Bank swallows are distinguished from other swallows by their distinct brown breast band and contrasting white underparts. The upper parts are brown.

Status:
In California, bank swallows rely on naturally eroding habitats of major lowland river systems. The species nests in colonies and creates nests by burrowing into vertical banks consisting of fine-texture soils. Currently, bank swallows are locally common only in restricted portions of California where sandy, vertical bluffs or riverbanks are available. Seventy-five percent of the State's remaining population is concentrated on the banks of Central Valley streams, including several colonies on the Sacramento River, particularly the upper reaches between Red Bluff and Butte City. In this alluvial plain, the river system provides suitable soil types and erosion needed for prime nesting habitat. The birds build nests within two to three-foot deep burrows that are dug perpendicularly into near vertical earthen banks along streams, coastal bluffs, and sand and gravel pits. The colonies that make up the breeding population in California each year have ranged in size from five to over 3,000 burrows; the average sized colony is about 350 burrows.

Research indicates that about half of all burrows dug are used as nest sites at any particular time. The birds lay a clutch of four to five eggs beginning in early to late April at the Sacramento River colonies. After a two week incubation period, and a further three weeks of chick development, fledgling bank swallows leave the nest. By mid-July, most nesting activities are completed. Bank swallows feed on a variety of flying insects. Bank swallows are relatively short-lived species with a high juvenile mortality rate (about 70-80%) and an average life span of two to three years for adults. Collapsed burrows due to natural bank sloughing or human caused disturbance and colony destruction are significant mortality factors for nestlings. The species is colonial and migratory, spending the spring and summer months in the Central Valley and wintering in north central South America. The South American wintering habitat is similar to the breeding habitat, being broad, open lowland river valleys.

The range of bank swallows in California has been reduced by 50 percent since 1900. Bank swallows have been extirpated from southern California due to channelization of rivers and flood control projects. Historically, they

occurred principally along the coast and bank swallow colonies thrived at the Los Angeles River, San Pedro, Oceanside, and Santa Cruz. Today, there remain only three coastal nesting areas, Smith River mouth, Ft. Funston in San Francisco, and Año Nuevo State Park, and a few colonies are known from Mono and Inyo Counties.

There have been significant changes in the degree and type of endangerment factors for the bank swallow since the 1992. The rip-rapping of natural stream banks associated with bank protection projects is the single most serious, human-caused threat to the long-term survival of the bank swallow in California. Existing colonies and areas of potential habitat may be lost over the next several years if current planning is implemented. Rip-rap installed under the Sacramento River Bank Protection Project has already affected almost 150 miles of Sacramento River bank since 1960. Many recent construction locations have coincided with the location of the largest remaining population segment of the bank swallow in the State. Additional rip-rap proposed under this project may result in extensive loss of essential, eroding bank habitat.

Survey information collected annually since 1986 indicates a long period of 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 13,170 pairs of bank swallows nested in Sacramento River habitats in 1986. In 1998, the population reached its lowest level of 4,990 pairs and then rebounded dramatically in 1999 to 8,210 pairs. Population estimates for the next four years have shown general increase, with the 2003 figure at about 9,590 pairs. The significance of the apparent turnaround may not be known for a few more years. Factors responsible for the fluctuating population levels are not completely understood, but the drought years followed by flooding may have had a major influence along with the loss of several major breeding colonies to bank protection projects. In addition, several thousand young swallows that were killed in their burrows during bank stabilization projects from about 1960 until 1985 may have suppressed the population's ability to rebound. In 1985, USFWS and DFG prevented the COE from constructing projects during the height of the nesting season.

A State Recovery Plan for the bank swallow was completed and adopted by the Fish and Game Commission in 1992. The goal of the recovery plan is to conserve and maintain a self-sustaining wild population free from the threat of habitat loss and unnatural disturbance. A major component of the recovery plan is a population model that assesses the risks of extinction and plots a target for a level of abundance and reproductive performance necessary to attain recovery based on survey information from 1986 to 1992. However, the recovery plan should be revised to reflect the current status of modeling technology and include Statewide and Sacramento River intensive studies, migration studies, and a revised population model utilizing the 18 years of monitoring data now available. It should also consider what options remain to prevent extirpation of the species from California in light of current flood management planning. The Recovery Plan identifies habitat preserves and a return to a natural, meandering riverine ecosystem as the two primary strategies for recovering the bank swallow. Several hundred acres of river habitat have been purchased by the USFWS over the last decade for inclusion into the Sacramento River National Wildlife Refuge. As a result, many large colonies of bank swallows have been protected.

A recovery planning team has also been established and has had periodic meetings since 1990. The group discusses bank swallow research and recovery issues, and the group has also cited the return to naturally functioning riparian ecosystems as the best way to preserve, recover, and conserve the many species, including the bank swallow, that are dependent on this unique ecosystem. There have been no meetings of the recovery team for the past six years. Revision of the recovery plan, funding, and completion of needed research continue to be important objectives.

The current status of the bank swallow is one of fluctuating population levels. Although the trend since 1986 is one of gradual increase statewide, the overall numbers of birds is still significantly lower than the 13,170 pairs documented in 1986.

Arizona Bell's vireo *Vireo bellii arizonae*

State: Endangered 1988
Federal:

General Habitat:
The vireo is a summer resident in the willow-mesquite thickets and willow-cottonwood riparian habitat along the lower Colorado River. In California, it is found only at a few sites along the Colorado River: near Needles in San Bernardino County, and at Picacho State Recreation Area and near Laguna Dam in Imperial County.

Description:
This small bird is drab gray above and whitish below, with sides and flanks faintly washed with grayish olive-yellow. It has indistinct white spectacles and faint wing bars with the lower bar being more prominent. The Least Bell's Vireo and the Arizona Bell's Vireo differ slightly in size and subtlety of color, with the latter being slightly smaller and more brightly colored. There is no known range overlap of the two subspecies.

Status:
Arizona Bell's vireo is threatened throughout its range by loss and degradation of its habitat. Water diversion, flooding due to water releases from dams, residential and industrial development, agricultural activities, recreational use of occupied habitat, fire in riparian habitat, nest parasitism by the brown-headed cowbird, and invasion of non-native plants (e.g., tamarisk and giant reed) have all impacted this species. Arizona Bell's vireo is a Special Status species in Arizona and is on the Watch List of the Nevada Natural Heritage Program.

The vireo is one of the species addressed in the Lower Colorado River Multiple Species Conservation Program (MSCP) of which California, Nevada, and Arizona are signatories. The program area covers the mainstream of the lower Colorado River from below Glen Canyon Dam to the southerly International Boundary with Mexico. Participants have agreed to pursue an ecosystem-based approach to developing the MSCP for interim and long-term compliance with applicable endangered species and environmental laws, and to implement conservation and protection measures for included species and habitats. The program area includes the 100-year flood plain and reservoirs to full-pool elevations. Potential conservation measures will focus on the lower Colorado River from Lake Mead to the international boundary, while the partnership is also open to considering cooperative conservation efforts developed by the Grand Canyon management effort. Among the potential impacts to the Arizona Bell's vireo identified in the MSCP with respect to flow reductions in two reaches of the Colorado River are degradation and removal of habitat and loss of prey species as a result of lowering groundwater elevations; disturbance in or near occupied habitat; and injury or mortality of individuals from the removal of occupied nest sites associated with the implementation of the plan. This plan still is still in a draft stage.

The DPR is restoring riparian habitat at Picacho State Recreation Area. To date, approximately 60 acres have been planted with willow, cottonwood, mesquite, and palo verde. At least three singing male Arizona Bell's vireos have been observed in 2003 at Picacho SRA and one pair of birds, believed to be nesting, has been observed yearly.

There have been no rangewide field surveys to determine the status of the vireo since the FGC listed the species and the vireo's current status is unknown.

Least Bell's vireo *Vireo bellii pusillus*

State: Endangered 1980
Federal: Endangered 1986

USFWS File Photo

BLM File Photo

General Habitat:

The least Bell's vireo is a summer resident of riparian areas in southern California. It was once abundant in its historic breeding range along lowland rivers from northwestern Baja California to Red Bluff, Tehama County. The species' breeding distribution is currently restricted to eight California counties: Kern, San Diego, San Bernardino, Riverside, Ventura, Los Angeles, Santa Barbara, and Imperial. Preferred habitat for this species is dense willow-dominated riparian habitat with a well-developed understory. The understory shrub thickets provide nesting habitat. Willows are most commonly used. High and low shrub layers are used as foraging substrate. Other plant species used for nesting and foraging include California wild rose and coast live oak. Most nest sites are located near the edges of thickets.

Description:

Least Bell's vireo is a small, olive-grey migratory songbird. It is dull olive-gray above, whitish below, with a faint white eye ring and wing bars. This subspecies of the Bell's vireo is quite similar in appearance to the Arizona Bell's vireo. The Least Bell's Vireo is slightly larger than the Arizona Bell's Vireo while the Arizona subspecies is more brightly colored than Least Bell's vireo. There is no overlap in their ranges.

Status:

Least Bell's vireo is threatened by loss and degradation of its riparian habitat and by brood parasitism by the brown-headed cowbird. Widespread habitat losses have fragmented most remaining populations into small, disjunct, widely dispersed subpopulations. The combined threat of cowbird parasitism and loss of riparian habitat resulted in the listing of least Bell's vireo as an endangered species. Currently, about half of the vireos in California occur at Camp Pendleton, with the remainder along half a dozen major drainages, including the Tijuana, Sweetwater, San Diego, San Luis Rey, and Santa Ana Rivers.

The USFWS designated critical habitat for the Least Bell's vireo in 1994, including ten stream systems from Santa Barbara south to San Diego County, an area of 38,000 acres. Approximately 10,000 acres of critical habitat is located within the Santa Clara River drainage in Ventura County. The critical habitat designation includes riparian corridors, as well as some adjacent upland habitat. A draft recovery plan is currently being circulated. The recovery strategy focuses on stabilizing existing populations by protecting currently occupied habitat, securing and

restoring riparian habitat within the historical breeding range, re-establishment of the least Bell's vireo in its historic range, modifying land uses where practicable and managing cowbird parasitism, monitoring and performing range wide surveys, and conducting research activities necessary to monitor and guide the recovery effort.

Cowbird trapping is an effective recovery action and has led to an increase in the number of breeding pairs of least Bell's vireos since 1986. Between 1977 and 1985, biologists were only able to locate 300 pairs of birds, primarily in San Diego County. Surveys of least Bell's vireo nests in the 1980s found that at least 15 percent of all vireo nests had been parasitized by the cowbird. In some cases, 90 percent of the vireo nests contained cowbird eggs. In other areas nest parasitism ranged from eight percent to as high as 45 percent. In 1998, about 2,000 pairs of birds were found in the eight counties that comprise its range in southern California. If trapping and other recovery activities outlined in the plan are implemented, the Least Bell's vireo could be downlisted under Federal law from Endangered to Threatened.

Least Bell's vireo is addressed in the majority of habitat conservation and multiple species planning efforts in southern California. These plans include the Coachella Valley MSHCP, Western Riverside MSHCP, the Camp Pendleton Resource Management Plan, and the Orange County NCCP. Recovery and management recommendations in these plans include continuing cowbird removal programs, nest monitoring for cowbird parasitism, and restoration of riparian vegetation. Resolution of land use conflicts, such as from livestock grazing within riparian corridors, water diversion, and developed parks adjacent to suitable vireo habitat, will require long-term planning.

The Coachella Valley MSHCP will conserve existing breeding habitat and migration corridors. Within the Plan Area, known breeding habitat is found in Chino Canyon and Andreas Canyon. Suitable habitat that could support breeding birds is found at a number of sites including Dos Palmas, the Oasis de Los Osos Ecological Reserve, and the Willow Hole-Edom Hill Preserve/ACEC. Approximately 95% of modeled breeding habitat (2,909 acres) within the Plan Area would be conserved. Because least Bell's vireo migrates through the Plan Area, conservation of migratory habitat will include protection of more than 40,000 acres (72%). In addition to conservation of existing natural habitats, the MSHCP will also enhance degraded habitat through tamarisk removal and create additional habitat along the Coachella Valley Stormwater Channel.

Community-based monitoring will be used for species addressed in the Western Riverside MSHCP. Distribution and nesting success would be monitored at least every three years following an initial baseline survey. Western Riverside MSHCP objectives that will benefit the least Bell's vireo include 1) conservation of at least 9400 acres of suitable riparian habitat; 2) conservation of eight population centers (core areas), connecting habitat, and buffers; 3) conservation of at least 90 percent of occupied habitat; and 4) maintenance of the continued use of and reproduction in a minimum of 75 percent of occupied habitat.

Current research sponsored by the USGS Western Ecological Research Center, is focused on colonization of restored riparian habitat, predation, and potential correlation between predation and habitat characteristics. Such research is exemplified by the Pilgrim Creek Restoration Project. The Pilgrim Creek Habitat Mitigation site is located in San Diego County adjacent to Camp Pendleton. It was originally acquired by Caltrans in 1995 to mitigate impacts to riparian and coastal sage scrub habitat from a nearby highway expansion protect. The Pilgrim Creek site is now owned by DFG. Restoration of riparian habitat began in 1995. Monitoring began in 1996 and continued for five years. Monitoring objectives were to 1) assess the status and reproductive success of least Bell's vireo; 2) evaluate the planted vegetation for its suitability for nesting vireos and other riparian birds; and, 3) to compare bird use in native habitat to the restoration site. The least Bell's vireo population within the study site numbered 25 territorial males in 2001, including 22 pairs and three unpaired males. Vireos occupied the entire site, but continued to expand into the restoration site. Thirteen territories were established within the restoration site, an increase of eight sites over the previous year. A total of 32 nests were documented, including five nests in the restored habitat. Young birds fledged successfully in about half of these nests.

A 2002 study of least Bell's vireos and their predators on the San Luis Rey River and Pilgrim Creek in San Diego

County used point counts and tracking stations with video photography to document potential predators. Four mammal and five bird species were identified as potential predators from point counts and tracking stations. Coyotes and yellow-breasted chats were the most abundant animals recorded. Twelve predation events were recorded on videotape. The western scrub jay was implicated in 67 percent of the predation events, Virginia opossum in two cases, gopher snake in one event, and argentine ants in one event. Although the coyote and yellow-breasted chat were recorded frequently by point counts and tracking stations, these methods did not identify actual nest predators. Similarly, the scrub jay was not recorded in high abundance during point counts, possibly due to the fact that they do not vocalize as much as the yellow-breasted chat. The use of video stations could improve predator detection and enhance management to benefit least Bell's vireo. Once a major predator is identified, management could focus on methods to control its abundance, change its foraging behavior, or alter the landscape to decrease their abundance.

In another recent study, the effects of habitat edge, nest site characteristics, nest predation, and adjacent land uses were analyzed. This study was designed to assess the effects of nest placement, edge, and surrounding land uses on nest predation, as well as the spatial distribution of nest predation within the landscape. The results were used to develop a model to describe nest predation. Specific nest locations and site characteristics provided fine scale measurements; the riparian edge, the intermediate scale; and surrounding land uses, the broad scale. None of the fine scale features (nest height, plant species, overstory cover, understory cover) were found to relate to nest predation when compared to nests that were not affected. Similarly, distance from the riparian edge, as well as gaps within the riparian zone, did not affect nest predation. On the broad scale, land use surrounding the riparian habitat did not affect the likelihood of nest predation with the possible exception of increased predation on nests located adjacent to a golf course. The clumping of nest predation around a single point, such as a golf course, can pinpoint areas of special management concern.

Least Bell's vireo use of restored habitat has also been documented at the Rancho Jamul Mitigation Bank, located in the DFG's Rancho Jamul Ecological Reserve. Approximately 150 acres of riparian and adjacent upland habitat were restored in cooperative effort with Wildlands, Inc., the Trust for Public Lands, and the DFG. Approximately 40 acres of emergent wetlands and riparian thickets were created, and invasive exotic plants were removed from over seven miles of riparian habitat along Dulzura and Jamul Creeks. After cattle were removed, willows began to regenerate in the creek channels. Prior to implementation of restoration activities, five least Bell's vireos were found along these creeks. In 2002, 15 birds had been documented: eight birds on Dulzura Creek and seven birds on Jamul Creek.

In 2003, a series of wildfires burned extensive areas in southern California. Although native species are adapted to natural fire cycles, the scale, severity, and patterns of the 2003 wildlifes could result in impacts for least Bell's vireo until habitat recovers. Impacts will be compounded by habitat fragmentation, lack of refugia, loss of migration corridors, potential erosion and siltation of riparian habitats downstream from burned areas, and the potential invasion or increase of non-native plants. As a result of these fires, 3% of critical habitat and 2% of WHR-modeled habitat for least Bell's vireo was lost. Localized impacts, however, could be greater, as in San Diego County, where approximately 3% of least Bell's vireo occurrences and 10.2% of habitat (about 4,500 acres) burned in the Cedar-Otay-Paradise fires. Suitable habitat for individuals that survived or those produced during the next breeding season may be limited, resulting in overcrowding and increased competition for limited food and nesting resources. Predation may also increase, particularly if snake and rodent communities survived the fires in burrows. Vegetation loss will impact least Bell's vireo and likely prevent reoccupation of burned habitat for the next two to five years. Nevertheless, long-term impacts may not be significant as riparian vegetation recovers. Because least Bell's vireo prefers successional riparian scrub and younger willow woodland habitat, the burn and subsequent flooding and associated material deposition may actually benefit this species, and mimic the natural scouring and deposition cycle of naturally functioning riparian ecosystems.

In San Bernardino County, the Old and Grand Prix fires affected approximately 3,000 acres of least Bell's vireo habitat. Seventy-five percent burned at a low to moderate fire intensity, leaving areas of intact or lightly-burned

riparian vegetation. However, increased sedimentation and increased flows are anticipated until upslope hillsides revegetate; there is the potential for additional loss of riparian habitat due to high or severe stream flows and erosion. The Piru fire in Ventura County similarly burned areas of habitat at a low to moderate intensity. Long-term effects of the Piru fire are not expected to be adverse to the least Bell's vireo. The Cedar, Otay and Paradise fires burned large areas of San Diego County. Of the three fires, the Paradise fire directly impacted the San Luis Rey River corridor which supported high densities of willow flycatchers and least Bell's vireo. Approximately 80% of Rancho Jamul Ecological Reserve burned in the Otay fire and destroyed breeding habitat for the least Bell's vireo. At this time, it is not known if birds will occupy stands of riparian vegetation that survived, areas in which they had not previously nested, or if they will occupy the adjacent Hollenbeck Canyon Wildlife Area, which did not burn.

Inyo California towhee

Pipilo crissalis eremophilus

State	Endangered	1980
Federal	Threatened	1987

Image is of a California towhee.

General Habitat:

The Inyo California towhee is restricted to dense riparian vegetation composed of willow, Fremont cottonwood, and desert olive in the southern Argus Mountains of Inyo County. This subspecies requires areas of dense riparian habitat to provide nesting substrate, protection from predators, and shade from the desert sun. Adjacent creosote bush habitat is their principal foraging ground and also provides nesting habitat.

Description:

The Inyo California towhee is a dull gray-brown bird with a moderately long, dark tail. It is an isolated subspecies of the California towhee in the southern Argus Mountains of Inyo County. Nesting occurs in the spring. Young are fully independent at about six months of age. Towhees forage for seeds and insects primarily on open hillsides, but will also forage on low branches and in litter in the dense riparian corridor. Its nearest relative is the California towhee whose range extends into the Sierra Nevada. Differences in wing and tail length, bill length, and length of the middle toe separate the Inyo California towhee from related subspecies. The spotted towhee also occurs with the Inyo California towhee.

Status:

The Inyo California towhee is a relict species whose range once extended from the southwestern United States into Mexico. It became isolated in its current range in the Argus Range following prehistoric climatic changes between 2.5 and 5.5 million year ago. The Inyo California towhee is threatened by loss and degradation of its habitat due to water diversions at springs, OHV activity, recreational use of its riparian habitat, grazing by feral

burros, military activities, rural development, and mining. For example, willows were routinely burned around springs as recently as the 1970s to improve access for bighorn sheep. Habitat degradation further creates conditions favorable to colonization by species, such as carrizo and tamarisk, which are not used by the towhee.

Critical habitat was designated for this species in 1987. It consists of several springs, associated riparian corridors, and adjacent creosote bush scrub habitat. Approximately 68 percent of its habitat occurs within the China Lake Naval Air Weapons Station (NAWS). The remaining habitat is on lands managed by BLM and DFG. When listed by the USFWS, population numbers were estimated at between 117 and 200 individuals. The most recent estimate of population size (1995) is still at about 200 individuals. A 1992 survey of BLM land found 109 individuals, including juveniles, and a 1995 survey of the lower Indian Joe Canyon documented successful breeding. Approximately eight to ten birds were observed. Springs higher in the canyon were not surveyed.

In 1998, USFWS released the recovery plan for the Inyo California towhee. The document proposes that USFWS consider the towhee for delisting when its population sustains a minimum of 400 individuals for five years. This is the estimated carrying capacity for the species. In addition, threats to its habitat must be reduced and managed and degraded habitat restored and maintained. NAWS has implemented recovery actions including removal of feral burros and horses, and elimination of mining in areas that support the towhee. NAWS and BLM have removed about 2000 burros from the Argus Range, a designated Wilderness Area.

The BLM designated a portion of towhee habitat the Great Falls Basin Area of Critical Environmental Concern (ACEC) in 1982. Eight areas within the ACEC are designated as critical habitat. Since that time, vehicular access to riparian areas and springs has been controlled, springs have been barricaded from OHV use, and some riparian restoration has been implemented. In 1994, DFG purchased Indian Joe Canyon, the only parcel in private ownership, to protect the towhee. This area now comprises the Indian Joe Spring Ecological Reserve. Long-term management for this species at the Ecological Reserve includes protection of the riparian habitat, protection of the water supply, and control of deleterious non-native species, such as the brown-headed cowbirds and feral burros, where necessary. Recent management activities have included erecting a fence around the spring to protect it from impacts associated with burros. A management plan for the area has not yet been written.

In January 2001, settlement of a lawsuit required BLM to implement conservation measures in the California Desert Conservation Area. The measures include restricting camping and vehicle access at all springs within the historic range of the Inyo California towhee. The court also stipulated that BLM install vehicle barriers at three specific springs to direct vehicle and recreation use away from the riparian area occupied by the towhee.

The DFG is participating in a planning processes anticipated to improve conservation of the species. The towhee is considered a special status species in the West Mojave Plan, currently in review, as well as the Northern and Eastern Mojave Desert Management Plan developed by the BLM. The Record of Decision for the Approved Northern and Eastern Mojave Management Plan was approved in December 2002. Ongoing burro removal, control of non-native plant species, revegetation, and control of vehicular access in Inyo California towhee habitat are aspects of this plan.

Belding's Savannah sparrow

Passerculus sandwichensis beldingi

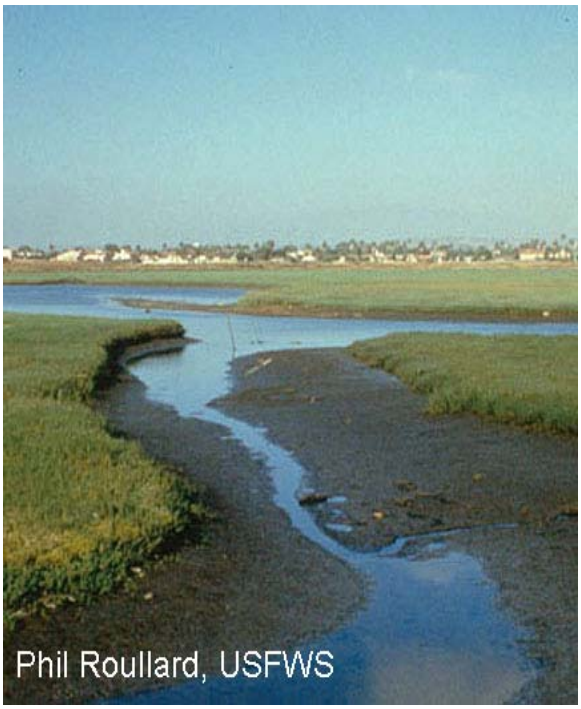
State Endangered 1974
Federal None

General Habitat:

This sparrow is resident in coastal salt marshes from Goleta Slough in Santa Barbara County to northern Baja California. Nesting occurs primarily in pickleweed (mainly the perennial species, *Salicornia virginica*) habitat at the mid- and high-marsh elevations of the salt marshes, above the reach of the highest spring tide. Birds occur in highest densities in marshes with full tidal flushing.

Description:

This 5.5 inch-long bird is similar to other subspecies of Savannah sparrow but is darker and is heavily streaked on the back, breast, and sides. The lores (feathers between the eye and bill) are yellow. Breeding birds are year-round residents in the wetlands, forming winter flocks when foraging on the ground and in the marsh vegetation or on mudflats. They feed on insects and on some vegetation in winter, such as the succulent tips of pickleweed. Unusual among passerine birds, this subspecies is able to drink seawater and is not physiologically adapted to use freshwater. It has no salt glands, as seabirds have; instead, it has extremely efficient kidneys.



Breeding territoriality begins by December, nest building starts as early as March; active nesting is under way from March to August. The outer shell of the nest is built of pickleweed twigs and it is lined with soft material, usually dried grass. Nests are usually placed a few inches above ground above the reach of the highest tides in spring, as the eggs are not resistant to inundation. Incubation lasts for about two weeks; young leave the nest by 10 days of age, before they can fly, and are fed by the parents in the vicinity of the nest for another week to 10 days, while young learn to forage.

Status:

The Belding's Savannah sparrow is restricted to mid and high elevations in coastal salt marshes of southern California. Historically, these marshes formed vast expanses of low-growing salt-tolerant vegetation suitable for nesting, in some places extending inland for miles. This marsh habitat is now greatly restricted, degraded, or eliminated in most areas as a result of filling, dredging, and development of wetlands, loss of regular tidal connection with the ocean. Continuing loss of habitat suitable for breeding and foraging is due to sedimentation,

changes in hydrology from upstream development and flood control, loss of natural tidal regimes in upper marsh habitat and degradation of pickleweed habitat, flooding from chronic closures of river-mouths, illegal trash dumping, human disturbance, and predation by native and non-native carnivores mainly in the upper levels of the marsh near developed areas.

Larger marshes support larger populations of the sparrow, but relatively few pairs are supported in marshes less than about 25 acres in size. Breeding territories range from less than .02 acres to over .20 acres. Pairs form territories throughout suitable habitat, occurring in densities of more than 20 pairs per 2.5 acres in the better habitats, sometimes exceeding 30 pairs. Limitations of male territory establishment and success in attracting mates allow relatively few males to have the opportunity to reproduce, contributing to genetic differentiation of the subpopulations.

Total population size may be quite variable from year to year. A partial statewide survey was conducted in 1973, and the first statewide survey was made in 1977. Since 1986, statewide surveys have been undertaken at five-year intervals. In interim years, data on populations also are collected at some wetlands as part of local wildlife management, research, or protection programs. Since 1973, breeding pairs have been recorded in 31 marshland locations.

The latest statewide count was conducted in 2001 by Richard Zembal, Orange County Water District, under contract from Department of Fish and Game and funded by Rare and Endangered Species Preservation Program (Tax Check-off) and Federal Aid in Wildlife Restoration Program (Pittmann-Robertson). During March through May 2001, 32 coastal salt marshes were surveyed, and Belding's were found to be breeding in 30 of them. A minimum of 2,902 pairs was detected, about 90% of which were present in 14 of the wetlands containing over 50 pairs each. This is the highest state total reported since periodic counts began in 1973. In 1996, 2,350 breeding pairs were counted. The largest populations in 2001 occurred at Mugu Lagoon (809 pairs), Upper Newport Bay (206 pairs), Tijuana Marsh (289 pairs), and Anaheim Bay (293 pairs). At least 100 pairs each were counted at Santa Margarita River Estuary, Bolsa Chica Wetlands, Los Penasquitos Lagoon, and South San Diego Bay Western Salt Company dikes/Otay River.

The statewide population is maintaining itself, and apparently increasing, although fluctuating greatly in total numbers and in local breeding population size annually. The number of habitat sites known to have supported breeding pairs apparently had been slowly declining from 28 in 1977, to 27 in 1986 and 1991, to 26 in 1996; however, pairs were found in 30 in 2001. Since surveys began, one subpopulation of these sparrows has disappeared; four apparently had disappeared by 1996, although all had pairs again in 2001; and one new population formed by 1996 at Newport Slough, site of a marsh restoration project by the COE at the mouth of the Santa Ana River.

Marshlands with large populations of Belding's Savannah sparrow have been supporting these populations long-term at stable or increasing levels, whereas areas with small populations are more subject to serious local declines. Most of the 17 largest populations, those with at least 50 pairs recorded on any survey, have increased or remained relatively stable in population size since the 1970s. Of the 30 breeding populations detected in 2001, nine, or 30 percent, were composed of 20 or fewer pairs.

Habitat improvement projects at several of the salt marshes have restored tidal flushing to the wetlands, eliminated exotic plants, and actively trapped and removed predators. Wetlands enhancement and restoration projects that benefit Belding's Savannah sparrows also benefit the California least tern, the light-footed clapper rail, and the tidewater goby. At the Mugu Lagoon, Ventura County, site of the largest population of the species, twice as many pairs of sparrows were found in 2001 compared with 1996. That represents 28% of the state's pair total. This substantial increase resulted from habitat restoration and predator control projects implemented by the Naval Air Weapons Station since the mid 1990s. The restoration projects reestablished tidal flow to formerly isolated patches of degraded salt marshes. Restoration of tidal processes and creation of estuarine conditions at

DFG's San Dieguito Ecological Reserve, San Diego County, also benefited breeding birds. Subsequently, approximately 75 pairs were reported in 2001, twice the populations recorded in surveys in the 1980s and 1990s before restoration at the Ecological Reserve commenced. Habitat protection and enhancement projects, such as those at Batiquitos Lagoon and the mouth of the Santa Ana River, have resulted in improvements in habitat conditions. Some wetlands, such as Goleta in Santa Barbara County, have been fenced to prevent human access. Several habitat restoration efforts planned or underway in the Goleta Slough and Bolsa Chica wetlands can expand the foraging habitat of the Belding's Savannah sparrow. Future management, under a Comprehensive Conservation Plan, of the *South San Diego Bay Unit of the San Diego National Wildlife Refuge and the Sweetwater Marsh National Wildlife Refuge, San Diego County,* will significantly improve habitat conditions for Belding's Savannah sparrow. Eight state and federal agencies are proceeding with planning and environmental compliance requirements for the Bolsa Chica Wetlands Restoration Project, Orange County, one of the largest wetlands restoration projects in Southern California, which would restore potentially hundreds of acres of Belding's Savannah sparrow pickleweed habitat.

The DFG is involved in several conservation planning efforts that include the Belding's Savannah sparrow. These include a multiple jurisdiction Multiple Habitat Conservation Plan, the San Diego MSCP, and the SDG&E subregional NCCP. Also, USFWS is working to enhance and restore San Elijo Lagoon, San Diego County under its Coastal Program. In conjunction with DFG, other government agencies, and private organizations, such as the San Elijo Lagoon Conservancy, the Coastal Program seeks to restore tidal circulation to several thousand acres of wetlands as its primary goal.

The status in 2003 of the Belding's Savannah sparrow: Stable to increasing (Trends: variable annual population size, increasing recently; promising increases in available habitat.)

Species Accounts - Mammals

Riparian brush rabbit

Sylvilagus bachmani riparius

State: Endangered 1994
Federal: Endangered 2000

General Habitat:

Riparian brush rabbits are only found in native riparian areas with large clumps of dense shrubs, low growing vines, and some tall shrubs and scrubby trees in the San Joaquin Valley. Grasses are the most important food, and riparian brush rabbits rarely venture more than one to two yards from dense cover. Its range is quite narrow. It is found in the 261-acre Caswell Memorial State Park in southern San Joaquin County, and near a railroad right of way in the Paradise Cut area south of Stockton.

Description:

The riparian brush rabbit is one of eight subspecies of the brush rabbit, an animal generally widespread in California. The riparian brush rabbit can be distinguished from other brush rabbit subspecies by its isolated location and its skull characteristics. This subspecies is slightly larger, has larger eyes and ears, is more grayish and yellowish in coloration, and has a very conspicuous tail. The animals are most active in the early morning and evening hours. The breeding season is typically from January to May, with peak activity between mid-January and mid-April. Gestation is about 27 days, and females may breed again shortly after giving birth. About three to four litters per female may be produced during the breeding season, with three to four young per litter.

Status:

Flooding, wildfires, predation, and disease remain the greatest threats to the riparian brush rabbit. The last documented estimate of population size was 200 to 300 individuals in 1993. During the mid-1970s, the population had dipped to an extreme low of 15 to 20 individuals due to severe flooding. The floods of 1996 may also have caused extensive mortality. Initial attempts to live-capture rabbits during a study that began in 1997 were of limited success, indicating an extremely low estimated population. In 1997, USFWS proposed endangered status

for the species

In 1998, USFWS finalized the *Recovery Plan for Upland Species of the San Joaquin Valley, California*. The Recovery Plan addresses the research, management, and recovery needs for the riparian brush rabbit, including restoring habitat and establishing additional populations within the historic range. In 2000, the riparian brush rabbit was listed as a federal endangered species. A brush rabbit working group has met periodically since 1997 to help guide conservation efforts for the subspecies. In 1998 live capture success was very low but improved slightly in 1999; a new population was discovered in the Paradise Cut area of San Joaquin County on Union Pacific Rail Road right of way lands. An agreement developed between the DFG and the rail road company allowed the rabbits within the right of way to be live captured and removed to a captive breeding facility, consisting of three large fenced and secured enclosed pens built in 2001-2002 on Department of Water Resources land in San Joaquin County.

Captive breeding facilities were stocked with wild caught rabbits in equal sex ratios. Genetic studies are ongoing to ensure the suitability of rabbits from different wild populations for captive breeding and translocation purposes. An additional wild population of rabbits was discovered on private land near the city of Stockton in 2003. Releases of radio-tagged rabbits began in 2002. To date, well over 100 rabbits have been produced in the three captive breeding pens and over 70 have been released to the wild to establish a new wild population on the San Joaquin River National Wildlife Refuge. Successful breeding within the new population has already been documented, and further releases are scheduled for 2003. Due to the ever accelerating nature of captive breeding a species such as a rabbit, the foregoing numbers must be considered a bare minimum of the total potential of the project. Mortality of the released rabbits is deemed moderate due to natural predation.

The goal of the recovery strategy is to continue to breed and release captive reared rabbits and establish at least three new wild populations in suitable habitat on secure public lands. Each such newly established population may ultimately consist of several hundred to thousands of individual riparian brush rabbits. With suitable areas provided, the populations are expected to reach the carrying capacity of the available habitats, which could lead to the ultimate recovery of the species. Augmentation of the Caswell Memorial State Park population with captive reared rabbits to near the carrying capacity of the available habitat is also proposed. The search continues for additional wild populations to protect and secure, as well as to serve as a source of breeders for the captive breeding facility.

The status in 2003 of the riparian brush rabbit: *Stable to Increasing*.

San Joaquin antelope squirrel

Ammospermophilus nelsoni

State: Threatened 1980
Federal:

General Habitat:

Habitats of antelope squirrels consist of grasslands with moderate shrub cover which includes such species as salt bush, ephedra, bladder pod, goldenbush, snakeweed, and others. Populations now exist primarily in marginal habitats of the low foothills and mountains of the western edge of the valley. Currently, populations of significant size exist only in western Kern County at Elk Hills and on portions of the Carrizo and Elkhorn plains.

Description:

The San Joaquin antelope squirrel is one of five species of antelope squirrels. The species is omnivorous with a diet consisting primarily of grass and forb seeds and insects. Antelope squirrels use burrows that they or other animals have dug. The general active period during spring and summer months coincides with air temperatures of 68°to 86°F.

Status:

Historically, San Joaquin antelope squirrels ranged from western Merced County to the southern end of western San Joaquin Valley. They occupied the valley floor in Kern County and along the eastern edge northward to Tipton, Tulare County. Conversion of native habitat to intensive forms of agricultural development is the greatest threat to the population. Recovery options for this species are addressed in the USFWS 1998 *Recovery Plan for Upland Species of the San Joaquin Valley, California*.

Researchers have gathered data on the interrelationships between antelope squirrels and the State and federally listed giant kangaroo rat. Translocation of giant kangaroo rats from one locality to another has been successful on the Carrizo Plain National Monument during 1989-92 and may have application to recovery efforts for antelope squirrels since the habitat requirements of the two species are quite similar. A study on the Lokern Area Preserve in Kern County, initiated in 1997, is addressing the issue of grazing as a management tool for several species including the antelope squirrel. San Joaquin antelope squirrels have steadily increased in number since 1998, due in large part to the below-average rainfall experienced since 1999. Numbers of antelope squirrels are now high across the Lokern Study Area. In 1999 and 2000, more squirrels were caught on the grazed plots compared to the ungrazed plots, but the lack of grass in both controls and treatments in recent years has masked any benefit we found from grazing. Rainfall levels that are higher than the average are needed in coming years in order to return the ungrazed sites to dense grass cover. Once the control plots are grassy, it should be possible to quantify the effect of cattle grazing on populations of San Joaquin antelope squirrels.

The DFG is involved in several conservation efforts for the San Joaquin antelope squirrel, including the

Metropolitan Bakersfield HCP, the California Department of Corrections Electric Fence HCP, the Coles Levee area 2081 Agreement, and the Arco Western Energy HCP.

The status in 2003 of the San Joaquin antelope squirrel is Stable to Declining.

Mohave ground squirrel

Spermophilus mohavensis

State: Threatened 1971
Federal: None

General Habitat:

The Mohave ground squirrel occurs only in California It is resident in the various desert scrub communities and Joshua Tree Woodland of the western Mojave Desert in southwestern Inyo, eastern Kern, northwestern San Bernardino, and extreme northeastern Los Angeles counties. The Mohave ground squirrel inhabits flat to moderate terrain and is not generally found in steep contours although juveniles apparently traverse steep terrain during dispersal. The species has been found most frequently in sandy, alluvial soils, but is also found in gravelly and occasionally rocky soils. Habitat features center on availability of food resources and soils with appropriate composition for burrow construction.

Description:

The squirrel is cinnamon-gray in color with white underparts. Juveniles are cinnamon-colored and molt to grayer pelage as they mature. The species lives in underground burrows, in which it spends at least seven consecutive months (usually from July or August through February) at a low metabolic rate, living on body fat alone, to avoid the seasons of the year in which food is least available.

Status:

The Mohave ground squirrel is threatened by loss and degradation of its habitat due to agriculture, urban, suburban, and rural development, energy development, military activities, livestock grazing, and OHV use. Agriculture affects the species through conversion of habitat, exposure to pesticides, herbicides, and rodenticides. Agricultural development has resulted in the loss of occupied and potential habitat in the area between Antelope Valley, Lucerne Valley, and the Mojave River Basin. Although the species likely occupied the Antelope Valley historically, widespread conversion of native habitats has apparently resulted in the extirpation of the species from west of Palmdale and Lancaster.

Urbanization has resulted in the loss of native habitats, particularly surrounding the cities of Palmdale/Lancaster and Victorville/Adelanto/Hesperia/Apple Valley. Urban development has accelerated in recent years in these and other areas, such as Mojave, California City, and Ridgecrest. Impacts associated with urban and rural development include the direct mortality of individuals due to increased vehicle use and increased numbers of domestic and feral cats and dogs. Energy development, including geothermal and solar energy development, has resulted in habitat loss for Mohave ground squirrels, and several such projects are now under consideration. For

example, the BLM has identified sites for potential renewable energy resources, such as wind, solar, and photovoltaics, in the Mojave Desert.

The Mohave ground squirrel is not absent from all urban areas. In 2002, a Mohave ground squirrel was observed south of Highway 138, near Pinyon Hills, and a second observation occurred near an aerospace industrial complex located adjacent to Palmdale. In the first case, the site and adjacent areas are comprised of extensive tracts of undeveloped lands and those with relatively light rural development. At the second site, there are about five to six contiguous square miles of relatively undeveloped land, but the entire area is surrounded by urban and agricultural development. The ground squirrel has also been observed in residential backyards in Inyokern and may be seen foraging on the golf course at China Lake. One squirrel was recently trapped at the proposed Hyundai facility south of California City, where the consultant had identified habitat as being marginal. In these latter cases, the sightings are adjacent to extensive areas of undeveloped lands. Given these observations, the only certain areas of extirpation within the range of the species are those that have been physically developed. Such areas include, but are not limited to, paved roads and parking lots; residential, commercial, and industrial sites occupied by buildings, graded areas, and other areas where vegetation has been mechanically removed; solar facilities at Kramer Junction and Harper Lake; and large mined areas such as at U.S. Borax, Rand Mining Company facilities, and in portions of the Shadow Mountains east of Edwards AFB.

Four major, active military installations occur within the West Mojave and comprise a total of 4,165 square miles: the Naval Air Weapons Station at China Lake, the Fort Irwin National Training Center, Edwards Air Force Base, and Marine Corp Air Ground Combat Center near Twentynine Palms. A 250-square mile expansion of Fort Irwin has been proposed. Military maneuvers result in mortality to ground squirrels, damage to vegetation, soil compaction, a change soil texture, and creation of fugitive dust. The results are largely denuded habitat; altered vegetation composition, abundance, and distribution; and a change to finer grained soils. In studies of the desert tortoise, military activities had the greatest adverse impact in valley bottoms, areas that also provide habitat for the Mohave ground squirrel. Changes in soil texture, from a coarser to finer texture, has been documented in agricultural areas and areas of military maneuvers. Finer textured soils do not provide a suitable substrate for ground squirrel burrow construction.

Grazing by livestock may affect Mohave ground squirrels through changes in soil and vegetative structure, accelerated erosion, and collapsing of burrows. Sheep are generally grazed in the desert between late February and the middle of June, which coincides with Mohave ground squirrel emergence from hibernation in February and its entire activity period, particularly during very dry years when the squirrel may enter hibernation in June. These times are critical for both adult and juvenile squirrels to attain sufficient fat reserves to enter into and successfully emerge from hibernation. The severity of grazing impacts may range from marginal in lightly-used areas to extreme at cattle troughs and sheep bedding areas. Research conducted at the Coso study area demonstrated that forage consumed by Mohave ground squirrels is also consumed by both sheep and cattle. Competition for winterfat, hopsage, and saltbush, all important ground squirrel food plants, could be exacerbated during times of drought because alternative sources of food are not available. Although the Mohave ground squirrel is adapted to drought and arid conditions, prolonged drought reduces productivity of forage plants and reproduction in the ground squirrel. Shrub cover required by the Mohave ground squirrel for thermoregulation and protection from predators can be reduced by grazing pressure.

Persistent grazing pressure has resulted in the replacement of native perennial grasses by non-native annual grasses throughout much of the western Mojave Desert. Human development in the desert has also resulted in the proliferation of non-native grasses, such as red brome, cheatgrass, and Mediterranean grass. Grazing, OHV use, and other types of ground disturbance facilitate the spread of these grasses, which are adapted to disturbance and outcompete the native species that constitute food plants of the Mohave ground squirrel. The increase in grass cover between desert shrubs has been linked to increased fire frequency and fire intensity in the desert. Fires cause direct mortality when ground squirrels are burned or inhale lethal amounts of smoke, which can occur both in and out of burrows. Fire changes the composition of vegetation by facilitating the

establishment of non-native grasses and removing forage plants. Fires also fragment habitat by creating patches of unsuitable habitat.

Habitat fragmentation results in the isolation of populations and potential loss of genetic variation. Small isolated populations may experience a reduced ability to adapt to environmental change, and a decrease in reproductive success, growth, and survivorship. Such populations face a greater probability of extirpation. During extended droughts, for example, lower quality habitat may not be capable of supporting the species, and result in local extirpation. Recolonization of these areas may occur when conditions favoring reproduction resume.

In 2003, the BLM released the draft environmental documents for the West Mojave Plan (Plan). If adopted by the BLM, the Plan amends the California Desert Conservation Plan of 1980. It presents a strategy to conserve and protect the Mohave ground squirrel, desert tortoise, and nearly 100 other sensitive plant and animal species, while providing a streamlined program for complying with the requirements of the California and federal Endangered Species Acts. Seven alternative conservation strategies, representing different approaches to achieving biological goals and objectives for the covered species, are provided. These strategies are intended to mitigate for the future incidental take of the proposed "covered species" from urban development and land management activities. Goals of the Plan include protecting Mohave ground squirrel habitat throughout its range and ensuring long-term viability of the species. The entire known range of the Mohave ground squirrel occurs within the West Mojave; all but a small part of that, which is located northeast of Searles Dry Lake, occurs within the planning area, west and north of the Mojave River.

The preferred alternative for the West Mojave Plan proposes ecosystem-scale conservation with the establishment of four very large Desert Wildlife Management Areas (DWMA) and additional lands for the Mohave Ground Squirrel Conservation Area. The desert tortoise and Mohave ground squirrel are "umbrella species", a term used to describe protection of many other species under the "umbrella" of conservation for important wide-ranging species. A conservation area would be established for the long-term survival and protection of the Mohave ground squirrel. This Conservation Area would include portions of the Fremont-Kramer and Superior-Cronese Tortoise DWMAs, and additional, essential habitats located west and north of the two tortoise DWMAs.

The West Mojave Plan would adopt provisions of the Los Angeles County Significant Ecological Area ordinance. Los Angeles County has identified a Significant Ecological Area (SEA) for northeastern Los Angeles County that should prove beneficial to protection of the Mohave ground squirrel. Within SEAs, the County performs a heightened environmental review for new projects, and has proposed zoning the area for a minimum lot size of 10 acres. The West Mojave Plan would focus on ground squirrel habitat on eastern side of the Sierra Nevada. This narrow band of habitat provides an important linkage corridor from north to south along Highways 178, 14, and 395. Projects in this area would also receive special review to ensure that habitat is not fragmented. Impact avoidance measure applicable to the desert tortoise would also be applied to the Mohave ground squirrel. These measures include restrictions on commercial activities, construction activities, and hunting and shooting.

The ultimate preserve design for the Mohave ground squirrel will need to conserve a substantial portion of its known range to allow for natural fluctuations in local and regional populations in response to climatic factors, rainfall. The size and location of preserve areas should be based on biological, demographic, and genetic considerations and core preserve areas must be large enough to support sufficient numbers of individuals to account for natural fluctuations in abundance. Further, it is critical that core reserves are situated in high quality habitats in which the species can persist during drought conditions. These "drought refugia" provide sources from which populations may expand under better conditions.

In contributing to the conservation strategy for the squirrel, the DFG expressed concern that no strategy would be successful without the participation of the military bases in the western Mojave Desert. Because the Mohave ground squirrel is not federally listed, the military departments are not required to develop policies to conserve

the species. The DFG and USFWS concurred that those wildlands on military bases not needed for current missions should be managed for the greatest biodiversity of wildlife species and that those local areas on bases be managed for listed species such as the desert tortoise and Mohave ground squirrel. Special protective measures would need to be implemented if the Fort Irwin National Training Center expands into the Superior Valley region, as has been proposed. In December 2000, legislation authorizing expansion of Fort Irwin into critical habitat for the desert tortoise in the Superior Valley region was passed and signed into law by President Clinton. The proposed expansion is currently undergoing extensive environmental review; the release date of the documents is not known at this time (late 2004).

Determining the status of the Mohave ground squirrel is difficult due to behavioral and demographic aspects of the species. The species is inactive throughout much of the year, and abundance as well as the period of surface activity varies from year to year. Live-trapping studies must be scheduled carefully and even then cannot necessarily establish the absence of the species from a site. These points were underscored in a recent study conducted by the USGS. USGS scientists reviewed existing Mohave ground squirrel trapping records to facilitate future habitat modeling and population trend predictions. The scientists found that the trapping records could not be used to develop models because of differences in sampling methodology and types of data reported. The researchers found, however, that trapping success declined significantly between 1980 and 2000 across most of the range of the species, raising concerns that Mohave ground squirrel numbers are decreasing across its geographic range. The exception was in the Coso geothermal region where numbers of animals increased between 1984 and 1998. Population numbers did not correlate with winter rainfall. Due to the lack of quantitative data, additional research is needed to accurately determine the status and trend of the Mohave ground squirrel.

Morro Bay kangaroo rat

Dipodomys heermannii morroensis

State:	Endangered	1971
	Fully Protected	
Federal:	Endangered	1970

General Habitat:

The Morro Bay kangaroo rat primarily inhabits low, sparse coastal dune scrub vegetation associated with stabilized sand dunes in the Morro Bay area. Its habitat is highly localized in the vicinity of Los Osos in San Luis Obispo County. Plant species in its habitat include bush lupine, dune lupine, mock heather, coyote bush, California sagebrush, croton, buckwheat, phlox, and deerweed. Plant roots provide support for burrows.

Description:

This kangaroo rat, like all species of kangaroo rats, has long hind legs, small front legs and feet, brown upper parts, and a white belly. It is smaller and darker than any other subspecies of Heermann's kangaroo rat. The average adult weight is approximately 2.3 ounces, and the average length is about 11 inches. The lack of a complete hip stripe also distinguishes this animal from other kangaroo rats.

Status:

The Morro Bay kangaroo rat is threatened by loss and degradation of its habitat due to development, invasion of non-native plant species, disruption of natural disturbance patterns, and OHV use. The kangaroo rat is also threatened by predation by cats. The historic known distribution of this species was approximately 200 acres. If it still exists, it is believed to occur only on one small, privately-owned parcel of native vegetation. The most recent observations of the kangaroo rat date from the mid-1980s. A revised Draft Recovery Plan for the Morro Bay kangaroo rat was released in 2000 by the USFWS. The recovery plan was revised to allow captive breeding of the species if individuals are found.

The Morro Bay kangaroo rat is geographically isolated from other subspecies of the Heermann's kangaroo rat. A mitochondrial DNA study of museum specimens conducted at San Francisco State University suggests recent origin of the Morro Bay kangaroo rat and that the historic population underwent at least one genetic bottleneck. Researchers also found that historical populations of the Morro Bay kangaroo rat exhibited low genetic diversity even prior to a population bottleneck that endangered the subspecies. A genetic bottleneck refers to a drastic reduction in the size of the original population, usually due to a catastrophic event, which reduces the gene pool of the species.

In 2002, San Luis Obispo County received a grant from the USFWS under the Service's Habitat Conservation

Planning Assistance and Land Acquisition Section 6 grant program. This grant will help initiate the development of an HCP which will cover 43,500 acres in the Estero area, the central coastal part of the county. Development of an HCP in this area will provide for a conservation strategy for covered species to address recovery needs and to allow for more flexible planning and implementation. This HCP will benefit several listed species including the Morro shoulderband snail and the Morro Bay kangaroo rat. Additional federal funding has been granted to conduct a two year field survey for the Morro Bay kangaroo rat and to estimate the genetic relatedness between the Morro Bay and Lompoc kangaroo rats. The Lompoc kangaroo rat has been used as a surrogate for the Morro Bay kangaroo rat to develop captive breeding protocols.

The DFG considered the Morro Bay kangaroo rat to be *Possibly Extirpated*.

Giant kangaroo rat *Dipodomys ingens*

State:	Endangered	1980
Federal:	Endangered	1987

General Habitat:

Giant kangaroo rats require annual grassland and shrub land habitats with sparse vegetative cover and soils that are well drained, fine sandy loams with slope generally less than 10 percent. Areas of low annual precipitation and infrequent flooding are preferred by this species for establishment of permanent colonies. The historical range extended from Merced County south to Kern County and west to eastern San Luis Obispo and northern Santa Barbara counties.

Description:

Giant kangaroo rats are small mammals with elongated hind limbs for hopping and external cheek pouches for carrying food 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 to 13 inches, including a tail that is six to eight inches. Giant kangaroo rats subsist almost entirely on the seeds of annual plants such as brome grasses and filaree. 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 kangaroo rat maintains and defends an individual territory in a colony that may consist of from two to thousands of precincts.

Status:

The historical range of the giant kangaroo rat extended from Merced County south to Kern County and 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. Today very little undisturbed suitable habitat remains. The loss of original habitat to agricultural conversion may be as much as 98 percent. Five relatively small areas totaling 12-square miles remain that support population densities typical of those existing prior to 1950.

In 1997, several population assessment studies confirmed that the giant kangaroo rat population had dramatically declined along with that of many other kangaroo rats in the southern San Joaquin Valley. At other locales such as the Elkhorn Plain in eastern San Luis Obispo County the declines were not as severe. In 1998 and 1999 giant kangaroo rat numbers began to increase at the Elkhorn Plain study area. Genetics studies, initiated in 1993, continue on this and other kangaroo rat species, and are yielding valuable information that can be applied to

recovery strategies for all endangered kangaroo rats.

In 1997, an additional research effort began at the Lokern Area in western Kern County to further investigate the role of livestock grazing on species and habitats on the floor of the San Joaquin Valley. However, few giant kangaroo rats have been caught on plots in the Lokern Study Area since the beginning of the study. Researchers did, however, capture the most individuals in any year of the study in 2002 when they caught three in each of two treatment plots (out of four). In addition, a colony of about 20 individuals was seen near one of these treatment plots. Although numbers have remained fairly low throughout the study, giant kangaroo rats have only been caught in plots grazed by cattle, never in any of the four ungrazed plots. In a separate study initiated by BLM in 1993 at a location about 3 km north of the Lokern Study Site, researchers have captured giant kangaroo rats twice a year since 1993. Population numbers were as high as 110 individuals caught in a six-night census when the study began, decreased to 0 for both sessions in 1998 (dense grass year), and has steadily increased back up to about 45-70 individuals caught in 2002/2003. Trends in population size seem correlated with the amount of grass cover: the less grass, the greater the number of giant kangaroo rats caught.

The conversion of native habitat to agricultural uses remains the greatest threat to the species. Ongoing studies, initiated in 1987 at the Elkhorn Plain, an area that is now included in the Carrizo Plain National Monument, which was established in 2000, indicate a healthy population that is reproducing well during years with adequate rainfall. Researchers from the Endangered Species Recovery Program conduct giant kangaroo rat population censuses twice a year at the Elkhorn Plain study area.

The recovery options for the giant kangaroo rat are addressed, along with those for 33 other species of plants and animals, in the USFWS 1998 *Recovery Plan for Upland Species of the San Joaquin Valley, California*. The DFG is involved in several conservation efforts for the giant kangaroo rat. Some of the efforts include the Metropolitan Bakersfield HCP, the California Department of Corrections Electric Fence HCP, the Coles Levee area 2081 Agreement, and the Arco Western Energy HCP. Despite these conservation efforts, habitat loss remains the primary obstacle to recovery with only populations on established preserve lands secure for the foreseeable future.

The status in 2003 of the giant kangaroo rat: *Stable to Declining*.

Stephen's kangaroo rat *Dipodomys stephensi*

State: Threatened 1971
Federal: Endangered 1988

General Habitat:

The Stephen's kangaroo rat inhabits annual grassland with sparse perennial vegetation in the San Jacinto Valley and adjacent areas of western Riverside and northwestern San Diego County. Occupied habitats consist of sparse, slightly disturbed coastal sage scrub, dominated by California sagebrush or California buckwheat, or annual grassland. The populations with the highest densities have been found in areas where the herbaceous layer still contains California native annuals, and where perennial plant cover is less than 30 percent. Stephens' kangaroo rat occurs on level or low rolling terrain with slopes of less that 30 percent where gravel is a common component of the soil. It is not found on extremely hard or sandy soils. In general, the highest abundances of Stephens' kangaroo rats occur on gentle slopes less than 15 percent.

Description:

Stephens' kangaroo rat physically resembles all other kangaroo rat species in having long hind legs, small front legs and feet, brown upper parts, a white belly, and a long, tufted tail. There are five toes on the hind foot and the tail is 1.45 times the length of the head and body. Stephens' kangaroo rat is distinguished from the sympatric agile kangaroo rat (*Dipodomys ogilis*) by a lateral white tail band that is one half or less (rather than one half or more) times the width of the dorsal tail stripe, dusky (rather than dark) soles on the hind feet, a comparatively grizzled appearance to the dorsal tail stripe due to many white hairs, a darker tail tuft due to few white hairs, a smaller ear, and a relatively broad head. The average adult Stephens' kangaroo rat is 11 to 12 inches in length and weighs 23 ounces.

Status:

Stephens' kangaroo rat is threatened by destruction, fragmentation, and degradation of its habitat through human and human-induced activities. Adverse impacts to kangaroo rat habitat result from clearing of land for urban and suburban development and for agriculture, water projects, military activities, wildland or prescribed fires, OHVs, livestock use, and invasion of non-native plant species. The Stephens' kangaroo rat is restricted to Riverside County and adjacent northern-central San Diego County.

The USFWS released its draft recovery plan for the kangaroo rat in mid-1997. The document proposes that USFWS consider the kangaroo rat for reclassification to threatened status when four reserves totaling at least 15,000 acres of habitat occupied by the kangaroo rat in western Riverside County and one habitat reserve in San Diego County are "permanently protected, funded, and managed." The USFWS would consider delisting the kangaroo rat when at least five habitat reserves in western Riverside County, totaling at least 16,500 acres of occupied habitat and two additional reserves in San Diego County are "permanently protected, funded, and

managed."

Stephens' kangaroo rat populations at several reserves in Riverside County are being monitored through burrow counts and live-trapping. The kangaroo rat is the sole species addressed in the 1996 *Habitat Conservation Plan for the Stephens' Kangaroo Rat in Western Riverside County* (SKR HCP), prepared by the Riverside County Habitat Conservation Agency. The HCP provides Take Authorization for the species within its boundaries. The West Riverside Multiple Species Habitat Conservation Plan (MSHCP) provides Take Authorization for the kangaroo rat outside the boundaries of the Stephen's Kangaroo Rat HCP, but within the MSHCP boundaries. The core reserves established by the NCCP will be managed as part of the MSHCP Conservation Area consistent with the NCCP. Under the MSHCP, species conservation objectives include maintaining occupied habitat within the NCCP boundary; maintaining occupied habitat within the MSHCP Plan Area but outside of the HCP boundary; and maintaining a specified population density.

Approximately 22,400 acres of occupied sites and suitable habitat will be conserved in the MSHCP Conservation Area, 3,200 acres more than acreage conserved under the SKR HCP. The Conservation Area will conserve adequate representations of the older and younger populations with three of the core reserves containing the older populations and at least four of the core reserves containing the younger populations. In general, the largest and key populations of the Stephens' kangaroo rats are centered within the larger core reserves in western Riverside County: 1) the San Jacinto Wildlife Area/Lake Perris-Badlands-Potrero Valley complex; 2) the Lake Mathews/Estelle Mountain-Steele Peak-Kabian Park-Sedco Hills complex; and 3) the Lake Skinner/Domenigoni Valley-Sage-Wilson Valley-Vail Lake-Aguanga-Anza Valley complex. Other important locations in the MSHCP Plan Area not in the existing Stephens' kangaroo rat reserve include the Potrero Valley, Anza and Cahuilla valleys, and the Sage/Aguanga area.

Preserve configuration and connectivity within and between populations are essential to the long-term conservation of the species. Research has shown that the Stephen's kangaroo rat is more sedentary than other species of kangaroo rat and that genetic exchange between populations of the species is restricted in fragmented habitat. Maintaining connectors between core areas is, therefore, critical to maintaining genetic exchange in the species. Because the kangaroo rat is relatively sedentary, these connectors should include functional habitat that can be permanently colonized. The preserve design envisioned under the MSHCP would include the three large core reserves in western Riverside County. Culverts under Highway 79 and Highway 60 in the first area allow kangaroo rat movement to habitat bisected by these highways. Culverts could be installed under Highway 74, a potential barrier to movement in the Lake Matthews habitat complex.

The Stephens' kangaroo rat populations in the southeastern portion of the Plan Area probably have the best existing habitat connections, within contiguous habitat linking Lake Skinner-Domenigoni Valley, Sage, Wilson Valley, Lewis Valley, Vail Lake, Aguanga, Tule Valley and Anza Valley. Potential obstacles to movement between these areas are Sage Road, Highway 79 (between Temecula and Aguanga), and Highway 371. However, the rural character of this region will be preserved and it is expected that existing habitat connection function also will be preserved. Two core reserves that are, and probably will remain, functionally isolated from other reserves are the Motte-Rimrock Reserve and Sycamore Canyon-March Air Reserve Base. Existing land uses and high economic values in these areas preclude connecting these reserves to other large reserve areas.

In northern San Diego County, Stephens' kangaroo rat occurs at Camp Pendleton, Fallbrook Naval Weapons Annex, Lake Henshaw, Santa Maria Valley (Ramona), and Guejito Ranch. Occurrences in grasslands adjacent to Guajome Lake and Pilgrim Creek and Ramona that the species could be more widespread in grasslands of San Diego County than was previously thought, but suitable habitat is mostly north and east of the MHCP plan area. Available habitat in San Diego County has been greatly reduced and fragmented through urban and agricultural development. Periodic disturbances that reduce shrub cover and increase cover by annual plants may improve habitat for this species. Only about 31% of the remaining grasslands in the MHCP area are expected to be conserved, and much if this occurs on clay soils unsuitable for burrow construction and in isolated areas that are too small to support viable populations of kangaroo rat. Nevertheless, Stephens' kangaroo rat could potentially

colonize grasslands or agricultural fields in Oceanside, in the vicinity of occupied habitat on Camp Pendleton and Fallbrook Navel Weapons Annex. The 2003 wildfires burned large areas of San Diego County, including approximately 19,000 acres (25%) of habitat suitable for the Stephens' kangaroo rat. Because Stephens' kangaroo rats prefer low, sparse vegetation, compared to denser grassland or coastal sage scrub, the long-term effects of fire may be beneficial to the species.

Recent mitochondrial DNA (mtDNA) analysis found that the different geographic regions within the species' range (northern, central and southern) differ genetically, with the central area having the greatest diversity of genetic lineages. The data indicate that genetic flow has been restricted among the different geographic regions of the species' range. A notable finding was that genetic diversity of sample sites in the southern part of species' range (Fallbrook, Camp Pendleton, Lancaster Valley, and Guejito) was much lower than the northern and central sample sites. This low diversity may indicate a possible population bottleneck that occurred during a recent range expansion in the southern region. The genetic characteristics of the Anza and Cahuilla valleys population are unknown.

Other conservation efforts involving this species include the Lake Mathews MSHCP, Pacific Gateway Homes HCP, and Ridge at Cresta Verde HCP. A previously unknown population of the kangaroo rat was discovered in the Ramona Valley, San Diego County in October 1997. It is not known if this species still inhabits extreme southwestern San Bernardino County.

At the end of 2002, the DFG considered the trend and status for the Stephens' kangaroo rat to be *Unknown*.

Tipton kangaroo rat ***Dipodomys nitratoides nitratoides***

State: Endangered 1989
Federal: Endangered 1988

General Habitat:

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, iodine bush, and mesquite are sparsely scattered over the terrain with scant to moderate ground cover of grasses and forbs. Soils are typically fine-textured and alkaline.

Description:

The Tipton kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat (*Dipodomys nitratoides*). Tipton kangaroo rats are visually similar to other kangaroo rats; they have a tawny yellow head and back with a white belly and a white stripe on the elongated hind legs that continue down the sides of the otherwise black tail. Other characteristics include: a large head, compared to other rodents, with large eyes and small rounded ears; small forelegs with strong claws; and a long, tufted tail. Adult Tipton kangaroo rats weigh about one to 1.3 ounces.

Status:

This 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 1.7 million acres. An estimate of historic population based on today's density data and the estimated extent of former range is about 17.2 million individuals. Currently, approximately 190,200 individuals, or about 1 percent, remain. The conversion of native habitat to agricultural, residential, and commercial developments and flooding remain the principal threats to this species.

The recovery options for the Tipton kangaroo rat are addressed in the USFWS *Recovery Plan for Upland Species of the San Joaquin Valley, California*, completed in 1998. Proposed actions include establishment of habitat preserves and captive breeding and translocation of populations. Severe declines, beginning in 1994, affected all kangaroo rat populations, including Tipton, in the southern San Joaquin Valley. In 1998 and 1999 populations slowly returned to previous population levels of the early 1990s. As of 2003, the population levels of Tipton kangaroo rats are largely unknown but presumed to be still fairly low and vulnerable to further declines. Dense vegetation due to above average rainfall has had a negative impact on this and other kangaroo rat species. During wet years, kangaroo rat species may suffer from diseases precipitated by low food stores and seeds that are moldy.

The closely related short-nosed kangaroo rat (*D. n. brevinasus*) occurs at the Lokern grazing study area. Findings by researchers regarding the affects of cattle grazing on the short-nosed kangaroo rat may have application to the Tipton kangaroo rat. Short-nosed kangaroo rats have steadily increased in number since 1998, due in large part to the below-average rainfall experienced since 1999. Numbers of the species are now high across most of the Lokern Study Area. In 1999 and 2000 more short-nosed kangaroo rats were caught on the grazed plots compared to the ungrazed plots, but the lack of grass in both controls and treatments in recent years has masked any benefit we found from grazing. Higher than average level of rainfall is needed in future years to return the control sites to high grass cover. Once the control plots are grassy, researchers should be able to quantify the effect of cattle grazing on populations of short-nosed kangaroo rats.

The DFG is involved in several conservation efforts for Tipton kangaroo rat including the Kern County Valley Floor and Waste Facilities HCPs, Kern Water Bank HCP, Metropolitan Bakersfield HCP, and the PG&E San Joaquin Valley HCP. Despite these conservation efforts, the species is in severe decline; extinction could occur if current levels of habitat loss continue into the future.

The status in 2003 of the Tipton kangaroo rat: *Declining*.

Fresno kangaroo rat *Dipodomys nitratoides exilis*

State: Endangered 1980
Federal: Endangered 1985

General Habitat:

The Fresno kangaroo rat occupies chenopod scrub and grassland in the San Joaquin Valley. The historic range of the Fresno kangaroo rat extended from north central Merced County, south through southwestern Madera and central Fresno counties. Typical plants within the species habitat include seep weed, iodine bush, saltbush, peppergrass, filaree, wild oats, and foxtail fescue.

Description:

The Fresno kangaroo rat is one of three subspecies of the San Joaquin kangaroo rat. The Fresno kangaroo rat is the smallest of the San Joaquin kangaroo rats with a total length of nine inches, including a five-inch tail. Adults weigh about one ounce. Their fur is dark yellowish-buff on the back and white on the stomach. A white stripe extends along the flanks and on the sides of the tufted tail.

Status:

The current population distribution and population size are unknown. The species is critically threatened by loss of habitat and fragmentation throughout its range. Surviving populations are isolated and are likely small. The species is also threatened by flooding and the use of rodenticides within its range.

Demographic studies, initiated in 1993, are continuing to locate any extant populations of Fresno kangaroo rats. Beginning in 1995 and continuing to 2003, fire management has been applied to the habitat supporting a small population of kangaroo rats on a small patch of habitat at the Lemoore Naval Air Station, Fresno County. Additional study and management is planned; discussions are ongoing between land managers and researchers concerning the future management of larger tracts of land that may constitute suitable habitats at Lemoore NAS and at other locations within the range of the species in the San Joaquin Valley. Populations of Fresno kangaroo rats are suspected on certain private lands, but access to conduct the necessary surveys has not been granted.

The recovery options for the Fresno kangaroo rat have been addressed in the USFWS *Recovery Plan for Upland Species of the San Joaquin Valley, California*, completed in 1998. The recovery plan calls for establishment of additional habitat preserves and the possible captive breeding and translocation of populations of this species onto those secure refuges. The Fresno kangaroo rat may well be one of the most severely endangered mammal species in the State and drastic measures may be needed to save it from extinction in the next decade. One option that could be a step toward recovery of the species would involve the rehabilitation of deteriorated

kangaroo rat habitat at the DFG Alkali Sink Ecological Reserve where the species was last reported in 1992. The ecological reserve once supported a moderate population of the species. With suitable habitat established, the area could be re-populated with captive-reared Fresno kangaroo rats. Similar recovery actions could be attempted at other locations within the range of this species.

The status in 2003 of the Fresno kangaroo rat: *Declining*.

Salt-marsh harvest mouse

Reithrodontomys raviventris

State:	Endangered	1971
	Fully Protected	
Federal:	Endangered	1970

General Habitat:

The salt-marsh harvest mouse is found only in California, inhabiting tidal and nontidal salt marshes of Suisun, San Pablo, and central and south San Francisco Bays. Its preferred habitat is dominated by pickleweed although this species can occur in the upper marsh zone dominated by other salt-tolerant plants.

Description:

The salt-marsh harvest mouse has rich brown fur on its back, underparts of cinnamon to buffy white, and a unicolored tail. It is very similar in appearance to the western harvest mouse, a closely-related species, which complicates identification of the salt-marsh form in field studies. The salt-marsh harvest mouse can tolerate quite salty food and water.

Status:

The salt-marsh harvest mouse is threatened by loss and degradation of its habitat through human and human-induced activities. Of the 193,800 acres of tidal marsh that bordered San Francisco Bay in 1850, only about 30,000 remain. Parts of the East Bay shoreline are eroding. About 600 acres of former salt marsh along Coyote Creek, Alviso Slough, and Guadalupe Slough have been converted to fresh- and brackish-water vegetation due to freshwater discharge from South Bay wastewater facilities. This area may no longer support the salt-marsh harvest mouse. Adverse impacts to harvest mouse habitat have also resulted from filling of marshes to allow development, invasion of non-native cordgrass and other non-native species, and pollution from urban run-off, industrial discharges, and sewage effluent. The salt-marsh harvest mouse is likely subject to predation by the non-native red fox and non-native feral cat.

The USFWS is preparing a recovery plan for tidal-marsh species in the San Francisco Bay, including the salt-marsh harvest mouse. Determining the distribution and abundance of the mouse is one of the management goals of the San Francisco Estuary Wetlands Regional Monitoring Program (WRMP) Plan, the first version of which was released in June 2002. The mission of the WRMP, which is a product of the San Francisco Estuary Institute and wetland managers representing a variety of agencies including the DFG, "is to provide the scientific understanding necessary to protect, create, restore, and enhance wetlands of the San Francisco Bay Region, through objective

and cost-effective monitoring, research, and communication." Although the initial focus of the WRMP is on the tidal bay lands of the San Francisco estuary, the geographic scope of the WRMP is the entire estuary plus the watersheds that drain to the estuary within the nine-county San Francisco Bay Area.

At the end of 2002, the DFG considered the population trend and status for the salt-marsh harvest mouse to be *Unknown*.

Amargosa vole *Microtus californicus scirpensis*

State:	Endangered	1980
Federal:	Endangered	1984

General Habitat:

Habitat for the Amargosa vole consists of a discontinuous, narrow band of small, permanent fresh-water marshes along the Amargosa River of Inyo County. Bulrush is the dominant overstory species. Associated wetland species include cattail, saltgrass, and willow. The vole may occur downstream in adjacent San Bernardino County. The flooding of potential or inhabited vole habitat during late summer thunder storms and extended periods of winter rainfall probably allow permanent vole occupation only in marshes on the margins of the river's floodplain.

Description:

This small mammal is pallid, neutral gray above, smoky gray below, has a tail which is brown above and grayish below, and has feet of brownish gray. The comparatively short tail, small rounded ears, short legs, and compact, almost-cylindrical body shape distinguish voles from other mouse-like rodents. It differs from most other subspecies of California vole by its brighter coloration. As with other voles in the genus *Microtus*, the Amargosa vole probably is active year round.

Status:

The Amargosa vole is threatened by loss and degradation of its habitat through human and human-induced activities. Adverse impacts to vole habitat include groundwater pumping and water diversion, OHV use, cattle grazing, invasion by tamarisk and other non-native plants, and severe or prolonged flooding. Construction of the Tidewater-Tonopah Railroad and the Old Spanish Trail in the early 1900s, and development of springs in Shoshone and Tecopa, are believed to have fragmented or eliminated habitat that existed at that time. The vole is also subject to predation by the domestic cat from nearby human-occupied areas. The alien house mouse, found in marshes inhabited by this vole, may compete with the vole for food.

The USFWS prepared a Recovery Plan for this species in 1997. The Recovery Plan indicated that protection of extant wetland habitat and the water sources need to perpetuate these wetlands are critical to the survival and

recovery of the Amargosa vole. Delisting criteria and species-specific management options were not proposed due to the lack of detailed biological information for the species.

An analysis of effect of habitat fragmentation and genetics of the Amargosa vole revealed a significant level of differentiation between populations from different marshes. Because the marshes occupied by the Amargosa vole are fragmented within the surrounding desert habitat, dispersal by the voles, and consequently genetic exchange between populations, is limited. The data obtained in this study suggested a relatively recent divergence of the Amargosa vole from closely related species, and that is is persisting along an independently evolving lineage. Such data can be used to guide conservation activities by identifying individual marshes that are critical to preserving the genetic diversity of the species.

The vole is a featured species in the planning effort for the Northern and Eastern Mojave Desert Management Plan developed by the BLM, with considerable contribution by the USFWS and NPS. The BLM's July 2002 proposed plan included the elements of the Recovery Plan, including preservation and management of its remaining habitat. The final plan was approved by the BLM in December 2002, as an amendment to the California Desert Conservation Plan of 1980. Although the planning team had considered an alternative plan that would have emphasized managing lands for recovery of the vole, desert tortoise, and other species, the team recommended a plan allowing less land devoted to such recovery. For the Amargosa vole, the final plan maintains the emphasis of the alternative in protecting the watershed of the Amargosa River. Both versions of the plan propose establishing an Amargosa River Area of Critical Environmental Concern (ACEC). The final plan identifies five areas along the river for potential implementation of a conservation strategy for the vole. Two of the areas are Areas of Critical Ecological Concern: the Grimshaw Lake Natural Area and the Amargosa Canyon Natural Area. The final plan proposes identifying potential segments of the Amargosa River for addition to the National Wild and Scenic River system. The BLM anticipates purchasing approximately 2,600 acres of privately-held land containing currently-suitable and/or potentially-restorable habitat for the vole.

The DFG considers the population trend and status for the Amargosa vole to be *Unknown*.

Sierra Nevada red fox

Vulpes vulpes necator

State: Threatened 1980
Federal: None

General Habitat:

The Sierra Nevada red fox is known to inhabit types of vegetation similar to those used by the marten and wolverine. 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 southern Cascade Range in northern California, southeastward to the northern Sierra Nevada, and then south along the Sierra Nevada crest to Tulare County. Preferred habitat for the Sierra Nevada red fox appears to be red fir and lodgepole pine forests in the sub-alpine, and in the alpine of the Sierra Nevada.

Description:

The Sierra Nevada red fox, California's only indigenous subspecies, is one of 10 recognized North American subspecies of *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.

Status:

The Sierra Nevada red fox inhabits remote areas of the State where chance encounters with humans are uncommon. It occurs at low densities throughout Sierra Nevada and Cascade Range of California. Threats to the Sierra Nevada red fox are unknown.

The existence of the Sierra Nevada red fox in the Lassen Peak region has provided an opportunity to conduct research to assist in the recovery of this threatened species and to increase our information base on the ecology of the subspecies. Fox populations have been confirmed in two proposed wilderness areas: Wild Cattle Mountain on the southern boundary of Lassen Volcanic National Park and in Heart Lake on the southwestern boundary of the park below Brokeoff Mountain.

Since 1997, the University of California at Berkeley, Lassen Volcanic National Park, Lassen National Forest, and the DFG has been conducting research on the Sierra Nevada red fox in Lassen Volcanic National Park. Research has included home range size and composition, habitat use for foraging and reproduction, seasonal movements between federal and private lands, diet, local density and spatial interactions with other sympatric carnivores

such as coyotes (*Canis latrans*) and bobcats (*Lynx rufus*). Pilot studies were conducted in the summers of 1998 and 1999 and full-time research commenced in March 2000. In March 2000, researchers began a 30-month investigation of the basic ecology of the Sierra Nevada red fox in the Lassen Peak region. Radio-collared animals were tracked using ground and aerial telemetry, and non-collared animals were detected by systematic photostation surveys. Of particular interest were data on seasonal and elevational movements of red foxes and relationship to prey availability and the presence of other carnivore species in the Park.

As of July 2001, five red foxes (one male and four females) had been radio-collared and tracked by telemetry. Summer home ranges, primarily between June and October, averaged 2300 acres and had little overlap, suggesting territoriality. In winter, the foxes moved up to nine miles southward to lower elevations, returning to higher elevations once spring returned. The locations and characteristics of red fox rest sites and dens were recorded, and scats were collected for diet analysis. Photostations detected red foxes most often between 2100 and 0500 hrs.

The ongoing research is a spin-off of a study of the wolverine (*Gulo gulo*), initiated in 1990, using remote, automatic cameras for the first time in a large scale field investigation of a furbearer. That earlier study incidentally yielded the first documented photographs of the Sierra Nevada red fox in the Lassen Park area. Since then, additional remote-camera photographs of Sierra Nevada red foxes have been taken at that location in conjunction with the ongoing research of the subspecies. The techniques used in the wolverine study (i.e., baited stations with remote cameras) have shown promise for application to the study of several other carnivores including the Sierra Nevada red fox. Genetic samples taken from red foxes captured during this study are currently under analysis.

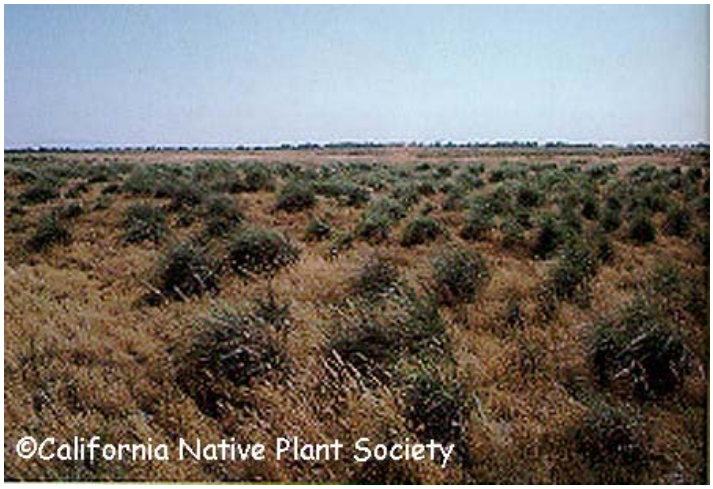
The current status of the Sierra Nevada red fox is unknown.

San Joaquin kit fox *Vulpes macrotis mutica*

State:	Threatened	1971
Federal:	Endangered	1967

General Habitat:

Kit foxes occur in the remaining native valley and foothill grasslands and chenopod scrub communities of the valley floor and surrounding foothills from southern Kern County north to Los Baños, Merced County. In addition, smaller, less dense populations are thought to exist further north and in the narrow corridor between Interstate 5 and the Interior Coast Range from Los Baños to Alameda and Contra Costa Counties. Portions of Monterey, Santa Clara, San Benito, San Luis Obispo, and Santa Barbara counties are also included in the range of the San Joaquin kit fox.



Description:

The kit fox *(Vulpes macrotis)* is the smallest canid species 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 to 12 inches at the shoulder. These slender-built mammals are characterized by relatively long legs and large, conspicuous ears. Adult males weigh about five pounds, and adult females weigh about 4.6 pounds.

Status:

Currently, kit foxes occur in the remaining native valley and foothill grasslands and chenopod scrub communities of the valley floor and surrounding foothills from southern Kern County north to Los Baños, Merced County. Distribution is spotty within this broad range. In addition, smaller, less dense populations are thought to exist further north and in the narrow corridor between Interstate 5 and the Interior Coast Range from Los Baños to Contra Costa County. Portions of Monterey, Santa Clara, San Benito, San Luis Obispo, 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.

Loss of native habitat to various kinds of agriculture (e.g., cotton fields and vineyards), and residential and commercial developments remain the principal threats to this species. Several research projects funded by the DFG and studies by cooperators, begun in the mid-1990s and continuing to the present, are yielding more information about the habitat needs and biology of the kit fox. The recovery actions recommended for the kit fox are contained in the USFWS *Recovery Plan for Upland Species of the San Joaquin Valley, California*, which was completed in 1998. The kit fox is described as a keystone species (i.e., a species essential to the health of the natural community), and efforts to save habitat for this species will result in benefits to other endangered plant and animal populations.

Long-term ecological studies at the Elk Hills Naval Petroleum Reserve in western Kern County terminated several years ago following the sale of the Reserve to private interests in the late 1990's. However, the landmark research that was conducted over a period of more than a decade is currently being published in a number of journal articles and will make valuable contributions to our understanding of the biology, ecology, and management of the species and its recovery. Considerable research activity has been initiated or continued for the kit fox in recent years. One study, started in 1997, examines the special case of the kit fox in the urban environment. Kit foxes have been captured, radio-collared and their movements monitored within the city of Bakersfield, Kern County. This field phases of this investigation of the demography and ecology of San Joaquin kit foxes in urban environments will continue through June 2004, and then data analyses and report and manuscript preparation will be conducted. Preliminary results have indicated that urban kit fox populations exhibit favorable demographic patterns, and that conservation of these populations could contribute to overall recovery efforts. The DFG has contributed funding, derived from federal sources, and support for this project.

Other studies on the San Joaquin kit fox include:

- An investigation of the effects of two-lane highways on San Joaquin kit foxes was initiated in 2001 and data collection will continue through June 2004. Results from this investigation will be used to develop strategies to mitigate road effects on kit foxes. Kit foxes are impacted by highways through direct road killing mortalities as well as indirectly through habitat loss and fragmentation effects.

- A study of the effects of livestock grazing and agricultural burning, as well as other farmland and ranchland activities on competitive interactions between San Joaquin kit foxes and coyotes was initiated in January 2003 and data collection will continue through June 2004. Results from this investigation will assist in developing habitat management strategies that may benefit kit foxes on these private lands.

- Research on the use of artificial den structures by San Joaquin kit foxes was initiated in May 2001 and data collection will continue through June 2004. Results from this investigation will be used to develop strategies to mitigate den loss and also to enhance den availability in areas where natural dens are a limiting factor for kit foxes. Escape dens help kit foxes avoid predation by coyotes and may provide secure sites for pup rearing.

- An investigation of strategies to facilitate survival of kit foxes crossing agricultural lands was initiated in 2001. This project is on-going, and represents a new approach to kit fox conservation in that it involves the establishment of a Safe Harbor Agreement with Paramount Farms. The DFG has contributed funding, derived from federal sources, for this effort.

- An investigation was completed in January 2003 on the efficacy of using search dogs and fecal DNA analyses as a non-invasive strategy for collecting demographic and ecological data on San Joaquin kit foxes. A doctoral dissertation and several manuscripts are being prepared that report the results of this effort. The technique proved to be useful where specially trained searchers were employed. Research confirmed Numerous locations throughout the historic range of San Joaquin kit foxes confirmed that

populations still exist in western Kern County and the Carrizo Plain National Monument and along the west side of the San Joaquin Valley north to Santa Nella. Despite the extensive search effort, no kit fox sign was found along the west side from Santa Nella to Contra Costa County, or in Valley floor locations north of Kern County. One kit fox was observed in eastern Merced County.

Various other studies have been conducted with San Joaquin kit foxes to examine social ecology and range-wide genetic exchange, kit fox-red fox interactions, and kit fox use of agricultural lands. Several manuscripts for scientific journal publications and technical reports for these past and ongoing studies have been produced.

Protection for the kit fox is addressed in several conservation plans. Some examples of these plans include the Kern County Valley Floor and Waste Facilities HCPs, Kern Water Bank HCP, Metropolitan Bakersfield HCP, and the PG&E San Joaquin Valley HCP. Despite these efforts, and other conservation efforts, San Joaquin kit foxes continue to decline throughout their range and are close to extinction in the northern most part of the range in Contra Costa and Alameda counties.

The status in 2003 of the San Joaquin kit fox: *Declining*.

Island fox *Urocyon littoralis*

State	Threatened	1971
Federal	Endangered	2004

General Habitat:

The island fox occurs on the six largest California Channel Islands, as follows: San Miguel, Santa Rosa, Santa Cruz, Santa Catalina, San Nicolas, and San Clemente. The fox appears to use most habitat types found on these islands.

Description:

This small fox has pepper-and-salt upper pelage with underfur that is rufous or buffy in color, with a dorsal median black stripe ending in the black tip of the tail. Faces are marked by distinctive black, white, and rufous-colored patterns. At 12 to 13 inches in height and 3 to 4 pounds, the island fox is about the size of a housecat. The island fox feed largely on insects, mice, and wild-growing fruits. They can live as long as 10 years, generally mate for life and give birth to litters of 2-5 pups in mid-April.

Status:

The island fox is endemic to the Channel Islands and is distributed as six genetically distinct subspecies, one on each of the six largest Channel Islands: San Miguel, Santa Rosa, Santa Cruz, San Nicolas, Santa Catalina, and San Clemente. On March 5, 2004 the Channel Island Fox of Santa Cruz, Santa Rosa, San Miguel, and Santa Catalina Islands were federally listed as endangered species. Fox populations on at least four of the six islands have experienced recent catastrophic declines – as much as 95% over 1994 population levels. The total island fox population is currently estimated at about 1300 individuals. This precipitous decline resulted in the island fox being listed as critically endangered by the International Union for Conservation of Nature (IUCN). Many experts fear the island fox could become extinct without implementation of recovery activities and intensive management. The NPS released a recovery strategy for foxes on the northern Channel Islands in 2003. The island fox is threatened primarily by golden eagle predation. Loss and degradation of its habitat, a result of overgrazing by non-native animals, disease, and low natural recruitment also threaten this species.

Golden eagle predation is severely impacting the island fox, which has no native predator. Golden eagles first arrived on Santa Cruz Island, and then spread to San Miguel and Santa Rosa Islands, in the 1990s. The first golden eagle nest was observed in 1999. Prior to that time, golden eagles were only occasional visitors to the Channel Islands. Feral pigs, introduced by early settlers on the islands in the 1850s, provide abundant year-round prey for the golden eagles, which now have established resident populations. The eagles also use the island fox as a prey species. The pigs adversely altered the native vegetation on the Channel Islands and restructured the food web. The pigs, and other introduced non-native animals, have fragmented native vegetation and converted stands of coastal sage scrub, chaparral, and oak woodlands to non-native annual grassland. The loss of plant species limits the native plant food sources available to the fox and reduces the numbers and availability of small animal prey species. Loss of vegetation structure has eliminated cover for the island fox, increasing its vulnerability to predation.

Island fox populations have declined dramatically as a result of predation by golden eagle. Research has provided correlation between the establishment of eagles on the islands and the decline of the island fox. On Santa Cruz island, the population of 1500 - 2000 individuals in 1993 dropped to fewer than 100 individuals in the wild by 2003. The cause of death in 21 of 29 foxes was due to golden eagle predation. On San Miguel Island, the first recorded fox mortality attributed to eagle predation was in 1995, the year in which the first golden eagle was sighted on the island. The San Miguel Island fox population showed dramatic decline, similar to that on Santa Cruz Island over the same time period, dropping from about 450 individuals to 39. A radiotelemetry study during 1998-1999 confirmed that golden eagle predation was the major cause of fox mortality on San Miguel Island. All but one of the 39 remaining foxes is now in captivity. Of the ~1700 foxes reported on Santa Rosa Island in 1994, 56 remain. All 56 individuals are in captivity. Similar trends are seen on Santa Catalina Island (~1300 in 1994; 220 in 2003). A monitoring study of the San Nicholas Island population was begun in the summer of 2000. There are an estimated 734 animals in the wild. In an attempt to safeguard remaining foxes and augment natural reproduction, the entire wild populations of San Miguel and Santa Rosa Islands and a portion of the populations of Santa Catalina and Santa Cruz islands were placed into captive breeding programs. Captive-breeding began on San Miguel Island in 1999, on Santa Rosa Island in 2000, and on Santa Cruz Island in 2002.

Possibly related to the influx of golden eagles is the decline and elimination of the bald eagle on the Channel Islands. The bald eagle occurred historically on the islands but disappeared by the 1960s as a result of egg-thinning caused by eating prey contaminated with DDT. Bald eagles nested on the perimeters of the islands near to their marine prey base. The bald eagle is highly territorial, and golden eagles were not resident on the Channel Islands when bald eagles were there in large numbers. Once the bald eagles were eliminated, a niche that could be occupied by another large raptor was available. NPS is reintroducing the bald eagle to the islands in conjunction with capturing the remaining golden eagles on the Channel Islands. The Santa Cruz Predatory Bird Group is working the USFWS, NPS, and TNC to remove golden eagles from the Santa Cruz, Santa Rosa, and San Miguel Islands. They have removed 32 eagles and relocated them into suitable habitat in northern California. None of these eagles has returned to the Channel Islands according to telemetry data obtained from the released eagles. NPS estimates that six golden eagles, two pair and two lone eagles, remain on Santa Cruz Island. There were active nests on Santa Cruz and Santa Rosa Islands in 2003. Golden eagle predation on the island fox continues on Santa Cruz Island. The most recent eagle predation event occurred in November 2003.

The interactions between the golden eagle, bald eagle, feral pig, and island fox exemplify one of many challenges facing conservation biologists: how to protect a critically endangered species being impacted by another protected species. The proposal to removal golden eagles from the Channel Islands is not without controversy although capturing the remaining eagles is critical to the survival of the island foxes. Removal of feral pigs is part of a conservation plan prepared by NPS for Santa Cruz Island. The plan is based on the eradication of the island pigs with the goal of eliminating the eagles' prey base. Removal of the eagles must be concurrent with eradication of the feral pigs so that the eagles do not concentrate prey activities on the island fox.

Populations of the fox on the southern three islands have faced other threats. The San Clemente Island population (~1000 animals in 1994; 500-875 in 2003) has been impacted by a history of severe overgrazing, use of the island as a Navy bombing range, a widespread feral cat problem, and predator management activities to protect the island loggerhead shrike, another federally-listed species. In an attempt to offset fox predation of the shrikes, the Navy implemented control activities for non-native predators (black rat and feral cat), as well as for the island fox. The Navy euthanized 13 foxes and shipped 15 foxes off the island to zoos. Euthanasia ceased in 1999. Subsequently, foxes were captured and held in captivity while fledgling shrikes were vulnerable to predation. Vehicle collisions are another source of fox mortality on San Clemente Island. On San Nicolas Island, vehicle collisions are the largest documented mortality source, with an average of 13 fox carcasses attributed to vehicle collisions recovered each year. The population on Santa Catalina Island was decimated by an outbreak of canine distemper in 1999-2000. The disease was likely introduced by an unvaccinated pet dog brought to the island. The Catalina Island Conservancy, with assistance from the Institute for Wildlife Studies, began a field vaccination program for wild foxes and a captive breeding program. The field vaccination program is part of a multifaceted

recovery program initiated in 2000. According to Institute for Wildlife Studies, the wild population of foxes on Santa Catalina Island is estimated at about 220 adults.

Morphological and genetic variation within and among populations of island foxes has been studied by a number of researchers. The levels of variability found support differentiation of the island fox into subspecies. The genetic data shows that inter-island diversity is greater than intra-island diversity. Genetic evidence suggests that the island foxes descended from the gray fox on the California mainland during one colonization event that occurred approximately 10,000-16,000 years before present. The genetic studies have also revealed that the populations on San Miguel and San Nicholas Islands have the lowest genetic variability of the island fox populations. This lack of variability could be attributed either to extensive inbreeding or a genetic bottleneck resulting from low population densities. A genetic bottleneck refers to a reduced pool of genetic material usually due to a catastrophic event that reduces the size of the original population. The foxes on San Nicholas Islands have essentially no variability and their population consists largely of adult animals. Low levels of reproduction observed for the foxes on San Nicholas Island and in captivity may be due to such a bottleneck. Genetically, the foxes on San Miguel are most closely related to foxes on Santa Rosa Island. Populations on these islands also occur at such low population numbers that they are highly vulnerable to random extinction events. NPS has funded genetic studies on all foxes in the captive breeding program. The results are being used to ensure that interbreeding between closely-related animals does not occur and to maximize the limited diversity that does occur. Introduction of foxes to the captive breeding program from another island may be necessary to increase the genetic diversity of the San Nicholas and Santa Rosa Island foxes.

In 2001, DFG received funds to initiate a candidate conservation agreement for island fox on Santa Cruz Island. This effort will include implementation of many of the actions included in the NPS recovery strategy. In 2002, the DFG used federal funds to help eliminate feral pigs from Santa Cruz Island. Six fenced enclosures will be built by TNC. Each enclosure will constitute a discrete management unit of about 12,000 acres. The DFG will manage public hunts within each enclosure to eliminate pigs.
DFG has participated in the Island Fox Conservation Working Group (IFCWG). The IFCWG is a team of experts convened by the NPS in 1999 and 2000 to recommend appropriate recovery actions for the island fox, The group is a loose affiliation of representatives of public agencies, landowners, conservancies, zoological institutions, non-profits, and academia concerned about conservation efforts for the island fox. Its initial purpose was to evaluate the status of island foxes on park lands and to make findings regarding appropriate recovery actions. Their focus later broadened to include all six subspecies. Individual working groups exchanged information on a variety of topics including captive breeding, veterinary care, and management of wild populations. They contributed to development of a recovery plan for the fox on the three northern islands.

The NPS released the recovery strategy for review in August 2003. Recovery strategy objectives are to remove mortality factors for all populations, augment fox populations through captive breeding, establish monitoring and management programs to protect the fox populations, and implement habitat restoration activities. The overall goal of the recovery strategy is to minimize the threat of extinction for the three subspecies of foxes under NPS jurisdiction. This recovery strategy can also be applied to the other islands. A Channel Island Fox Integrated Recovery Implementation Team was formed in 2004 and is currently working on developing a coordinated recovery implementation strategy. In the absence of active, intensive management based on the best available science, the island fox is in danger of extinction.

Guadalupe fur seal

Arctocephalus townsendi

State	Threatened	1971
	Fully Protected	
Federal	Threatened	1985

General Habitat:

The Guadalupe fur seal is a pelagic species most of the year, occurring in Pacific Ocean waters as far south as the Mexico/Guatemala border, and as far north as the Point Reyes National Seashore in California. When ashore, this seal occupies rocky caves and crevices and sandy beaches.

Description:

Guadalupe fur seals are medium-sized eared seals (Family Otariidae). They have dense gray-brown underfur covered with course guard hairs that tend to bleach out on the head and shoulders of adult males. Their appearance is very similar to the northern fur seal (*Callorhinus ursinus*) but the Guadalupe fur seal is distinguished by a pointed muzzle. Males reach six feet in length and 350 pounds in weight, while females reach five feet in length and 100 pounds in weight. The maximum life span is estimated to be 17 to 20 years.

Status:

Guadalupe fur seals were thought to be extinct in the late 1800's and early 1900's but in 1928, two fur seals were sighted at Isle de Guadalupe off the coast of Mexico. The major cause of the Guadalupe fur seal's decline was commercial hunting in the late 1700's and early 1800's. The species was exterminated in southern California waters by 1825. Commercial sealing continued in Mexican waters through 1894. The Guadalupe Fur Seal is included in the *IUCN Red List of Threatened Animals* as Vulnerable. Potential threats to the seal include injury or mortality due to entanglement in gill nets. Although human-caused mortalities to the Guadalupe fur seal have not been reported in California waters since specific records were kept starting in 1983, similar information is not available for Mexican waters. Juvenile female Guadalupe fur seals have been found stranded in central and northern California with net abrasions around the neck, fish hooks and monofilament line, and polyfilament string.

Guadalupe fur seals breed on Isla de Guadalupe and Isla Benito del Este off the coast of Baja California, Mexico. Mating occurs approximately one week after pups are born; females bear a sole pup. In 1997 one Guadalupe fur seal was born on San Miguel Island off the California coast. The population is considered to be a single stock because all are recent descendants from one breeding colony at Isla Guadalupe, Mexico. The species has undergone

an extreme genetic bottleneck; this reduction in genetic diversity may influence further population expansion. Male seals are occasionally observed on rocky beaches of the southern Channel Islands. Little information exists on the diet or foraging behavior of this subspecies. However, it is believed that Guadalupe fur seals feed in deep waters on species of krill, squid, and small, schooling fish.

The most recent population estimate was made in 1993, and the estimate was 7,408 fur seals. Researchers estimate that the population is growing at a rate of approximately 14 percent. Mexican law fully protects the species and Guadalupe Island was declared a pinniped sanctuary by the Mexican government in 1975. The IUCN/SSC Seal Specialist Group recommended research to determine numbers and population limits for the Guadalupe Fur Seal, allowing an assessment of population status and development of conservation measures. No information is available for gillnet fisheries or related mortalities in Mexican waters.

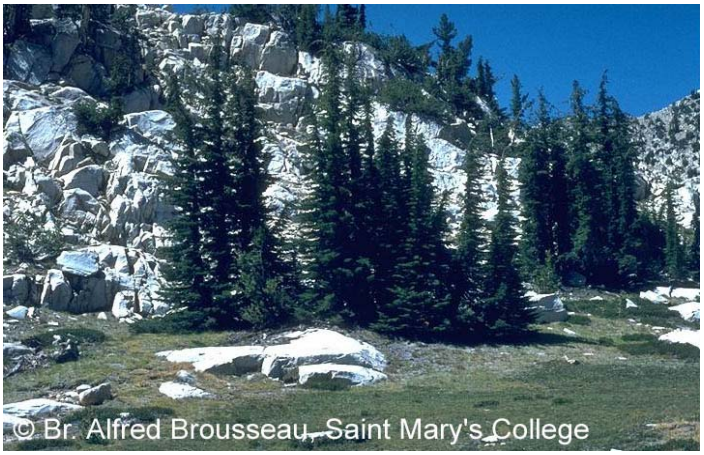
The Status in 1997-1999 of the Guadalupe fur seal: *Increasing to Stable*

Wolverine *Gulo gulo*

State: Threatened 1971
Fully Protected
Federal: None

General Habitat:

The wolverine is reported from a series of habitat types within an elevation range of 1,600 feet to over 14,000 feet. Based on the number of sightings in California, habitat generally consists of open terrain near or above timberline.



Description:

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 to 60 pounds and measure 35 to 45 inches long, including a six to 10 inch tail. They stand about 14 to 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 to 35 percent larger than females. 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.

Status:

Wolverines are often regarded as animals of high-elevation habitats; however, sightings collected by the DFG over the past several decades indicate that the species inhabits a variety of habitat types within an elevation range between 1,600 feet and 14,200 feet. The mean elevation of over 150 sightings in California is about 8,000 feet. Habitat generally consists of open terrain at or above timberline.

The present and historical ranges of the species are rather similar. The historic range encompassed an area from Mount Shasta in the southern Cascade Range south to Monache Meadows in the Sierra Nevada of Tulare County. Portions of the North Coast Range are also included in the historical range. No population density data are available on the wolverine in the State due to difficulties involved in studying such an elusive and far-ranging species. An estimate of 50 to 100 wolverines was made over 20 years ago based on available habitat and home range information from studies in other parts of North America.

Specific threats to the wolverine are unknown. 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.

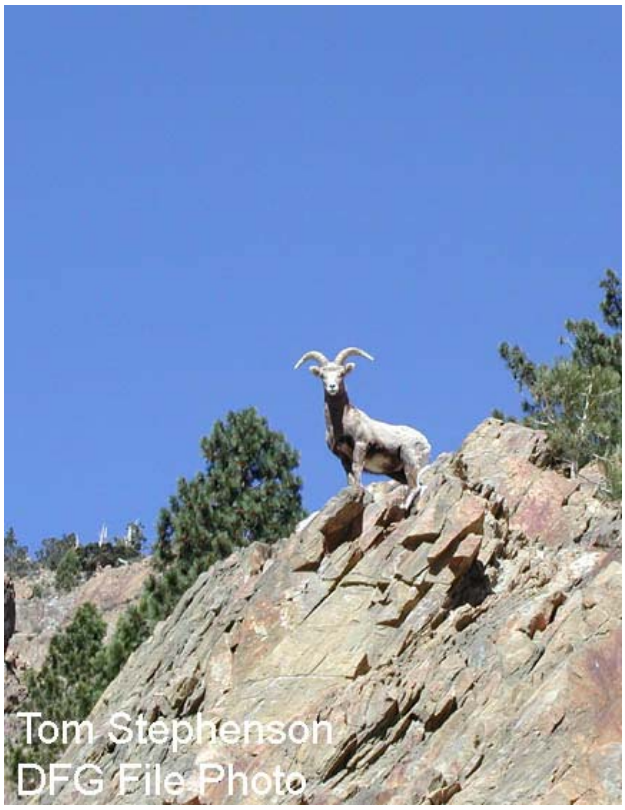
Individual research programs, being carried out primarily by USFS and university biologists, continue to place remote camera stations out each winter in an attempt to photograph wolverines. The technique works well with a variety of species, including wolverines in other states, and has been adapted to a variety of research objectives since the DFG's initial attempts with wolverines. Although none have been recorded yet, the primary goal of the ongoing study remains to document the occurrence of wolverines in selected habitats within the suspected range by the use of remote sensor cameras associated with a carrion bait station. An ongoing study, begun in 1997 in Lassen Volcanic National Park, to locate and capture Sierra Nevada red foxes for radio telemetry may offer a further opportunity to incidentally photograph wolverines.

The status in 2003 of the wolverine: *Unknown*.

Sierra Nevada bighorn sheep

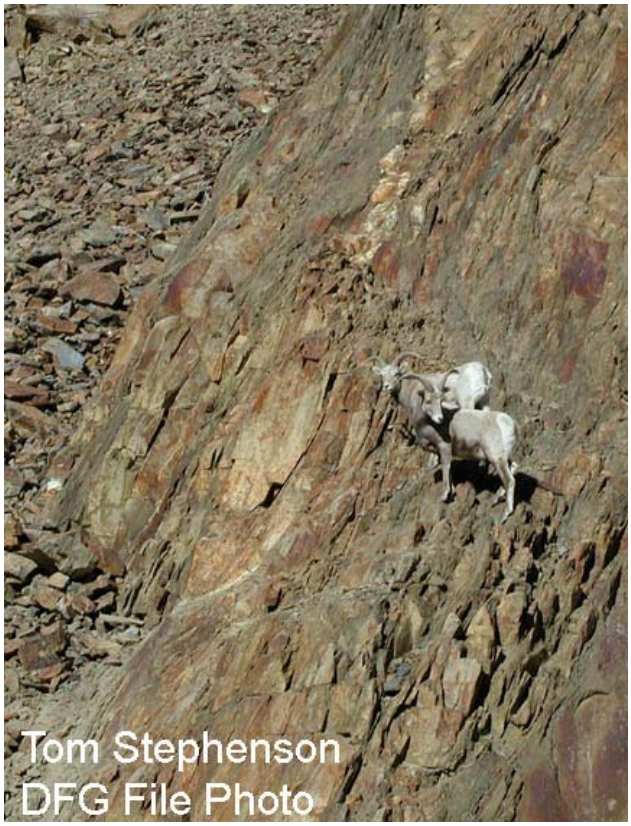
***Ovis canadensis sierrae* (*O. canadensis californiana*)**

State	Threatened	1971
	Endangered	1999
	Fully Protected	
Federal	Endangered	2000



General Habitat:

The Sierra Nevada bighorn sheep is found on the eastern slopes of Sierra Nevada from alpine habitat down to Great Basin scrub. Sierra Nevada bighorn sheep occur in five distinct geographic areas along the Sierra Nevada that are defined, from north to south, as: Lee Vining Canyon, Mono County (reintroduced); Wheeler Ridge, Inyo County (reintroduced); Mount Baxter, Inyo County (native); Mount Williamson, Inyo County (native); and, Mount Langley, Inyo County (reintroduced). Basic habitat requirements include open, rocky, and precipitous slopes that are important to sheep for detecting and evading predators. These bighorn sheep occur as high as 14,000 feet in the summer and typically descend to lower elevations in the winter, depending on severity of storms.



Description:

The Sierra Nevada bighorn sheep is one of two subspecies of mountain sheep found in California, and one of four found in North America. Both males and females have horns. The horns of males are massive and may grow to full curl when viewed from the side, and horns of females are 10 to 12 inches long and rather goat-like in appearance. Adult males may be 40 inches tall at the shoulder and weigh 200 pounds. Females weigh approximately 140 pounds. Formerly called *Ovis canadensis californiana*, the accepted name for the species is now *O. canadensis sierrae.*

Status:

Action was taken in 1999 by the California Fish and Game Commission to list Sierra Nevada bighorn sheep (SNBS) as endangered under the State endangered species act. In addition, it was listed as endangered under the Federal endangered species act the same year. Listing under the Federal act became permanent in 2000. Those actions were taken in response to a significant decline in the population, from an estimated 310 individuals in 1985

to an estimated 100 individuals in 1999. Causes of the decline remain uncertain, but may have included predation, changes in habitat use, severe winters, and accidental deaths.

The Sierra Nevada bighorn sheep is one of the most endangered subspecies of large mammals in North America. Because of this, and concomitant high levels of public concern, the Department of Fish and Game was provided funding through a member's legislative request to implement a recovery program for these sheep. That funding allowed the Department to establish a long-term, comprehensive population recovery program. Elements of the recovery program include intensive population monitoring, reducing mortality, reestablishing additional populations in historical range of the species, and preparing for, and potentially implementing, captive breeding as a means to ensure the availability of translocation stock to increase populations and geographic distribution. Funding for the recovery program has since become part of the Department's budget base. Continued monitoring of all bighorn sheep populations in the Sierra Nevada remains a high priority, and recovery will be dependent upon continued availability of monies for this important conservation effort. Since the recovery effort was initiated, the number of Sierra Nevada bighorn sheep has increased to an estimated 300 individuals.

The status in 2003 of the Sierra Nevada bighorn sheep: *Increasing*.

Peninsular bighorn sheep

Ovis canadensis cremnobates

State	Threatened	1971
Federal	Endangered	1998

General Habitat:

Peninsular bighorn sheep inhabit dry, rocky, low-elevation desert slopes, canyons, and washes from the San Jacinto and Santa Rosa Mountains near Palm Springs, California south into Baja California, Mexico. Mountains in this geographic area collectively are referred to as the Peninsular Ranges. Bighorn sheep in the Peninsular Ranges seldom occur above 4,000 feet. Proximity to sources of standing water such as springs, creeks, and oases are also important elements of their habitat.

Description:

Males and females both have horns; those of males are curled but those of females are slightly curved and are goat-like in appearance. Adult males can weigh in excess of 200 pounds, and females weigh approximately 125 pounds.

Status:

Bighorn sheep inhabiting the Peninsular Ranges were recognized originally as a distinct subspecies (*Ovis canadensis cremnobates*), but recently have been assigned to *O. c. nelsoni*. State-listed threatened status remains for the bighorn sheep occupying the Peninsular Ranges, and sheep in that area were listed in 1998 as an endangered population segment under the Federal Endangered Species Act. In listing the Peninsular bighorn sheep as endangered, the USFWS determined that the sheep are in danger of extinction throughout a significant portion of their range due to disease, insufficient lamb recruitment, habitat loss, habitat degradation and fragmentation by urban and commercial development, and predation coinciding with low population numbers. The greater bighorn sheep population in the Peninsular Ranges is considered a metapopulation; each ewe group, or subpopulation, is essential for the survival and recovery of the overall population.

Loss of winter forage sites and lambing sites, off-highway vehicle use within the range of the species, impacts to water sources, overgrazing by cattle and domestic sheep, exposure to diseases of domestic livestock, and the spread of rangeland weeds have adversely affected these animals. Habitat fragmentation, often a result of human encroachment into native habitat, restricts the sheep to small or isolated areas, limits movement of the sheep between subpopulations (referred to as ewe groups), and results in genetic isolation. Since 1970, metapopulations of bighorn sheep have experienced additional fragmentation as a result of the expansion of the interstate highway system in southeastern California. Some reestablishment of populations has occurred since then via translocation. In the 1990's, heavy mountain lion predation in conjunction with lowered lamb recruitment rates suppressed bighorn populations. Although a healthy bighorn population can withstand predation, a population debilitated by low survivorship and disease is often not able to survive additional threats.

The impacts of human encroachment into bighorn sheep habitat have been well documented in the preparation of the Coachella Valley MSHCP. Hiking trails located in bighorn habitat and vehicular use in proximity to the sheep have resulted in sheep avoidance of areas normally used. When golf courses and residential developments have been located within Peninsular bighorn sheep habitat, some ewe groups have become habituated to foraging in urban areas. Foraging around dwellings is especially problematic during the warm season when native food plants dry out and become less palatable. At least five bighorn sheep apparently died after eating toxic ornamental plants in the Coachella Valley (oleander has been implicated), and intestinal nematode parasites have been detected in bighorn sheep that graze regularly on lawns. Bighorn sheep at the urban interface are also threatened by domestic dogs, automobiles, and drowning. For example, a six-year study conducted by the Bighorn Institute, a conservation and research group working with USFWS, BLM, and DFG, showed that urbanization accounted for 34% of the adult bighorn mortalities in the Coachella Valley area. Over a three-month period, law enforcement officers and Bighorn Institute personnel herded groups of bighorn sheep off Highway 111 over 24 times.

The Coachella Valley MSHCP Plan Area supports four of the eight subpopulations, or ewe groups, of the Peninsular bighorn sheep metapopulation. Each ewe group is designated by the name of the area in which they occur: the San Jacinto Mountains group, the northern Santa Rosa Mountains group, the southern Santa Rosa Mountains group, and the Deep Canyon group. These ewe groups form the basis for the four recovery regions in the federal recovery plan. The Plan ensures conservation of habitat and connectivity among the four areas through conservation of 168,350 acres of essential habitat (97%). Three conservation areas will protect essential habitat for the bighorn sheep: Cabezon Conservation Area, Snow Creek/Windy Point Conservation Area, and Santa Rosa and San Jacinto Mountains Conservation Area. Special measures will be implemented in these areas to ensure protection of bighorn during lambing season and to minimize human impacts on bighorn habitat.

In 1997, a working group was formed to collaborate on a federal recovery plan for bighorn sheep in the Peninsular Ranges. The working group included representatives from the DFG, DPR, BLM, USFWS, USFS, University of California, Agua Caliente Band of Cahuilla Indians, Bighorn Institute, and the Zoological Society of San Diego. Following listing of the peninsular bighorn sheep in 1998, the working group was reorganized as a recovery team. In 2000, the *Recovery Plan for Bighorn Sheep in the Peninsular Ranges* was completed, and currently is being implemented. The primary charge of the recovery team is to advise the USFWS with respect to actions that will conserve and maintain bighorn sheep in viable numbers through the application of scientifically based management decisions.

Critically important to the long term survival of bighorn sheep in the Peninsular Ranges, and in California in general, is the maintenance of "connectivity" between areas occupied by subpopulations, which facilitates emigration and immigration and, thereby, gene flow and opportunities to colonize vacant habitat. In 1994, the number of bighorn sheep in the Peninsular Ranges was estimated at 360 adults, distributed among eight distinct population segments. Subsequent surveys have yielded population estimates that suggest an upward trend in numbers. In 2002, the total number of bighorn sheep occupying the Peninsular Ranges was estimated to be 670. Population assessments from ground monitoring and aerial surveys will continue as part of the recovery effort. Long-term monitoring provides information on the ecology of the sheep and documents habitat use, nutritional levels, disease exposure, nursing rates, survival rates, and causes of death.

In 2001, the Federal Cooperative Endangered Species Conservation Fund was been used to protect one particular ewe group in the Coachella Valley. These grants are authorized by Section 6 of the Endangered Species Act and enable states to work with private landowners, conservation groups, and other agencies to initiate conservation planning efforts and acquire and protect habitat to support the conservation of threatened and endangered species. The Northern Santa Rosa ewe group was most impacted by the urban environment where its home range corresponds to the boundaries of the City of Rancho Mirage. This ewe group declined considerably from its historic levels in the 1970's. Given high levels of mortality, it was unlikely that the Northern Santa Rosa ewe group would survive without intervention. The City of Rancho Mirage, USFWS, DFG, and the Recovery Team

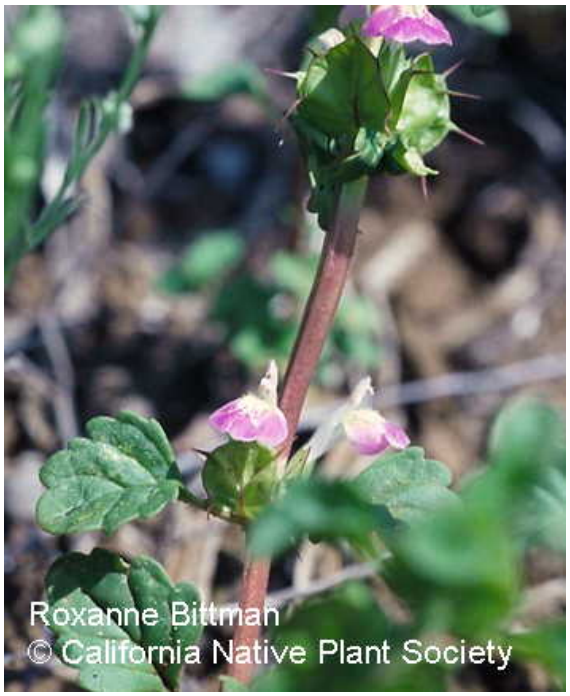
agreed that a barrier fence along the wildland/urban interface would be the solution to the high mortality rates experienced by the Northern Santa Rosa ewe group. Funding was used to acquire a key parcel, thereby facilitating fence construction. Additional acquisitions under this fund are proposed.

The status in 2003 of bighorn sheep in the Peninsular Ranges is increasing.

Species Accounts - Plants

San Diego thorn-mint

Acanthomintha ilicifolia



State: Endangered 1982
Federal: Threatened 1998

General Habitat:

San Diego thorn-mint genus occurs almost exclusively in California and every taxon within the genus is rare. This species is restricted to calcareous marine sediments, clay, or gabbro-derived soils and is associated with coastal sage scrub, chaparral, and native needlegrass grassland. It ranges from San Diego County and Baja California Norte, Mexico.

Description:

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.

Status:

Approximately 30 natural populations of San Diego thorn-mint remain in San Diego County and more than 15 populations are known to have been extirpated. The extirpations are largely the result of urban development along the coastal plain of western San Diego County from Carlsbad south to Otay Mesa. Urban development, unauthorized off-highway vehicle (OHV) activity, and continuing invasion of natural habitat by weedy, non-native annual plants are ongoing threats to this species. For example, researchers have found that tocalote, one of the yellow star thistles, significantly reduces the seed production in San Diego thorn-mint. Habitat protection and active management will be essential to the continued preservation of San Diego thorn-mint.

Though the majority of known populations occur on privately owned lands, scattered populations of San Diego thorn-mint are found on lands owned or managed by public agencies or conservation organizations such as the Cleveland National Forest, The Nature Conservancy's (TNC) McGinty Mountain, City of San Diego's Mission Trails Regional Park, the Manchester Avenue Conservation Area in Encinitas, and on DFG land in Sycamore Canyon. The two largest known occurrences are on National Forest lands on Viejas and Poser Mountains. San Diego thorn-mint is covered in the San Diego Multiple Species Conservation Plan NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating

jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. San Diego thorn-mint is considered to be a narrow endemic species under the MSCP and 85 percent of the major populations will be conserved. Monitoring was conducted under the San Diego County MSCP in 2002. A population of San Diego thorn-mint near the summit of McGinty Mountain was estimated at over 2,250 individuals and a population in Hollenbeck Canyon also supported individuals in the thousands.

The City of San Diego has implemented a monitoring for selected populations of San Diego thorn-mint within its portion of the San Diego Multiple Habitat Conservation Program preserve lands. In 2001, the populations at Mission Trails Regional Park, Peñasquitos Canyon, Black Mountain Ranch, and Sabre Springs were surveyed. Surveyors counted a total of 354 flowering adults and 0 non-flowering adults in the southwest portion of Mission Trails Regional Park. The area in which the thornmint is found at this location is approximately 12,982 square feet in size. Surveyors also counted a total of 508 flowering adults and 63 non-flowering adults within the population at Peñasquitos Canyon; 770 flowering adults and 7 non-flowering adults within the Black Mountain Ranch population; and 2,830 flowering adults and 2 non-flowering adults within the Sabre Springs population.

Results of surveys at Otay Mesa were reported in 2002. Five quadrats were surveyed at this locality where the small thorn-mint populations are in danger of extinction. The majority of suitable habitat at Otay Mesa is dominated by non-native grasses and forbs. Monitoring found that the average number of individual thorn-mint plants was only 18 plants per meter^2. Non-native cover ranged from about 50 percent to over 80 percent cover. The surveyors observed that grazing was an ongoing problem at this site, with cattle coming in from adjacent private property through highly deteriorated fences. This grazing disturbance appears to contribute to the invasion of non-native species into the clay soils that provide habitat for the thorn-mint.

The species is also included in the San Diego Multiple Habitat Conservation Program (MHCP). The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. Over 90 percent of the known locations and major populations will be conserved under the MHCP. Specific guidelines in the MHCP for San Diego thorn-mint include managing all conserved populations to control edge effects; implementing fire management plans to protect conserved populations from frequent or high-intensity fires and fire suppression activities; enhancing declining populations through adaptive management; implementing conservation seed storage; and conducting intensive surveys prior to potential impacts.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 15% of habitat suitable for San Diego thorn-mint burned during the fires. Eleven vernal pool complexes burned in the Cedar Fire and two complexes burned in the Otay Fire. Thirty pools or swales that supported San Diego thorn-mint were impacted. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on Marine Corps Air Station Mirimar, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on San Diego thornmint.

San Diego thorn-mint is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

San Mateo thorn mint *Acanthomintha obovata spp. duttonii*

State: Endangered 1979
Federal: Endangered 1985

General Habitat:

San Mateo thorn mint is restricted to serpentine soils in grassland and chaparral. It occurs on deep, heavy clay lenses on flats and slopes. It is associated with tidy-tips, soap plant, owl's clover, clarkia, and species of needlegrass. Much of its native grassland habitat is now dominated by invasive non-native grasses such as wild oats and Italian ryegrass.

Description:

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.

Status:

Historically, San Mateo thorn mint was known from six populations in the Crystal Springs region of San Mateo County. The only remaining large population, in Edgewood County Park, is a remnant of a more extensive population damaged by motor-vehicle use. Edgewood County Park also contains a small subpopulation. There is an introduced population at Pulgas Ridge. The remaining populations were extirpated by urbanization. The populations occur on land owned by the City and County of San Francisco and managed by SFWD. The small population at Edgewood Park lies directly downhill from a housing development; the resulting changes in drainage patterns and water chemistry threaten this population. Population sizes vary from year to year due to local rainfall and competition from nonnative plants. Projects are being implemented at Edgewood Park to remove competing non-native grasses and weeds to benefit the federally-listed bay checkerspot butterfly could also benefit San Mateo thorn mint. To protect this plant from extinction, natural and introduced populations must be preserved; further reintroduction into suitable habitat should be pursued. Management and recovery actions for the species have been addressed in the 1998 federal *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*.

Marin bent grass

Agrostis blasdalei var. marinensis

State: Rare 1978
Federal: None

General Habitat:

This variety grows on a decomposed granite outcrop at a single location in Marin County. It is very closely related to Blasdale's bent grass (*Agrostis blasdalei* var. *blasdalei*), which is found in northern coastal dunes.

Description:

Marin bent grass, a member of the grass family (Poaceae), has erect stems and slender leaves. Its green flowers occur in narrow spikes.

Status:

Taxonomic classification no longer treats Marin bent grass as a separate species and it is now placed within Blasdale's bent grass. Marin bent grass was described from a single population of approximately a dozens individuals growing near a popular parking area for picnickers; no plants were found during a survey in 1998. The area from which Marin bent grass was collected is on private property near the junction of two roads although the specific location is not known.

Blasdale's bent grass is a USFWS Species of Concern. A Species of Concern is an informal term that refers to those species that USFWS believes might be declining or be in need of concentrated conservation actions to prevent decline.

Munz's onion *Allium munzii*

State: Threatened 1990
Federal: Endangered 1998

General Habitat:

Allium munzii is restricted to moist clay soils in the rapidly disappearing grasslands of western Riverside County. This species is frequently found in association with southern needlegrass grassland, grassy openings in coastal sage scrub or, occasionally, in cismontane juniper woodlands. It is associated with mariposa lily, blue-dicks, goldfields, and purple needlegrass.

Description:

Munz's onion is a small, bulb-bearing perennial herb in the lily family (Liliaceae). Plants can reach 1.5 feet (35 cm) in height. Flowers are produced in head-like clusters. Each cluster contains 10 to 35 individual white flowers that turn red with age.

Status:

Munz's onion is found only in two areas of western Riverside County; more than 90% of its historic habitat has been lost. Loss of habitat is due primarily to clay mining, agricultural conversion, flood control activities, urbanization, and OHV activity. Ongoing threats include impacts of fire suppression activities, such as mowing and discing, competition from invasive plant species, and changes in hydrology. Prior to large-scale habitat conversion, Munz's onion probably occurred as scattered, interrelated populations within a larger area (metapopulation). The remaining 14 populations are fragmented and isolated and only half of them are on public land on USFS land or within natural reserves or county parks. Munz's onion is considered to be a narrow endemic species in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) although only a portion of occupied habitat is included within the MSHCP planning area. Under the MSHCP, conservation of Munz's onion will be achieved by inclusion of at least 21,260 acres of suitable habitat (grassland, coastal sage scrub, chaparral and peninsular juniper woodland between 300 and 1,000 m in the Riverside Lowlands and Santa Ana Mountains Bioregions) and 15 known localities within large blocks of habitat in the MSHCP Conservation Area. This acreage will include at least 2,070 acres of clay soils to which the onion is restricted. Munz's onion shares its range and habitat with an onion of similar appearance, the red-skinned onion (*Allium haematochiton*). The two species occur within several feet of each other at some sites, but do not interbreed.

A 2002 court decision requires that the USFWS designate critical habitat for Munz's onion and several other plants that occur in the same area of western Riverside County. The critical habitat designation identifies the habitat that is essential to the survival and recovery of listed species and provides mechanisms for protecting that habitat from destruction or degradation. The Department has received funding from USFWS to implement a research project involving Munz's onion. The project will investigate several aspects of the plants

biology relevant to adaptive management considerations: identification of pollinators and pollinator ecology; seed production and biology; and persistence of individual bulbs over time. Data collected by a researcher at UC Riverside will be incorporated into the study. For example, this research has shown that a portion of bulbs do not send up leaves or flowers each year, and therefore cannot be counted. Although this response is likely correlated with broad climatic patterns in annual temperature and rainfall, it renders monitoring difficult. The same researcher has found that establishment of new plants in two populations is primarily by seed, rather than by bulbs.

Yosemite onion

Allium yosemitense

State: Rare 1982
Federal: None

General Habitat:

Yosemite onion is restricted to steep, open slopes in the Merced River watershed of the central Sierra Nevada (Mariposa and Tuolumne Counties). It is found on talus and scree slopes, metamorphic rock outcrops, and on the margins of large granitic slabs. It is reported from elevations of 1400 feet to 6600 feet. It is associated with two other state-listed species, Congdon's lewisia, Congdon's woolly sunflower, as well as selaginella and species of Penstemon.

Description:

Yosemite onion, a member of the lily family (Liliaceae), 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.

Status:

Yosemite onion is known from three extant populations on federal lands within Yosemite National Park and in the Sierra and Stanislaus National Forests. It has also been reported from a number of other locations although the majority of these occurrences are in remote areas. Threats to this species are few although trail routing and maintenance and development of transmission line corridors could impact some colonies.

Large-flowered fiddleneck *Amsinckia grandiflora*

Susan Cochrane Levitsky, DFG File Photo

State: Endangered 1982
Federal: Endangered 1985

General Habitat:
Grassland on dry inland hills of Alameda, Contra Costa, and San Joaquin counties. Much of the habitat of the species is now grazing land dominated by non-native grasses such as wild oats and species of cheat grass (*Bromus*). The historic habitat for large-flowered fiddleneck is native perennial grassland dominated by purple needlegrass.

Description:
Large-flowered fiddleneck is an erect, coarsely hairy annual herb in the borage family (Boraginaceae). The large, orange-red flowers are borne on stalks curved like the neck of a fiddle.

Lawrence Livermore National Laboratory

Status:
Large-flowered fiddleneck is the rarest of the ten California species of *Amsinckia*. It is currently known from three populations, two natural and one introduced. The populations all occur in the Altamont Hills of the Diablo Range. Two of the natural populations occur on Lawrence Livermore National Laboratory (LLNL) land at Site 300, a high-explosive testing facility operated by the University of California for the United States Department of Energy. The two natural populations at Site 300 are known as the Drop Tower population and the Draney Canyon population. The Draney Canyon population is now believed to have been extirpated. The third natural population is on private ranch land in Carnegie Canyon near the southern border of Site 300.

Attempts at establishing two experimental populations have also occurred near Site 300. An experimental population was established at the Department's Corral Hollow Ecological Reserve but is not considered successful since no reproducing plants have been observed at this site in recent years. Another experimental population was established at the Connolly Ranch near the southeast border of Site 300. This population did not persist, possibly due to extremely high rodent activity. Other experimental populations attempted at Black Diamond Mines Regional Preserve in eastern Contra Costa County and at Los Vaqueros have not been successful.

In April 2000, the Department of Energy entered into an agreement with the USFWS and designated 160 acres within LLNL Site 300 as the Amsinckia grandiflora Reserve to provide for the survival and recovery of the species. As the landowner, the Department of Energy will manage the environmental compliance, safety, health, fire protection, access, and cleanup activities at Site 300, while limiting the future programmatic use of the area. The U.S. Fish and Wildlife Service will manage the recovery efforts for *Amsinckia grandiflora* resources within

the area, and provide expertise and technical advice to DOE for the Reserve's ecological management.

The principal current threat to large-flowered fiddleneck is competition from non-native, annual grasses. Research has shown that these invasive grasses threaten endangered plants through competitive exclusion. The goal of long-term management at the LLNL site is to reduce the exotic annual grass cover and restore and maintain the native perennial bunch grass community to ensure the persistence of the large-flowered fiddleneck. The use of controlled burning is being investigated as a tool for creating and maintaining perennial grasslands. Finally, the impact of seed predation is being investigated to determine its impact on the population dynamics of *Amsinckia grandiflora*.

Population numbers at both the native and experimental Drop Tower locations remain low according to 2001 data from LLNL. Competition from encroaching shrubs and high seed predation pressure by birds and rodents may be contributing to the low number of plants.

McDonald's rock cress *Arabis macdonaldiana*

State:	Endangered	1979
Federal:	Endangered	1978

General Habitat:

McDonald's rock cress is restricted to serpentine soils in open, rocky areas of montane coniferous forests. It occurs on barren to shrub-covered dry ridges and rocky outcrops, often in rock crevices. It is associated with huckleberry oak, ceanothus, manzanita, and buckwheat. McDonald's rock cress is known in California from Red Mountain in Mendocino County and from Del Norte, Trinity, and Siskiyou Counties. It also occurs in Curry County, Oregon.

Description:

McDonald's rock cress is a member of the mustard family (Brassicaceae). It is a small rosette-forming perennial herb with rose-purple flowers and erect flattened seed pods. This species is closely related to rose rock cress (*Arabis blepharophylla*) which grows in coastal California.

Status:

McDonald's rock cress occurs on private and BLM lands in Mendocino County and on USFS land in Del Norte, Siskiyou, and Trinity Counties. BLM has designated Red Mountain as an ACEC and a Research Natural Area and has conducted studies on the population dynamics and reproductive biology of the species there. These populations continue to be monitored as part of a long-term study being conducted by CSU Sacramento with support from BLM. The Six Rivers National Forest has designated 21,370 acres of the North Fork Smith River watershed as a Botanical Area and has developed a monitoring plan. The goals of this plan are to develop a habitat management guide, investigate habitat characteristics, and continue to survey for potential habitat. Other sensitive taxa known to occur on the serpentine soils of Red Mountain include the State-listed endangered Kellogg's buckwheat and Red Mountain catchfly, as well as the unlisted, but rare, Red Mountain stonecrop.

McDonald's rock cress has apparently never been abundant or widespread since the substrate to which it is adapted is restricted to few locales. McDonald's rock cress is known from three occurrences on Red Mountain in Mendocino County. It is also known from 25 occurrences in from Siskiyou, Trinity, and Del Norte Counties, in Siskiyou, Klamath, Six Rivers, and Shasta-Trinity National Forests. The majority of these occurrences are in a specific geographic area in Del Norte County.

The main threat to this species is potential mining of the significant nickel and chromium deposits under or adjacent to populations. OHV activities may also threaten populations located on the North Fork of the Smith River in Del Norte County in this area. Outlying colonies growing in the Rough and Ready Creek watershed in Oregon could also be threatened by mining.

Baker's manzanita *Arctostaphylos bakeri*

State: Rare 1979
Federal: None

General Habitat:
This species is largely restricted to serpentine soils in the localized chaparral communities in the vicinity of Occidental, Sonoma County. It is associated with Sargent cypress, Jepson's ceanothus, and native bunchgrasses.

Description:
Baker's manzanita is an upright, evergreen shrub in the heath family (Ericaceae) with pinkish flowers, dark purple bark, pungent leaves, and bright red fruits. Its branchlets and leaves have sticky glandular hairs, and its flower stems are hairless. One population in the vicinity of the Bohemia Ranch possesses a unique trait: young branches root along the ground.

Status:
Most populations are clustered in the area near Occidental, Sonoma County where it is know from eight occurrences. One occurrence is within the Department's Harrison Grade Ecological Reserve managed by the Department and the California Native Plant Society; the remainder is on private land. Baker's manzanita is considered by the USFWS to be a Species of Concern. This designation is an informal term that refers to those species that we believe might be declining or be in need of concentrated conservation actions to prevent decline.

The chief threat to Baker's manzanita is residential development, agricultural conversion to vineyards, road development, OHV use, dumping, nonnative plant encroachment, and hybridization with common manzanitas. Succession toward oaks and California bay, which shade out Baker's manzanita, is also occurring as a result of fire suppression at most locations. Fire suppression also constitutes a threat to Baker's manzanita. This species does not possess an underground burl from which it can regenerate. Rather, it reproduces by seed, often following fires. In the absence of such disturbance, mature plants eventually die. Active management to remove encroaching vegetation and invasive plants, as well as the ecological use of fire, is needed to ensure long-term survivorship of this species. This species is in horticultural cultivation and sold as Arctostaphylos bakeri "Louis Edmunds."

Vine Hill manzanita *Arctostaphylos densiflora*

State: Endangered 1981
Federal: None

General Habitat:

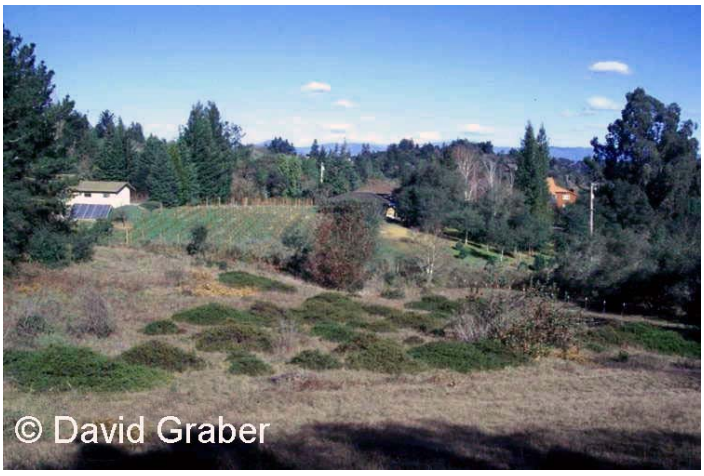
Vine Hill manzanita is found only in an area of acid marine sand deposits in western Sonoma County. Associate species include coyote brush, Vine Hill ceanothus, and Vine Hill clarkia.

Description:

Vine Hill manzanita is a low 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.

Status:

Over the last 20 years, Vine Hill manzanita has come close to extinction. All but one population in the Vine Hill area have been destroyed by agricultural conversion, 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 CNPS one-acre Vine Hill Preserve. Plants at the preserve suffer from a persistent fungal disease. Vine Hill manzanita is known to hybridize with common manzanita (*Arctostaphylos manzanita*) and with Stanford manzanita (*Arctostaphylos stanfordiana*), its closest relative. Plants are also in the horticultural trade and sold under the names of cultivars: "Howard McMinn," "Sentinel," and "Harmony."



Hanging Gardens manzanita

Arctostaphylos edmundsii var. parvifolia

State: Rare 1981
Federal: None

General Habitat:

This member of the heath family (Ericaceae) grows near the ocean on eroded ridges and sandstone banks subject to strong on-shore winds. It is known from one population on private land near Point Sur in Monterey County.

Description:

Hanging Gardens manzanita is a prostrate evergreen shrub without a basal burl, with glossy green leaves and bright red berries.

Status:

The plant grows down perpendicular banks in closely adherent drapes. A recent taxonomic treatment has consolidated Hanging Gardens manzanita with Little Sur manzanita (*A. edmundsii*), which is itself limited to only nine occurrences on the Little Sur coast. Little Sur manzanita is not a listed species.

Hearst's manzanita ***Arctostaphylos hookeri ssp. hearstiorum***

State: Endangered 1979
Federal: None

General Habitat:

Hearst's manzanita is found in coastal sage scrub vegetation near Arroyo de la Cruz Creek north of San Simeon. It grows on sandy loam substrates derived from old, stabilized sand dunes. Summer fog drip contributes to the annual rainfall at the site. Hearst's manzanita is associated with several species of Ceanothus, including the listed species, Hearst's ceanothus (*Ceanothus hearstiorum*). Other associate species include chamise, coyote brush, poison oak, and bush monkeyflower.

Description:

Hearst's manzanita is a mat-forming, 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 reproduces solely from seed.

Status:

All five known occurrences of Hearst's manzanita are located on the Hearst Ranch, owned by the Hearst Corporation, in San Luis Obispo County. The DFG's most recent observation information for this species dates from the mid-1980s. The population status and habitat conditions for this species need further investigation. Hearst's manzanita is in cultivation and is offered in the horticultural trade.

Presidio manzanita ***Arctostaphylos hookeri ssp. ravenii***

State: Endangered 1978
Federal: Endangered 1979

General Habitat:
This member of the heath family (Ericaceae) grows on exposed bedrock outcrops composed of serpentine and greenstone. It was formerly associated with Franciscan manzanita (*Arctostaphylos hookeri* ssp. *franciscana)* which is now extinct in the wild. Torrey's melic, miner's lettuce, and soap plant are most common associates of Presidio manzanita today.

Description:
Presidio manzanita is a prostrate, evergreen shrub covered with fine gray hairs, with round leaves and compact flower stalks of urn shaped white to pink flowers. This low-growing evergreen shrub has reddish bark and does not have a basal burl. The leaves are round to broadly elliptic, growing from branchlets covered with fine grayish-white hairs. The small white flowers and fruit are sparse. Blooming time is from February to March

Status:
Historically, Presidio manzanita was known from three other sites in San Francisco County that were destroyed by urbanization in the late 1930s. This taxon has been reduced to a single wild plant plus some clones, which are managed by the National Park Service (NPS). The single wild plant was found in the winter of 1997-98. This plant was infected with a fungal pathogen resulting in approximately 10% dieback of branches. The parent plant and 18 clones were monitored in 2000. The parent plant shows signs of growth and new leaf production.

Fungal infection is potentially a greater threat to the clones, due to their smaller sizes, than it is to the native parent plant. Up to 40% of the clonal plants have died as a result of the twig blight. Another concern is the potential susceptibility of Presidio manzanita to Sudden Oak Death (*Plytopthera*) which attacks common manzanita (*Arctostaphylos manzanita*).

In 2001, the USFWS prepared a Draft Recovery Plan for coastal plants of the northern San Francisco peninsula. The plan was written to recover the Presidio manzanita and San Francisco lessingia (*Lessingia germanorum*). Recovery of Presidio manzanita will depend, in part, upon the protection of the remaining natural plant at the Presidio and ongoing research into propagation of this species and its reintroduction into former parts of its range.

San Bruno Mountain manzanita

Arctostaphylos imbricata

State: Endangered 1979
Federal: None

General Habitat:

San Bruno Mountain manzanita is restricted to the slopes of San Bruno Mountain in northern San Mateo County. It occurs on shallow soils derived from Franciscan sandstone, greywacke, and shale in coastal scrub vegetation. Associate species include wild lilac (*Ceanothus thrysiflorus*) and coyote brush (*Baccharis pilularis*). San Bruno Mountain manzanita also grows with bearberry (*Arctostaphylos uva-ursi*), another mat-forming manzanita that it superficially resembles.

Description:

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 fruits with glandular hairs. It forms dense, mat-like colonies.

Habitat image courtesy of Eric Goetze at http://www.virtualparks.org/

Status:

San Bruno Mountain manzanita is known only from the summit of San Bruno Mountain in San Mateo County. At present there are six small colonies of San Bruno Mountain manzanita. Five of these occur within San Mateo County Park, while one is located on privately owned property.

In 1997, USFWS withdrew its Proposed Rule to list San Bruno Mountain manzanita as threatened based on protection given to the plant under the 1982 San Bruno Mountain HCP. The HCP preserves most of San Bruno Mountain and provides for monitoring and management of San Bruno Mountain manzanita. None of the colonies are threatened by the level of development permitted under the HCP. In 2002, Federal Section 6 funds were provided to San Mateo County to update the San Bruno Mountain HCP. The revision will focus on the conservation of sensitive species and habitats and provide guidance on the control and eradication of exotic invasive plants that threaten these species and the habitats on which they depend. Ongoing restoration activities on San Bruno Mountain will benefit San Bruno Mountain manzanita and other sensitive species. These activities include control and removal of gorse and eucalyptus, as well as restoration of native grasslands and coastal scrub vegetation.

Pacific manzanita *Arctostaphylos pacifica*

State Endangered 1979
Federal

Image of bearberry.

General Habitat:
Pacific manzanita is found in the northern coastal scrub of San Bruno Mountain, San Mateo County. It is associated with coyote brush and blue blossom.

Description:
Pacific manzanita, in the heath family (Ericaceae), was described as a low, prostrate, evergreen shrub with a basal burl, pale green leaves, branchlets covered with fine hairs, and fruits with short stiff hairs.

Status:
Pacific manzanita is believed to be of hybrid origin, derived from bearberry *(A. uva-ursi)* and *A. glandulosa*. It is no longer recognized as a valid taxon. Current taxonomic treatment consolidates Pacific manzanita with bearberry. The DFG is considering proposing Pacific manzanita for delisting based on invalid taxonomy.

Alameda manzanita ***Arctostaphylos pallida***

State: Endangered 1979
Federal: Threatened 1998

General Habitat:

Alameda manzanita occurs in the Diablo Range of Contra Costa and Alameda Counties where grows on siliceous shales of uplifted marine terraces. It is primarily in manzanita-dominated shrub surrounded by oak woodland and coastal scrub. Associated species include brittleleaf manzanita and shrubby interior live oak. It is also found in the understory of landscaping trees such as Monterey pine and Monterey cypress.

Description:

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.

Status:

Alameda manzanita, also referred to as pallid manzanita, is found primarily at Sobrante Ridge Preserve and Huckleberry Preserve in Contra Costa and Alameda counties. Sobrante Ridge is completely within a 111-hectare (277-acre) Regional Preserve owned and managed by East Bay Regional Park District. Most of the population at Huckleberry Ridge is within lands owned and managed by East Bay Regional Park District (EBRPD) as part of the 94-hectare (236-acre) Huckleberry Botanic Regional Preserve. Scattered plants within the Huckleberry Ridge population also exist on privately owned lots along Villanova and Manzanita Drives in the City of Oakland. Several other small (natural and planted) populations occur in Alameda or Contra Costa Counties.

Alameda manzanita is addressed in the 2003 Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay California. The primary threats to *Arctostaphylos pallida* are the effects of fire suppression, shading, and competition from native and nonnative plants. The species also is threatened by disease, herbicide spraying, hybridization, and the ongoing effects of habitat loss and fragmentation. Possibly the single most important factor limiting the recovery of the *Arctostaphylos pallida* is the continuing suppression of its natural disturbance regime.

It is believed that fire plays a major role in maintaining the health of manzanita stands and the genetic diversity of populations. *Arctostaphylos pallida* is a fire-adapted chaparral shrub that shows signs of decline with great size and age. Fire suppression in the Oakland/Berkeley Hills, in combination with increased browsing of tree and

shrub seedlings and acorns by deer and livestock, has led to structural and compositional change in habitats within the range of *A. pallida*. Open-canopied oak woodlands maintained historically by frequent fire have been converted, in the absence of fire, into closed-canopied woodland-forests dominated by California bay, other native trees, or exotic coniferous or *Eucalyptus* forests. The denser canopies of these forests and woodlands create a microclimate unsuitable for healthy *A. pallida* plants. Additionally, as populations of *A. pallida* dwindle, the negative effects of genetic drift and inbreeding depression may be magnified. Small populations often are subject to increased genetic drift and inbreeding as consequences of their small populations. A loss of genetic variability, and consequent reduction in genetic fitness, provides less opportunity for a species to successfully adapt to environmental change.

Proposed management by East Bay Municipal Utility District includes rectifying some of the shading and competition problems, and collecting seed for greenhouse propagation for the purpose of planting this species in a more manageable location. This area has an extremely high wildfire potential and East Bay Municipal Utility District is considering a plan to remove the woody plants and plant grasses to reduce the fire threat to nearby homes. EBRPD has purchased some small lots that are contiguous with existing park land and that support Alameda manzanita. Removal of non-native trees such as Monterey pine and eucalyptus also benefit the species. However, much of the species' habitat is close to existing homes, and ecological use of fire in this intermix of residential development and wildland is not feasible. Due to past and present fire suppression policies and inactive or ineffective fire management plans, the long-term viability of *Arctostaphylos pallida* is in doubt.

Marsh sandwort *Arenaria paludicola*

State: Endangered 1990
Federal: Endangered 1993

General Habitat:

Historically, this species occurred in swamps and freshwater marshes in widely disjunct localities in California and Washington. It occurred in four counties in San Francisco, Santa Cruz, San Luis Obispo, and San Bernardino Counties in California, as well as the coastal region of Washington. It is associated with cattail, sedge, bur-reed, and Gambel's watercress (*Rorippa gambelii*), a listed species.

Description:

Marsh sandwort is a perennial herb in the pink family (Caryophyllaceae). It has weak, trailing stems and small white flowers which bloom from May through August. The trailing stems often root at the nodes.

Status:

The distribution of this species is limited to two locations in San Luis Obispo County on the Nipomo Mesa. One population is in Black Lake Canyon, and one population was rediscovered in 1998 at Oso Flaco Lake. Two of three historically documented locations in Black Lake Canyon no longer appear to support plants; one was last seen during the 1980s, one in the mid-1990s, and the last site was documented in April 1998. Encroachment of non-native eucalyptus trees and drilling of water wells in the immediate watershed of Black Lake Canyon are serious threats to the continued existence of this species. Seven of the nine known California occurrences have been lost because the fresh water habitat in which they occurred was eliminated. Even when extant, all the sites supported only a few plants in a limited area. Despite thorough searches, no populations of marsh sandwort have been verified in Washington in recent years. A population of a related species of sandwort from Mendocino County was originally thought to be marsh sandwort.

The Land Conservancy of San Luis Obispo County acquired two acres in Black Lake Canyon which include the existing marsh sandwort site and one of the previously occupied marsh sandwort sites; they have prepared a management plan for the canyon which addresses marsh sandwort. In addition, The Nature Conservancy (TNC)

recently purchased a conservation easement in the Nipomo Dunes which includes a large dune lakes complex; this area, which has not been surveyed by botanists for half a century, will be surveyed to determine if other populations exist and if potential habitat is available for establishment of experimental populations of this species. Beginning in 1993, research into demography, general ecology, and recovery options was conducted by researchers from the University of California, Santa Barbara.

Cuttings have been used to propagate marsh sandwort. These cuttings have been transplanted into suitable sites in Black Lake Canyon and have established. Best establishment was seen when plants were placed in proximity to a nurse plant, such as a tussock of rush, on which the stems could climb. Some of the transplants that failed to establish, apparently due to rising water levels and increases in cover by other marsh species. Rodent predation on transplants has been observed in the field and plant protection measures would improve the likelihood of successful establishment. Greenhouse plants continue to thrive although some have been attacked by fungus. Although the cultivated plants flower, plants do not produce viable seed. Hand pollinator has not been attempted. A Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's watercress (*Rorippa gambellii*) was completed in 1999.

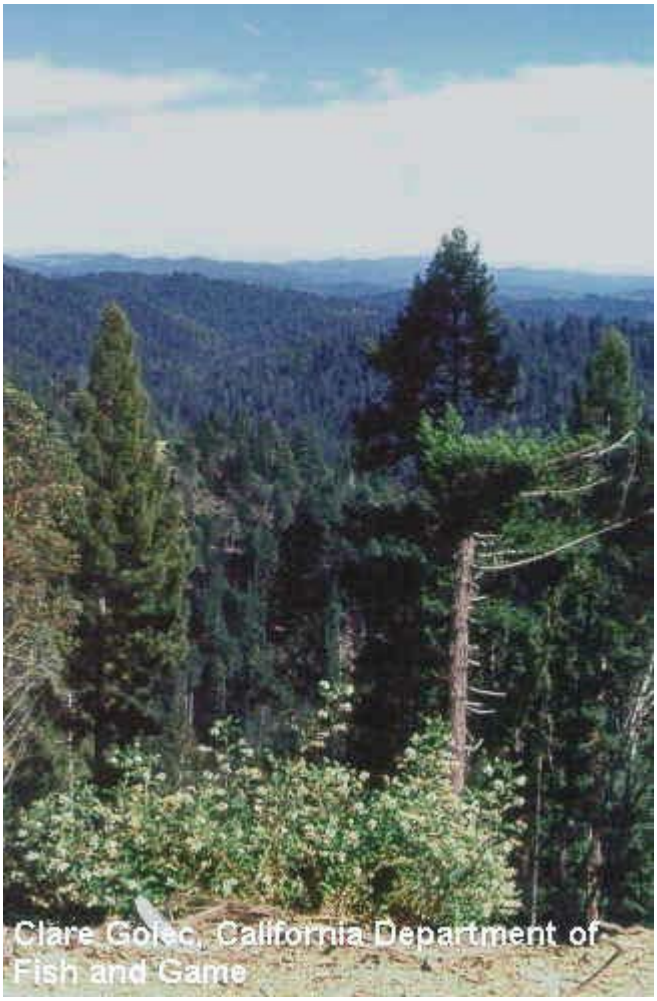
Humboldt milk-vetch *Astragalus agnicidus*

State: Endangered 1982
Federal: None

General Habitat:

Humboldt milk-vetch occurs in openings of mixed conifer and hardwood forests, often disturbed sites. Overstory species include Douglas-fir, coast redwood, tanbark oak, and Pacific madrone. Understory species include ceanothus, manzanita, orange bush monkey-flower, deerweed, iris, phacelia, bracken fern, yerba de selva, and various grasses. The species is restricted to localized areas of western Humboldt and Mendocino counties.

Extensive potential habitat exists on managed forest lands, however, occurrences are highly localized and appear primarily to be the consequence of the exposure of dormant seed banks. Natural and human-made disturbance events likely increase available habitat. Reforestation, competition from invasive non-native plants, and fire suppression likely decrease available habitat.



Description:

Humboldt milk-vetch, a member of the pea family (Fabaceae), is a low-shrubby perennial up to 3.5 feet tall, with hollow stems, sparsely hairy pinnately divided leaves without tendrils, many small white flowers on a branched flower stalk, and a flat hairy pod.

Status:

Humboldt milk-vetch was the target of a weed eradication effort during the 1920s when this reportedly toxic plant was implicated in the death of lambs. 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, the species was rediscovered on the ranch in Humboldt County where it was originally found. Dormant seeds that had persisted in the soil were stimulated by the opening of the tree canopy when a dead tree was felled and removed a few years earlier.

Soon after rediscovery of the population on the ranch, the landowner agreed to voluntarily protect the plant in

coordination with TNC and volunteers of CNPS. Portions of the population were fenced and monitored by TNC and CNPS volunteers. Results of monitoring have demonstrated that Humboldt milk-vetch is an early successional species with specific germination requirements. It requires frequent openings in the forest to allow germination and growth and is shade intolerant. Studies on this species have indicated that it is subject to inbreeding depression, but there is a persistent seed bank, presumed to be genetically diverse.

Within the last few years, the forest canopy openings at the ranch have contracted in size and, since no new openings have occurred, the population size of Humboldt milk-vetch has declined. TNC was the primary leader in coordinating protection and monitoring on Humboldt milk-vetch for ten years. However, since 1998 the local chapter of CNPS is taking over the coordination of monitoring and protection activities. A new management plan is in preparation. The current landowner is one of the active cooperators protecting Humboldt milk-vetch.

Two populations of Humboldt milk-vetch were discovered on a ridge in 1999 in the Jackson State Forest in Mendocino County during a survey for a Timber Harvest Plan. Subsequent to 1999 twenty-four additional populations have been discovered in western Humboldt and Mendocino counties on managed forest lands. Population numbers of Humboldt milk-vetch are highly variable from a few individuals to thousands of plants, and frequently include numerous seedlings. The species appears quite cyclic in occurrence with population numbers fluctuating substantially over time.

Humboldt milk-vetch is an endemic species to California with a very limited distribution, and belongs to a distinct small taxonomical group of four species that are all rare or highly localized and distinct from the European and Asian species. DFG management objectives for Humboldt milk-vetch on forest lands is to maintain adequate presence and numbers of Humboldt milk-vetch plants to ensure completion of life cycle, visitation by pollinators, establishment of seed banks, and to prevent genetic and habitat degradation. Research is proposed in 2003 by DFG and Humboldt State University to conduct an analysis of the genetic variation between populations.

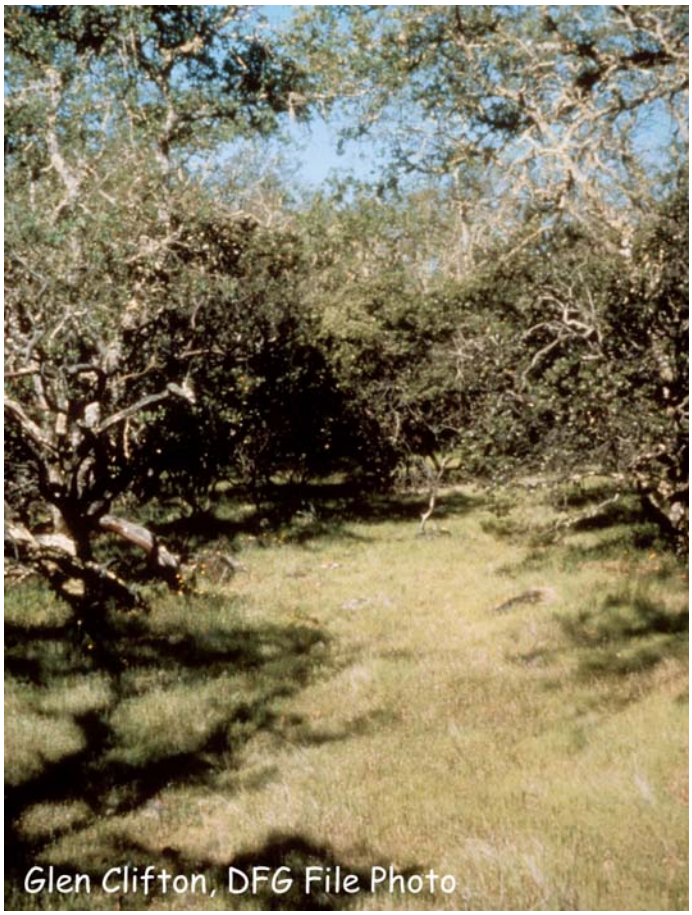
Clara Hunt's milk-vetch

Astragalus clarianus

State: Endangered 1990
Federal: Endangered 1997

General Habitat:

Clara Hunt's milk-vetch occurs on thin rocky clay soils derived from volcanic material or serpentine. It is found in openings of grasslands, manzanita chaparral, and blue oak woodland in Napa and Sonoma Counties. It is associated with purple needlegrass, species of brodiaea, California poppy, and gilia.



Description:

Clara Hunt's milk-vetch is a small annual herb in the pea family (Fabaceae). The milk-vetch has up to nine leaflets per leaf and white, purple-tipped flowers which bloom in March and April.

Status:

Astragalus clarianus is known from five occurrences. Principal threats to this species are urbanization, maintenance activities, introduced invasive plants and animals (feral pigs), and recreational activities. Natural vegetation succession in the absence of disturbance regimes is another factor affecting Clara Hunt's milk-vetch.

Several colonies in one area occur in a pasture. Road widening and nearby development threaten this site. Foot traffic at Bale Grist Mill State Historic Park has impacted the second population, although high dense stands of yellow star thistle and plant community succession are also factors. The third population is adjacent to a fishing access road and is impacted by vehicle traffic and invasive plants. A large portion of this occurrence was accidentally buried in 1990 by dredge material which was subsequently removed. The site was fenced subsequent to clean-up and plants have been observed there as recently as 1998. The fourth site, south of St. Helena, is the largest known population. When observed in 2000, it supported 134 plants in native grassland. French broom is

invading this site and there is evidence of feral pigs in the meadow in which the milk-vetch occurs. The fifth site was discovered in 1997 in Napa County in an area proposed for vineyard expansion. The landowner agreed to a vineyard setback that will protect at least a portion of the plants, and in 1998, 290 plants were observed. Because this milk-vetch is an annual plant with extremely small populations, sites could be eliminated through random fluctuations in population size from year to year or other chance events such as drought or invasion by weeds.

Sodaville milk-vetch

Astragalus lentiginosus var. sesquimetralis

State: Endangered 1979
Federal: None

General Habitat:
This species is restricted to moist, open, alkaline hummocks and drainages near cool springs with salt grass, greasewood, and alkali sacaton.

Description:
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.

Status:
Big Sand Spring in Inyo County is the only known occurrence of Sodaville milk-vetch in California. Sodaville milk-vetch also occurs at two sites in Nevada where it is considered a fully-protected species. Sodaville milk-vetch was proposed for federal listing in the 1990s. The proposed rule was withdrawn when Big Sand Spring was placed within Death Valley National Park. Prior to 1994, the site was owned and managed by BLM. The site was maintained within a cattle grazing allotment and a wild burro Herd Management Area by BLM.

The population was almost destroyed by feral burros and cattle before BLM erected established a 25-acre enclosure in 1985 to keep the animals from entering the site. The only milk-vetch plants remaining at that time were being protected by shrubs. An electric fence was erected in 1997 since the existing fence did not exclude cattle or burros. Cattle grazing was not permitted after 1996 and the lease was officially terminated in 2002. In 2001 and 2002, feral cattle and burros were removed from the area. Census data indicate milk-vetch plants have made a substantial comeback, from only 10 individuals in 1995 to 1,500 individuals in 1997, and 3,000 in 1998.

Peirson's milk-vetch

Astragalus magdalenae var. peirsonii

State: Endangered 1979
Federal: Threatened 1998

General Habitat:

Peirson's milkvetch occurs in open sand in the Algodones Dunes system in Imperial County, California. It is associated with two other listed species, Algodones Dunes sunflower (*Helianthus niveus* ssp. *tephrodes*) and Wiggins' croton (*Croton wigginsii*).

Description:

Peirson's milk-vetch is a stout, herbaceous perennial with a woody base. Its leaves are divided into numerous oblong leaflets. This purple-flowered member of the pea family (Fabaceae) is covered with fine, silky hairs and produces inflated pods.

Status:

Historically, Peirson's milkvetch was known from Borrego Valley in San Diego County and at a site southwest of the Salton Sea in Imperial County, but it has not been seen in these locations for years. A collection from the Yuma Dunes of Arizona thought to represent Peirson's milkvetch was found to be misidentified. In Mexico, Peirson's milkvetch is known from the Gran Desierto of northwestern Sonora and from northeastern Estado de Baja California.

Destruction of plants and modification of habitat associated with OHV activity is considered the primary threat to Peirson's milkvetch. Vehicles may have a direct impact on the plants by crushing and killing them or reducing their reproductive output. Vehicles can alter dune structure by altering hydrological traits of the dune, cover standing plants with encroaching sand, or expose standing plants by causing sand to fall away from the plants.

The Algodones Dunes has long been used as an off-highway vehicle recreational area with approximately 75 percent of the dune system open to off-highway vehicles (OHVs). The remainder of the dune system is within an Area of Critical Environmental Concern (ACEC) and closed to OHV use. The majority of Peirson's milk-vetch occurrences known in 1977 were in the open area. Subsequent surveys found significantly fewer plants. In March 2000, several conservation organizations brought suit against BLM for impacts to Peirson's milk-vetch. As a result of the lawsuit, a temporary closure of the Algodones Dunes (called Imperial Sand Dunes by BLM) was implemented. The closure was to remain in effect until BLM completed formal consultation with the USFWS under provisions of the National Environmental Policy Act (NEPA).

In 2001, BLM prepared a Biological Evaluation regarding the present management of Peirson's milk-vetch and submitted the evaluation to USFWS with its request for formal consultation. BLM then filed a notice of its intent to amend the California Desert Conservation Area Plan and to prepare a management plan for the Imperial Sand Dunes Recreation Area. This amendment would also designate the North Algodones Dunes as a wilderness area with restricted public access. The vehicle closure was extended until the management plan was completed. The draft management plan was released in March 2002 and has not been finalized. Later in 2002, a federal judge ordered USFWS to designate critical habitat for eight listed plants, including Peirson's milk-vetch.

The Department is collaborating on a research project for Peirson's milk-vetch. Research began in 2002. Six populations of Peirson's milk-vetch were selected for monitoring. Few seedlings were found. A suite of features, including associated plant species, herbivory, pollination vectors, direct human impacts, and demographics, were documented at each site. Soil samples were collected at each of the sites to evaluate microhabitat characteristics for the populations.

One pollinator was identified in the field, a native solitary bee. Insect predation of seed was also observed, but the insect was not identified. Seed germination was analyzed at Rancho Santa Ana Botanic Garden. Results of the experiment found that seeds that had been abraded (scarified) germinated readily. A thick impervious seed coat is common in many native species in the pea family. Abrasion of the seed coat facilitates water uptake and subsequent germination. Twenty plants were grown at the botanic garden for additional experiments. A high mortality rate, however, was documented with loss of 75% of seedling plants. Research is still ongoing.

Proposed critical habitat of approximately 52,000 acres was designated in August 2003. FWS has not yet developed a recovery plan or a conservation strategy for the milkvetch. Based on their current understanding of the species' biology, the primary conservation needs include: maintenance of the major occurrences to conserve genetic diversity; management of the species' habitat to prevent catastrophic population declines; and collection of additional information concerning recreational use-patterns in the Algodones Dunes, the direct and indirect effects of OHV use on this species, and biological factors affecting milk-vetch demographics.

Mono milk-vetch *Astragalus monoensis*

State: Rare 1982
Federal: None

General Habitat:

Mono milk-vetch is endemic to pumice flats from western Long Valley to the Mono Basin. It occurs in loose sandy or gravelly soil and is associated with Indian rice grass, western needlegrass, species of buckwheat, sand verbena, and Mono lupine, another endemic species.

Description:

Mono milk-vetch is a slender-stemmed, perennial herb in the pea family (Fabaceae) with divided yellow-green leaves and whitish, purple-veined flowers.

Status:

Mono milk-vetch is known from approximately 16 populations. Most of the sites are subject to the effects of seasonal cattle grazing, although light to moderate grazing may not threaten this plant. Mono milk-vetch is found on BLM, USFS, and LADWP lands. The BLM prevents grazing of the occurrences during the peak growth period, and limits grazing during the rest of the year. Current survey information for this plant is lacking. Mono milk-vetch is considered to be a Species of Concern by the USFWS. A Species of Concern is an informal term that refers to those species that might be declining or be in need of concentrated conservation actions to prevent decline.

Ventura marsh milk-vetch

Astragalus pycnostachys var. lanosissimus

State: Endangered 2000
Federal: Endangered 2001

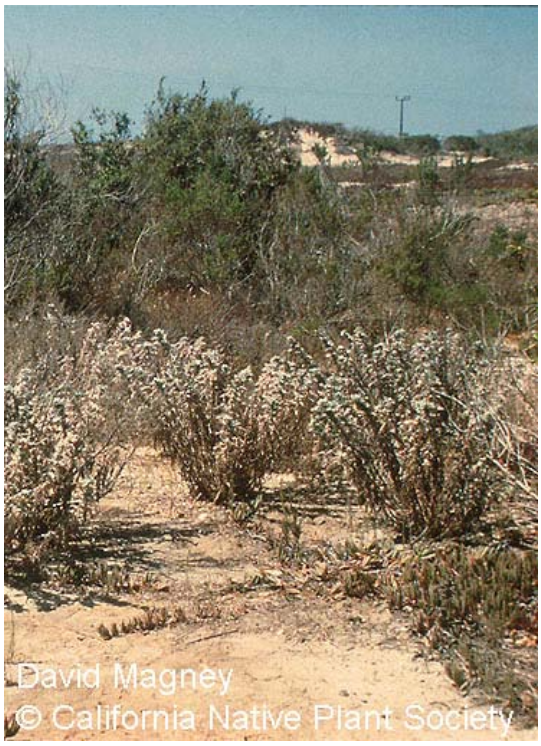
General Habitat:

Historically, Ventura marsh milk-vetch occurred in back dune habitat, coastal meadows and near coastal salt marshes from Ventura County to Orange County. It is now known from a single site in degraded backdune habitat near the City of Oxnard. The population occurs with sparse vegetative cover provided primarily by coyote brush, mule fat, non-native sea fig, and non-native red brome.

Description:

Ventura marsh milk-vetch is a short-lived, herbaceous perennial in the pea family (Fabaceae). It has a thick taproot and multiple erect, reddish stems that emerge from the root crown. Leaves are divided into 27-39 leaflets and are densely covered with silvery white hairs. The numerous yellowish-white to cream colored flowers are in dense clusters.

This variety is distinguished from *A. pycnostachyus* var. *pycnostachyus* (brine milk-vetch) by certain flower characteristics. It is distinguished from other local *Astragalus* species by its overall size, perennial growth form, size and shape of fruit, and flowering time.



Status:

Over the last century seven historical occurrences were known to exist. Ventura marsh milk-vetch was extirpated from these sites and was believed to be extinct. It was rediscovered in 1997 in an area proposed for bioremediation of contaminated soils and subsequent urban development near the City of Oxnard in Ventura County. The entire population occurs on fill material at a closed oil-waste dump site and occupies about 2900 square feet. Since 1997, between 192 and 374 Ventura marsh milk-vetch individuals have been observed at the site. The number of reproductive adults has varied from as many as 97 to as few as 12. Studies show low levels of seed production in the wild. Although seed germination is successful, survivorship and recruitment to older

age classes is quite low. Continued survival of this species depends upon stabilizing the existing population and establishing additional populations in suitable protected coastal wetland sites.

Experimental populations have been established at two locations on lands managed by the California Department of Parks and Recreation and the University of California Reserve System. Based upon experimental results, survivorship and mortality in these habitat areas are being evaluated. Various research, germination, and propagation efforts are being undertaken by the Santa Barbara and Rancho Santa Ana Botanic Gardens, affiliates of the Center for Plant Conservation. Research at the University of California, Santa Barbara is focused on soil habitat requirements for the milk-vetch. Soil moisture will be monitored and selenium in the soil, plants, and oil/tar deposits will be analyzed. Water table salinity levels will also be assessed. Plant roots will also be examined for evidence of symbiotic nitrogen-fixing bacteria. Additional propagation and research efforts are in progress at the University of California's Coal Oil Point Reserve, funded largely by the private landowner of the only existing wild population of Ventura Marsh Milkvetch. Dialogue is continuing with the Pt. Mugu Naval Air Station, another potential introduction site.

On October 9, 2002, the USFWS proposed to designate approximately 420 acres of land in Ventura and Santa Barbara counties, at Mandalay near Oxnard, McGrath State Beach, and Carpenteria Salt Marsh, as critical habitat for the Ventura Marsh milk-vetch. Features identified as primary constituent elements of critical habitat for the milk-vetch include 1) native vegetation cover between 50 and 75 percent; 2) low densities of non-native annual plants and shrubs; 3) the presence of a high fresh or brackish water table; 4) fine-grained, well-drained soils composed primarily of sand with some clay and silt; and 5) non-saline or non-alkaline substrate conditions. Of primary importance is to ensure that areas designated support the ecological processes of which the plant's life cycle. Because Ventura Marsh milk-vetch appears to suffer from poor seed set, the maintenance of a pollinator community is critical.

Coastal dunes milk-vetch

Astragalus tener var. titi

State:	Endangered	1982
Federal:	Endangered	1998

General Habitat:

This plant grows in moist depressions on clay soils in coastal terrace grasslands and in coastal strand vegetation on sand dunes. Colonies of the milk-vetch occur on a relatively flat coastal terrace within 100 feet ft of the ocean beach and are exposed to ocean spray and periodic inundation. Coastal dunes milk-vetch grows in sandy soils fine sands that comprise a series of shallow swales on the terrace surface. Individual plants are found on the bottoms or sides of the swales with other low growing grasses and herbs, including the nonnative cut-leaf plantain.

Description:

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.

Status:

Coastal dunes milk-vetch is critically threatened and in danger of extinction. Historically, coastal dunes milk-vetch was known from seven sites in Monterey, Los Angeles, and San Diego counties. Only one population is currently known to occur; it is made up of approximately 11 scattered patches of plants that are separated by 17-Mile Drive on the western edge of the Monterey Peninsula. This population is highly fragmented. The small size of the population and human uses surrounding the population greatly increase its chance of extinction from random events (genetic drift, wave erosion during a storm event) or those associated with human activities (mowing, trampling, equestrian use). The species is also threatened by competition from the nonnative sea-fig, cut-leaf plantago, and Pansa sedge.

The land on which the milk-vetch occurs is owned by the Pebble Beach Company and the Monterey Peninsula Country Club. In 1989, the Pebble Beach Company constructed an enclosure on the west side of 17-mile Drive to protect plants on its property. Hundreds of individuals were found in the enclosure in 1998. No flowering individuals were observed in the enclosure in 2000, and no plants were observed in the enclosure in 2002. Multiple individuals flowered, however, outside of the enclosure, indicating that light disturbance facilitate seed germination. Although patches of suitable habitat occur in the vicinity of the existing population, these sites are surrounding by golf greens and a bank covered by sea-fig. Plants on the east side of 17-Mile Drive on country club property are vulnerable to equestrian use along trails, golfing activities, and potential effects of fertilizers and pesticides used in turf management. Coastal dunes milk-vetch is threatened by habitat alteration and

fragmentation, as well as by competition from non-native plants such as ice plant and cut-leaf plantain. A Draft Recovery Plan was published by the USFWS in 2002.

Trask's milk-vetch *Astragalus traskiae*

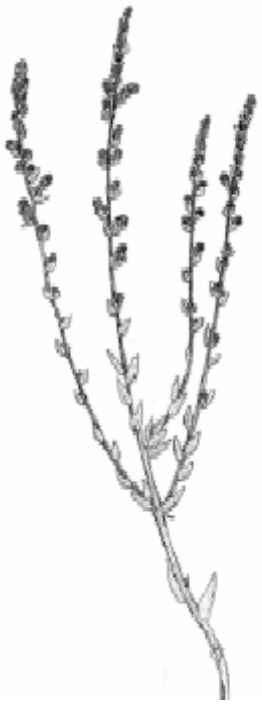
State: Rare 1979
Federal: None

General Habitat:
This species is restricted to Santa Barbara and San Nicolas Islands. On San Nicolas Island, Trask's milk-vetch is widespread and abundant around the perimeter of the island, especially in sand dunes, sandy coastal flats, and on open sandstone slopes. It occurs mostly at elevations between 50 and 800 feet.

Description:
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.

Status:
The Navy's Environmental Division reviews all land use plans and activities that may affect sensitive species. Surveys were conducted in 1992 to determine the distribution, habitat preference, and population status of this species. Occurrences of this milk-vetch on Santa Barbara Island were intensively studied by Clark and Halvorson in the 1980s and they reported a severe decline in the populations due to drought and severe winter storms in 1988. The DFG has no recent data on this species.

Bakersfield smallscale *Atriplex tularensis*



State: Endangered 1987
Federal: None

General Habitat:
Bakersfield smallscale was restricted historically to a small area of south-central Kern County between Greenfield and Mettler. Associated species included alkali heath, glasswort, creeping wild-rye, iodine bush, scratchgrass, and saltgrass.

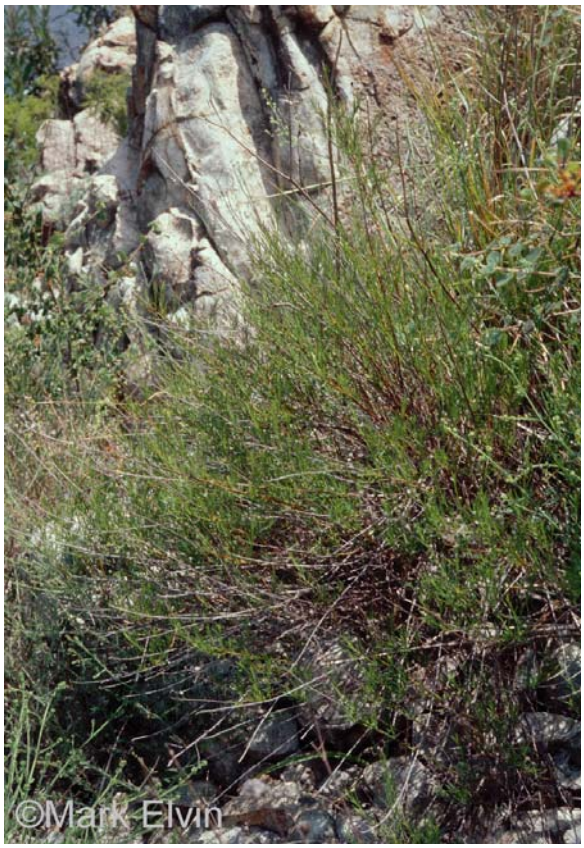
Description:
Bakersfield smallscale, a member of the goosefoot family (Chenopodiaceae), is an erect, branched annual covered with white scales. Tiny greenish flowers are produced throughout the plant. The reddish-brown seeds are enclosed in diamond-shaped bracts that are smooth on the surface but toothed on the margin.

Status:
Five of the six historically known populations have been destroyed by agricultural conversion of the habitat. First collected in the 1890s, the species had not been seen since the 1930s when it was rediscovered in 1983 at Kern Dry Lake. Since the discovery, the site had been leased and managed by TNC as the Kern Lake Preserve until the lease was discontinued by the private landowner. The plants are threatened by land conversion and lowering of the water table. This latter threat was greatly exacerbated by a series of drought years from 1987-1992. The plant was last observed in 1991.

The identity of the plants at the site has been questioned, because plants collected in the area historically differ in appearance from those observed in the 1980s. One opinion is that the plants are hybrids of Bakersfield smallscale and bractscale (*A. serenana*), which also grows in the area, and that pure Bakersfield smallscale no longer occurs. Another opinion is that *A. tularensis*, as originally described, was never a distinct species, but was a variant of bractscale that only appeared in high rainfall years. The Kern County Valley Floor Habitat Conservation Plan is expected to provide incentives for protecting the Gator Pond area. Other protection measures for Bakersfield saltbush are included in the USFWS Recovery Plan for Upland Species of the San Joaquin Valley, California, completed in 1998.

Encinitas baccharis *Baccharis vanessae*

State:	Rare	1982
State	Endangered	1987
Federal:	Threatened	1996



General Habitat:

This plant occurs on steep slopes in the southern maritime chaparral communities of San Diego County in the vicinity of Encinitas. Its range extends to Mount Woodson and the vicinity of Poway, with one population in the Santa Margarita Mountains of northern San Diego County where it is associated with mixed chaparral. Encinitas baccharis is associated with Del Mar manzanita, Mission manzanita, and Mojave yucca.

Description:

Encinitas baccharis is a slender stemmed, shrub in the sunflower family (Asteraceae) that grows to a little over 3.5 feet tall. It has alternate leaves, reflexed floral bracts, and heads of whitish flowers. Male and female flowers occur on different plants (dioecious).

Status:

Encinitas baccharis is currently known from 20 occurrences. A population was established in San Dieguito Park, but did not persist. This species has undergone rapid habitat loss due to residential development and agricultural conversion, and decline continues. A portion of the range of Encinitas baccharis occurs within the San Diego MSCP area. The MSCP will conserve 92% of all major populations within the Plan Area.

Encinitas baccharis is included in the San Diego Multiple Habitat Conservation Program (MHCP). The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. Within the MHCP, this species is known only from Carlsbad and Encinitas. The MHCP will conserve nearly 100% of known locations, major populations, and critical locations in the study area. In addition, approximately 67% of potential habitat will be

conserved. Specific guidelines in the MHCP for Encinitas include managing all conserved populations to control edge effects and implementing fire management plans to protect conserved populations from frequent or high-intensity fires and fire suppression activities while promoting natural regeneration following natural fire events. In addition, adequate preserve design for this species must include sufficient habitat to support appropriate pollinators.

This species is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. Encinitas baccharis is also covered in the San Diego Multiple Habitat Conservation Program NCCP. The species is covered in the Escondido subarea MHCP, and in October 2002, The Escondido Creek Conservancy acquired 345 acres of habitat in the vicinity of Lake Hodges in northern San Diego County. The parcel supports a population of Encinitas baccharis.

In 2003, three huge fires burned larges areas of San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 64% of habitat suitable for Encinitas baccharis burned during the fire and resulted in impacts to some populations. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of Encinitas baccharis.

Bensoniella *Bensoniella oregana*

State: Rare 1982
Federal: None

General Habitat:

Bensoniella is found only in Humboldt County in California and in Curry and Josephine counties in Oregon's Siskiyou Mountains. Bensoniella grows in the margins of moist, grassy meadows and in small openings in evergreen forests. Ecological conditions most important to the survival of Bensoniella include partial shade, moist soils derived from ancient sedimentary rock, high rain fall (approximately 100 to 140 inches per year), and summer fog. Bensoniella is associated with arrow-leaf groundsel, stream violet, wild ginger, blue wild-rye, and slender rush.

Description:

Bensoniella is a perennial herb in the saxifrage family (Saxifragaceae). It has basal, heart-shaped leaves, unbranched flowering stems, and small, saucer-shaped flowers with vivid orange anthers. Bensoniella resembles similar members of the Saxifrage Family, including piggy-back plant, foamflower, leafy-stemmed mitrewort, and large fringe-cup.

Status:

Bensoniella is limited to the Klamath Mountain Province and Coast Range of southwest Oregon and northwest California. There are approximately 86 Bensoniella occurrences in Oregon and six occurrences in California. The California occurrences are geographically isolated from the Oregon sites by approximately 110 miles. All six California sites occur within a six-mile radius of Snow Camp Mountain in central Humboldt County. There are four occurrences on private land and two in the Six Rivers National Forest. One of the Six Rivers National Forest sites is an experimental population established in 1980. A potential still exists to discover additional sites in the Coast Range and Klamath Mountain Province of Oregon and California.

Viability of *Bensoniella* in California is a concern because of the small size of populations, limited genetic variability (jeopardizing adaptive ability of individual known sites), isolation from Oregon populations, poor seed dispersal, habitat specificity, limited number of known sites (six total with two on federal land), and the lack of protection on private land. Of the four recently observed California occurrences, three are found on private land,

and one occurs on Six Rivers National Forest.

In California, documented impacts to the species include cattle grazing, salvage logging operations, increased exposure to light resulting from timber harvesting, firewood gathering, and the removal of woody debris by firewood gatherers. Additional threats include changes in hydrology, stream erosion, and soil compaction.

Nevin's barberry *Berberis nevinii*

State: Endangered 1987
Federal: Endangered 1998

General Habitat:
Nevin's barberry occurs in two habitat types: gravelly wash margins in alluvial scrub, and on coarse soils in chaparral. This species typically is found between 900 and 2,000 ft in elevation. The native range of the species extends from the foothills of the San Gabriel Mountains of Los Angeles County to near the foothills of the Peninsular Ranges of southwestern Riverside County.

Description:
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.

Status:
Nevin's barberry is currently known from more than 30 occurrences although the total number of plants is reportedly fewer than 1,000. Loss of habitat continues to be a major threat to this species. This species is dependent upon natural fire regimes which are interrupted or eliminated at the urban interface. The lack of reproduction and recruitment at most sites, and the very low number of individuals at most populations in the absence of fire are indicative of fire responsive species. Viable seed has been obtained from some populations and successfully grown in botanical gardens, but establishment in the wild appears limited.

The largest native populations, which collectively contain about 200 individuals, occur in Riverside County in the Vail Lake/Oak Mountain area. The majority of the known populations are on private lands in the Vail Lake region, although a few individuals occur on Bureau of Land Management (BLM) lands north of Vail Lake and in the Cleveland National Forest southeast of Vail Lake. Nevin's barberry is included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Conservation for this species will be achieved by inclusion of at least 8,000 acres of suitable chaparral and Riversidean alluvial fan sage scrub between 300 and 659 m in the Vail Lake area and the Agua Tibia Mountains Bioregion.

In Los Angeles County, another population of 130-250 individuals occurs on an alluvial terrace and on steep slopes in San Francisquito Canyon, Angeles National Forest. Another site was discovered on the Angeles National Forest in 1998 according to the U.S. Fish and Wildlife Service. The species was reported from the desert foothills near Ranchita, but was never relocated. The range of *Berberis nevinii* has been extensively surveyed, and additional populations are not likely to occur in the Vail Lake area. Searches for *B. nevinii*, based on published habitat parameters, revealed no additional plants on the San Bernardino National Forest.

This species is included in the San Diego Multiple Species Conservation Plan (MSCP). No known natural populations of Nevin's barberry occur within the MSCP planning area. However, the species persists at Spring Valley and within Torrey Pines State Reserve as two populations established from cultivated plants. These two populations will be conserved. Nevin's barberry is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. Nevin's barberry is in the horticultural trade. The species has been used in landscaping within its native range.

Truckee barberry ***Mahonia sonnei (Berberis sonnei)***

State	Endangered	1979
Federal	Delisted	2003

General Habitat:

When described, Truckee barberry was thought to occur in only one natural occurrence on alluvial granitic soils along the upper banks of the Truckee River in the town of Truckee, Nevada County.

Image of creeping barberry

Description:

Truckee barberry was described as an upright, evergreen shrub with divided spiny leaves, small clusters of yellow flowers, and blue-black berries. It is in the barberry family (Berberidaceae).

Status:

Truckee barberry is no longer recognized as a valid taxon; rather current scientific literature establishes that the species is a form of another species, creeping barberry (*Berberis aquifolium* var. *repens*). Creeping barberry is widespread in the western United States and Canada, and is not considered to be threatened or endangered within its range. The DFG is considering proposing Truckee barberry for delisting based on invalid taxonomy.

Island barberry *Berberis pinnata ssp. insularis*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:
Island barberry is restricted to north-facing slopes and canyons in shaded, often moist sites in association with island woodland and island chaparral on Santa Cruz Island. Species with which it is associated include toyon, poison oak, island cherry, and lemonade berry, and summer holly.

Description:
Island barberry is an evergreen shrub in the barberry family (Berberidaceae). The plants have glossy, divided leaves, yellow flowers, and blue berries. The species can sprout new shoots from underground rhizomes, indicating that many stems may actually represent one genetic clone.

Status:
This endemic barberry was historically known from three of the Channel Islands: West Anacapa, Santa Cruz and Santa Rosa. Today, the species is found only on Santa Cruz Island.

Island Barberry is threatened by soil loss and habitat alteration caused by rooting of feral pigs. In the wild, no signs of successful reproduction have been found. Of the Santa Cruz Island populations, the Diablo Peak occurrence has 24 large stems and 75 small stems; this may represent one or several clonal individuals. The Campo Raton occurrence was recently examined, and only two individuals were located. The Hazard Canyon population, which hadn't been seen for 15 years, was relocated and appears to be vigorous. The USFWS completed a recovery plan for island barberry and twelve other island plants in 1999. The final Recovery Plan was published in 2001.

Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%). In 1997, TNC drafted operating

principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Feral pig eradication efforts will likely begin in late summer, 2003.

Island barberry is in cultivation, for example at the University of Santa Cruz arboretum and Santa Barbara Botanic Garden. The plants cultivated at the Santa Barbara Botanic Garden include a clone of at least one plant now extirpated on Santa Cruz Island and are part of the Center for Plant Conservation National Collection of Endangered Plants.

Sonoma sunshine

Blennosperma bakeri

State: Endangered 1992
Federal: Endangered 1991

General Habitat:

Sonoma sunshine is a California endemic, restricted to grasslands within vernal pool and swale complexes on the Santa Rosa Plain in the Sonoma Valley of Sonoma County. It is associated with Burke's goldfields and Sebastopol meadowfoam.

Description:

Sonoma sunshine is a small, annual herb in the sunflower family (Asteraceae) with yellow, daisy-like flowers that bloom during 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.

Status:

Sonoma sunshine is known from 33 locations in the Cotati Valley and seven other sites in the Sonoma Valley, according to the USFWS. The majority of these occurrences are on private property. At least 30 percent of the historic occurrences of Sonoma sunshine have been eliminated or seriously damaged, and westward expansion of the City of Santa Rosa threatens 50 to 70 percent of the remaining Sonoma sunshine habitat. Housing development, agriculture, waste water irrigation, and long-term intensive livestock grazing have contributed to the decline and demise of most of the area's pools. In some cases pools spared in development projects in the Santa Rosa Plain area are declining in viability as a result of being within "postage-stamp" reserves surrounded by homes. Foot traffic, increased refuse, and altered hydrology due to lawn irrigation, have contributed to site quality reduction in some areas. Agricultural conversion (including discing, vineyards, and orchards) has destroyed or damaged other vernal pool areas. Only a few moderately-sized viable vernal pool areas remain in the region. The floristic quality of the remaining pools has declined in some areas due to long-term intensive grazing.

In order to resolve the conflicts with land use and wetland resources a Vernal Pool Task Force was formed. Composed of federal, state, and local agencies, local development and agricultural interests, and local environmental groups, the Task Force developed a Vernal Pool Ecosystem Preservation Plan. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan identifies areas for wetland and rare species protection, and areas

for wetland creation, restoration, or enhancement. This plan is currently being implemented.

To date, more than 23 separate properties, ranging in size from 1 acre to 174 acres, have been placed under the jurisdiction of DFG in cooperation with local agencies, such as the Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), for the protection of vernal pool species. Sonoma sunshine is protected with the DFG Todd Road Reserve contains 75 acres of vernal pools and associated uplands. A portion of the Carinalli Property near Laguna de Santa Rosa (150 acres) and a recent acquisition of an adjacent 75 acres both contain some vernal pool habitat and have been acquired under the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. 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*).

Research on the vernal pool plants is ongoing, funded primarily by FWS Section 6 grants. For example, projects examined the biological and logistic characteristics of the reserve properties, developed a management framework for recovery of the listed plants, designed and installed a long-term mowing/phytomass removal experiment to improve habitat quality, and conducted trials for intensive management techniques, e.g. fire and herbicide. This scientific approach has been used to develop practical, large-scale prescriptions that can directly affect recovery of the listed plants and improve native plant cover in vernal pool and adjacent upland habitats. These prescriptions gain wider applicability when supported by experimental data from multiple years with variations in climate and plant cover. In another study, Dr. Joan M. Leong, Sonoma State University, studied pollinator visitation to translocated and natural populations of *Blennosperma bakeri*. Future studies may elucidate genetic variability within and between populations of Sonoma sunshine, Burke's goldfields, and Sebastopol meadowfoam.

Point Reyes blennosperma

Blennosperma nanum var. robustum

State: Rare 1978
Federal: None

General Habitat:

Point Reyes blennosperma occurs mostly on sandy soils in the coastal prairie habitat of the Point Reyes Peninsula in Marin County.

Description:

Point Reyes blennosperma, a member of the sunflower family (Asteraceae), is a yellow-flowered annual herb with hollow, sprawling stems.

Status:

Point Reyes blennosperma is known from approximately 15 populations, including approximately a dozen populations within Point Reyes National Seashore. One population occurs in Mendocino County in north coast bluff scrub overlying sand dunes. This population is entirely on private land; its status is unknown.

The effects of tule elk grazing on vegetation of Tomales Point following removal of cattle were studied at Point Reyes National Seashore. One of the goals of the study was to maintain viable populations of Point Reyes blennosperma and the Myrtle's silverspot butterfly. Point Reyes Blennosperma and San Francisco owl's clover were mapped and inventoried in 1983, and populations have been surveyed by California Native Plant Society teams on a nearly annual schedule since then. Results indicate that populations of these rare plants fluctuate in response to rainfall and summer drought. There is no apparent decline associated with tule elk presence, although the data need to be analyzed more fully to contrast trends on Tomales Point with those from other parts of the seashore.

Dwarf golden star *Bloomeria humilis*

State: Rare 1978
Federal: None

General Habitat:
Dwarf golden star 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. Associated State-listed species include the rare Hearst's ceanothus and maritime ceanothus, as well as the endangered Hearst's manzanita.

Description:
Dwarf golden star is a perennial herb in the lily family (Liliaceae) 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.

Status:
Only two known occurrences of dwarf golden star are known to exist. Both known populations occur on the Hearst Ranch on land used primarily for cattle grazing. No surveys of the plants have been conducted in at least ten years to DFG's knowledge.

Dwarf golden star had been a federal candidate species in the 1990s and is still considered by FWS to be sensitive. In 1996, a number of candidate species were reclassified. According to the report published in the Federal Register, land uses at the Hearst Ranch, including light cattle grazing and periodic shrub removal, were not shown to be detrimental to the species. The report concluded that there were no known imminent threats to the species at that time.

Indian Valley brodiaea ***Brodiaea coronaria ssp. rosea***

State: Endangered 1979
Federal:

General Habitat:
Populations are restricted to serpentine clay and gravel in open areas along creeks, meadows and flood terraces, and gravel banks of ephemeral creeks. This subspecies often occurs with other rare serpentine plants.

Description:
Indian Valley brodiaea is a member of the Lily Family (Liliaceae). It produces long, linear leaves from a perennial corm and bears rosy pink flowers on a leafless flowering stem.

Status:
Indian Valley brodiaea is known from approximately 10 locations. 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 portion of the population's occupied habitat in Glenn County is used as a local dump. BLM has established the Indian Valley Area of Critical Environmental Concern (ACEC) and Research Natural Area Management Plan to protect and enhance 40 acres of existing Indian Valley brodiaea habitat on their land.

Thread-leaved brodiaea

Brodiaea filifolia

State: Endangered 1982
Federal: Threatened 1998

General Habitat:

This species typically occurs on gentle hillsides, valleys, and floodplains in mesic, southern needlegrass grassland and alkali grassland plant communities in association with clay, loamy sand, or alkaline silty-clay soils. Sites occupied by this species are frequently intermixed with, or near, vernal pool complexes. The historical range of *B. filifolia* extends from the foothills of the San Gabriel Mountains at Glendora (Los Angeles County), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside Counties to Carlsbad in northwestern San Diego County, California.

Description:

Thread-leaved brodiaea, a member of the lily family (Liliaceae), produces several linear leaves from an underground corm and a leafless flowering stalk bearing blue to red-purple flowers.

Status:

Thread-leaved brodiaea is known from approximately 40 occurrences, many of which are threatened by continuing residential and commercial development in Southern California. Fewer than 2000 individuals occupy most sites and occurrences are often less than 10 acres in size. A number of habitat occurrences for the species have been lost in the past decade in northwestern San Diego County. Proposed residential/commercial developments in San Diego, Orange and Los Angeles counties threaten additional populations. Small populations of the species occur on the DFG's lands at the San Jacinto Wildlife Area in Riverside County and Carlsbad Highlands in San Diego County. A significant population occurs on TNC's Santa Rosa Plateau in western Riverside County, and a small population occurs in Aliso-Wood Canyons Regional Park in Orange County. The City of Glendora manages the Brodiaea Reserve which was established to protect thread-leaved Brodiaea. The Brodiaea Preserve constitutes the second largest preserve, after the TNC preserve, on the Santa Rosa Plateau.

A few efforts have been made to translocate populations of thread-leaved brodiaea from areas approved for development to new areas of presumably suitable but unoccupied habitat. Several of these have failed. The others are ongoing, and it will be several years before their outcome can be reasonably assessed. This species is covered in the San Diego Multiple Species Conservation Plan (MSCP) NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Thread-leaved brodiaea is

considered to be a narrow endemic species under the MSCP and 88 percent of its vernal pool habitat will be protected. Under the MSCP, 85 percent of the major populations will be conserved. The MHCP will protect this species by conserving about 90% of known locations and major populations, and assuming the critical locations in Carlsbad and San Marcos will be 100% conserved.

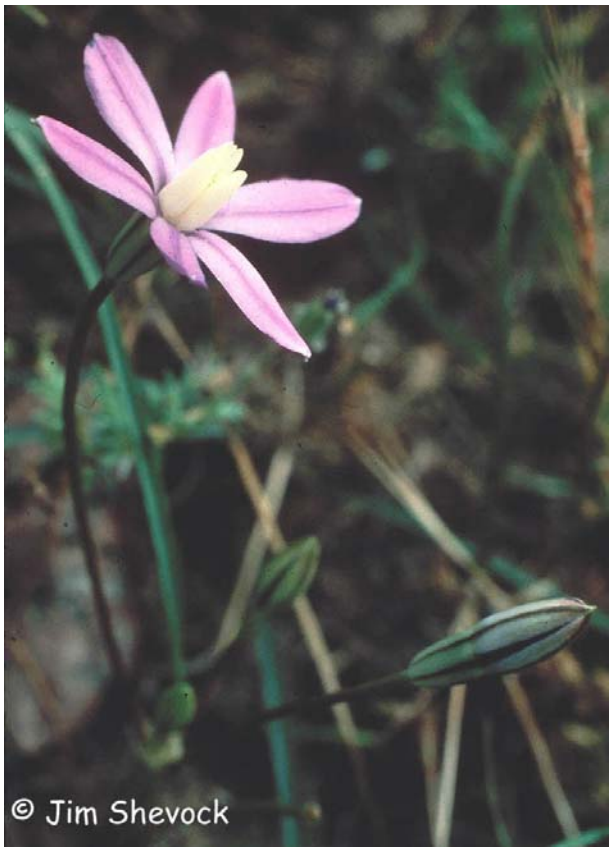
The MHCP includes specific conditions that must be met to adequately conserve thread-leaved brodiaea. These include conservation and management of the population in San Marcos; control of edge effects; protection of vernal pool hydrology through watershed management; implementation of fire management plans to protect populations from frequent or high-intensity fires and fire suppression activities; and enhancement of declining populations. The City of San Diego has implemented a monitoring for selected populations of San Diego thorn-mint within its portion of the San Diego Multiple Habitat Conservation Program preserve lands. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Thread-leaved brodiaea is also included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Twelve populations of thread-leaved brodiaea are known from western Riverside County along the San Jacinto River in Nuevo, Perris, and the San Jacinto Wildlife Area; on Salt Creek; on the Santa Rosa Plateau; and west of the Santa Rosa Plateau. These populations are primarily clustered into two complexes: one along the San Jacinto River near Perris and Lakeview, and the other on the Santa Rosa Plateau. The San Jacinto River floodplain supports about half of the remaining western Riverside County populations. A small population is known to occur in the Old Salt Creek drainage west of Hemet. The MSHCP will conserve thread-leaved brodiaea through protection of at least 6,900 acres of grassland, playas, and vernal pools within the San Jacinto River, Mystic Lake and Salt Creek portions of the MSHCP Conservation Area. At least 12 populations will be protected, with focus on core areas at Goetz Road (EO1), Perris Valley airport (EO2), Tenaja Road (EO3), Mesa de Colorado (EO5), Hemet vernal pools (EO 26), South SJWA (EO27), Squaw Mountain (EO29), Santa Rosa ranch (EO30), Slaughterhouse (EO31), North San Jacinto Wildlife Area (EO43) and Redondo Mesa (EO 52). Core areas represent large blocks of habitat with relatively intact ecological functions that support sensitive species. Floodplain processes will be maintained along the river in order to provide for the distribution of the species to shift over time as hydrologic conditions and seed bank sources change.

The species has been observed to hybridize with several other species of *Brodiaea* where they co-occur. Hybridization is facilitated by cross pollination from non-native honey bees. Studies on the biology of thread-leaved brodiaea are needed before adequate recovery strategies can be developed for this species.

Kaweah brodiaea *Brodiaea insignis*

State: Endangered 1979
Federal: None



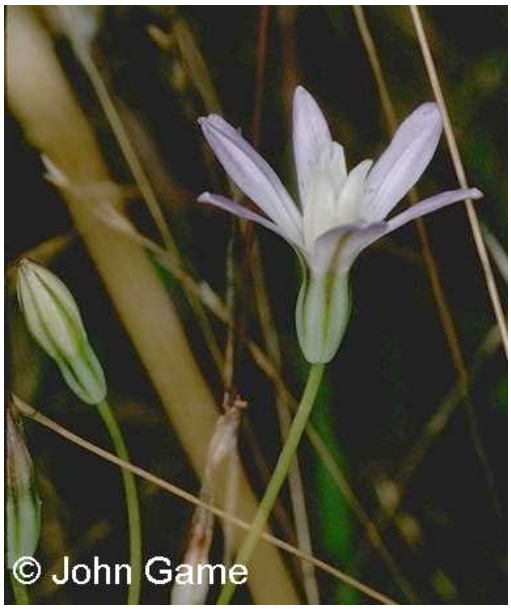
General Habitat:
This species is endemic to the Kaweah and Tule rivers' drainages in Tulare County, where it grows on granitic substrates and deep, clayey soils on south- and southwest-facing slopes in blue oak woodland and savannah.

Description:
Kaweah brodiaea is a showy, herbaceous perennial in the lily family (Liliaceae). From a fibrous corm, it produces 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. It forms pink carpets in May and June within blue oak savannahs.

Status:
Fewer than 25 extant populations are known, of which 90 percent are on private land or roadsides. Populations occur at the DFG's Kaweah and Blue Ridge Ecological Reserves, in Sequoia National Forest, on Caltrans rights-of-way, and on private property. Kaweah brodiaea also occurs within the BLM's Case Mountain ACEC, located near Sequoia National Park, six miles east of Three Rivers, California. The ACEC encompasses 18,530 acres of land, including several hundred acres of suitable habitat for the brodiaea. There is currently no public vehicular access to the area. The number of flowering plants varies from year to year, and at least some amount of grazing appears to benefit the species by reducing competition by nonnative weeds.

Residential development, roadside maintenance activities, road widening, and intensive livestock activities threaten Kaweah brodiaea. In addition, water storage development in the Upper San Joaquin River drainage basin was assessed by USBR in 2003. Development of a dam on Dry Creek would have an adverse affect on a population of Kaweah brodiaea in the area.

Chinese Camp brodiaea *Brodiaea pallida*



State:	Endangered	1978
Federal:	Threatened	1998

General Habitat:

This species is confined to one occurrence southwest of Chinese Camp in Tuolumne County. *Brodiaea pallida* grows in overflow channels and seeps and springs in clays derived from serpentine soils.

Description:

Chinese Camp brodiaea is an herbaceous perennial in the lily family (Liliaceae). It forms an underground corm, linear basal leaves, and terminal clusters of rose pink to pale blue flowers. Chinese Camp brodiaea can spread by suckers.

Status:

Chinese Camp brodiaea is restricted to a narrow 10 to 20 foot-wide area along a half mile-long section of an intermittent stream entirely on private property. The entire population is scattered over approximately 65 acres. Occasional hybrids between Chinese camp brodiaea and a more common brodiaea from the area, *Brodiaea elegans*, have been observed. A portion of the population was destroyed prior to 1982. A subdivision has been proposed for the area that includes the Chinese Camp brodiaea population, which could disturb the hydrology upon which the species depends or increase disturbance from human activities, even if the plants are not directly affected by construction activities. In addition, species such as Chinese Camp brodiaea, that have very small populations and occupy only small areas, are vulnerable to decline and extinction due to genetic problems or random catastrophic events such as disease outbreaks, insect predation, or extended droughts. In 1994 a private landowner expressed interest in selling his Chinese Camp brodiaea habitat to the DFG, but after lengthy negotiations, no agreement was reached. A very small portion of the population along a road has been fenced and is being leased by CNPS in order to protect the plants.

Leafy reed grass *Calamagrostis foliosa*

State: Rare 1979
Federal: None

General Habitat:
It is an early successional species found on rocky coastal bluffs, in riparian habitats and cliff slopes, and on steep road cuts in Mendocino, Humboldt, and Del Norte counties. It occurs on low nutrient, low moisture substrates which are unstable and eroding.

Description:
Leafy reed grass is a low-growing, tufted perennial member of the grass family (Poaceae) with compact, densely flowered inflorescences.

B. Dawson, BLM File Photo

© Oren Pollak

Status:
There are numerous 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 inaccessible to livestock and humans, though a few may be subject to development. Leafy reed grass is widely available as an ornamental plant. The large number of known occurrences and the lack of threats to the species support removal of this species from the list of rare plants in California.

Dunn's mariposa lily *Calochortus dunnii*

State: Rare 1979
Federal: None

General Habitat:

This species is known only from the Peninsular Ranges of San Diego County and adjacent Baja California Norte, Mexico. Rocky openings in chaparral or at the grassland/chaparral ecotone are the preferred habitat of this species. Dunn's mariposa lily is restricted to gabbro and metavolcanic soils. It is associated with Sonoma sage and chaparral pea.

Description:

Dunn's mariposa lily is an herbaceous perennial of 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.

Status:

Approximately 20 occurrences of Dunn's mariposa lily are known, some of which are small populations of only a few plants. Property ownership of this species habitat includes the Bureau of Land Management, California State Parks, National Forest land, and private property.

The principal threat to this species is overcollection. Introduction of wild turkeys to the area are also considered to be a threat because wild turkeys eat the bulbs. Several populations are adjacent to heavily used outdoor recreation areas and may need to be fenced to provide adequate protection for the plants. Recent proposals have been developed for introduction of non-native wild turkeys into the range of Dunn's mariposa lily. Potential impacts of turkey introductions on the growth and reproduction of small populations of Dunn's mariposa lily will be assessed. The diet of wild turkeys introduced into other parts of California includes related species of mariposa lilies.

Studies of the biology of Dunn's mariposa lily are needed before adequate recovery or management plans for Dunn's mariposa lily can be completed. This species is covered in the San Diego Multiple Species Conservation Plan NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. *Calochortus dunnii* is considered to be a narrow endemic species under the MSCP and 100 percent of its populations will be protected. Fifty-one percent of its major populations are found in the Otay Mesa area. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from

Orange County to the Mexican Border. The plants cultivated at Rancho Santa Ana Botanic Garden include as part of the Center for Plant Conservation National Collection of Endangered Plants.

Siskiyou mariposa lily *Calochortus persistens*

State: Rare 1982
Federal: None

General Habitat:
Siskiyou mariposa lily is restricted to shallow, dry, rocky, and acidic soils on two disjunct ridge tops in the Klamath-Siskiyou Range on the California-Oregon border. *Calochortus persistens* plants occur in openings where there is little vegetative cover and litter layer is shallow or absent. Dominant shrubs are curl-leaf mountain mahogany, Oregon-grape, and bitter cherry, and lupine.

Description:
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.

Status:
Two historical populations are known: the type locality on Gunsight-Humbug Ridge, west of Yreka, Siskiyou County, California and the Bald Mountain site, west of Ashland, Jackson County, Oregon. In California, this species is currently found at nine separate sites on approximately 24 acres of Klamath National Forest and privately-owned lands that stretch for four miles along the Gunsight-Humbug Ridge. A 1982 census resulted in a California population estimate of 3,455 plants in nine separate occurrences. In 1987, 1,140 plants were counted in eight separate locations. In June 1995, all known California locations were surveyed resulting in an estimate of 3,000 plants. No plants have been seen at the Oregon site for the past four years.

In 2001, a petition was filed Klamath-Siskiyou Wildlands Center to list this species under the federal Endangered Species Act. The petition identified several major threats to the species. Major threats include fire suppression

resulting in shading; competition by native and non-native species; increased fuel loading; fragmentation by roads, fire breaks, tree plantations, and radio-tower facilities; maintenance and construction around radio towers and telephone relay station located on Gunsight Peak and Mahogany Point; and soil disturbance and exotic weed and grass species introduction as a result of heavy recreational use. For example, dyer's woad, a germination inhibitor, now affects over 90 percent of the known *Calochortus persistens* habitat in California.

Fire suppression since the 1955 Haystack Fire has resulted in shading and competition by native species including curl-leaf mountain mahogany and Oregon grape (Knapp 1995). Conifers appear to be encroaching as well. Fire suppression may have resulted in an increased fuel load that could result in complete destruction of habitat, should a high-intensity fire occur. Direct destruction of plants and habitat has occurred as a result of site maintenance around the Gunsight Peak radio installation in Spring 2000 and snow plowing to replace a power pole in the winter of 1999/2000. Road grading and controlled burning may also result in direct destruction of habitat.

Deer, rodent, and insect herbivory is common and causes significant losses to leaves, buds, flowers, and fruits. In a 1995 to 2000 demographic study, no seeds matured in 4 out of 6 years, due in large part to predation on reproductive structures according to Klamath National Forest. Unpublished data show that there has been no successful reproduction of *C. persistens* in the last five years (Klamath-Siskiyou Wildlands Center 2001). There is no evidence of asexual reproduction by bulbils or bulblets and plants do not begin to flower until 8 to 10 years of age (Klamath-Siskiyou Wildlands Center 2001).

The Klamath National Forest issued "Botanical Investigation and management Guidelines for Calochortus persistens" in 1987, and designated 100 ac as Special Habitat for *C. persistens* in 1994. Although the management goals set forth in the Klamath National Forest Land and Resource Management Plan must be implemented, currently there are no funds directly allocated to specific projects to reduce or eliminate dyer's woad. In their petition to list this species, the Klamath- Siskiyou Wildlands Center cites the fact that the management guidelines have not been implemented as one of the threats to the survival of the species.

Tiburon mariposa lily *Calochortus tiburonensis*

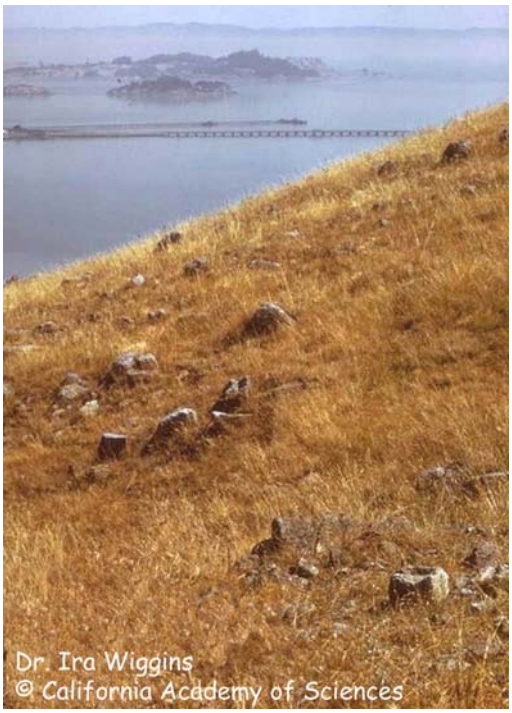
State:	Endangered	1978
State:	Threatened	1987
Federal:	Threatened	1995

General Habitat:

This mariposa lily is known only from serpentine grassland on Ring Mountain on the Tiburon Peninsula of Marin County.

Description:

Tiburon mariposa lily is a bulb-forming, perennial herb in the lily family (Liliaceae). It has a single persistent, basal, linear-oblong leaf 1-2 feet long. The flowering stem, about 20 inches tall, is usually branched and bears erect flowers in twos or threes at the ends of the branches. The three petals and three sepals are light yellow-green with reddish or purplish-brown markings. Long slender hairs on the upper surface and margins of the petals and the lack of wings on the capsule distinguish the Tiburon Mariposa lily from the other two *Calochortus* species found on the Tiburon Peninsula, the Oakland star-tulip or Mariposa lily and the yellow Mariposa lily.



Status:

Its distribution encompasses roughly three populations, all of which occur in the Ring Mountain Preserve. The Marin County Department of Parks, Open Space, and Cultural Services owns and manages the Preserve. In 1997, the DFG held two recovery workshops to address Tiburon mariposa lily and 11 other plants known from serpentine habitats in the San Francisco Bay Area. At one workshop, a graduate student reported on her research showing that the Tiburon mariposa lily's reproduction is highly dependent on its presumed primary pollinator, the bumblebee, so management activities that would affect the bee would also affect the plant. The highest priority recovery action for the plant identified by workshop participants is research into appropriate management practices to reduce competition from weedy species and to maintain high quality habitat. Management and recovery actions for Tiburon mariposa lily have been addressed in the federal Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998. At that time, more than 32,000 plants were seen.

Stebbins' morning glory

Calystegia stebbinsii

State: Endangered 1981
Federal: Endangered 1996

General Habitat:

This member of the morning glory family (Convolvulaceae) grows primarily on the gabbro-derived soils of the Pine Hill gabbro formation in the Sierra Nevada foothills of El Dorado County and to a much lesser extent on serpentine-derived soils near Grass Valley in Nevada County. *Calystegia stebbinsii* in El Dorado County is associated with chaparral on gabbroic soils. It occurs within openings within chaparral, associated with whiteleaf manzanita. Stebbins' morning glory is often associated with two other state listed plants: Pine Hill ceanothus and Layne's butter-weed. In Nevada County it occurs on serpentine in chaparral associated with chamise, manzanita, and foothill pine.

Description:

Stebbins' morning glory is a perennial, herbaceous vine with long slender stems, deeply divided leaves, and large, funnel-shaped, white flowers.

Status:

Stebbins' morning glory is known from approximately 18 occurrences. Most occurrences are discontinuously scattered within two population centers in the northern and southern portions of the Pine Hill formation. The Pine Hill formation consists of approximately 30,000 acres; approximately half contains the habitat types that support the rare species. Stebbins' morning glory does not occur at the center of the formation on Pine Hill. It also occurs sparsely scattered along a narrow band over a distance of approximately 3.5 miles in Nevada County.

In the southern half of the Pine Hill gabbro formation, residential development has occurred in habitat near known colonies of the morning glory. These projects went through the development approval process before El Dorado County was aware of these species. Potential habitat near known colonies has also been cleared under ministerial grading permits.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (*Senecio layneae*), and El Dorado bedstraw (*Galium*

californicum ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 areas have been preserved. Portions or all of 7 of the 19 occurrences are protected on public land.

In the northern portion of the gabbro soil formation, approximately 2,079 acres have been purchased and transferred to the DFG, BLM, or El Dorado County. This area includes a population of Stebbins' morning glory. A prescribed fire on nearby property held by BLM appears to have rejuvenated a dwindling population on that site. In the southern portion of the gabbro soil formation, approximately 454 acres have been purchased and transferred to BLM or El Dorado County. *Calystegia stebbinsii* appears to be an early successional species that occupies temporary openings on gabbro or serpentine and is eliminated as vegetation grows up around it. Preserves must include sufficient habitat to allow for expansion or shifts in occupied habitat.

Recovery is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. Fire or disturbance is needed for seed germination, and fire is needed to establish seedlings. Assuming recovery criteria are met, *Calystegia stebbinsii* could be delisted after three natural fire cycles (approximately 80 to 100 years).

White sedge *Carex albida*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:
This species is restricted to the sphagnum bog at Pitkin Marsh in Sonoma County. White sedge is associated two other State listed endangered plants: Pitkin Marsh lily and Pitkin Marsh Indian paintbrush.

Description:
White sedge, a member of the sedge family (Cyperaceae), is a short, tufted, grass-like perennial herb. The triangular stems are 1.3 to 2 feet tall, and longer than the leaves. The leaves are flat, 1 to 2 inches wide, and have closed sheaths. The inflorescence consists of 4 to 7 oval to oblong spikelets that are 0.3 to 0.7 inches long.

Status:
White sedge was thought to be extinct until 1987, when a single population was found in a sphagnum bog in Sonoma County. The species has been extirpated from its four historical populations, all in Sonoma County. The single population, which is located on private land, has approximately 800 to 1,000 plants. This site is subject to persistent development pressures. Any change in the hydrology of the marsh, including draining, could eliminate the white sedge and other rare plant species there.

The City of Sebastopol General Plan includes a provision to reintroduce white sedge to the Laguna de Santa Rosa marshes where it once occurred. Pitkin Marsh is privately owned and the DFG has no recent information on this species.

Tompkins' sedge

Carex tompkinsii

State: Rare 1979
Federal: None

General Habitat:

Tompkin's sedge grows in soils derived from metamorphic or granitic rock in the Sierra Nevada in the Kings River Canyon in Fresno County and the Merced River Canyon in Mariposa County. It grows not only on steep, dry, south-facing rocky slopes, but also on shady, mesic, north-facing slopes, and occasionally in moist riparian areas.

Description:

Tompkins' sedge, a member of the sedge family (Cyperaceae), is a perennial, densely-tufted grass-like herb.

Status:

Many additional populations have been discovered since Tompkins' sedge was State-listed in 1979, and the species is now known to occur in a wider variety of habitat types than originally thought. In 1997, the species was reported from the Hetch Hetchy area in the Tuolumne River Canyon, and two new occurrences were discovered in Stanislaus National Forest in the area burned by the Ackerson Fire in 1996. Additionally, plants were transplanted along Highway 180 in the Kings River Canyon in Sequoia National Forest to serve as a seed source for revegetation efforts after the highway was damaged by flooding in January 1997. In 1998, the Forest Service removed this species from its Sensitive Species list because new populations have been discovered and because most plants grow in areas unlikely to experience human impacts. . Fires reduce competition and appear to invigorate Tompkins' sedge plants. Most occurrences are on public land within Sequoia and Sierra National Forests and Kings Canyon and Yosemite National Parks. The large number of known populations and the low level of threat to this species support its removal from the list of rare plants.

Tree-anemone *Carpenteria californica*

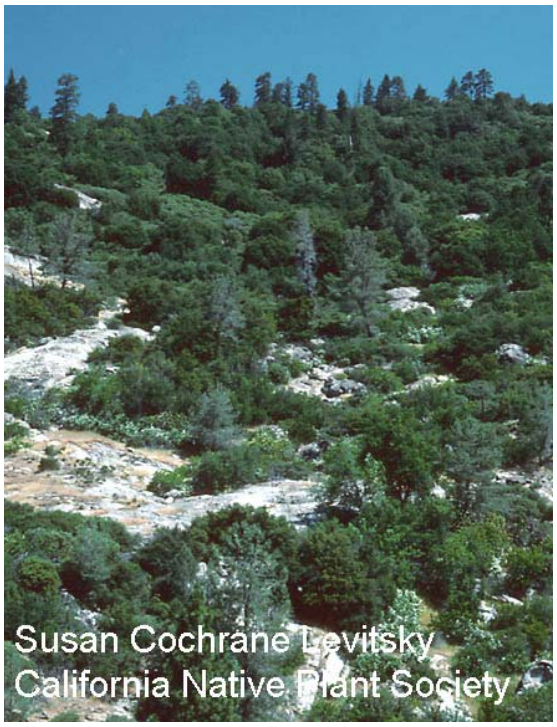
State: Threatened 1990
Federal: None

General Habitat:

Tree-anemone is an extremely localized endemic species occurring only on the west slope of the Sierra Nevada, between the San Joaquin and Kings Rivers in eastern Fresno County, California. It grows on well-drained granitic soils and is most abundant on north-facing ravines and drainages in chaparral and cismontane woodland communities. Most stands are in small drainages on dry rocky slopes, mixed with gray pine, interior live oak, chaparral whitethorn, and other representatives of the foothill woodland at the lower elevation limits of its range. At their upper elevational limit, carpenteria plants can be found growing with ponderosa pine, interior live oak, and other species of the lower yellow pine zone.

Description:

Tree-anemone, a member of the mock orange family (Philadelphaceae), is an erect to spreading evergreen shrub that grows to a height of three to 13 feet. It has glossy green leaves and pale bark that peels in large sheets in the fall. It has large and showy flowers with white petals and yellow centers.



Status:

The total range of the species covers an area of approximately 225 square miles, within which there are ten extant native populations. The total number of plants has been estimated at fewer than 5,000. About two-thirds of the existing plants occur on Sierra National Forest land, and carpenteria is classified as a sensitive plant by the USDA Forest Service.

Tree-anemone 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 appears to be an important ecological requirement of this species. Burned tree-anemone

plants can resprout vigorously, and fires reduce competition from native shrubs and trees. Sierra National Forest is considering using prescribed burning to conserve tree-anemone, and USFS and USFWS staff are investigating incorporating a prescribed burn plan into a habitat conservation agreement or recovery plan.

It has been estimated that since the species was discovered in the 1840s, at least one-third of its distribution has been destroyed. Tree-anemone is threatened by residential development, fire suppression and fire at the wrong time of year, highway construction, OHV use, road maintenance, hydroelectric operations, and logging. USFS has established a Carpenteria Botanical Area that includes a portion of the largest tree-anemone occurrence, and its Backbone Creek Research Natural Area supports another population. A portion of a tree-anemone population is protected on the Black Mountain Preserve that was transferred from TNC to the Sierra Foothill Conservancy in 1997. Also in 1997, the Preserve was expanded through the addition of a conservation easement. In 1997, the small population was discovered in Madera County.

Tiburon Indian paintbrush

Castilleja affinis ssp. neglecta

State:	Endangered	1990
Federal:	Endangered	1995

General Habitat:

Tiburon paintbrush grows in serpentine bunchgrass communities on north to west facing slopes. The range of the species is from Marin and Napa Counties to Santa Clara County.

Description:

Tiburon Indian paintbrush is a perennial herb in the figwort family (Scrophulariaceae) with woody basal stems, narrow lobed leaves, and showy yellow to red-yellow flowers that appear from March through June. It is a root hemiparasite, meaning its roots develop interconnections with the roots of other plants to increase water and nutrient flow.

Status:

There are seven known occurrences of the plant. Three occur on the Tiburon Peninsula in Marin County, with a total of approximately 250 plants in 1997. A portion of one of these three populations was destroyed by a residential development, and a portion of the plants formerly seen at a second population have not been observed in recent years. A bond issue that passed in 1997 allowed the purchase for open space of a parcel upslope from this latter population. Because the plants grow on thin, low-nutrient soils, preservation of this parcel was considered critical to protecting the Tiburon Indian paintbrush, as runoff containing herbicides and fertilizers from any homes built upslope could have eliminated the population. The Middle Ridge population on the Tiburon Peninsula may be impacted by human use (hiking and dog walking) in the area.

Approximately 550 plants occur at a private quarry in American Canyon in Napa County. Two sites, with a total of approximately 75 plants, occur on Golden Gate National Recreation Area lands in Marin County. One population exists on private land in Santa Clara County. A portion of this population has disappeared since 1993, possibly due to rooting by wild pigs, which was evident in 1999. Approximately 80 plants were observed at this location in 1999. The Marin County populations are threatened by residential development, foot traffic, and soil slumping. The Napa County population is threatened by gravel mining. Development projects threaten the Coyote Ridge population in Santa Clara County.

In 1997, the DFG held two recovery workshops to address Tiburon Indian paintbrush and 11 other plants known from serpentine habitats in the San Francisco Bay Area. Several participants volunteered to work to remove pampas grass and broom plants that are threatening the Tiburon Peninsula populations. Priority recovery actions identified by workshop participants included research into the management needs of the plant and protecting the populations on private lands.

Management and recovery actions for the species have been addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Succulent owl's-clover *Castilleja campestris ssp. succulenta*

State:	Endangered	1979
Federal:	Threatened	1997

General Habitat:

This species grows in drying vernal pools in valley grassland areas of the San Joaquin Valley at the base of the Sierra Nevada foothills. Its discontinuous distribution extends through northern Fresno, western Madera, eastern Merced, southeastern San Joaquin, and Stanislaus counties.

Description:

Succulent owl's-clover is a succulent, hemiparasitic (partly parasitic) annual herb in the figwort family (Scrophulariaceae). It has brittle narrow leaves and heads of bright yellow flowers.

Status:

Succulent owl's-clover is known from more than 60 occurrences. Nearly one-half of the currently known populations of fleshy owl's-clover are variously threatened by loss and degradation of habitat resulting from urban development, agricultural land conversion, discing, flood control projects, grazing and a highway expansion project. Twenty-two populations occur on private lands without protection for the species. Discing appears to have eliminated at least one population in Fresno County. Seven populations are protected at the Flying M Ranch in Merced County, where The Nature Conservancy has purchased conservation easements. Two other populations occur on lands managed by the U.S. Bureau of Reclamation and the U.S. Bureau of Land Management

Conversion of habitat to agriculture, urbanization, proposed gravel and aggregate mining, land fills, flood control, highway expansion, discing of vernal pools, competition from non-native weeds, and inappropriate grazing practices have all been cited as threats to succulent owl's clover. The type-locality of the species near Ryer in Merced

County has been destroyed.

In 1992, the DFG purchased land on Big Table Mountain in Fresno County that supports succulent owl's-clover. In 1995, Caltrans purchased a vernal pool complex in Madera County for mitigation purposes. Just prior to their acquisition by Caltrans, the pools had been disced. As a result of this disturbance, these pools have been invaded by upland plants, but they still support succulent owl's-clover and other rare species.

The proposed University of California Merced campus will directly affect succulent owl's-clover and other listed vernal pool species. This project plus associated residential development and access roads are threats to the primary and relatively extensive population in that area. Of the 12 occurrences recorded in the California Natural Diversity Database on the proposed campus and associated community, four are in the area that is expected to be developed within the next 15 years; these four occurrences include 76 percent occupied pools in the University planning area.

The small size of a number of populations renders the populations highly susceptible to chance events. Among the 24 populations of fleshy owl's-clover for which size estimates have been recently documented, ten consisted of fewer than 100 plants each at their peak size according to CNDDB records.

In 2002, the report, **San Joaquin Valley and Adjacent Sierra Foothills Vernal Pool Geomorphic Classification and Conservation Prioritization,** was completed. The primary objective of this project was to develop a systematic framework for assessing ecological variation of vernal pools in the San Joaquin Valley, and the adjacent Sierra foothills. The framework provides conservation planners with information to focus active protection of vernal pools on complexes that represent the range of geomorphic1 vernal pool types in the region, and those with viable populations of special status species. Information presented in this report will aid conservation of succulent owl's clover and associated vernal pool species.

Mount Gleason Indian paintbrush ***Castilleja gleasonii (=Castilleja pruinosa)***

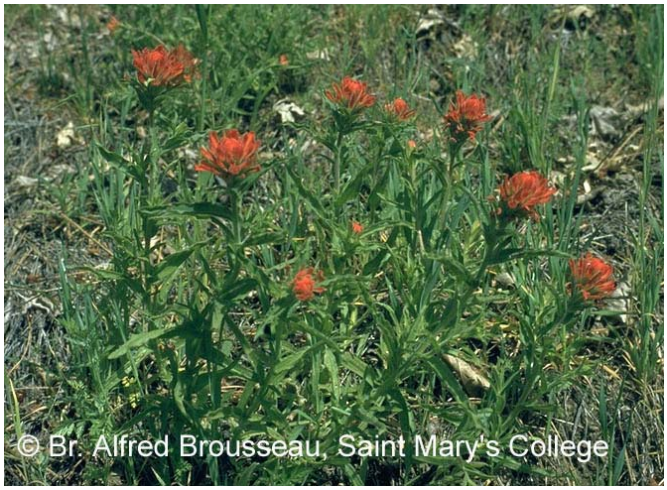
State: Rare 1982
Federal: None

General Habitat:

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.

Description:

Mount Gleason Indian paintbrush is a grayish, hairy perennial herb with scarlet flowers in the figwort family (Scrophulariaceae).



Images are of Castilleja pruinosa.

Status:

There are six known occurrences near Mount Gleason in the Angeles National Forest. In 1997, a seventh occurrence was discovered in the Forest within the Knapp Ranch area, and in 1998, two additional occurrences were found in the Forest.

Under current taxonomic treatments, frosted Indian paintbrush (*Castilleja pruinosa*) plants with wide calyx lobes from the San Gabriel Mountains have been called Mt. Gleason Indian paintbrush. Mt. Gleason Indian paintbrush is no longer accepted as a distinct species and is thought to be derived from a hybrid of *Castilleja affinis* and wooly paintbrush (*Castilleja foliolosa*). Frosted Indian paintbrush and related species are part of a highly variable complex in need of further study.

San Clemente Island Indian paintbrush

Castilleja grisea

State: Endangered 1982
Federal: Endangered 1977

General Habitat:

San Clemente Island Indian paintbrush grows in maritime desert scrub on the rocky slopes and canyons of San Clemente Island, the southernmost of the eight Channel Islands off the coast of California. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

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.

Status:

Early reports of this species described it as quite common on the cliffs of San Clemente Island. In 1963, it was noted that the species was only occasionally found along the coast and rarely in the canyon sides. By 1978, it was reported that only three plants were to be found on the island, in inaccessible areas on canyon walls. This decline was likely caused by ranching operations on the island during the past century, which resulted in overgrazing and elimination of much of the native vegetation. In addition, intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. Steep cliffs and canyon sides were likely the only refuge from these animals.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. This removal program may benefit the species. The last available information reported forty-four populations of San Clemente Island Indian paintbrush scattered around the island, about half containing fewer than 10 individuals. The DFG has no current information on the status of this species.

Pitkin Marsh Indian paintbrush

Castilleja uliginosa

State: Endangered 1978
Federal: None

General Habitat:

Pitkin Marsh Indian paintbrush is restricted to the freshwater marsh habitat of upper Pitkin Marsh in Sonoma County. This species is associated two other State listed endangered plants: Pitkin Marsh lily and white sedge.

Description:

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.

Status:

Historically, Pitkin Marsh Indian paintbrush was restricted to the wet marsh habitat of upper Pitkin Marsh, Sonoma County. Reports from the 1950s suggest there was a larger 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. Current taxonomic treatment places *Castilleja uliginosa* under a related species, *Castilleja miniata*.

Pitkin Marsh Indian paintbrush requires two plants for pollination, so the single known plant cannot reproduce. Under a MOU with the DFG, the Jepson Herbarium developed tissue cultures and other vegetative propagation techniques to increase Pitkin March Indian paintbrush numbers. The U.C. Berkeley Botanic Garden propagated this plant from a cutting taken from the original plant by the late Dr. Larry Heckard. In addition, researchers have successfully hybridized and backcrossed the paintbrush with related species. In recent years, DFG personnel have not been allowed access to cut back competing vegetation or monitor the health of the single, fenced individual. This last wild plant is probably already gone. Protection of the current hydrology and control of competing vegetation will be necessary to maintain the habitat.

In late 1996, the DFG, Jepson Herbarium, and other interested parties met to develop a conservation strategy for this species. The conservation strategy includes a possible reintroduction project, contingent upon the success of propagating more plants for reintroduction and on a cooperative arrangement with the landowner.

California jewelflower *Caulanthus californicus*

State: Endangered 1987
Federal: Endangered 1990

General Habitat:

California jewelflower occurred historically in slightly alkaline sandy loam in native grasslands of the southern San Joaquin Valley and adjacent valleys. Native plant species, such as annual fescue, clovers, red maids, and goldfields comprise a high proportion of the vegetation at many of the known locations. California jewelflower has been reported from elevations ranging from approximately 75 to 900 meters and from level terrain to 25% slopes. Primary soil types at known sites are sub-alkaline, sandy loams.

Description:

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.

Status:

The historical range of California jewelflower is based on specimens collected between 1880 and 1973. Nearly half of the collection sites were on the floor of the San Joaquin Valley in Fresno, Kern, and Tulare counties. Several other collections came from two smaller valleys southwest of the San Joaquin Valley: the Carrizo Plain (San Luis Obispo County) and the Cuyama Valley (Santa Barbara and Ventura counties). Three collections were from the Sierra Nevada foothills at the eastern margin of the San Joaquin Valley in Kern County. The remainder of the historical sites was in foothills west of the San Joaquin Valley, in Fresno, Kern, and Kings counties. As of 1986, all natural occurrences of California jewelflower on the San Joaquin and Cuyama Valley floors had been extirpated.

Today, known populations of California are confined to three areas in hilly terrain west of the San Joaquin Valley: the Carrizo Plain, Santa Barbara Canyon (adjacent to the Cuyama Valley in Santa Barbara County), and the Kreyenhagen Hills (Fresno County). The Carrizo Plain and Kreyenhagen Hills populations are on public land administered by the U.S. Bureau of Land Management, as is approximately 10% of the Santa Barbara Canyon population. Additional populations of California jewelflower may persist in the foothills of Fresno, Kern, and Kings

counties, where potential habitat remains in private rangeland. However, access to historical sites in these areas is limited, so the presence of the species has not been verified in over 50 years.

The primary reason for the decline of California jewelflower is loss of habitat, either through conversion to agriculture or by urbanization. Oilfield activity may also have eliminated sites in the foothills at the western margin of the San Joaquin Valley. Potential threats to the remaining populations include competition from introduced plant species, pesticide effects on pollinators, and small population size. California jewelflower on private land in the upper portion of Santa Barbara Canyon is subject to cattle grazing throughout the growing season, but the magnitude of threat posed by livestock is unknown.

The Carrizo Plain population is on public lands managed as part of the Carrizo Plain Natural Area, a cooperative effort between BLM, TNC, and the DFG. The Cuyama Valley population consists of 19 known sites west of the Cuyama River, both north and south of Santa Barbara Canyon. BLM owns seven of these 19 sites and has fenced them to protect them from unauthorized grazing. The remaining 12 sites are on private land. On the Carrizo Plain, California jewelflower occurs primarily on the burrow systems of giant kangaroo rats, another endangered species. Although the kangaroo rats damage some of the jewelflowers, the rat's activities appear to reduce mulch and non-native seeds within their precincts, especially during the dry season, which may promote jewelflower the following year.

As is typical of annuals, both plant size and population size in California jewelflower can vary dramatically, depending on site and weather conditions. Seeds of California jewelflower begin to germinate in the fall when the rainy season begins, but additional seedlings may continue to emerge for several months. The seedlings develop into rosettes (clusters of leaves at ground level) during the winter months, and the stem elongates as flower buds begin to appear in February or March. Flowering and seed set continue until the plants die, which may occur as late as May in years of favorable rainfall and temperatures. The flowers are pollinated by insects. Seed-dispersal agents are not known, but those that have been suggested for *Caulanthus* and related genera include gravity, seed-eating animals, wind, and water. California jewelflower probably forms a persistent seed bank.

Several experimental introductions of California jewelflower have been attempted in Kern, Santa Barbara, and Tulare counties, but none of the populations have persisted. In all instances, the number of plants at each site has declined precipitously following initial seeding. Protection measures for California jewelflower are included in the USFWS Recovery Plan for Upland Species of the San Joaquin Valley, California, completed in 1998.

Slender-pod jewelflower

Caulanthus stenocarpus

State Rare 1979
Federal None

General Habitat:
None

Description:
None

Status:
When listed as rare by the Fish and Game Commission in 1979, slender pod jewelflower was considered to be a distinct species, known from only approximately four reported locations in San Diego County and an unknown number of sites in Baja California. This "species" has since been determined to have been described from a mixed herbarium sheet containing material from *Caulanthus heterophyllus* var. *heterophyllus* and *Guillenia lasiophylla*, another mustard. The DFG has drafted a petition to delist this species.

Hearst's ceanothus

Ceanothus hearstiorum

State: Rare 1981
Federal: None

General Habitat:

It grows in coastal prairie 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 Hearst's manzanita and maritime ceanothus. The soil varies from a near adobe through red clay on hard pan to a gray sand-rock composite. It receives summer fog and rainfall of about 20-30 inches.

Description:

Hearst's ceanothus is a prostrate, mat-forming evergreen shrub in the buckthorn family (Rhamnaceae) with bright green leaves and deep blue flowers.

Status:

All five known occurrences of Hearst's ceanothus are located on the Hearst Ranch, owned by the Hearst Corporation, in San Luis Obispo County. The DFG's most recent information on the species dates from the mid-1980s. A historical threat has been the conversion of habitat to grazing land; the DFG has no current information regarding this or other potential threats.

Maritime ceanothus

Ceanothus maritimus

State: Rare 1978
Federal: None

General Habitat:

Maritime chaparral occurs grows on old ocean beaches and bluffs near Arroyo de la Cruz, San Luis Obispo County. Associated species include Hearst's ceanothus and Hearst's manzanita. The soil varies from a near adobe through red clay on hard pan to a gray sand-rock composite. It receives summer fog and rainfall of about 20-30 inches.

Description:

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

Status:

All occurrences of maritime ceanothus are located on the Hearst Ranch, owned by the Hearst Corporation, in San Luis Obispo County. In the mid-1980s, several of the occurrences were noted to have declined substantially. The DFG has no recent information on this species.

Mason's ceanothus *Ceanothus masonii*

State: Rare 1978
Federal: None

General Habitat:
This member of the buckthorn family (Rhamnaceae) occurs in chaparral on Franciscan sandstone. The entire global distribution of Mason's ceanothus is on Bolinas Ridge in Marin County. It is associated with leather oak, bush monkeyflower, chaparral pea, and other species of ceanothus.

Description:
Mason's ceanothus is an erect, spreading, evergreen shrub with shiny opposite leaves and dark blue to violet flowers. Some plants appear to be intermediate between *Ceanothus gloriosus* var. *exaltatus* with which it grows.

Status:
This species is closely related to *Ceanothus gloriosus* var. *exaltatus;* taxonomic work is needed. 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 depends on fire to reproduce. Long-term fire suppression may be detrimental to this species as plants are overtopped by taller shrubs in the absence of fire. DFG has no recent information on the status of this plant.

Vail Lake ceanothus *Ceanothus ophiochilus*

State: Endangered 1994
Federal: Threatened 1998

General Habitat:

Ceanothus ophiochilus is found on metavolcanic or gabbroic soils on north facing slopes in chamise chaparral elevations of 2000-3000 feet.

Description:

Vail Lake ceanothus is a rounded, rigidly-branched shrub in the buckthorn family (Rhamnaceae) with pale blue to pinkish-lavender flowers. It superficially resembles chamise with which it grows.

Status:

This species was first discovered during a spring 1989 botanical survey of the property surrounding Vail Lake in southwestern Riverside County. Two additional populations of Vail Lake ceanothus were discovered in 1993 within the Agua Tibia Wilderness of the Cleveland National Forest, also in southwestern Riverside County. Both populations include hybrids between Vail Lake ceanothus and the common hoaryleaf ceanothus (*Ceanothus crassifolius*). All occurrences of the species are on north-facing slopes and on soils derived from an unusual pyroxenite-rich rock outcrop that may be gabbroic in origin. Soil on the outcrop is nutrient poor and constitutes harsh growing conditions for most plants. Extensive botanical surveys have been conducted in the Agua Tibia Mountains, but to date, no other populations have been found. The Agua Tibia Wilderness supports approximately 2,000 to 4,000 individuals in the northern stand and 6,000 to 12,000 individuals in the southern stand.

While the Cleveland National Forest populations of Vail Lake ceanothus are adequately protected within National Wilderness, the Vail Lake population, the most genetically pure occurrence, has been threatened for nearly a decade by the potential for residential development of the area surrounding Vail Lake. Multi-agency efforts to acquire the Vail Lake property as public open space, and an attempt to establish the property as a conservation

bank, to date, have been unsuccessful. Studies of the effects of fire frequency on the establishment, survival and reproduction of Vail Lake ceanothus are critically needed. Unlike some chaparral shrubs, Vail Lake ceanothus lacks the ability to crown-sprout following a wildfire and reproduces only from seed stored in the soil. Information from studies on the ecology of this species will be essential to the development of recovery strategies and management plans, as well as the design of an adequate preserve for Vail Lake ceanothus. There is the potential for serious decline should the Vail Lake population be lost. Vail Lake ceanothus is included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Conservation for this species will be achieved by inclusion of at least 13,290 acres of suitable chaparral habitat and three known localities (representing 54 records) within large blocks of habitat in the MSHCP Conservation Area.

Specimens of Vail Lake ceanothus are grown by Rancho Santa Ana Botanic Garden for the Center for Plant Conservation National Plant Collection.

Pine Hill ceanothus

Ceanothus roderickii

State: Rare 1982
Federal: Endangered 1996

General Habitat:

This ceanothus occurs on red clay soils of the Pine Hill gabbro formation within openings in chaparral in the Sierra foothills of El Dorado County. It is commonly associated with two other State-listed plants: Stebbins' morning glory and Layne's butterweed. It also occurs in habitats near Pine Hill flannelbush and El Dorado bedstraw.

Description:

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. Stems root where they touch the ground.

Status:

There are approximately 15 occurrences of Pine Hill ceanothus. Portions of four occurrences of Pine Hill ceanothus are protected. Two of these sites are in the vicinity of Salmon Falls, to the north and south of the South Fork of the American River, and managed by BLM and the DFG. Another site is 240 acres managed by the DFG on Pine Hill. Continued losses of habitat are occurring through grading being conducted under ministerial grading permits that are not subject to review under the California Environmental Quality Act; development of telecommunications facilities on property managed by CDF on top of Pine Hill; and urban development in the

vicinity of Cameron Park and Shingle Springs.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (Senecio layneae), and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 areas have been preserved.

In the northern portion of the gabbro soil formation, approximately 2,079 acres have been purchased and transferred to the DFG, BLM, or El Dorado County. This area includes a population of Stebbins' morning glory. A prescribed fire on nearby property held by BLM appears to have rejuvenated a dwindling population on that site. In the southern portion of the gabbro soil formation, approximately 454 acres have been purchased and transferred to BLM or El Dorado County.

The rapidly growing community of Cameron Park, California, located in the Sierra foothills outside of Sacramento, is a community at high risk of wildfires. Heavy fuel loads of manzanita, toyon, chamise and other chaparral vegetation in and around the community are an annual concern for firefighters and residents alike. In an effort to mitigate the situation, the BLM Folsom Field Office has initiated the Cameron Park Phase I fuels project on its Pine Hill Preserve situated in the hills above the town. The BLM, in concert with cooperating agencies, developed a plan to reduce the fuel load while protecting and even benefiting the sensitive plants. Many of the plants, including *Ceanothus roderickii*, may benefit from fuel reduction activities and the reproduction following fire.

Ceanothus roderickii does not appear to be an early seral species; however survival and growth of seedlings under shrub canopy is poor. Without fire, seed germination is poor. Recovery is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. Assuming recovery criteria are met, *Ceanothus roderickii* could be downlisted after three natural fire cycles (approximately 80 to 100 years).

Santa Catalina Island mountain mahogany

Cercocarpus traskiae

State: Endangered 1982
Federal: Endangered 1997

General Habitat:

Santa Catalina Island mountain mahogany is endemic to Santa Catalina Island, one of the Channel Islands off the coast of southern California. It is found in Wild Boar Gully in the Salta Verde region of the island, on the slopes of a steep-sided, narrow, dry arroyo in a coastal sage scrub community with sausserite gabbro soils.

Description:

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.

Status:

When first described in 1897, the only known population of Santa Catalina Island mountain mahogany was comprised of 40 to 50 mature plants. Today, the natural distribution is limited to one small population of seven trees in Wild Boar Gully in the Salta Verde region of the island.

Browsing by introduced deer and goats and rooting by feral pigs has disturbed the soil and inhibited the establishment and growth of seedlings. The Santa Catalina Island Conservancy owns and manages the island and is carrying out protection and recovery actions. The individual trees were fenced in 1988 with enclosures of varying sizes. In the two largest fenced enclosures, a total of several hundred seedlings of varying ages were evident in 1995. Enclosures around the remaining trees are smaller and few or no seedlings were observed. In 1999, the Conservancy fenced the entire perimeter of Wild Boar Gully, enclosing 112 acres. The Conservancy conducts yearly monitoring of the population. Their management goal is to increase the population by two trees of sapling size or larger every five years.

Genetically, Santa Catalina Island mountain mahogany is threatened by both inbreeding depression and genetic assimilation through hybridization. Two individuals were found to be hybrids with the more common island mountain mahogany (*C. betuloides* var. *blancheae*) in a 1989 study. The establishment of additional populations outside Wild Boar Gully, in areas where the probability of hybridization is minimal, will be important to the long-term survival of this species.

Camatta Canyon amole ***Chlorogalum purpureum var. reductum***

State:	Rare	1978
Federal:	Threatened	2000

General Habitat:

Camatta Canyon amole grows in open areas with low vegetation cover in hard-packed, gravelly, red serpentine soil within the blue oak woodland community. It is restricted to the La Panza region of San Luis Obispo county.

Description:

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.

Status:

The entire global distribution of this plant is in upper Camatta Canyon, San Luis Obispo County. One occurrence is on the Los Padres National Forest and one on nearby private property. The species occurs at the Caltrans Navajo Road Botanical Management Area. The Botanical Management Area program was created to identify, study, and manage state highway right-of-way locations that contain environmentally-significant, natural remnants of California's botanical diversity.

The plant is threatened by illegal vehicle trespass into the population on Forest Service land, road maintenance, displacement by nonnative annual grasses, and by livestock grazing depending upon the intensity of grazing use within the population area. In 1996, the DFG initiated research on the population on Los Padres National Forest property on Red Hill Road to determine appropriate methods for increasing numbers of Camatta Canyon amole, with funds from the California OHV Grant Program. Work continued through 1997. One indirect benefit of conducting this research was that an interested passer-by stopped to inquire about the work, and upon seeing the amole, reported that he had a population on his property. This has now been verified, and brings the total number

of populations for this species to two. Though no surveys have been done for the population on private land, the site at Red Hill Road supported tens of thousands of individuals in 1996, indicating that 1984 fencing from OHVs has resulted in increased numbers. Although the OHV grant has run out, the DFG will continue to gather data on the experimental restoration project.

The research also revealed that using bulbs as propagules resulted in extremely high survival (approximately 90 percent) after two winters; however, the effort needed to procure the bulbs in the summer (dormant) season was very high. Propagation by seed was successful, although seedlings grow extremely slowly and take years to mature and produce seed.

Critical habitat for Camatta Canyon amole was designated by FWS in October 2002.

Howell's spineflower *Chorizanthe howellii*

State: Threatened 1987
Federal: Endangered 1992

General Habitat:
This member of the buckwheat family (Polygonaceae) is generally restricted to northern dune scrub habitat in Mendocino County and occurs with the State-listed endangered Menzies' wallflower and the rare North coast phacelia.

Description:
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.

Status:
Howell's spineflower is known from six populations in the vicinity of MacKerricher State Park in the Ten Mile Dunes north of Fort Bragg, Mendocino County.

The DPR is conducting dune restoration, including removal of invasive non-native species such as ice plant, which will improve some habitat for Howell's spineflower. In 1998, abundant spineflower emerged in areas from which iceplant and European beachgrass was removed. MacKerricher State Park is proposing to reconstruct or reroute a 16-foot wide, paved trail through occupied habitat although trampling by horses and people continues to threaten the plant. The USFWS completed a recovery plan for Howell's spineflower and six other coastal plants in 1998.

Orcutt's spineflower *Chorizanthe orcuttiana*

State: Endangered 1979
Federal: Endangered 1996

General Habitat:

Orcutt's spineflower is restricted to openings in coastal chaparral in neutral to slightly acidic, fine, sandy soils derived from eroded ferruginous sandstone where competition for resources is low. The historic range of Orcutt's spineflower extended from Oceanside south to Point Loma in coastal San Diego County. It is now found only on U.S. Navy land at Point Loma.

Description:

Orcutt's spineflower is a prostrate annual herb in the buckwheat family (Polygonaceae). It has basal leaves, leaf-like bracts in pairs, and small yellow flowers. One-seeded fruits are produced in late spring and the seeds germinate after the seasonal winter rains. The vegetative stage occurs from late fall until early spring with the reproductive stage occurring in April.

Status:

Historically, this species was known from ten occurrences and was thought to be extinct until it was found in 1979 at Torrey Pines State Reserve and later at Oakcrest Community Park. The Torrey Pines State Reserve population was last seen in 1987 despite the continued presence of suitable habitat and several efforts to relocate this occurrence. In the spring of 1997 a population of Orcutt's spineflower was rediscovered on U.S. Navy lands at Point Loma. Much of the original habitat for Orcutt's spineflower in coastal San Diego County has been eliminated by residential and commercial development.

Because of the small population size of Orcutt's spineflower, there is very little known of its biology or reproduction. It is theorized that the possible means of pollination is insects and that it is closely associated with California spineflower (*Mucronea californica*) although there have been no definitive studies on the breeding or symbiotic relations performed. It is believed that the causes for rarity of Orcutt's spineflower are the loss of required specialized habitat with few competitors, reduced fitness due to the low number of individuals, and possible germination requirements that may not be met each year causing population size to fluctuate.

The Soil Ecology and Research Group at San Diego State University have initiated habitat restoration work at Point Loma. This project is ongoing and entails removal of ice plant, installation of erosion control, and outplanting of native perennials. The goal of this project is create suitable habitat for the natural expansion of the spineflower. This species is covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border and in the San Diego Multiple Habitat Conservation Program NCCP.

San Fernando Valley spineflower

Chorizanthe parryi var. fernandina

State: Endangered 2002
Federal: None

General Habitat:

San Fernando Valley spineflower is restricted to open sites (less than 50% plant cover) in coastal sage scrub and chaparral of Los Angeles and Ventura Counties. At both sites it is found on well-drained soils on mesas and alluvial fans.

Description:

San Fernando Valley spineflower is a low-growing herbaceous annual in the buckwheat family (Polygonaceae). This species produces a rosette of basal leaves from which flowering stems arise. Small clusters of white flowers are produced at the ends of branches. Flowers are enclosed in involucres that have straight spines.

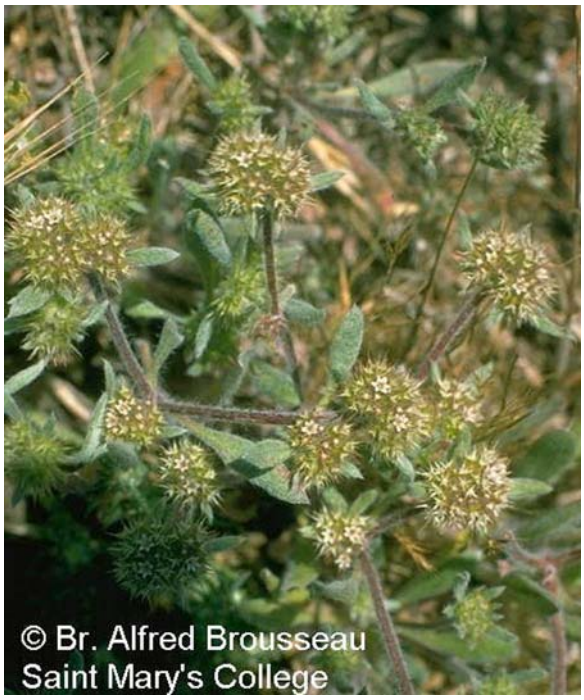
Status:

San Fernando Valley spineflower is restricted to two population centers in Ventura and Los Angeles Counties. Both areas are in private ownership and have been proposed for residential and commercial development. Historically, the spineflower was known from approximately 10 sites in the San Fernando Valley and Los Angeles areas. Until it was rediscovered at Ahmanson Ranch in Ventura County in May 1999, the plant had been last seen in 1929 and was thought to be extinct. The spineflower was found subsequently at Newhall Ranch in Los Angeles County during biological surveys for the Newhall Ranch Specific Plan. Plants at both sites occur in annual grassland in openings of coastal sage scrub and chaparral vegetation. Grazing has occurred at Ahmanson Ranch and is ongoing at Newhall Ranch.

The Department is working closely with both property owners to ensure protection for the San Fernando Valley spineflower. Ahmanson Ranch is conducting experiments on the spineflower to determine habitat parameters and expand the existing colonies onto new sites. Experiments are on-going. Germination occurred in experimental plots at the Ahmanson Ranch in early spring 2003. The long-term survivorship of plants in the experimental plots will not be known until several growing seasons have passed. Seeds have been placed in conservation storage at Rancho Santa Ana Botanic Garden.

A Conservation Easement between the Newhall Ranch and the Department has recently been finalized. This Conservation Easement protects 64 acres of occupied spineflower habitat at Airport Mesa and Grapevine Mesa, two of the three populations centers within the Newhall Ranch Specific Plan. A management plan for the preserves is being developed.

Sonoma spineflower ***Chorizanthe valida***



State: Endangered 1990
Federal: Endangered 1992

General Habitat:

The only extant population of Sonoma spineflower is in the Lunny pasture by Abbott's Lagoon in Point Reyes National Seashore. The population occurs exclusively in the sandy coastal prairie soil at an elevation of about 40 feet. Plants associated with Sonoma spineflower include two species of concern–Point Reyes horkelia and Gairdner's yampah. Other associated species include coyote brush, large-flowered linanthus and several annual grasses.

Description:

Sonoma spineflower is an ascending or erect annual herb in the buckwheat family (Polygonaceae). It grows up to one foot tall and has highly branched slender soft-hairy stems. The small (less than 1-inch) leaves are egg-shaped, with the widest part at the tip of the leaf. Conspicuous spiny red and white bracts (stiff scaly or leaf-like appendages) are associated with the flowers, which are clustered at the ends of stems in spiny masses. The inconspicuous flowers are less than 1/3 inch long and have six white to rose petal-like appendages which are unequal in size. Flowers bloom from June to August.

Status:

Until its rediscovery in 1980, Sonoma spineflower was thought to be extinct. The 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, and consists of the main, native population and a reintroduction plot. In the past, the main population has exceeded 20,000 individuals. California Native Plant Society volunteers census the main population of the Sonoma spineflower each year. The Point Reyes National Seashore Association and NPS vegetation managers established a second population in 2000. By consulting historical records, soil maps, and local plant taxonomists, and by conducting field searches to identify potentially suitable habitat, the vegetation managers of the national

seashore identified suitable sites for trial plantings with seeds from the existing population. A second population was established in 2000. Seeds on the trial plot yielded 34 plants, all of which produced flowers; many flowers later set seed. With additional funds from the Point Reyes National Seashore Association in 2000, the natural resource managers of the national seashore established two more plots within 565 feet (200 meters) of the first trial plot and planted them with seed from the first population. Seeds were also placed in long-term storage in the seed bank facility of the Rancho Santa Ana Botanical Garden.

The NPS believes there is a high degree of natural variability in plant numbers from year to year, and the overall population trend is unknown. Plant collections from the 1800s indicate that the spineflower formerly had a much broader range in Marin and Sonoma Counties. Intensive agriculture and urbanization since the early 1900s have significantly altered the habitat. Information from research suggests that today the species is limited by its dependence on grazing by cattle or wildlife, which reduces competition with nonnative plants, and its restriction to well-drained, disturbed, sandy soils. These ecological requirements, in addition to narrow endemism, render the plant particularly vulnerable to events such as disease outbreak, fire, flood, and other circumstances that could eliminate the population and cause extinction.

The USFWS completed a recovery plan for the Sonoma spineflower and six other coastal plants in 1998. NPS is attempting to secure funding to develop and implement repeatable monitoring protocols for the species.

Ashland thistle *Cirsium ciliolatum*

State: Endangered 1982
Federal: None

General Habitat:
California populations are known from the vicinity of Montague in Siskiyou County, and populations occur in southern Oregon. This thistle often grows in dry plains and open grassland habitats, where the soils are thin with rocky outcrops present.

Description:
Ashland thistle is a perennial member of the sunflower family (Asteraceae), with a tall stem, short lateral branches, and yellowish-white flower heads.

T. Fuller, DFG File Photo

Pete Figura, DFG File Photo

Status:
There are only five known occurrences of Ashland thistle in California. All are on private land in agricultural areas devoted to grazing or grain production. Most occurrences tend to have numbers of individuals ranging from 10 to 100. An introduced beetle used as a biological control of Italian thistle, musk thistle, and milk thistle is also attracted to *Cirsium* species and may be a threat to Ashland thistle. There have been no surveys of the five known occurrences for this species in over 12 years. Efforts to locate Ashland thistle on BLM parcels in the Montague area resulted only in finds of peregrine thistle (*Cirsium cymosum*). Surveys of all known occurrences are needed, as is a monitoring program to determine the trend of Ashland thistle. The limited occurrences and small number of individuals per occurrence suggest instability with a potential for decline for this species.

Ashland thistle is a BLM and USFS sensitive species. Additional population biology and distribution information is necessary to determine this species rarity and extirpation status. According to the BLM, the taxonomy of Ashland thistle is still in question which could result in this species being rarer than currently considered. Threats to this species include rural development, power line corridor development, and overgrazing. These threats are aggravated as much of the existing habitat is privately owned and therefore not protected.

Seeds from Ashland thistle have been placed in conservation storage at Berry Botanic Garden in Oregon.

Fountain thistle *Cirsium fontinale var. fontinale*

State: Endangered 1979
Federal: Endangered 1995

General Habitat:

This member of the sunflower family (Asteraceae) is restricted to perpetually moist clay openings in riparian or serpentine chaparral. Historically, this plant occurred in both San Mateo and Santa Clara counties, but it is now found in only three locations in the Crystal Springs region, San Mateo County. Associate species include purple and foothill needlegrass.

Description:

Fountain thistle is an herbaceous perennial with several stout, erect, reddish stems, and large white to pinkish, nodding flowering heads. The flowers bloom from June to October and become brown with age. The nearest relative of *C. fontinale* var. *fontinale*, Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*), is found further south, in San Luis Obispo County.

Status:

Fountain thistle is known from four populations in San Mateo County. One population occurs east of Crystal Springs Reservoir on both sides of Interstate 280. A second population occurs west of Interstate 280 in the same area and may have been part of one large population before the construction of the highway. A third population is in the "Triangle area," a triangular piece of land west of Edgewood County Park, which is bounded by Interstate 280 to the east, Edgewood Road on the north and Canada Road on the west. The fourth site is at the southeast end of upper Crystal Springs Reservoir west of Canada Road. A single plant was found in Edgewood County Park in 1987 but has not been seen since. A new population was found in 2003 on open space near Edgewood Park.

The Crystal Springs Reservoir population is threatened by several factors, including roadside maintenance and trail construction. Trail construction would threaten the plants through direct destruction of the habitat or through modification of hydrologic regimes. Because fountain thistle is dependent upon seeps and springs to provide abundant soil moisture, any disruption in the flow of water would threaten the plants. Nonnative plants such as pampas grass (*Cortaderia selloana*) have become established, and threaten several subpopulations of fountain thistle. Dumping of garden debris from households on the ridge above the plants covers plants and renders the habitat unsuitable for plant establishment and growth.

The few existing fountain thistle occurrences are on public land owned and managed by Caltrans and the San Francisco Water District. DFG, in cooperation with USFWS, conducted a recovery workshop addressing this

species in April 1997, and as a result of recommendations made at that meeting, Caltrans and SFWD have initiated pampas grass control programs to try to prevent further degradation of populations on their property. These eradication efforts will need to continue. Management and recovery actions for the species are addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Chorro Creek bog thistle

Cirsium fontinale var. obispoense

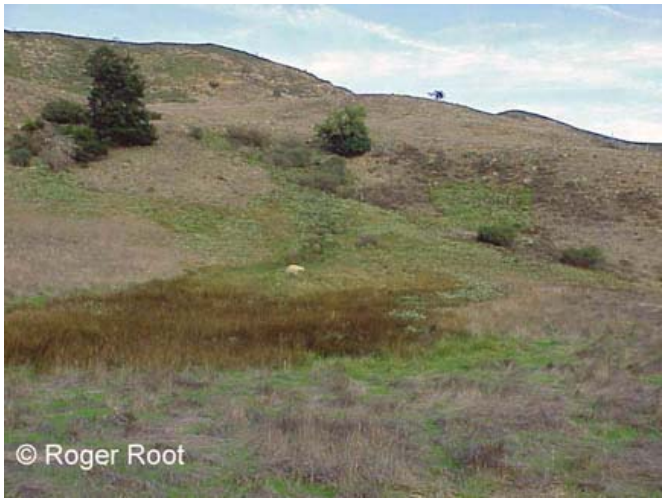
State: Endangered 1993
Federal: Endangered 1994

General Habitat:

Chorro Creek bog thistle is of extremely limited distribution, found only in perennial seeps and springs in serpentine in western San Luis Obispo County.

Description:

Chorro Creek bog thistle is a perennial in the sunflower family (Asteraceae). First year plants form a large rosette; in the second or third year, the plant produces a branching stalk up to six feet in height and bearing numerous heads of whitish to pinkish-lavender tinged flowers. Its nodding flower heads and glandular hairs on the leaves separate it from other thistles that occur in the area. Chorro Creek bog thistle is closely related to fountain thistle (*Cirsium fontinale* var. *fontinale*), which is found only in San Mateo County.



Status:

Ten populations of Chorro Creek bog thistle are known; nine populations occur within a five-mile radius of the City of San Luis Obispo, and one other about 30 miles to the northwest. Three populations are on publicly-owned property, one each managed by California Polytechnic State University, San Luis Obispo, the City of San Luis Obispo (only a portion of population), and the California National Guard.

The National Guard has been monitoring the population at Camp San Luis Obispo since fencing the population from cattle grazing in October of 1994. Monitoring data indicated that in the absence of grazing by cattle, various native wetland species increased, coupled with a drastic decrease in recruitment of Chorro Creek bog thistle, resulting in an overall decline in numbers of the thistle. However, recruitment of thistle into grazed wetland areas outside of the cattle exclosure was observed. Beginning in January 1998, cattle were allowed access to about half of the population of bog thistle. Two years later, the number of plants doubled in the grazed area and remained approximately the same in the ungrazed area. Although the cows eat and trample many of the plants, the increased recruitment under controlled grazing more than makes up for the impact. Protection measures for Chorro Creek bog thistle are included in the USFWS Recovery Plan for Morro Shoulderband Snail and Four Plants frrm Western San Luis Obispo County, California, completed in 1998.

La Graciosa thistle *Cirsium loncholepis*

State:	Threatened	1990
Federal:	Endangered	2000

General Habitat:

La Graciosa this is a member of the sunflower family (Asteraceae). It is largely restricted to back dune and coastal wetlands of southern San Luis Obispo County and northern Santa Barbara County, from the Pismo Dunes lake area and south historically to the Santa Ynez River. The Guadalupe Dune complex, in which the majority of the species occurs, extends inland only up to two miles. Deflation areas behind the foredunes often intersect the water table, creating wetlands and back dune lakes. *Cirsium loncholepis* is found in wet soils surrounding the dune lakes and in the moist dune swales, where it is often associated with rushes, tules, and willow.

Description:

La Graciosa thistle is a short-lived, spreading, mound-like or erect and often fleshy, spiny member of the sunflower family (Asteraceae). Plants are from four to 39 inches tall, with purplish flower heads occurring in wide, tight clusters at the tips of the stems. This species closely resembles Indian thistle (*Cirsium brevistylum*), a taller plant with the upper portion covered with cobwebby hairs.

Status:

There are approximately 17 known locations for La Graciosa thistle in San Luis and Santa Barbara counties. The historic distribution of the species included extensive areas in the Orcutt region that have been converted from wetland habitat to agricultural uses or otherwise developed. Large populations, similar to an existing one at the mouth of the Santa Maria River, likely occurred in these areas prior to their conversion. Historic maps show the area covered with extensive wetlands, which no longer exist. One small population has been reported from moist openings in coastal scrub habitat in a coastal drainage in southern Monterey County.

The populations in the dune systems are small and isolated, and show a reduced reproductive vigor. Several have declined significantly in size in recent years, and a population south of Oso Flaco Lake may have been extirpated by encroaching vegetation. At least one population on Unocal property in the Guadalupe Dunes just north of the Santa Maria River and the population at the mouth of the Santa Maria River are at risk from long-term soil and water contamination on Unocal's property. Surveys in 1998 of five known population locations found that all of them were much reduced or apparently extirpated since surveys were conducted in 1990.

Ongoing threats to this species include groundwater pumping, oil field development, competition from nonnative plants, browsing by rabbits, recreation facility development, and trampling. Cattle grazing in the riparian habitat

at the mouth of the Santa Maria River may reduce the competition from other species, but the long-term effects of livestock use on the habitat are unknown. All but one population of La Graciosa thistle are on private lands. In 1999, the DFG met with DPR and the Land Conservancy of San Luis Obispo County to outline a program of European beach grass and Veldt grass removal within the Guadalupe Dunes. It is expected that at least one population of La Graciosa thistle will benefit from this program, to be conducted by the Land Conservancy. Restoration projects implemented at the Guadalupe Oil Field by Unocal will also benefit this species.

Critical habitat for this species was proposed in 2002 and has not been finalized due to questions about the taxonomy of this species. Recent research on *C. loncholepis* raises significant questions regarding the taxonomy of the species. The taxonomic relationship between *C. loncholepis* and *C. scariosum* (elk thistle), which is widespread in montane wetland areas in California, is under review according to Dr. David Keil, California Polytechnic University, San Luis Obispo, California. *Cirsium loncholepis* may be proposed as a new taxon, *C. scariosum* var. *citrinum*, in The Flora of North America, which will be submitted for peer review in December of 2002.

Surf thistle *Cirsium rhothophilum*

State: Threatened 1990
Federal: None

General Habitat:
Surf thistle is endemic to the dunes of the central California coast, from the Nipomo Dunes of southern San Luis Obispo County to Point Concepcion 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 or tops of cliffs. Associate species include coast buckwheat, ambrosia, and coast sundrops.

Description:
Surf thistle is a low-growing, 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. Flowering occurs between May and July.

Status:
Surf thistle is known from approximately 22 sites. It was proposed for federal listing in the 1990s. The species was considered to be threatened by oil production, missile facility construction, beach users, recreational vehicles, cattle, and non-native ice plants. Approximately 57 percent of the recorded locations, with 80 percent of the total number of plants, are on Vandenberg Air Force Base within designated special management areas for the western snowy plover a listed threatened species. The protection and management of these western snowy plover areas by the Air Force have also protected the Surf thistle sufficiently to stabilize the population, and federal listing was not pursued. However, activities promulgated under implementation of Homeland Security could alter the manner in which the air force base is managed.

Several populations on Unocal property in the foredunes of the Guadalupe Dunes just north of the Santa Maria River are at risk from long-term soil and water contamination on Unocal's property. Restoration projects implemented at the Guadalupe Oil Field by Unocal will benefit this species.
In 1999, the DFG met with DPR and the Land Conservancy of San Luis Obispo County to outline a program of European beach grass and Veldt grass removal within the Guadalupe Dunes. It is expected that at least one

population of surf thistle will benefit from this program, to be conducted by the Land Conservancy. The Nature Conservancy has turned over management of Oso Flaco Lake to California State Parks, and a new organization called the Dunes Center is attempting to unite all major landowners in the Guadalupe-Nipomo Dunes Complex under one administrative body with the goal of preserving this open space and ecology of natural and endangered species in the dunes. Private, county, state, and corporate owners are represented within the preserve. An interpretive center is being built to aid in educating the public about the unique dune system; docent-led tours are also given to help educate the public about the dunes.

Presidio clarkia *Clarkia franciscana*

State: Endangered 1978
Federal: Endangered 1995

General Habitat:

This member of the evening-primrose family (Onagraceae) occurs is restricted to 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-listed Endangered Presidio manzanita.

Description:

Presidio clarkia is a slender branched annual species with stems about 12 inches tall and with few, small, slender entire lance-shaped leaves. The sparse flowers have four wedge-shaped petals that are lavender to pink. The middle of the flower is lighter in color with a reddish-purple basal spot. Blooming time is from May to July.

Status:

Presidio clarkia occurs in San Francisco and Alameda Counties. It is known from only three sites within a mile of each other in Alameda County and from two sites at the Presidio. Current ownership includes EBRPD, NPS, and private landowners.

There is ongoing monitoring of the two populations at the Presidio. Park resource managers have undertaken an aggressive program of habitat protection and restoration of the endangered Presidio clarkia. Restoration efforts have centered on the expansion of potentially suitable habitat through the removal of invasive non-native weeds, including more than 100 non-native trees. To ensure the effectiveness of future management efforts, this project will evaluate the effectiveness of potential techniques for removing the introduced duff and thatch thereby providing suitable habitat for clarkia to expand into. Research and funding is required to determine the most ecologically sensitive, sustainable and effective method to remove the duff and thatch layers. Two potential methods of removal are fire and manual or mechanical scraping. In the "scraping" experimental design, the organic horizon was removed by raking and shoveling during summer 1998, and any plant material that establishes after scraping is manually removed before seeding occurs. Although EBRPD has removed nonnative trees and other vegetation that threaten the population at Redwood Regional Park, the three populations of *Clarkia franciscana* in Alameda County are all threatened by nonnative species such as annual non-native grasses, pampas grasses and

French broom.

Genetic comparisons made between the Presidio and Oakland populations concluded that at least one of the Oakland populations is indigenous and was not planted. Although the discovery of the Oakland populations has greatly increased the likelihood that Presidio clarkia can be protected, its numbers are still so low that extinction remains a distinct possibility.

Presidio clarkia is maintained by the University of California Botanic Garden for the Center for Plant Conservation National Plant Collection. Management and recovery actions for the species have been addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Vine Hill clarkia *Clarkia imbricata*

State: Endangered 1978
Federal: Endangered 1997

General Habitat:
This species has been found in valley grasslands, meadows, and chaparral in sandy loam soils. Historically, it was known from only two natural occurrences in the Vine Hill area of Sonoma County.

Description:
Vine Hill clarkia, a member of the evening primrose family (Onagraceae), is a late-blooming, slender annual herb. Stems grow to 2.5 feet in height. This plant is densely leafy with smooth leaf margins and lanced-shaped leaves. The leaves grow ascending and overlapping one another. Flowers bloom from June through July. Each flower has a conspicuous funnel-shaped tube at its base and four fan-shaped lavender petals with a v-shaped purple spot extending from the middle to the upper margin of the petal. The flowers are grouped closely together.

Status:
Vine Hill clarkia has never been abundant. This plant is now known from only two sites. One population is natural and the other was propagated from cuttings. The two populations are about 1 mile apart. The two populations have a total number of plants ranging from 2,000 to 5,000, as is typical for an annual plant. Both populations occur on private lands. The native population of Vine Hill clarkia was formerly split between two privately owned parcels. Until several years ago, TNC had cooperative agreements with both landowners to protect the population. Since then, the soil on one of the parcels was scraped, and the plants there have been extirpated. The other parcel was sold in 1997 and a portion of the Vine Hill clarkia habitat on this second parcel was disturbed. Plants may not reestablish on the disturbed soil based on prior observations that the plant depends on the presence of an undisturbed soil crust. The DFG is seeking cooperation to protect this last remaining portion of the native population of Vine Hill clarkia.

The introduced population of Vine Hill clarkia is in a preserve owned by the California Native Plant Society

(CNPS). Although CNPS has attempted to discourage unauthorized collection by fencing the preserve and by not publicizing the exact location of the site, trespassers have damaged the fence, trampled the vegetation, and collected seed of Vine Hill clarkia on several occasions. Vine Hill clarkia is also threatened by genetic contamination from introduced hybrid clarkias and by encroaching non-native plants.

Vine Hill clarkia is maintained by the University of California Botanic Garden for the Center for Plant Conservation National Plant Collection. Seed from this species is available commercially.

Merced clarkia

Clarkia lingulata

State:	Rare	1988
State	Endangered	1989
Federal:		

General Habitat:

The distribution of Merced clarkia consists of only two populations along Highway 140 in the Merced River Canyon of Mariposa County. It occurs on steep, north-facing hillsides in the understory of pine/oak foothill woodlands. It is associated with *Clarkia dudleyana*, Chinese houses, poison oak, and elegant madia.

Description:

Merced clarkia is a slender annual herb in the evening primrose family (Onagraceae) with bright pink flowers. It reaches approximate two feet in height.

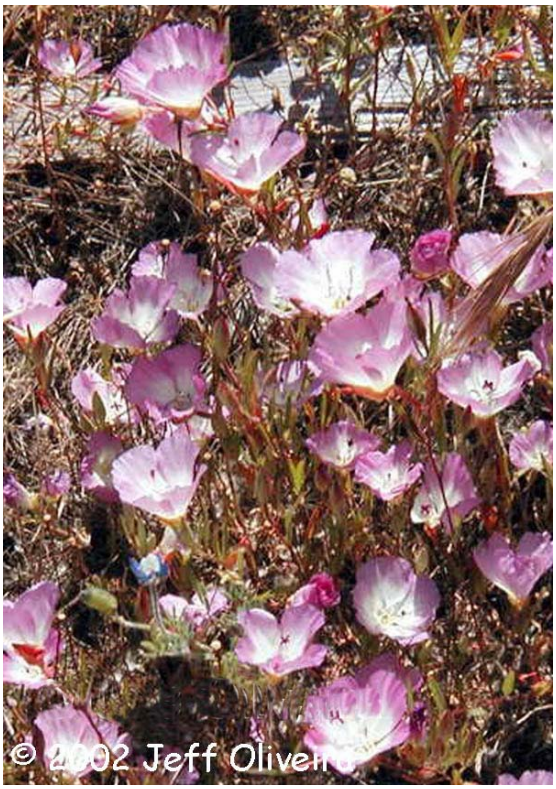
Status:

Merced clarkia is known from two sites in Merced County. The species was considered to be threatened by road construction and maintenance activities, power line maintenance activities, and landslides, and had been proposed for federal listing in the 1990s. Herbicide spraying along the highway right-of-way and management of stockpiled soils from landslides had been threats to this species. However, implementation of protection measures through a Memorandum of Understanding signed by the Forest Service, Caltrans, DFG, and Pacific Gas and Electric reduced the level of threats to the Merced clarkia. The available information indicated that the degree of the threats to the Merced clarkia did not warrant issuance of a proposed rule or continuation of candidate status for this species.

USFS annually monitors the Merced Clarkia populations. Merced Clarkia had vigorous populations in 1995, but 1996 and 1997 were successively poorer years. The lowest numbers ever observed by Sierra National Forest personnel were in 1997, probably due to the lack of rainfall during the entire spring after the massive flooding in early January. In 1997, the DFG, USFS, and CSU - Fresno, initiated a study of the genetics of Merced clarkia. Genetics studies have continued to date. In 1998, the last reported monitoring date, both Merced clarkia populations had returned to full vigor.

Pismo clarkia

Clarkia speciosa ssp. immaculata



State:	Rare	1978
Federal:	Endangered	1994

General Habitat:

This species grows is found on pockets of dry sandy soils, possibly ancient sand dunes, within grassy openings in chaparral and oak woodlands.

Description:

Pismo clarkia, a member of the four o'clock family (Onagraceae), is an erect or decumbent herb, with branched stems up to 20 inches long. The fan-shaped petals are white or cream-colored at the base, streaking into pinkish or reddish-lavender in the upper part. It is distinguished from the subspecies *speciosa* by its larger flowers and the pattern of petal color. The plant flowers from May to July.

Status:

This plant is known 14 occurrences in the Pismo Beach area of San Luis Obispo County. All sites are on private land. Portions of two occurrences have been extirpated by residential development, and development has been proposed for six of the other sites. Additional threats to some of the sites include grazing, road construction and maintenance, and fiber optic cable installation. One site was extirpated in the early 1990s, although an attempt is being made to establish a population at a new site using seed that was collected from the plants before their habitat was destroyed. The DFG has not been able to obtain data on the success or failure of this site, however. In 1998, a new location was discovered on the Nipomo Mesa north of Black Lake Canyon. A conservation easement was acquired and will be given to the City of San Luis Obispo to conserve Indian Knob, which supports a population of Pismo clarkia and the State- and federally-listed endangered Indian Knob mountain balm (*Eriodictyon altissimum*). Protection measures for Pismo clarkia are included in the USFWS Recovery Plan for Morro Shoulderband Snail and Four Plants form Western San Luis Obispo County, California, completed in 1998. In January 2001, The Nature Conservancy purchased a conservation easement on the 1,488-acre John Guidetti Ranch. The conservation agreement protects the ranch, which lies south of San Luis Obispo within the city's greenbelt area, and contains maritime chaparral, coast live oak woodlands, and native grasslands that harbor a variety of native animals and plants, including the endangered Indian Knob mountain balm and Pismo clarkia.

Springville clarkia *Clarkia springvillensis*

State:	Endangered	1979
Federal:	Threatened	1998

General Habitat:

Springville clarkia is found on granitic soils in openings in the blue oak (*Quercus douglasii*) woodlands and on road banks in the Tule and Kaweah River drainages. It can be found at elevations between 1,200 and 3,000 feet. All known populations are found in Tulare County. The population is found within a 43 square mile area.

Clarkia capsules

Habitat

Description:

Springville clarkia (*Clarkia springvillensis*) is an erect annual herb belonging to the evening-primrose family (Onagraceae). The plant can grow to 3 feet in height. Its stems are usually branched. The bright green leaves can grow to 3 inches long and 1 inch wide. Lavender-pink flowers appear in May to July and have a characteristic purple spot at the base of the flower. Features on the outside of the flower that separate this clarkia from others growing near it include color and the absence of long hairs. It is associated with speckled clarkia (*Clarkia cylindrica*), Lobb's poppy, common madia, blue dicks, and introduced grasses.

Status:

Springville clarkia is currently known from approximately 23 occurrences (20 confirmed in 1998) on Sequoia National Forest lands, as well as on Bureau of Land Management (BLM), California Department of Fish and Game (CDFG), Tulare County, and private lands. Eight occurrences are located on the Sequoia NF (in the Middle Tule, West Bear Creek, and Rancheria grazing allotments). The populations are clustered near the North and Middle Forks of the Tule River northeast of Springville. One population occurs at the DFG's Springville Ecological Reserve. Plants found 16 miles to the northwest near Salt Creek, a tributary of the Kaweah River near Three Rivers may represent another species. Springville clarkia is threatened by urban development, heavy livestock grazing, and roadway maintenance activities. Due to its few populations and low numbers, the species is vulnerable to extirpation from random events. Springville clarkia is a late-blooming species that may not develop mature seeds before its grassland habitat is mowed annually for fire protection.

In 1993, the DFG funded research that found that the species had a fair amount of genetic diversity despite its small population size and considerable annual fluctuation in population numbers. Subsequent studies found that the seed bank maintained a higher genetic diversity than was expressed in the flowering plants. The report concluded that the seed bank not only maintained the genetic diversity of the species, but also served to slow differentiation of populations.

In response to an unusually cool, wet spring in 1998, a delayed but unusually extensive flush of growth was observed for nearly all species, including Springville clarkia. Based on field observations, almost all previously surveyed occurrences were much larger in both numbers of individuals and area covered. Because seed dispersal is generally restricted to an area near the parent plants, this may be interpreted as further evidence of a dormant seedbank, which was produced by more abundant, widespread plants in previous years of optimal conditions. The periodic "suppression and release" of an extended seedbank may also indicate that environmental conditions such as available water, particularly during a critical time of growth, may be one of the most critical factors influencing seed germination, plant vigor and yearly fluctuations in population sizes.

Occurrences of Springville clarkia on and adjacent to Sequoia NF are monitored annually. Palatability of the species to livestock is presumably moderate, as the species appears to be incidentally but not preferentially grazed. Evidence of grazing and trampling has been documented at more heavily used sites in certain years, indicating that Springville clarkia may be at high risk of impact from grazing. Competition from introduced annual grasses and forbs, such as star thistle, and dense chamise, may be equal impact to grazing. Use of grazing to control non-native species and reduce the build-up of thatch has been suggested as a means of improving conditions for Springville clarkia. Reintroduction of fire into the ecosystem by means of carefully timed controlled burns may also benefit the species by reducing competition from other species without seriously impacting Springville clarkia populations. Cooperative research studies among the several agency and private land owners are needed to examine the effects on the species of various timings and intensities of grazing and prescription burning to determine the most effective regimes.

Grazing management on the Sequoia NF West Bear, East Bear and Rancheria allotments was modified for the 1999 and 2000 grazing seasons, after Springville Clarkia was listed as a threatened species by the U.S. Fish and Wildlife Service in 1998 even though the species was listed by DFG as endangered in 1979. Known Springville Clarkia populations are found on the West Bear Creek and Rancheria allotments. East Bear Creek does not have known populations of Clarkia but it is managed in conjunction with West Bear Creek and there is generally drift between the two allotments. The Middle Tule Allotment and Lumereau Administrative Pasture had populations discovered or suspected populations confirmed in 2000. Populations of Springville clarkia on the Middle Tule Allotment are in an area not used by the existing livestock and no changes were made to this operation. The Lumereau Pasture is used by Forest Service stock and exchange of use with a local packer. Use was modified to reduce from 60 head of horses to 6. With the lower number of stock, past experience indicates that the stock do not use the upper portion of the pasture where the clarkia were found. Lumereau Pasture will be used only by Forest Service stock and from approximately October 1 to June 1 in the 2001 grazing season. The clarkia population will be monitored during the period of use and operations modified as needed.

Most *Clarkia springvillensis* occurrences on National Forest system lands exist within the urban-wildland intermix zone ("threat" zone). Project-specific NEPA analysis and BAs will be prepared for fuels treatments projects. Sequoia NF has taken measures to protect Springville clarkia from livestock as described in the Biological Assessment for the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement. Populations near special use roads are fenced and excluded from further disturbance. However, plants have established outside of the fences, indicating that some disturbance may be important. This role of disturbance in the survivorship of Springville clarkia is being studied at the CDFG Clarkia Reserve. Populations that have migrated outside of the exclosures have been protected through education and training of the special use permittee. The effects of moderate intensity prescribed burns on undiscovered populations of Springville clarkia are unknown but likely to be beneficial if conducted at the appropriate time of year. Such activities will be evaluated on a case-by-case basis in biological assessments prepared by the Forest Service and in consultation with the Fish and Wildlife Service.

The effects of livestock grazing on Springville clarkia are undocumented. Anecdotal information is variable.

Heavy livestock grazing was identified as a possible threat in the publication of the proposed listing and final rule. There also has been some speculation that either early season grazing or late season after seed dispersal may be beneficial by controlling highly competitive non-native grasses. Field observations indicate that ungrazed stalks with intact dehisced seed capsules of Springville clarkia were left with little or no grazing after surrounding forage was removed. This would indicate low palatability and low potential for adverse effect other than trampling.

The Clarkia reserve, managed by the California Department of Fish and Game, had until 1999 received light to moderate trespass use by horses and cattle. Populations of *Clarkia springvillensis* have persisted there, although they may have been crowded by the invasive weed tocalote in some years. Fenced populations in the Middle Tule Allotment appear to have migrated outside of the fenced exclosures and disappeared inside in some years. Removal of early competing non-native annual grasses is usually considered to be beneficial to forbs such as *Clarkia springvillensis*. High residual dry matter may favor grasses over forbs and may contribute to high intensity fire. However, fire intensity effects on *Clarkia springvillensis* are unknown as well. Currently the Sequoia National Forest is cooperating with the Department of Fish and Game to investigate response of *Clarkia springvillensis* to wildfire.

Salt marsh bird's-beak

Cordylanthus maritimus ssp. maritimus

State: Endangered 1979
Federal: Endangered 1978

General Habitat:

Salt marsh bird's-beak grows in the higher reaches of coastal salt marshes to intertidal and brackish areas influenced by freshwater input. Some plants occur in non-tidal areas or in areas of perched water tables; there may be different ecotypes. It is associated with pickleweed, salt grass, alkali heath, and poverty weed.

Description:

Salt marsh bird's-beak is a diffusely branched annual herb with grayish-green, tinged purple hairy leaves. This member of the figwort family (Scrophulariaceae) has spikes of bee pollinated flowers with two-lipped petals. Upper petals are beak-like with yellowish tips, and lower petals have a purplish pouch. The plants are hemiparasitic, obtaining moisture and nutrients from the roots of host plants such as salt grass.

Status:

Historically, salt marsh bird's-beak was widespread in coastal salt marshes from Morro Bay in San Luis Obispo County to San Diego County and northern Baja California Norte. Presently, it occurs only in scattered sites at fewer than 10 remnant salt marshes. Half of the original occurrences are now extirpated. In California, it is currently found at Tijuana Estuary and Sweetwater Marsh in San Diego County, Upper Newport Bay, Mugu Lagoon in Ventura County, Carpinteria Marsh in Santa Barbara County, Morro Bay in San Luis Obispo County, and possibly Anaheim Bay in Orange County.

A recently completed restoration plan has been developed for the privately owned Ormond Beach population which, if implemented, is expected to improve habitat for the bird's-beak and other associated species. A project to restore salt marsh habitat and expand the salt marsh bird's-beak population is also in progress at Carpinteria Salt Marsh by the University of California Natural Reserve System. Maintenance of appropriate hydrological conditions for this species continues to be one of the most challenging management issues. The interaction between tidal flows and local surface and subsurface freshwater flows is complex and important to the species' survival. Recently approved water diversions from Calleguas Creek may substantially reduce freshwater input into Mugu Lagoon and impair efforts being planned by the military to expand habitat for salt marsh bird's-beak. This species is also found in the DFG's Upper Newport Bay Ecological Reserve and the

management plan addresses the conservation of the plant. Salt marsh bird's-beak is highly vulnerable to loss of genetic variation, and future reintroduction attempts should strive to create contiguous patches of plants or to periodically reseed existing patches. Maintenance of nearby upland habitat supporting native pollinators is important to the species' survival. Several non-native competitors are displacing salt marsh bird's beak from their habitat, including sea lavender and several exotic grasses.

This species is covered in the San Diego Multiple Species Conservation Plan NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Salt marsh bird's-beak is considered to be a narrow endemic species under the MSCP and all populations will be conserved. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Soft bird's-beak *Cordylanthus mollis ssp. mollis*

State: Rare 1979
Federal: Endangered 1997

General Habitat:

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. It is found predominantly in the upper reaches of salt grass/pickleweed marshes at or near the limits of tidal action. Associate species include pickleweed, saltgrass, marsh jaumea, alkali heath, and seaside arrowgrass.

Description:

Soft bird's-beak is a sparingly branched, hemiparasitic, herbaceous annual plant in the figwort family (Scrophulariaceae). Its stems are covered by soft hairs, and it bears white two-lipped flowers.

Status:

There have been 19 confirmed locations of soft-bird's beak. Five sites have been extirpated by habitat loss or modification. Five other sites surveyed in 1993 no longer had the plants, although some potential habitat still existed. Nine sites are presumed to still exist. They are widely scattered throughout coastal salt or brackish tidal marshes fringing San Pablo and Suisun Bays, in Contra Costa, Napa, and Solano counties. Of the remaining sites, one (McAvoy) has only 23 plants. Three sites, Point Pinole, Rush Ranch and Joice Island Bridge, have very limited habitat and cover less than1 acre each. The population at Fagan Slough covers approximately 3 acres. The two largest populations are at Hill Slough and at Concord Naval Weapons Station, each covering about 10 acres. The entire distribution of Soft bird's-beak currently is restricted to about 31 gross acres. Individual populations fluctuate in size from year to year, as is typical of annual plants.

Habitat conversion, water pollution, water diversion, increases in salinity of tidal marshes due to upstream withdrawals of fresh water, habitat fragmentation, indirect effects of urbanization, competition with nonnative vegetation, insect predation, projects that alter natural tidal regime, mosquito abatement activities (including

off-road vehicle use), erosion, and grazing. Soft bird's-beak is also threatened by non-native invasive species that compete directly with native marsh species in the upper intertidal area. For example, salt marsh cord grass has impacted habitat for soft bird's-beak at Southampton Marsh in Benicia State Recreation Area as has perennial pepperweed at DFG's Grizzly Island Wildlife Area in Suisun Marsh. The CA Department of Parks & Recreation is developing a Habitat Conservation Plan for the Benicia State Recreation Area as well as monitoring for soft bird's-beak.

Mount Diablo bird's-beak *Cordylanthus nidularius*

State: Rare 1978
Federal: None

General Habitat:
Mount Diablo bird's-beak occurs on bare ground in openings of serpentine chaparral on Mt. Diablo, Contra Costa County. It is associated with big berry manzanita, Mt. Diablo fairy lantern, Brewer's dwarf-flax, and native grasses.

Description:
Mount Diablo bird's-beak, a member of the figwort family (Scrophulariaceae), is a prostrate to ascending, branched, mat-forming annual. Its leaves are very narrow with linear divisions, and has small white and purple-veined flowers.

Status:
Cordylanthus nidularius forms an interlacing, 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, within Mount Diablo State Park. This population is stable, although it appears to require some disturbance. Disturbed sites, such as fire breaks, road edges, and post-fire landscapes, support the best populations of this species.

Mt. Diablo bird's-beak is considered to be a species of concern by the FWS and is addressed in the 2003 Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, CA. It is being considered for coverage in the East Contra Costa County HCP/NCCP. There is no current management plan for this species and annual surveys within the park are sporadic. To prepare a meaningful management plan, certain aspects of this plant's biology still need to be investigated. For example, it will be essential to understand the population dynamics of this species. The root host, pollinators, and seed germination requirements are unknown, among other aspects of the species' biology. Any naturally occurring event could lead to a drastic reduction in population size and possible extirpation. To buffer the effects of naturally occurring events, discovering or establishing populations that are disjunct from the current known population may prove essential. Human-caused threats also need to be identified, addressed, and monitored as part of a management plan. Additionally, the role of fire should be addressed immediately, both as a research need and a management tool.

The California Department of Parks and Recreation has proposed a prescribed burn that would encompass this area. This controlled burn should take place only under the most rigorous research and monitoring framework with

the research results used to improve the chances for long-term persistence of this species. Collection and banking of seed in Center for Plant Conservation certified botanic gardens is also a high-priority action for *Cordylanthus nidularius*. Seed banking is prudent to guard against extinction of the species from chance catastrophic events and to provide material for enhancement efforts in existing populations, reintroductions, and/or introductions to new sites. Other important conservation activities for *C. nidularius* include research on seed germination and propagation techniques to assist in establishing refugia populations.

Palmate-bracted bird's-beak

Cordylanthus palmatus

State: Endangered 1984
Federal: Endangered 1986

General Habitat:

This species is confined to the saline-alkaline soils and is a component of Valley Sink Scrub and Alkali Meadow natural communities in relatively undisturbed, seasonally flooded lowlands in the Central and Livermore valleys. Palmate-bracted bird's-beak is associated with iodine bush, alkali heath, pickleweed, and saltgrass. This species occupies a narrow zone of favorable conditions based on soil pH, salinity, and moisture content.

Description:

Palmate-bracted bird's-beak is a pale green-gray annual herb in the figwort family (Scrophulariaceae). It branches from the base, and the leaves and bracts are covered by salt deposits extruded from special glands. Flowers are white and enclosed in pale purple leaf-like bracts. *Cordylanthus* species are *hemiparasitic*, meaning that they manufacture their own food but obtain additional water and nutrients from the roots of other (host) plants. Several species serve as host plants for *Cordylanthus palmatus*. This species flowers from May until October.

Status:

Palmate-bracted bird's-beak is restricted to seasonally-flooded, saline-alkali soils in lowland plains and basins at elevations of less than 509 ft. Within these areas, palmate-bracted bird's-beak grows primarily along the edges of channels and drainages, with a few individuals scattered in seasonally-wet depressions, *alkali scalds* (barren areas with a surface crust of salts), and grassy areas. The combination of hemiparasitism, salt excretion, and a deep root system allows palmate-bracted bird's-beak to grow during the hot, dry months after most other annuals have died. Under natural conditions, this species occurs on neutral to alkaline soils. Bumblebees are the primary pollinators of palmate-bracted bird's-beak, and both self- and cross-pollination can contribute to seed-set. Individual plants can produce up to 1,000 seeds in a single growing season, which form a persistent seedbank. The number of plants in a population varies annually in response to environmental conditions, particularly precipitation.

Historically, the species is known from scattered locations in Fresno and Madera counties in the San Joaquin Valley, San Joaquin, Yolo, and Colusa counties in the Sacramento Valley and the Livermore Valley area of Alameda County. It is currently known to occur in seven locations in the Sacramento, Livermore and San Joaquin Valleys. From north to south, these are Sacramento National Wildlife Refuge (NWR) in Glenn County, Delevan NWR in Colusa County, Colusa NWR in Colusa County, the Woodland area, Springtown Alkali Sink near Livermore, western

Madera County, and the combined Alkali Sink Ecological Reserve and Mendota Wildlife Management Area. The total occupied surface area over the seven locations is estimated at less than 741 acres.

The Springtown Alkali Sink Ecological Reserve, located north of Livermore in Alameda County, supports a large and genetically diverse population. The population occurs on lands owned by the Federal Communication Commission, the City of Livermore, and private landowners. Because *Cordylanthus palmatus* occupies a narrow ecotone between upland and wetland, maintaining the hydrologic functioning of this system is important to maintaining the bird's-beak at the site. Many of the existing colonies are degraded by motorcycle and bicycle use and by heavy grazing. Increased public use of the site, a direct result of development of the area surrounding Springtown, further degrades the habitat.

The principal threats to palmate-bracted bird's-beak include habitat conversion, development, alteration of site hydrology, and introduction of non-native grasses. Protection measures for palmate-bracted bird's-beak are included in the USFWS Recovery Plan for Upland Species of the San Joaquin Valley, California. The plan was completed in 1998.

Seaside bird's-beak *Cordylanthus rigidus ssp. littoralis*

State: Endangered 1982
Federal: None

General Habitat:

Seaside bird's-beak grows in sandy soils of stabilized dunes in closed-cone pine forest, cismontane woodland, or maritime chaparral from Monterey to Santa Barbara Counties. Plants thrive in areas of recent surface soil disturbance or in areas with reduced levels of competition from shrubs and herbaceous plants. Associate species include coast live oak, black sage, and manzanita.

Description:

Seaside bird's-beak is a bushy annual herb in the figwort family (Scrophulariaceae). The yellowish green branches and leaves are covered with fine hairs, and its pale yellow flowers are clustered at the ends of branches.

Status:

The historic distribution of this bird's-beak was, until recently, thought to be restricted to northern Monterey County; the base closure of Fort Ord resulted in the protection of several of these populations. In the early 1980s, several collections were identified from Burton Mesa in Santa Barbara County. About 10 sites are known at present on publicly and privately owned lands and on Vandenberg Air Force Base. At some of the Santa Barbara County sites, subspecies *littoralis* hybridizes with subspecies *rigidus.* A population was later identified on Vandenberg AFB. In Santa Barbara County, populations of seaside bird's-beak are located on land managed and conserved by DPR at the La Purissima Mission State Park. Several populations of this species are also protected on the 5,125-acre Burton Mesa Management Area which was acquired by the State Lands Commission and surrounds the small community of Vandenberg Village.

There is currently little information on the status of these populations. Prescribed burning, wildfires, vegetation fuel break construction, invasive species, and recreational activities on protected lands may pose a threat to the rare Burton Mesa chaparral plant community and populations of seaside bird's-beak found there. High fire frequency and out-of-season burning may adversely affect the species. Fires, ground disturbing activities and recreational use contribute to the spread of invasive species like pampas grass, iceplant, and veldt grass, which are capable of overtaking bird's-beak habitat.

Pennell's bird's-beak

Cordylanthus tenuis ssp. capillaris

State: Rare 1978
Federal: Endangered 1995

General Habitat:

Pennell's bird's-beak is restricted to open sites and clearings in the serpentine chaparral plant community in Sonoma County. This bird's-beak is associated with the State-listed rare Baker's manzanita.

Description:

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.

Status:

Both plants are found a few miles southeast of Occidental at Harrison Grade in Sonoma County. There are two occurrences of Pennell's bird's-beak. One is on private land and is being severely impacted by trespassing OHV users, campers, and hikers. A small portion of the other occurrence is on the DFG's Harrison Grade Ecological Reserve, but most of this second population is on adjacent private land.

In 1997, the DFG held two recovery workshops to address Pennell's bird's-beak and 11 other plants known from serpentine habitats in the San Francisco Bay Area. The highest priority recovery action for the plant identified by workshop participants was preserving at least the majority of one of the populations either through acquisition or conservation easement, since the ecological reserve is too small to afford long-term protection for the species as a whole. Management and recovery actions for the species have been addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Wiggin's croton *Croton wigginsii*

State: Rare 1982
Federal: None

General Habitat:
Wiggins' croton occurs in stabilized and partially stabilized sand dunes in the Algodones Dunes in southeast Imperial County, where it occurs primarily on the west side of the dune system. It is associated with several sensitive plant species, including sand food, Peirson's milkvetch, and Algodones Dunes sunflower. Wiggins' croton also occurs in Baja California Norte and Sonora, Mexico.

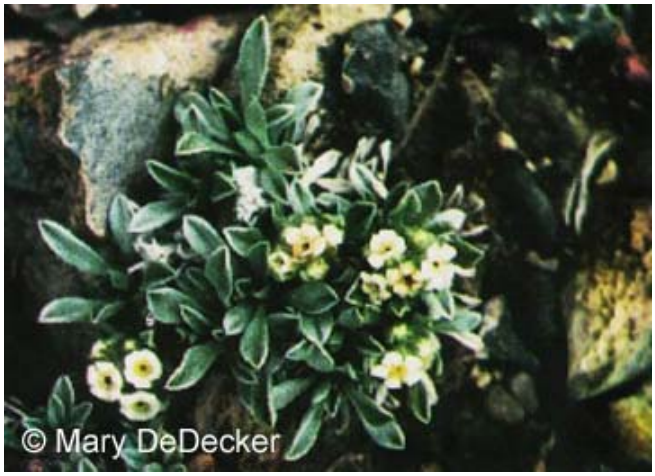
Description:
Wiggin's croton is a silver-haired, much branched, perennial shrub in the spurge family (Euphorbiaceae). Male and female flowers are produced on separate plants.

Status:
Wiggin's croton is known from only two occurrences in the Algodones Dunes system of Imperial County. Approximately 75 percent of the dune system remains open to OHVs, which poses a major threat to the species. The remaining portion of the Algodones Dunes is been designated as the North Algodones Dunes Wilderness under the California Desert Protection Act and is closed to OHV activity.

In the 1990s, DFG staff collaborated with the BLM, CNPS, and the USFWS to conduct spring monitoring surveys for Wiggins' croton and four other plant species of concern in the Algodones Dunes. The purpose of the surveys was to establish and monitor transects across the dunes, both within the OHV open areas and the North Algodones Dunes Wilderness, for the presence and size of plant populations in those areas. As of 2000, monitoring data showed that the abundance of *Croton wigginsii*, did not fluctuate much from year-to-year in response to annual rainfall. Based on statistical analyses, the researchers concluded that Wiggins' croton appears to be able to maintain its population over at least two low-rainfall years. The species was significantly more abundant in 1998 than in 1977, mostly as a result of increases in the open area. Unlike the other sensitive species in the Algodones Dunes, Wiggins' croton responds well to moderate levels of disturbance. The observed increase in plant numbers could be the result of OHV disturbance in the open area, but is probably more likely the result of differences in rainfall amounts between the northern and southern dunes during periods of establishment or of other unknown factors.

Bristlecone cryptantha

Cryptantha roosiorum



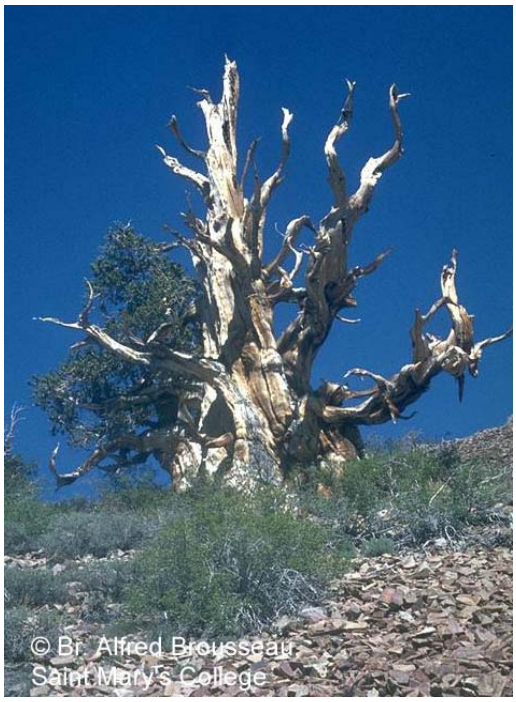
State: Rare 1982
Federal: None

General Habitat:

This diminutive perennial plant is found on gentle slopes or flats of dolomite or limestone in open sunny sites of the limber pine or bristlecone pine community in the Inyo Mountains of Inyo County. Associate species include sagebrush, penstemon, and species of milkvetch.

Description:

Bristlecone cryptantha is a member of the borage family (Boraginaceae). It occurs as dense cushions of grayish leaves with compact heads of small white flowers.

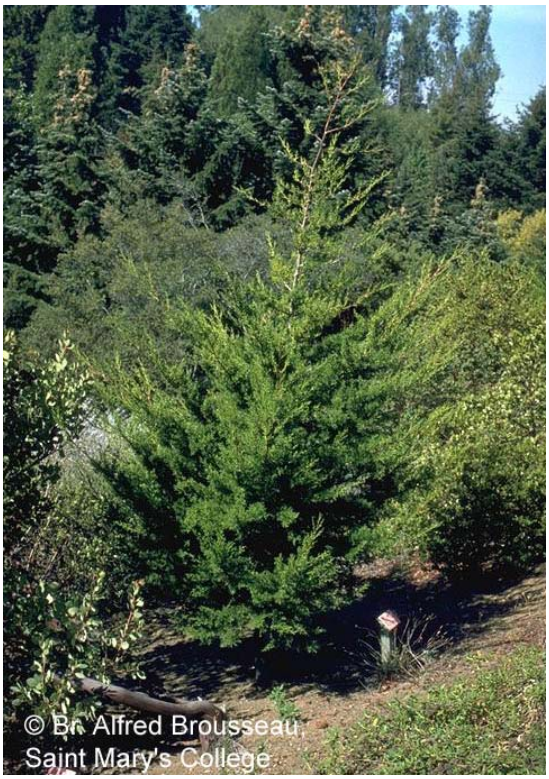


Status:

Bristlecone cryptantha is known from two occurrences in Inyo County where it is common within its habitat. DFG has no recent information on this species.

Santa Cruz cypress

Cupressus abramsiana



State:	Endangered	1979
Federal:	Endangered	1987

General Habitat:

Santa Cruz cypress is restricted to a localized area within the Santa Cruz Mountains. It also occurs at Butano Ridge in San Mateo County. Habitat for Santa Cruz cypress consists of chaparral and closed-cone cypress and pine forest within a mosaic of redwood and mixed evergreen forest. The groves grow atop old marine sandstones and granitic soils within an area influenced by a Mediterranean-type climate and with little to no coastal fog. Associated species include knobcone pine, canyon live oak, bush poppy, chamise, ceanothus, and manzanita.

Description:

This erect, densely branched tree, a member of the cypress family (Cupressaceae) attains a height of up to 34 feet and typically develops a compact, symmetrical, pyramidal crown. The mature foliage of Santa Cruz cypress is scale-like and rich light green and its bark is gray and fibrous. The trees annually produce numerous female cones near the growing branch tip. These cones, which are firmly attached to the branch, remain closed and retain their seeds until the tree or supporting branch dies, generally as a result of fire.

Status:

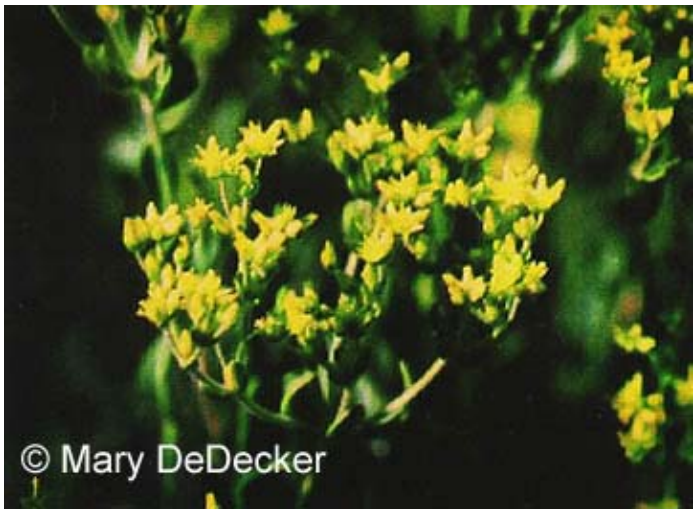
Santa Cruz cypress is known from eight occurrences in Santa Cruz and San Mateo Counties. In Santa Cruz County, it occurs near Bonny Doon, Eagle Rack, and Braken Brae Creek, and between Majors and Laguna Creeks. It occurs on Butano Ridge n San Mateo County. Its distribution suggests that Santa Cruz cypress is a relict species, representing a type of vegetation widespread during glacial times but now confined to scattered sites.

A Draft Recovery Plan was published by the Service in April 1997. Land use plans and ordinances of Santa Cruz County and San Mateo County afford some protection to the species, although three populations, including half of the Bonny Doon population, and more than half of all of the individual plants occur on private lands. The remainder of the plants are protected within State or county parks, and watershed management plans have begun for some of these areas. Management of the Zayante sand hills in Santa Cruz County will protect a stand of this species, as well as two listed species of insect also found there.

Logging, agricultural conversion, residential development, changes in natural fire regime, and introduction of non-native species, such as broom and pampas grass, have impacted Santa Cruz cypress. This species is available commercially as a nursery plant.

July gold *Dedeckera eurekensis*

State: Rare 1978
Federal: None



General Habitat:
July gold occurs on rocky ridges, cliffs, talus slopes, and washes in mixed desert shrub and shadscale scrub. It commonly occurs on limestone or on rubble derived from limestone.

Description:
July gold 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. This species flowers in July and August.

Status:
July gold is known from about 20 occurrences. Most of the occurrences are in remote areas along the sides of steep canyon walls above the effects of flash floods. July gold has probably existed for hundreds of thousands of years without any significant genetic modifications. The species has very low seed production and research found that the successful seed set of July gold is less than 2.5% of the flowers produced annually. However, a single shrub can produce as many as 10,000 flowers each year. Even with only a minute survival rate of these seeds, the successful replacement of a shrub that can live up to 140 years is obviously enough to allow the long-term survival of the species. Long-term survivorship may also be conferred by the exceedingly high genetic variability found in the species. Individual plants share less than 70 percent of their genes.

Mineral exploration and OHV use have the potential to impact July gold. The majority of the populations occur on land managed by the Bureau of Land Management. A smaller number of populations are on the Inyo National Forest and in Death Valley National Park.

Baker's larkspur *Delphinium bakeri*

State:	Rare	1979
Federal:	Endangered	2000

General Habitat:

Baker's larkspur grows on decomposed shale within coastal scrub plant community, at an elevation of 400 to 500 feet. Historically, it was known from Coleman Valley in Sonoma County and from near Tomales in Marin County. There is one known populations currently remaining, along a roadside in Marin County

Description:

Baker's larkspur is an erect, leafy-stemmed perennial in the buttercup family (Ranunculaceae) with shallowly five-parted leaves that occur primarily along the upper third of the stem. It grows from a thickened, tuber-like, fleshy cluster of roots, to a height of 26 inches. In April and May it produces showy, bright blue and white irregularly shaped flowers.

Status:

Although Baker's larkspur has always been rare, habitat losses have nearly caused its extinction. Baker's larkspur was once known from several populations in Marin and Sonoma counties, which were extirpated by extensive livestock grazing, roadside maintenance activities, and conversion of its habitat to cultivated farmland. The single remaining population is extremely small and privately owned, occurring on a steep road bank. It is threatened by roadside maintenance, overcollection, and grazing. Because the species has been reduced to a single population of fewer than 100 individuals, it is exceptionally vulnerable to chance catastrophic events, such as fire or insect outbreak.

In 2000 and 2001, surveys found approximately 65 plants at the site. In 2002, 85 plants were found, many of

which were seedlings. In late May, 2002, when the plants were partially in seed, the population was mowed by a county roadside maintenance crew. The impact this mowing will have on the population is not yet known. In 2004, an intense wildfire burned through the population. The status of the plants is not currently known.

Research is currently underway at the Illinois Natural History Survey and UC Berkeley to test the genetic variability of the species. Preliminary results indicate that the species has lower levels of genetic diversity in general compared to other rare and more common larkspur species. Efforts are also underway to collect seed and propagate it at the University of California Botanical Garden to produce a cultivated population for use in conservation efforts and research. Unfortunately, both projects experienced setbacks due to the 2002 mowing incident.

The USFWS designated critical habitat for this species in 2003.

Baker's larkspur is in danger of becoming extinct in the wild due. The extremely restricted distribution of this species and high level of immediate threat support uplisting from State-rare to State-endangered.

Cuyamaca larkspur

Delphinium hesperium ssp. cuyamacae

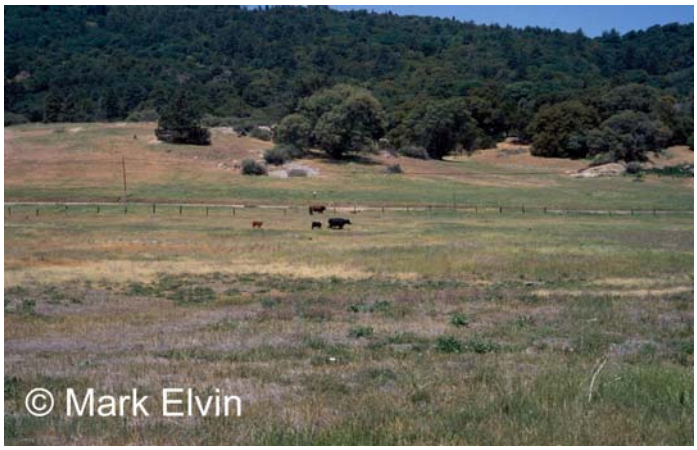
State: Rare 1982
Federal: None

General Habitat:

This larkspur is found in moist, relatively densely vegetated meadows. Known locations in San Diego County include Cuyamaca Lake, Laguna Mountain Recreational Area, and Palomar Mountain. It is found with deer grass in low, moist areas within the grassy meadows bordering Cuyamaca Lake and nearby areas in eastern San Diego County. It is also found in the San Jacinto Mountains of Riverside County.

Description:

Cuyamaca larkspur is a herbaceous perennial in the buttercup family (Ranunculaceae) with erect leafy stems that produce dense blue-violet blooms.



Status:

Approximately 20 occurrences of Cuyamaca larkspur are known and nearly 70 percent of these are found within the boundaries of Cuyamaca Rancho State Park.

DPR established the Cuyamaca Meadows Natural Preserve within the Park in 1990 to provide protection to Cuyamaca larkspur habitat as well as habitats for other listed plant species found in that portion of the State Park. Following two years of extended negotiations, in 1996 the DFG entered into an interagency MOU with USFWS, Helix Water District, Lake Cuyamaca Recreation and Park District, DPR, and USFS to protect Cuyamaca larkspur and two State-listed endangered species. These species, Cuyamaca Lake downingia (*Downingia concolor* var. *brevior*) and Parish's meadowfoam (*Limnanthes gracilis* var. *parishii*), occur in the Cuyamaca Valley and other portions of the Cuyamaca, Laguna and Palomar Mountains in eastern San Diego County. The MOU identifies

particular actions to be taken by each of the signatory land managers to preserve and protect the populations of Cuyamaca larkspur on their lands. Development, grazing, highway maintenance activities, and recreational and trail development are threats to Cuyamaca larkspur.

In 2003, the huge Cedar Fire burned a large portion of central San Diego County including the Cuyamaca Mountains and the area around Cuyamaca Lake. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 13% of suitable habitat was burned during the fire. However, the ability to precisely locate vernal pool complexes within the fire perimeter was limited. Botanists visiting Cuyamaca Lake during the spring in 2004 found a dense carpet of wildflowers covering the meadows at the lake. Few of the grasslands supporting vernal pools burned with a high intensity and impacts to sensitive species found in these pools were not severe.

Yellow larkspur *Delphinium luteum*

State: Rare 1979
Federal: Endangered 2000

General Habitat:
Yellow larkspur occurs on steep, rocky outcrops within the coastal sage scrub plant community near the town of Bodega Bay, Sonoma County, from sea level to 300 feet in elevation. There are also several unconfirmed populations just to the south in Marin County.

Description:
Yellow larkspur is an herbaceous perennial in the buttercup family (Ranunculaceae), with fleshy basal leaves, and growing to 22 inches tall. Its distinctive yellow flowers, which bloom from March to May, are cornucopia-shaped, with the posterior sepal elongated into a spur. Yellow larkspur is pollinated by hummingbirds; although it is self-compatible, it requires visitation by hummingbirds or insects for good seed set.

Status:
Although the distribution of yellow larkspur has always been restricted to fewer than a dozen occurrences near the town of Bodega Bay in Sonoma County, impacts due to rock quarrying activities, overcollection, residential development, and sheep grazing have reduced the species to near extinction. Only two confirmed populations of genetically pure yellow larkspur are remaining in the wild, both very small and on private land. Several additional populations appear to be hybrids with other larkspur species. Further research on these potential hybrid populations is needed. Several unconfirmed populations of yellow larkspur have also been reported to occur in Marin County. Further investigation into these potential occurrences is also needed.

Counts of one population between 1985 and 2000 found between 50 and 130 plants, with the number fluctuating from year to year. The other population contained between 8 and 50 plants from 1983-1987. That site has not been accessible since 1987, and no current population numbers are available; however, the management of the site does appear to be compatible with the continued existence of the species. Due to its restricted range and small population size, yellow larkspur is threatened by chance catastrophic events, such as fire or insect outbreak.

Two ex situ populations are in cultivation in Sonoma County and at the University of California Botanical Garden at Berkeley. The plants are easily grown in cultivation.

Recent genetic research on the species found that it is not of recent hybrid origin. Only one wild population was

sampled and it has the most genetic diversity, but the cultivated populations contain several alleles and markers not found in the wild population that could be used to establish new populations or enhance diversity of wild populations.

The USFWS designated critical habitat for this species in 2003.

The extremely restricted distribution of this species, high level of threat, and lack of formally protected populations would support uplisting from State-rare to State-endangered.

San Clemente Island larkspur ***Delphinium variegatum var. kinkiense***

State: Endangered 1979
Federal: Endangered 1977

General Habitat:
San Clemente Island larkspur is endemic to San Clemente Island, the southernmost of the eight Channel Islands off the coast of southern California. It occurs in gently sloping annual and native perennial grasslands, primarily on the eastern slopes of the island, at an elevation of 150-1500 feet. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:
San Clemente Island larkspur is a perennial herb in the buttercup family (Ranunculaceae). Plants have a woody, branching root and divided, basal leaves. Elongated flower stalks, reaching 16-20 inches tall, produce white to pale violet flowers from March to May. Another rare species endemic to the island, Thorne's larkspur (*D. variegatum* var. *thornei*) is distinguishable from San Clemente Island larkspur only by the color of the flowers; Thorne's larkspur has light to bright blue flowers, while San Clemente Island larkspur's are white to pale violet. Populations that occur in the center of the island have individual plants with white, bright blue, and intermediate flower colors, suggesting that the two subspecies may be hybridizing.

Status:
San Clemente Island larkspur occurs in highly localized colonies, primarily on the northern and eastern end of the island; lone individuals are not usually observed. San Clemente Island larkspur populations have been highly impacted by grazing, rooting, and habitat disturbance. Ranching operations during the past century resulted in overgrazing and elimination of much of the native vegetation on the island. Intense grazing, rooting, and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. The grassland areas where San Clemente Island

larkspur occurs suffered particularly high levels of grubbing activity by feral pigs due to the presence of other rhizomatous and bulbous perennials, favorite food-stuff of the pigs. In 1985 it was reported that the type locality of the species had been extirpated due to pig rooting.

There are no longer ranching operations on the island. Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program.

The latest information available for this species documents 10 occupied sites in grasslands on the eastern slopes of San Clemente Island. The status of the species may be improving since the removal of grazing and feral animals. However, sites that were extirpated due to grazing and rooting may require reintroduction efforts to become reestablished. DFG has no current information on the status of this species.

The U.S. Fish and Wildlife Service completed a recovery plan for this and other Channel Island species in 1984.

Geyser's dichanthelium ***Dichanthelium lanuginosum var. thermale***

State: Endangered 1978
Federal: None

General Habitat:

It is found only in the Big Sulfur Creek drainage of The Geysers area, Sonoma County. It is restricted to the hydrothermally altered soil of geothermal areas where it is adapted to the high acidity, high soil moisture, and high soil temperatures at these sites.

Description:

Geyser's dichanthelium, a member of the grass family (Poaceae), is a tufted, velvet-haired, perennial grass.

Status:

Geyser's dichanthelium is known from eight occurrences in the Geysers area of Sonoma County. The principal threat to this species is habitat alteration due to geothermal exploration and development. Road and culvert construction, erosion, and introduction of non-native species have also affected this species. The DFG and the California Energy Commission have been working with private companies to avoid disturbance to the plant within the Little Geysers Natural Area, and the main owner/operator is conducting yearly demographic monitoring of the plants under an MOU with DFG. Most recent surveys at the Little Geysers Natural area found 110,000 plants.

Recent research characterized temporal and spatial variations in soil temperature and its relationship to survivorship. Small changes in soil temperature facilitated plant establishment and expansion into areas not previously colonized due to high heat or dryness. Favorable soil temperatures promoted seed germination, growth, and plant maturation. Although drought and absence of heat inhibited seed germination, absence of heat from steam restricted germination when other conditions were favorable. Alteration of subsurface heat and water from steam extraction could adversely affect this species. The researchers concluded that management

should focus on maintaining conditions that permit a dynamic response of Geyser's dichanthelium populations to perturbations in its habitat.

Current taxonomic treatments do not recognize Geyer's dichanthelium as a distinct species. It is considered to be a species of panicgrass (*Panicum acuminatum* var. *acuminatum*).

Beach spectacle pod *Dithyrea maritima*

State: Threatened 1990
Federal: None

General Habitat:

Beach spectacle pod is found in small transverse foredunes within approximately 50-300 meters from the surf, from San Luis Obispo County south to Baja California, Mexico. Beach spectacle pod is usually found in areas of these fragile dunes where the sand is relatively unstable. Common associates include sand verbena and dune dandelion.

Description:

Beach spectacle pod is a small, low growing, white-flowered perennial herb in the mustard family (Brassicaceae). Its unique twin-fruited seed pods have two side by side sections, each surrounded by a rim, giving this plant its common name.

Status:

Although historically ranging from San Luis Obispo County as far south as Los Angeles County and possibly Baja California, Mexico, this species currently occurs in the dunes of San Luis Obispo and Santa Barbara counties and on San Nicolas and San Miguel Islands.

San Miguel Island is part of the Channel Islands National Park, and is managed by the National Park Service. At the one known population on San Miguel Island, 700-1000 plants were seen in 1998. The U.S. Navy owns and manages San Nicolas Island, and the Navy's Environmental Division reviews all land use plans and activities that may affect sensitive species. This island supports several healthy populations of this plant, which are limited to the sand dune communities on the west and southwest coasts. Surveys in 1998 found less than 1000 plants at each occurrence. Expanding northern elephant seal populations are trampling some dune occurrences of this plant on the island. The Navy surveys beach spectacle pod populations regularly, and a study is being conducted to identify factors limiting population growth on the island.

Several populations on Unocal property in the foredunes of the Guadalupe Dunes just north of the Santa Maria River are at risk from long-term soil and water contamination from a diluting substance on Unocal's property. The habitat is also at risk from invasion of non-native species. A program of dunegrass and Veldt grass removal within

the Guadalupe Dunes began in 1999. This effort, conducted by the Land Conservancy of San Luis Obispo County, is expected to improve areas of beach spectacle pod habitat. In 2000, approximately 2,500 plants were observed at this location. The Dunes Center, a new organization, is attempting to unite all major landowners in the Dunes Complex under one administrative body with the goal of preserving this open space and the rare species found there. Private, county, state, and corporate owners are represented within the preserve. An interpretive center is being built to aid in educating the public about the unique dune system; docent-led tours are also given to help educate the public about the dunes.

Several populations of beach spectacle-pod have also been observed on Vandenberg AFB in Santa Barbara County, which is managed by DOD.

Slender-horned spineflower

Dodecahema leptoceras

State: Endangered 1982
Federal: Endangered 1987

General Habitat:

Slender-horned spineflower is known from alluvial fans, floodplains, stream terraces, washes and associated benches in San Bernardino and Riverside Counties. It is generally restricted to silty substrates low in organic matter in open areas in alluvial fan scrub. It is associated with other species of spineflower, brittlebush, California buckwheat, yucca, white sage and lemonade berry. Cryptogamic crusts are frequently resent in areas occupied by slender-horned spineflower.

Description:

Slender-horned spineflower is in the buckwheat family (Polygonaceae). It is a small annual with a rosette of leaves and spreading flowering stems. Slender-horned spineflower is distinguished from other spineflowers by the presence of 6 terminal awns and 6 hooked basal awns on each involucre. The involucre is a group of bracts that have been fused together to enclose approximately three to five white to pink flowers. Slender-horned spineflower blooms from April to June.

Status:

Slender-horned spineflower is threatened primarily by loss of habitat and habitat fragmentation. Impacts include gravel mining, construction of flood control facilities, OHV use of fan habitat, urbanization, and competition from aggressive non-native species. Long-term conservation of this species will entail protection of an adequate amount of habitat to buffer the species against random extinction events, as well as protect the dynamic floodplain processes to which the species is adapted.

Slender-horned spineflower is typically found in sandy soil in association with mature alluvial scrub although it is associated with gravel soil in chamise chaparral in the Vail Lake area. The ideal habitat appears to be a terrace or bench that receives overbank deposits every 50 to 100 years. It is known from approximately 20 populations. Four areas supporting the species are found in Riverside County. The largest of these appears to be a population composed of several subgroups at Arroyo Seco and Kolb Creek along the north flank of the Agua Tibia Mountains and at Vail Lake. The Santa Ana River may support as many as 22 subpopulations, although eight of those have not been seen in recent years. Protected populations occur on public lands at Santa Ana River, Bautista Creek, and Arroyo Seco Creek in San Bernardino and Riverside counties. Most of the remaining populations on private lands. A draft recovery plan for slender-horned spineflower was released by USFWS in 1997; it has not been finalized.

Slender-horned spineflower is included as a narrow endemic species in the Western Riverside Multiple Species

Habitat Conservation Plan (MSHCP). This species is dependent on mature alluvial scrub that is maintained by periodic flooding and sediment transport and only occurs along Arroyo Seco and Kolb Creeks, Temescal Wash at Indian Creek, central Bautista Creek, Vail Lake and the upper San Jacinto River near Valle Vista and Hemet. Conservation for this species will be achieved by protecting at least 8,350 acres of chaparral and Riversidean alluvial fan sage scrub between 200 and 700 m in the Vail Lake Narrow Endemic Species survey area and Agua Tibia Mountains Bioregion. In addition, at least 11 of the known populations of this species will be included in the MSHCP Conservation Area. Management will also focus on maintaining and enhancing fluvial processes of Arroyo Seco and Kolb Creeks, Temescal Wash at Indian Creek, central Bautista Creek, and the San Jacinto River. Particular management emphasis will be given to flood control measures, sand and gravel mining, trampling, off-road vehicle use, and competition from non-native plant species.

Cuyamaca Lake downingia

Downingia concolor var. brevior

State: Endangered 1982
Federal: None

General Habitat:

Cuyamaca Lake downingia grows only in vernally moist swales and pools of Cuyamaca Lake and Cuyamaca Valley in the Cuyamaca Mountains of eastern San Diego County. It is associated with the State-listed endangered Parish's meadowfoam, and State-listed rare Cuyamaca larkspur.

Description:

Cuyamaca Lake downingia is a member of the bellflower family (Campanulaceae). This plant is a small annual herb with stems from two to eight inches long. Its flowers are blue and white and have a dark purple blotch at the base of the petals. Cuyamaca Lake downingia flowers from May to July.

Status:

Cuyamaca Lake downingia is known from three occurrences, one of which may be extirpated. It occurs in vernal pools and swales on the margins of Cuyamaca Lake and adjacent low lying areas. Plant numbers and their locations within the Cuyamaca Valley vary widely from year to year, depending upon seasonal rainfall and standing water levels. A small portion of the known population is found within Cuyamaca Rancho State Park and on private property at the eastern end of Cuyamaca Lake. The vast majority of the species habitat occurs on land owned by the Helix Water District and managed jointly by the Water District and the Lake Cuyamaca Recreation and Park District.

In 1990, DPR established the Cuyamaca Meadows Natural Preserve within Cuyamaca Rancho State Park to provide additional protection to Cuyamaca Lake downingia habitat as well as habitats for other rare species found in that portion of the State Park. In 1996, following two years of extended negotiations, DFG became a signatory to the "Conservation Agreement for the Preservation of Cuyamaca Lake Downingia (*Downingia concolor* var. *brevior*) and Parish's Meadowfoam (*Limnanthes gracilis* ssp. *parishii*)." The other signatories are the Helix Water District, Lake Cuyamaca Recreation and Park District, California Department of Parks and Recreation (State Parks), the FWS, and the U.S. Forest Service. The conservation agreement identifies particular actions to be taken by each of the signatory land managers to preserve and protect the populations of Cuyamaca Lake downingia on their lands.

In 2003, the huge Cedar Fire burned a large portion of central San Diego County including the Cuyamaca Mountains and around Cuyamaca Lake. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. However, the ability to precisely locate vernal pool complexes within the fire perimeter was

limited. Botanists visiting Cuyamaca Lake during the spring in 2004 found a dense carpet of wildflowers covering the meadows at the lake. Few of the grasslands supporting vernal pools burned with a high intensity and impacts to sensitive species found in these pools were not severe.

Short-leaved dudleya

Dudleya brevifolia
(= Dudleya blochmaniae ssp. brevifolia)

State: Endangered 1982
Federal: None

General Habitat:

Short-leaved dudleya is restricted to openings in the maritime chaparral community of western San Diego County. Its habitat is dominated by cryptobiotic crust species such as lichens, mosses, and ashy spike-moss. It occurs on extremely shallow, sandy soils that overlay a cemented sandstone hardpan, often at the edges of canyons.

Description:

Short-leaved dudleya is a tiny succulent perennial plant with a rosette of leaves that sprout from a corm. This member of the stonecrop family (Crassulaceae) produces short stalks of white flowers with red or purple markings.

Status:

Short-leaved dudleya is known from only five extant occurrences on sandstone mesas of the Del Mar and La Jolla region of San Diego County. The largest populations are found in the main portion of Torrey Pines State Park and within the Carmel Mountain Preserve. Smaller populations are found at Crest Canyon in Del Mar Heights, Skeleton Canyon at U.C. San Diego, and the Torrey Pines State Park extension north of Peñasquitos Lagoon. Three populations were destroyed by urbanization and development.

In 1997, USFWS withdrew its Proposed Rule to list short-leaved dudleya as endangered since it receives protection under the Multiple Species Conservation Program (MSCP) of southern San Diego County. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Short-

leaved dudleya is considered to be a narrow endemic species under the MSCP and 98 percent of major short-leaved dudleya populations will be conserved. The City of San Diego prepared a Subarea Plan under the MSCP to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. Management directives for this species require specific measures to maintain and increase populations, reduce or eliminate threats to the species, and address ecological relationships of the species.

Short-leaved dudleya is the focal species for conservation on Carmel Mountain, which is largely in City of San Diego ownership. The Carmel Mountain Preserve was established to protect the sensitive biological resources in the area. A management plan was developed for the Preserve in accordance with the MSCP and the Subarea Plan. All subpopulations on Carmel Mountain have suffered from past and ongoing disturbances such as road grading, and off-road vehicle, horse, bicycle, and foot traffic. Access by illegal off-road vehicles is still possible from a San Diego Gas & Electric (SDG&E) access road. Bicycle, hikers, and horse use is uncontrolled and traverses short-leaved dudleya habitat. Because short-leaved dudleya grows in openings that are favored as overlooks by hikers, trampling by people and dogs is a considerable threat to these occurrences and site-specific measures to lessen these impacts are needed. In addition, these disturbances are damaging and removing the surrounding cryptogamic crust. Removing or disturbing the lichen and moss crust facilitates weed invasion. Following initial disturbance, pocket gophers frequently move into the area to feed on the non-natives and the gopher burrowing promotes additional weed growth.

The goals of the Carmel Mountain Preserve Plan are to: 1) Eliminate vehicle, horse, and foot traffic in short-leaved dudleya habitat; 2) Restore the associated disturbed habitat, including roads through habitat; 3) Maintain and expand self-sustaining populations of short-leaved dudleya within the Preserve to ensure their long-term existence; 4) Preserve, protect, restore, and enhance the sandstone terraces that constitute habitat for species associated with the dudleya; and 5) Establish new populations with a minimum of 10,000 short-leaved dudleya on appropriate sandstone terraces on Carmel Mountain. Exotic plant control and promoting an assemblage of native pollinators are important aspects of proposed restoration activities.

The City conducts annual quantitative monitoring of short-leaved dudleya. Census numbers generated through the MSCP monitoring program for the three subpopulations of short-leaved dudleya on Carmel Mountain show an increase in the number of flowering individuals in 2001 from the two previous years. Approximately 66,637 individuals were found in 2001, 23,500 in 2000, and 27,000 in 1999. These numbers likely reflect responses of the populations to the timing and amount of rainfall each of those years and probably do not indicate an actual increase in population numbers in light of the continued disturbance and ongoing weed invasion. In 1999 and 2000 rainfall was well below average and long dry periods of up to several weeks occurred in midwinter.

The species is included in the San Diego Multiple Habitat Conservation Program (MHCP) as a narrow endemic species. The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. All major populations will be conserved under the MHCP. Conservation of occupied habitat, suitable adjacent habitat that supports pollinators, and unoccupied habitat that may support a persistent seedbank will contribute to the recovery of the species. An estimated 472 acres (75%) of potentially suitable habitat for this species will be conserved in the MHCP area. In addition, any newly detected localities for this species would be conserved inside the planning area and a minimum 80% would be conserved outside of the planning area.

The MHCP includes specific conditions that must be met to adequately conserve the species and allow for limited incidental take. These conditions include conservation of at least five self-sustaining, distinct populations within the geographic range of the species; conservation of any newly-discovered populations or experimental populations; management of all populations as a metapopulation to conserve genetic variability within in the species; limiting edge effects at populations sites; implementing fire management plans to protect conserved

populations from frequent or high-intensity fires and fire suppression activities; enhancing declining populations through adaptive management; and conducting intensive surveys prior to potential impacts.

This species is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. According to the SDG&E Subregional Plan, the short-leaved dudleya is adequately conserved by the Subregional Plan because impacts will be avoided unless deemed necessary for emergencies or repairs. Pursuant to the SDG&E NCCP, narrow endemic species may not be impacted for non-emergency work without consultation with the USFWS and DFG. If impacts are unavoidable, state of the art conservation practices will be used to determine the best impact minimization and mitigation method consistent with SDG&E operational protocols.

Marcescent dudleya *Dudleya cymosa ssp. marcescens*

State:	Rare	1978
Federal:	Threatened	1997

General Habitat:

Marcescent dudleya grows on rocky volcanic cliffs and canyon walls in the Santa Monica Mountains from Hidden Valley to Malibu Creek State Park. It typically occurs on the lower reaches of sheer volcanic rock surfaces and canyon walls adjacent to perennial streams. In most locations, the topographic relief has precluded soil formation; therefore, the dudleya may be the only vascular plant occurring in a microhabitat which is otherwise dominated by mosses and lichens.

Description:

Marcescent dudleya is a succulent perennial in the stonecrop family (Crassulaceae). It has a basal rosette of leaves. The rosette leaves are 0.6 to 1.6 in long; floral stems are 1.6 to 4 in tall; corollas are bright yellow to yellow with red markings to bright red. *Dudleya cymosa* ssp. *marcescens* is distinguished from other subspecies of *D. cymosa* by the habit of the rosette leaves withering in the summer.

Status:

Marcescent dudleya is known from nine occurrences and the total number of known individuals is estimated to be fewer than 1,000. Ownership is divided between NPS, DPR, and private individuals. Threats to the species include urban development; recreational activities such as rock climbing and bouldering; alteration of surrounding vegetation and natural fire patterns; and illegal collecting for garden or horticultural uses. A draft recovery plan has been prepared for this and five other species of plants from the mountains surrounding the Los Angeles Basin.

Santa Cruz Island dudleya *Dudleya nesiotica*

State: Rare 1979
Federal: Threatened 1997

General Habitat:
Santa Cruz Island dudleya is known only from the west end of Santa Cruz Island, growing on sea bluffs and coastal terraces near Fraser Point.

Description:
Santa Cruz Island dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with a basal rosette of leaves, and a flower stalk of white flowers with erect petals.

Status:
Santa Cruz Island dudleya is known from only one extensive population occupying about 32 acres. Since 1994, Santa Barbara Botanic Garden has been conducting monitoring as well as research on the life history and ecological requirements of Santa Cruz Island dudleya. Their recent estimates, based on random transects with multiple observers, found the population to be in excess of 50,000 plants, with as many as 80,000 in flower during a recent estimate. Their research findings suggest that herbivory by feral pigs and disturbance by pig rooting pose the greatest threats to the species. The species is also vulnerable to soil loss. Despite these threats, the population currently appears to be stable. Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%).

In 1997, TNC drafted operating principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Sequential, island-wide eradication of feral pigs by zone hunting is proposed. Zones would be established by temporary fencing. Sensitive plants and vegetation would also be fenced during eradication activities. Following fennel control and eradication of feral pigs from a given zone, protection of irreplaceable island resources would be immediate.

The final recovery plant for Santa Cruz Island dudleya and twelve other island plants was released by the USFWS in 2001.

Laguna Beach dudleya *Dudleya stolonifera*

State:	Rare	1979
State:	Threatened	1987
Federal:	Threatened	1998

General Habitat:

Laguna Beach dudleya is found only in the vicinity of Laguna Beach (Orange County) on steep cliffs in canyons. It is primarily restricted to weathered sandstone rock outcrops on cliffs in microhabitats within coastal sage scrub or chaparral. Associated species include California polypody fern, *Dudleya lanceolata*, and *Dudleya multicaulis.*

Description:

Laguna Beach dudleya is a succulent perennial member of the stonecrop family (Crassulaceae) and has basal rosettes of flat, oblong, bright green leaves arising from a woody base. Its flowers have bright yellow-green petals that are fused near their base. This species is distinguished by its branching stolons (horizontal stems that root at the nodes) and lateral vegetative branches that arise from the basal rosette.

Status:

Laguna Beach dudleya is known from nine occurrences, all but one on privately owned land. Two of the occurrences represent historic collections. The range of the species lies entirely within the boundaries of the Central/Coastal subregion of the Orange County Natural Communities Conservation Planning (NCCP). One of the four major populations is within the lands designated as a preserve within the Central/Coastal subregion. This population is on DFG's Laguna Laurel Ecological Reserve, which predates the NCCP program. Three major populations, representing about 70 percent of the individuals of this species, are found on private lands managed by nonparticipating landowners. One minor population is within lands designated as a preserve within the Central/Coastal subregion.

Santa Barbara Island dudleya *Dudleya traskiae*

State:	Endangered	1979
Federal:	Endangered	1978

General Habitat:

Santa Barbara Island dudleya is endemic to Santa Barbara Island, the smallest of the Channel Islands off the coast of southern California. It is restricted to steep, rocky slopes and outcrops within canyons, within the coastal bluff scrub plant community.

Description:

Santa Barbara Island dudleya is a small, succulent perennial in the stonecrop family (Crassulaceae). The plants have short stems and basal rosettes of broad, thickened leaves and yellow flowers on short stalks.

Status:

Santa Barbara Island dudleya is known from four populations on Santa Barbara Island where approximately 500 plants are reported by NPS. In the past, grazing by goats and rabbits, soil erosion caused by these animals, and plant collecting seriously threatened the native flora of Santa Barbara Island. Shortly after acquiring Santa Barbara Island, NPS eliminated the introduced exotic herbivores and, as a result, the native vegetation is recovering. The overall trend for Santa Barbara Island dudleya appears to be one of stability, since the primary threat, herbivory, has been removed. However, numbers are low enough that extirpation of some populations is a continued threat.

Santa Ana River woolly-star ***Eriastrum densifolium ssp. sanctorum***

State: Endangered 1987
Federal: Endangered 1987

General Habitat:
Santa Ana River woolly-star occurs in alluvial fan scrub vegetation in the Santa Ana River drainage. It is restricted to the sandy soils of river flood plains or terraced alluvial deposits. Associate species include white sage, scalebroom, and California buckwheat. It is also associated with slender-horned spineflower, an endangered species.

Description:
Santa Ana River woolly-star is a much-branched, erect, shrub of the phlox family (Polemoniaceae). It occasionally reaches one three feet in height. This plant has gray-green stem and leaves. The bright blue flowers are contained in heads of about 20 blossoms each.

Status:
Historically, the Santa Ana River woolly-star was known to extend along 60 river miles in Orange, Riverside and San Bernardino counties, but now plants occupy only about 18 linear miles of river floodplain along the Santa Ana River mainstem, City Creek, and Plunge Creek. Populations exhibiting intermediate characteristics between the subspecies *sanctorum* and a more widespread subspecies occur in the vicinity of Lytle and Cajon washes. The Santa Ana River woolly-star is one of five subspecies of the perennial sub-shrub *Eriastrum densifolium*. This species exhibits complex morphological variation and the subspecies are difficult to distinguish although a study of nineteen quantitative characters showed that the Santa Ana River woolly star has a significantly longer corolla than that of the other four subspecies. A genetic study showed no major discontinuity between the Santa Ana River woolly-star and other subspecies. Instead, genetic variation within *E. densifolium* is a continuum and differentiation among populations is related to geographic distance and not morphological characteristics.

The biggest threat to the continued existence of the Santa Ana River woolly-star stems from the construction of the Seven Oaks dam, which was completed in 1999. Although Seven Oaks Dam impedes sediment transport and reduces the magnitude, frequency, and extent of floods, the system still retains partial fluvial dynamics because contributions from Mill Creek are not impeded by a dam or debris basin. Nevertheless, completion of the dam substantially reduced the historic floodplain areas necessary to support the species, which germinates only on clean sand. Without habitat-rejuvenating flooding events, open, sandy substrates eventually will close in with vegetation, which is anticipated to make these areas eventually unsuitable for woolly-stars.

The Wooly-Star Preservation Area was established in 1988 by the U.S. Army Corps of Engineers in an attempt to minimize the effects of Seven Oaks Dam on the federally endangered Santa Ana River woolly-star along the

Santa Ana River. Approximately 764 acres of alluvial fan scrub in the wash near the low-flow channel of the river were designated for preservation as mitigation because these sections of the wash were thought to have the highest potential to maintain the hydrology necessary for the periodic regeneration of early phases of alluvial fan sage scrub. The preservation area is also included in the FWS critical habitat designation for the endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus)*.

Santa Ana River woolly-star is also directly threatened by sand and gravel mining, which removes large areas of intact habitat, alters river hydrology, fragments remaining populations and generates dust which is believed to reduce pollination activity and speed up the expansion of competing vegetation. Considerable scientific information has been obtained on woolly-star pollinators, which are essential to seed production. An array of pollinators have been identified, including giant flower loving flies, sphinx moths, digger bees, hummingbirds, and others.

Santa Ana River woolly-star is conserved in the Western Riverside County Multiple Species Habitat Conservation Plan. This species is restricted to open washes and early-successional alluvial fan scrub on open slopes above main watercourses on fluvial deposits where flooding and scouring occur at a frequency that allows the persistence of open shrub lands. The Santa Ana River woolly-star has a narrowly restricted distribution within the Plan Area (Santa Ana River) and thus requires species-specific monitoring and management in order to ensure species persistence within the Plan Area. Conservation for this species will be achieved by including at least 2,340 acres of Riversidean alluvial fan sage scrub between 150 and 580 m in the Riverside Lowlands Bioregion. At least three populations in the Santa Ana River floodplain will be included in the MSHCP Conservation Area. Alluvial processes will be maintained in order to provide for the distribution of the species to shift over time as hydrologic conditions and seed bank sources change. Specific management actions will focus on conservation of the natural the natural river bottom and banks, with a 500 foot buffer zone of alluvial terraces and riparian habitat. Tributaries to the Santa Ana River in Riverside County at their confluences with the Santa Ana River will also be protected.

Tracy's eriastrum *Eriastrum tracyi*

State: Rare 1982
Federal: None

General Habitat:
Tracy's eriastrum occurs in open, dry gravelly flats within closed-cone forest, chaparral, and serpentine scrub in Trinity, Tehama, Glenn, Lake, Colusa, and Santa Clara Counties. Associated species include deer brush, California juniper, sagebrush, golden bush, and annual grasses.

Description:
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.

Status:
Tracy's eriastrum is known from seven occurrences. A taxonomic revision indicates that this species should be included in the species *Eriastrum brandegeae*, an equally rare taxon. Extant occurrences are being degraded by OHV 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. More studies are needed to evaluate this species' population trend.

Indian Knob mountainbalm

Eriodictyon altissimum

State: Endangered 1979
Federal: Endangered 1995

General Habitat:

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 coast live oak woodland and coast maritime chaparral. It is associated with Morro manzanita, Pismo manzanita, coast live oak, and chamise.

Description:

Indian Knob mountainbalm is an evergreen shrub of the waterleaf family (Hydrophyllaceae). It reaches a height of approximately six to 13 feet. It is characterized by long, narrow sticky leaves and clusters of tubular pale lavender flowers. As with other fire-adapted chaparral plants, *E. altissimum* produces new growth primarily from rhizomatous suckers.

Status:

Indian Knob mountainbalm is known from six occurrences. The species ranges from the south end of Morro Bay to Indian Knob between San Luis Obispo and Arroyo Grande. The rugged terrain in the Irish Hills (between Mono Bay and Indian Knob) has precluded extensive botanical surveying that may have identified other stands of *E. altissimum.* In January 2001, The Nature Conservancy purchased a conservation easement on the 1,488-acre John Guidetti Ranch. The conservation agreement protects the ranch, which lies south of San Luis Obispo within the city's greenbelt area, and contains maritime chaparral, coast live oak woodlands, and native grasslands that harbor a variety of native animals and plants, including the endangered Indian Knob mountain balm and Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*).

In 2002, FWS awarded a grant DFG to assist in the purchase of property in the vicinity of Los Osos. This property consists of ancient stabilized dunes that support several sensitive plant communities including coastal dune scrub and maritime chaparral. The dunes provide habitat for the federally endangered Indian Knob mountain balm, Morro shoulderband snail, and Morro Bay kangaroo rat. Protection measures for Indian Knob mountainbalm are included in the 1998 USFWS Recovery Plan for Morro Shoulderband Snail and Four Plants form Western San Luis Obispo County, California.

Lompoc yerba santa ***Eriodictyon capitatum***

State: Rare 1979
Federal: Endangered 2000

General Habitat:

Lompoc yerba santa is found on shallow, acidic soils in maritime chaparral and southern bishop pine forest in the Santa Ynez Mountains, the Solomon Hills, in Pine Canyon, and on Burton Mesa in Santa Barbara County. Associated species include manzanita, black sage, ceanothus, and bush poppy.

Description:

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).

Status:

The four known locations of *Eriodictyon capitatum* occur in western Santa Barbara County. Fire management practices, invasive non-native plant species, low seed productivity, and naturally occurring catastrophic events pose significant threats to the long-term survival of this species. Based on the presence of appropriate soils and associated species, other populations may occur, but have not yet been detected by botanists. Final critical habitat was designated in 2002.

Lompoc yerba santa produces few seed; however, it spreads vegetatively from rhizomes. New stems, called ramets, arise from the rhizomes. Recent observations by FWS staff show that new stems can occur more than 100 feet from the near ramet, indicating an extensive root system. Based on enzyme analysis, one researcher found that all of the Santa Ynez Mountains groups and one of the Vandenberg AFB groups were comprised of several genetically distinct individuals. These "individuals" are referred to as "genets." An individual genet can be composed of many ramets. The other Vandenberg AFN groups constituted one genetic individual (genet) spread over a wide area. The Solomon Hills location was inaccessible and not analyzed. Other genetic individuals may be present as viable seed in the soil seed bank.

This species apparently does not reproduce from seed following fire although stems can resprout after burns. It appears to respond well to ongoing disturbance along roads and near facilities associated with fire control practices in the Solomon Hills. However, ongoing vegetation removal for fire control may destroy individual ramets or the root structure of plants. Similarly, prescribed fire management activities outside of the normal fire season may result in mortality of plants and seeds. It is not known how these activities may affect sexual reproduction and influence the expression of the soil seed bank.

Trinity buckwheat *Eriogonum alpinum*

State: Endangered 1979
Federal: None

General Habitat:
Trinity buckwheat is found only the slopes of Scott Mountain (where known only from the type collection), Cory Peak, and Mt. Eddy on the border of Siskiyou and Trinity Counties, California. It is restricted to high elevation serpentine talus and scree slopes with little soil development. It occurs in subalpine forest with Jeffrey pine, foxtail pine, and whitebark pine. Understory associates include spreading phlox, jewelflower, and sedum.

Description:
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.

Status:
Trinity buckwheat is known from eight occurrences. All known occurrences are managed by the Klamath and Shasta-Trinity National Forests and periodically monitored as part of their sensitive plant program. The lack of commercial timber and steep alpine slopes precludes impacts from timber harvesting or grazing activities. Limited threats may occur from mining or ski area development, although most sites are very difficult to access. The last mining operation in the area was abandoned in 1988, and no future mining activities are currently planned. Trinity buckwheat is a FWS Plant Species of Concern.

Ione buckwheat *Eriogonum apricum var. apricum*

State:	Endangered	1981
Federal:	Endangered	1999

General Habitat:

Ione buckwheat occurs in Ione chaparral in the Sierra Nevada foothills of Amador County. It is restricted to barren red clay soils of the Ione formation. Associated species include Ione manzanita, a federally-listed Endangered species, as well as Bisbee Peak rush-rose.

Description:

Ione buckwheat, also called Apricum Hill buckwheat, is a smooth, hairless, compact, herbaceous perennial in the buckwheat family (Polygonaceae). Its leaves are basal, round to oval. Short stems bear clusters of white flowers with reddish midribs. Ione buckwheat flowers from July to October. It is closely related to Irish Hill buckwheat (*Eriogonum apricum* var. *prostratum*), which has prostrate stems. Irish Hill buckwheat also flowers earlier, from June to July.

Status:

Ione buckwheat is known from nine occurrences occupying a total of approximately 10 acres. Most of the occurrences are in the vicinity of Buena Vista and Ione. One occurrence is further west in the area of Carbondale Mesa. *Eriogonum apricum* var. *apricum* occurs primarily on private land. Of the known occurrences, one is partially protected by CDFG and one is managed by BLM. In addition, Caltrans has designated a portion of S.R. 88 in Amador County, near the City of Ione, as a botanical management area for the protection, preservation and enhancement of the endemic species of the Ione chaparral.

Principal threats to this species are clay mining, clearing of vegetation for agriculture and for fire protection; inadequate regulatory mechanisms, habitat fragmentation, increased residential development, and erosion variously threaten populations of this plant. OHV trails traverse a number of sites.

Irish Hill buckwheat *Eriogonum apricum var. prostratum*

State:	Rare	1981
State:	Endangered	1987
Federal:	Endangered	1999

General Habitat:

This buckwheat grows on barren, cobbly areas in chamise-manzanita chaparral in the Ione formation. It is restricted to the Sierra Nevada foothills of Amador County. Associated species include Bisbee Peak rush-rose and Ione manzanita, a federally-listed endangered species.

Description:

Irish Hill buckwheat is a perennial herb in the buckwheat family (Polygonaceae) with reddish-veined white flowers. It strongly resembles Ione buckwheat in most respects. However, its overall appearance is strikingly different from Apricum Hill buckwheat, because in Irish Hill buckwheat the inflorescences lie along the ground, radiating like spokes from the rootstock and the small basal rosette of leaves. This variety also blooms earlier in the year, June and July. No other perennial buckwheat of this area is similar in appearance.

Status:

The two known populations of Irish Hill buckwheat occur in open barren areas within the Ione chaparral plant community on Irish Hill and Carbondale Mesa in Amador County. Both sites are on private property and the development of housing and mining continues to result in habitat loss for this species. OHV activity also impacts the plant.

Butterworth's buckwheat

Eriogonum butterworthianum

State: Rare 1979
Federal: None

General Habitat:

Butterworth's buckwheat occurs in crevices of dry sandstone outcrops within chaparral or mixed evergreen forests in the Santa Lucia Mountains. It is found near the headwaters of the Arroyo Seco in Monterey County. It is associated with woolly Indian paintbrush and bush monkeyflower.

Description:

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, yellowish flowers with reddish midribs.

Status:

Butterworth's buckwheat is known from five occurrences from the headwaters of Arroyo Seco Creek on the Monterey Ranger District, Los Padres National Forest. Little information is available on the ecology or population biology of this species. Population trends in the late 1990s appeared to be stable according to the Forest Service. Abundance estimates for each occurrence ranged from 50 to fewer than 1,000 individual plants. Updated surveys and a management plan are needed.

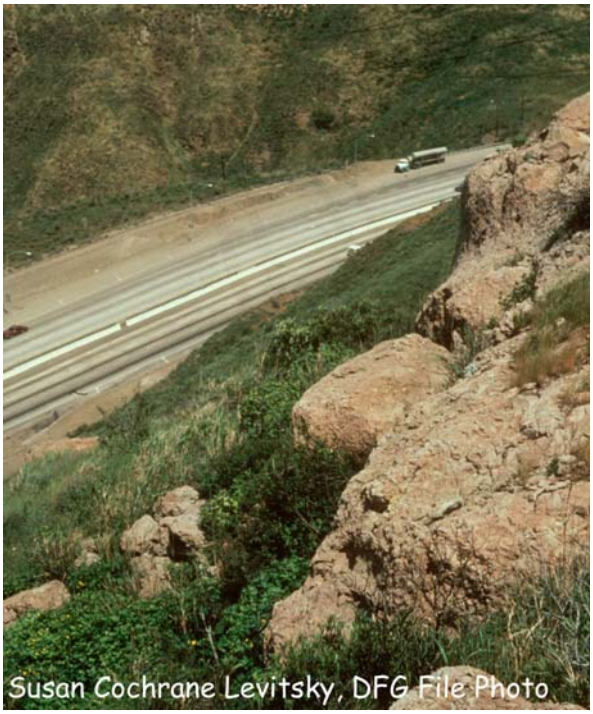
According to the Forest Service, Butterworth's buckwheat has low vulnerability on National Forest System lands and the primary threat to the species is from foot traffic on trails or high visitor use areas near populations. Such populations could be monitored and, if these populations appear to be in decline, measures such as signage, visitor education, or restrictions to visitor access could be implemented.

Conejo buckwheat *Eriogonum crocatum*

State: Rare 1979
Federal: None

General Habitat:
Conejo buckwheat is found on dry slopes of volcanic rock within coastal sage scrub and chaparral plant communities. The coastal sage scrub is dominated by California sagebrush, California buckwheat, giant coreopsis, and purple sage. It is associated with the federally-listed Threatened Verity's dudleya on Conejo Mountain. Conejo buckwheat is endemic to Ventura County.

Description:
Conejo buckwheat, a member of the buckwheat family (Polygonaceae), is a short, loosely branched, woolly perennial with bright sulfur-yellow flowers.



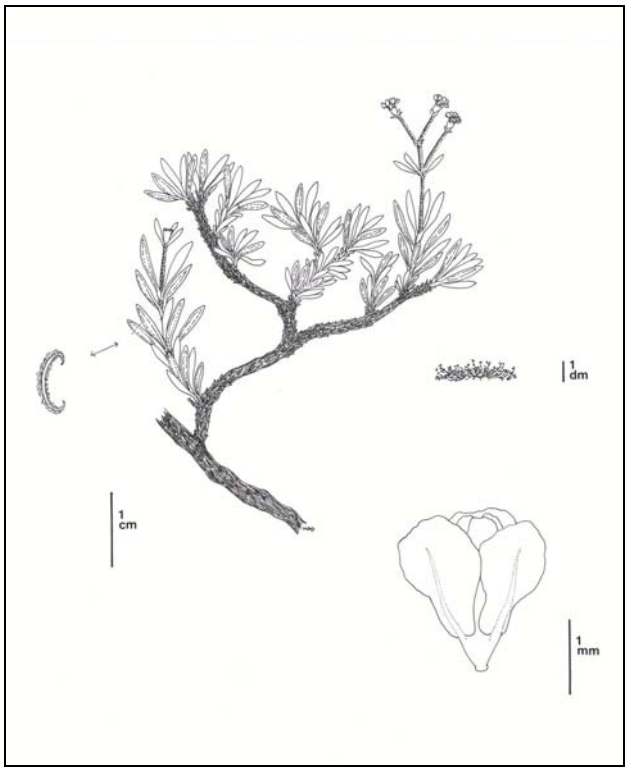
Status:
About a dozen occurrences of this species are known; these are restricted to Conejo Grade and Long Grade of the Santa Monica Mountains in Ventura County. Most are very small and on private lands. Threats include residential development in the area, rock quarrying, and trampling by hikers.

Thorne's buckwheat *Eriogonum ericifolium var. thornei*

State: Endangered 1979
Federal: None

General Habitat:
Thorne's buckwheat is found in pinyon-juniper woodland in 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. It is associated with Wright's buckwheat, cory cactus, pinyon pine, Utah juniper, and banana yucca.

Description:
Thorne's buckwheat, a low spreading subshrub in the buckwheat family (Polygonaceae), has leaves that are felty below and soft-shaggy above, and bears white flowers in a compact flower stalk.

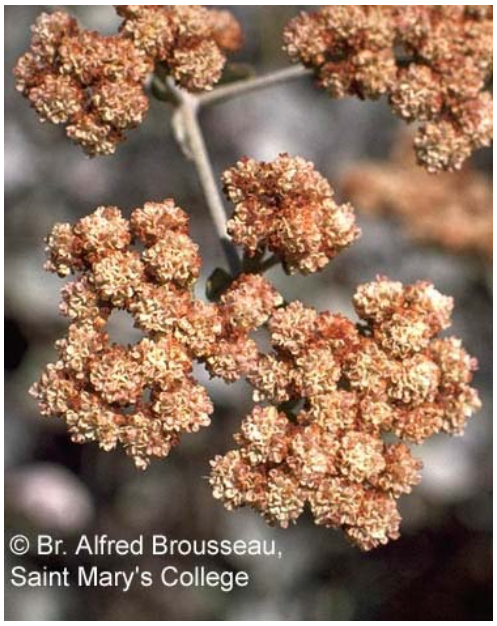


Thorne's buckwheat leaf cross-section, individual flower, and general habit. Illustration by Mary Ann Showers, DFG.

Status:
Thorne's buckwheat is known from one site in the Fourth of July Canyon in the New York Mountains of eastern San Bernardino County. Although it has been reported from a second site, this location has not been verified in the field. Fourth of July Canyon is within the Mojave National Preserve. Past mining activities negatively impacted Thorne's buckwheat, and because mining claims exist in the species' habitat, there is potential for renewed mining activity which could threaten this plant. BLM has withdrawn the area from future mining claims. Current taxonomic treatment elevates *var. thornei* to species level as *Eriogonum thornei.* Data from collections of *Eriogonum thornei* outside of California indicate that it found on limestone and volcanic gravels; however, California plants grow on soils derived from weathered granite. Information on the natural history of the species is needed to accurately determine its taxonomic classification and habitat, as well as its current status.

Santa Barbara Island buckwheat

Eriogonum giganteum var. compactum



State: Rare 1979
Federal: None

General Habitat:

It grows on rocky sea bluffs and within the coastal grasslands on Santa Barbara Island and Sutil Island in Channel Islands National Park.

Description:

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.

Status:

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, NPS eliminated the introduced exotic herbivores and, as a result, the native vegetation is recovering. NPS supported a monitoring program, funded in part by a federal Section 6 Grant from USFWS, which was conducted from 1985 to 1989. 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 to be fewer than 4,000 individuals. Current information on these populations is needed.

Santa Barbara Island buckwheat is grown at Santa Barbara Botanic Garden as part of their Island Display.

San Nicolas Island buckwheat

Eriogonum grande var. timorum

State: Endangered 1979
Federal: None

General Habitat:

This subspecies is endemic to the east and southeastern slopes of San Nicolas Island, one of California's Channel Islands. Plants are found in a variety of habitats, including exposed sandstone ridgetops and slopes, coastal flats, and sandy canyon walls and bottoms.

Description:

San Nicolas Island buckwheat is a short, white-woolly perennial with a woody base, wavy or curled leaves, and clusters of white flowers. It is in the buckwheat family (Polygonaceae).

Status:

Sheep ranching practices at the turn of the century diminished many native species, including San Nicolas Island buckwheat, and encouraged the spread of invasive nonnative species. The U.S. Navy has owned the island since 1933, and has conducted operations and construction projects that have modified the island's vegetation over the years. Currently, the Navy's Environmental Division reviews all land use plans and activities that may affect sensitive species. Surveys were conducted in 1992 to determine the distribution, habitat preference and population status of this species. Regular removal of introduced species of buckwheat is done to prevent potential hybridization with San Nicolas Island buckwheat.

No current information is available on the status of San Nicolas Island buckwheat.

Kellogg's buckwheat *Eriogonum kelloggii*

State: Endangered 1982
Federal:

General Habitat:
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 in chaparral and montane coniferous forest. It is associated with McDonald's rock cress, a State and federally-listed Endangered species, Red Mountain campion, and Eastwood's sedum.

Description:
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.

Status:
Kellogg's buckwheat is known from five occurrences. Much of Red Mountain is administered by 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. Populations of this species occur on private land and on BLM land, and a small area of this species' habitat occurs within the DFG's Little Red Mountain Ecological Reserve.

Twisselmann's buckwheat

Eriogonum twisselmannii

State: Rare 1982
Federal: None

General Habitat:

Twisselmann's buckwheat is endemic to Slate Mountain and The Needles in Sequoia National Forest. This species grows on open, granitic outcrops in the montane conifer forest of the southern Sierra Nevada. It is associated with pinemat manzanita, Newberry's penstemon, and Sierra onion.

Description:

Twisselmann's buckwheat, a member of the buckwheat family (Polygonaceae), is low, spreading, loosely-matted, woody perennial. Leaves are in rosettes at the base of the flowering stems. Pale yellow flowers, borne in head-like clusters, are produces from June to September.

Status:

Twisselmann's buckwheat is known from 13 occurrences, all located on USFS land. The species is a FWS Plant Species of Concern. There are no known threats to this species due to its remote location.

Congdon's woolly sunflower

Eriophyllum congdonii

State: Rare 1982
Federal: None

General Habitat:

Congdon's woolly sunflower occurs on in cracks of metamorphic rock outcrops, scree, and talus within chaparral and oak woodlands of the Merced River Canyon in Mariposa County. It is associated with Yosemite onion and Congdon's lewisia, two listed species, as well as jewel flower, goldfields, and common woolly sunflower.

Description:

Congdon's woolly sunflower is an erect, freely branched annual with heads of yellow flowers and gray foliage covered with dense hairs. It is in the sunflower family (Asteraceae)

Status:

Congdon's woolly sunflower is known from 14 occurrences in Sierra and Stanislaus National Forests and in Yosemite National Park. The occurrences are primarily in inaccessible areas or in areas managed for dispersed recreation. Trail construction, road maintenance, mining, and salvage logging operations could constitute threats to this species. Congdon's woolly sunflower is a FWS Plant Species of Concern.

San Mateo woolly sunflower

Eriophyllum latilobum

State:	Endangered	1992
Federal:	Endangered	1995

General Habitat:

San Mateo woolly sunflower occurs in shaded conditions in the understory of coast live oak woodland. Overstory species include coast live oak, buckeye, and California bay. Understory associates are foothill needlegrass, white fairy lanterns, and golden yarrow.

Description:

San Mateo woolly sunflower is a bushy perennial of the aster family (Asteraceae) with leafy stems 12 to16 inches high. The upper surfaces of the deeply three-cleft leaves are a smooth dark green and the lower surfaces are covered with densely interwoven white hairs. The golden flower heads, which bloom in May and June, are borne in loose clusters.

Status:

San Mateo woolly sunflower is a highly restricted endemic whose distribution is limited to one occurrence of several hundred individuals in the Crystal Springs area of San Mateo County

San Mateo woolly sunflower is threatened by many factors. Dumping of garden debris and downhill seepage of pesticides from homeowners living above the population may have a negative impact. The plant also is threatened by competition with nonnative plants. The steep slopes along Crystal Springs Road provide a very unstable habitat for San Mateo woolly sunflower. The slopes are subject to erosion and soil slippage. After soil slippage occurs, road maintenance crews remove the slumped soil, which may contain mature individuals, seedlings, and/or seeds. The road cut is then reshaped, which may damage plants remaining on the banks. In 2002, utility corridor maintenance crews sprayed and killed a significant portion of one of six remaining subpopulations of San Mateo wooly sunflower located along a sewer line easement in San Francisco Watershed lands. That population is recovering although invasive weeds now form a dense cover in disturbed areas. Remediation is ongoing.

Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.

San Diego button-celery

Eryngium aristulatum var. parishii

State:	Endangered	1979
Federal:	Endangered	1993

General Habitat:

This species is restricted in California to vernal pools and vernally moist areas in San Diego and Riverside counties; it is also known from Baja California Norte. Associated State-listed species include San Diego mesa mint, California Orcutt grass, and Otay mesa mint.

Description:

San Diego button-celery, a member of the carrot family (Apiaceae), is an herbaceous perennial with heads of greenish flowers and spine-tipped bract margins at the base of the flower stalk.

Status:

San Diego button-celery was known from almost 80 occurrences; however, fewer than half are still in existence. Loss of habitat due to development, construction activities, and recreational use, are the principal threats to this species. Land ownership is under the Department of Defense, San Diego County, the City of San Diego, TNC, CALTRANS, and other private landowners. Protection measures for San Diego button-celery are provided in the USFWS's Recovery Plan for Vernal Pools of Southern California, released in 1998. Additional protection may be afforded this species through protection of pools that support species of fairy shrimp. The San Diego National Wildlife Refuge Vernal Pools Unit provides habitat for several listed species including the San Diego mesa mint, San Diego button celery, and California Orcutt grass, as well as two species of vernal pool fairy shrimp.

The pools at Marine Corps Air Station Miramar, California, which represent 80% of the remaining pools in San Diego County, support San Diego mesa mint, San Diego button celery, and the San Diego fairy shrimp. While under Navy ownership, Navy resource managers and local scientists used aerial photographs and field inspections to identify sites at Miramar where vernal pools once existed but had been damaged before the Navy bought the land. Thirty-three of the pools were then restored, by carefully excavating fill material without damaging the hard clay underneath. Seeds, soil, and other fill material were then added to the restored pools. The soils, which had been collected from vernal pools in an off-base area that was about to be developed, held seeds from the mesa mint and button celery, as well as eggs from the fairy shrimp. Both seeds and eggs often lie dormant for months or even years awaiting the next rainfall. This successful project added significant vernal pool habitat without impacting the military mission.

This species is included in the Multiple Species Conservation Program (MSCP) of southern San Diego County. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental

groups. San Diego button celery is considered to be a narrow endemic species and 82 percent of the major populations are covered under the MSCP. There are also important populations that are found on military installations throughout the county. The City of San Diego prepared a Subarea Plan under the MSCP to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. Management directives for this species require specific measures to maintain and increase populations, reduce or eliminate threats to the species, and address ecological relationships of the species.

San Diego button celery is one of several vernal pool species targeted for conservation on Del Mar Mesa. Del Mar Mesa has been the subject of biological study for many years, particularly the unique type of vernal pools that are found there. Unlike other vernal pools in San Diego County, those on Del Mar Mesa Preserve are almost exclusively found within chaparral habitats, versus other pools that may occur in coastal sage scrub or grasslands. Numerous vernal pools occur on Del Mar mesa. Vernal pools located away from existing roads and trails in the chaparral vegetation are the least disturbed or weedy. A portion of the vernal pools on Del Mar mesa have been damaged by road grading, off-road vehicle traffic, and creation of new trails by mountain bikes riders. Levels of damage to the pools range from pools that are undisturbed relatively to pools that have been nearly eliminated by past road grading and associated vehicle traffic. Pools that have been the most severely impacted are located in and adjacent to roads and unauthorized trails through the DFG vernal pool preserve area and along the graded access roads west of the preserve. In some cases vernal pools along the graded roads have been bisected and formerly contiguous sections of pools are now divided by the access road. The DFG owns 81 acres within the Preserve.

A detailed vernal pool restoration and enhancement plan is outlined in the Subarea Plan. Enhancement would involve restoring the natural hydrology to disturbed pools, removal of exotic plants, and the reintroduction of plant propagules for the button celery, San Diego mesa mint, and spreading navarretia. San Diego button-celery is one of the few perennial species found in vernal pools. While the plant can reproduce clonally, it relies largely on seed germination for successful reproduction. If restored pools have the hydrologic conditions suitable for the San Diego fairy shrimp, seed for vernal pool plants could also be introduced. The Del Mar Mesa Preserve was established to protect the sensitive biological resources in the area. A management plan was developed for the Preserve in accordance with the MSCP and the Subarea Plan. The population on Del Mar Mesa is likely subject to edge effects such as vehicular and recreational activity, road grading, and weed invasion. Protection will include directing all activities to less sensitive areas when possible. Seed collected from button-celery plants in the Del Mar Mesa Preserve would be used to inoculate restored vernal pools.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 17% of habitat suitable for San Diego thorn-mint burned during the fires. Eleven vernal pool complexes burned in the Cedar Fire and two complexes burned in the Otay Fire. Twenty-four pools or swales that supported San Diego button celery were impacted. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on Marine Corps Air Station Mirimar, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on San Diego button celery.

This species is included in the San Diego Multiple Habitat Conservation Program NCCP, as well as the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. San Diego button-celery is also included in the Western Riverside MSHCP where four vernal pools on the Santa Rosa Plateau support the button-celery. Within western Riverside County, San Diego button-celery is known only from four populations on the Santa Rosa Plateau within the Santa Rosa Plateau Preserve. Two populations are on Mesa de Colorado, and two are on Mesa de Burro. The populations contain fewer then 1,000 individuals. The known populations and the watersheds in which the vernal pools occur will be conserved under the Western Riverside MSHCP. Additional populations are not expected to be found in the planning area.

Loch Lomond button-celery *Eryngium constancei*

State: Endangered 1987
Federal: Endangered 1986

General Habitat:

Loch Lomond button-celery is endemic to Lake and Sonoma Counties and is restricted to vernal pools. At Loch Lomond, the vernal pool is surrounded by ponderosa pine and black oak. Vernal pools associates include Bogg's Lake hedge hyssop, two listed species of navarretia, quillwort, and downingia.

Description:

Loch Lomond button-celery, also known as Loch Lomond coyote-thistle, is a perennial herb of the carrot family (Apiaceae). It annually produces slender, weak, leafless flowering stalks up to 12 inches in height from its over-wintering rootstock. The basal leaves range from 4 to 8 inches in length. Slender petioles (the stalk that connects the leaf to the rest of the plant), 3 to 5 inches in length and usually longer than the leaf blade, bear diminutive spines. A dense "down" of minute hairs, unique to this species, covers the leaves and especially the stalks. This character together with the species' sparse flowers, which bloom from April to June, distinguish it from its closest relative, *Eryngium aristulatum* var. *aristulatum*, and all other species of western North American *Eryngium*.

Status:

Loch Lomond button-celery is known from three occurrences in Lake and Sonoma Counties. One occurrence is in the DFG's Loch Lomond Ecological Reserve in Lake County. Loch Lomond coyote-thistle grows abundantly within the borders of the meadow-like bed of the Loch Lomond Lake. The occurrence covers approximately 6 acres, at an elevation 2,800 feet. Cabins and State Route 175 largely encircle the southern and eastern sides of the lake bed. The pool has been fenced to prevent OHV access. Another population of Loch Lomond button-celery was discovered in 1996 in two spring-fed, shallow pools in Sonoma County. A berm has been built to prevent runoff into the pools at this location from increased sedimentation due to logging in the area. A third population was discovered in Lake County in 1997. This population was threatened by soil erosion into its pool habitat due to vegetation removal along the edges; it is also risk from planned reservoir construction. This species continues to be threatened by habitat conversion in the watershed, for example, to vineyards.

Delta button-celery

Eryngium racemosum

State: Endangered 1981
Federal: None

General Habitat:

Delta button-celery occurs on heavy clay to silty soils in seasonally flooded flood plains and swales. It is associated with spikerush, salt grass, lippia, and cocklebur.

Description:

Delta button-celery, a member of the carrot family (Apiaceae), is a slender, prostrate herb with greenish, rounded flower heads.

Status:

Delta button-celery is reported from 28 occurrences, seven of which are historic or likely extirpated. The historical distribution of Delta button-celery includes Calaveras, Merced, Stanislaus, and San Joaquin counties. Known populations occur on private land, USFWS National Wildlife Refuges, and the DFG's North Grasslands and Los Baños Wildlife Areas. Delta button-celery is adapted to seasonal inundation of its habitat. Prolonged inundation during the spring and summer will adversely affect this species. The species is also threatened by grazing, channel maintenance activities, and dredging.

Delta button-celery occurrences 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. Most of this species' remaining occurrences are in Contra Costa, Calaveras, and Merced County. In Merced County, it occurs along the historical floodplain of the San Joaquin River. Friant Dam on the San Joaquin River and an extensive levee system have greatly reduced the frequency and intensity of flooding of Delta button-celery's floodplain habitat.

Surveys for Delta button-celery were conducted during the planning phases for the U.C. Merced campus. Very little potentially suitable habitat was found in the regional study area. Areas of potential habitat could exist along the margins of the Merced River and Chowchilla Rivers, as well as along some of the larger creeks, leaking irrigation canals, and stock ponds. Delta button-celery has been recorded from the vicinity of Turlock Lake Reservoir immediately to the north of the campus area in southeastern Stanislaus County and further surveys are warranted.

The species is addressed in the Merced River Corridor Restoration Plan.

Contra Costa wallflower *Erysimum capitatum var. angustatum*

State:	Endangered	1978
Federal:	Endangered	1978

General Habitat:

Contra Costa wallflower occurs in loose sand in semi-stabilized dunes and on clay lenses along the San Joaquin River near Antioch in Contra Costa County and at Brannan Island State Recreation Area. Its habitat at the Antioch Dunes constitutes a remnant of a unique dune system. Vegetation consists of scattered native herbaceous plants and grasses on the dunes. Common native plants in the dunes include elegant clarkia, California poppy, California croton, gumplant, deerweed, California matchweed, and silver bush lupine. The Antioch Dunes evening primrose, an Endangered species, occurs here as well. Many of the plants that comprise the unique stand have desert affinities.

Description:

Contra Costa wallflower is an erect, coarse-stemmed, biennial herb in the mustard family (Brassicaceae). Plants grow from a somewhat woody base that typically elongates into multiple branched stems 8-32 inches tall in mature plants. The elongated woody base distinguishes this subspecies of *E. capitatum* from related subspecies. The lower leaves are lance-like to linear, up to 6 inches long and nearly half an inch wide, with minute teeth. Leaves taper to a petiole at base. Yellow four-petaled flowers, which bloom from March to July of the second year, resemble those of garden wallflowers. The slender pod-like fruit (silique) is dry when ripe and up to 4 inches long.

Status:

The Contra Costa wallflower is restricted two populations, one at the Antioch Dunes National Wildlife Refuge (Refuge) and the other on adjoining PG&E and Kemwater properties. The historic range of the species is not known. The Refuge, which consists of 55 acres of stabilized sand dunes, was established in 1980. Along with the adjacent 12 acres of Pacific Gas and Electric Company (PG&E) land, the site is a relict of what was once a larger dune system that hosted a unique assemblage of plants, insects, and reptiles. The Refuge provides protection and critical habitat for three endangered species: Lange's metalmark butterfly (*Apodemia mormo langei*), Contra Costa wallflower, and Antioch Dunes evening-primrose. The Final Comprehensive Conservation Plan for the Antioch Dunes National Wildlife Refuge was released by the USFWS in 2002. The USFWS recovery plan for this species calls for enhancement of existing populations of Contra Costa wallflower and establishment of new populations within its historic range.

Little is known about the reproductive phenology of the wallflower. Germination may occur in October, and leafing from October through December. Budding occurs in February, while flowering begins in March, peaking in April or May. Fruiting begins in April and peaks in July. Seeds are dispersed by wind, beginning in mid-May and peaking in September. A variety of different insect species have been observed visiting the plant

and carrying pollen away with them. Unlike other members of the Mustard Family, which are typically pollinated by specialized insects, the wallflower does not require a specific pollinator.

Research on the Antioch Dunes populations had determined that seed production can be substantially reduced by environmental limitations such as low pollination rates and seed predation by insects. 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.

Although current populations of wallflower at the Refuge seem to be concentrated on steep, north-facing slopes by the river, wallflower at one time grew on flat terrain in an excavated area within the dunes on the Kemwater property. There are individual plants growing 160 to 660 feet away from the river bank in a flat hard pan area of the Refuge. In these areas the hard pan has been broken and the loose, sandy soil below has been exposed. A large stand of wallflower is found on the East PG&E parcel adjacent to the Refuge. This stand is atop and over a ledge leading down to the San Joaquin River. Although their population is now self-sustaining, overall, the wallflower appears to be more physically restricted within the dunes than the primrose.

In 1999, the population peaked at 11,567 individuals, the greatest number of wallflowers ever counted on the Refuge. It is possible that the increase in the number of mature plants was due to the influence of El Niño during the winter of 1997-98. Seeds that germinated that winter would have reached reproductive maturity in 1999 and germination or survival may have been higher than normal as a result of increased rainfall. About 1000 plants were observed in 2000. Population survey results indicate that the total number of mature plants is highly variable year to year.

Historically, many factors have contributed to the decline of these species, including OHV use, development, and sand mining of the dunes. Currently the primary threat to these species is the stabilization of the dunes and the encroachment of non-native vegetation such as rip-gut brome grass, yellow starthistle, and vetch.

The wallflower is grown at the Botanic Garden at Tilden Regional Park.

Menzies' wallflower *Erysimum menziesii*

State: Endangered 1984
Federal: Endangered 1992

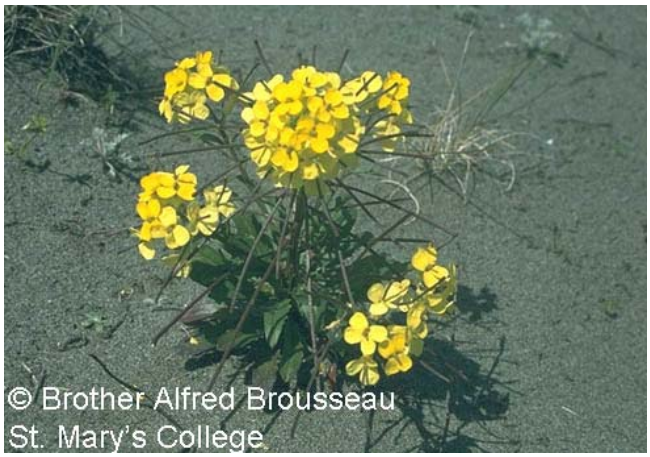
General Habitat:

Menzies' wallflower is found in coastal strand, coastal dunes, central dune scrub, and northern dune scrub on loose sand lacking in organic matter and minerals. Habitat also occurs in recent bluff scrub, and open, sparsely vegetated dunes. The species has high exposure to strong wind, salt spray, and occasional wave action from storms and high tides. Associated species include beach primrose, beach morning-glory, beach-bur, and yellow sand verbena. Iceplant is also associated with the Monterey populations.

Description:

Menzies' wallflower is a biennial or perennial herb in the Mustard Family (Brassicaceae). Flowers are fragrant and pale to bright yellow. Each plant usually has several flowering stems from 1-6 inches tall. The fleshy leaves form a basal rosette and are somewhat spoon-shaped and abruptly narrow to the leaf stalk. The fruit consists of very long, narrow pods, 1-5 inches long.

Yadon's wallflower



Humboldt Bay wallflower

Menzies' wallflower

Status:

When first listed, Menzies' wallflower was treated as a single species distributed in coastal dune systems from Monterey County to Oregon. Research has shown that this species is a complex, comprised of four subspecies, three of which are rare. The three rare subspecies (ssp. *menziesii,* ssp. *eurekense*, and ssp. *yadonii*) are endemic to three counties in northern California and are known from sixteen populations consisting of 33,300 individuals. The fourth subspecies, cream-colored wallflower (ssp. *concinnum*), is not listed; its distribution extends from southern Oregon to Point Reyes in Mendocino County into southern Oregon. These subspecies are primarily differentiated by geographic location.

Menzie's wallflower is distinguished by flower stalks that are 1.2-3.5 inches long and the longest fruits are usually less 3.1 inches, whereas **Humboldt Bay wallflower** has flower stalks that are 0.4-0.6 inch long, and the longest fruits are usually greater than 3.1 inches in length. The leaves of Menzies' wallflower are generally lobed or irregularly toothed and the flowers are rich yellow. **Yadon's wallflower** differs from the other subspecies because it blooms in summer (June-August), whereas the other subspecies bloom in winter or spring, and tends to be perennial with a branched caudex. **Cream-colored wallflower** can be distinguished from *Erysimum menziesii* ssp. *eurekense* by its sharply toothed and fleshy leaves.

Menzies' wallflower (*Erysimum menziesii* ssp. *menziesii*) is located in Monterey and Mendocino Counties where it is found in coastal strand, coastal dunes, central dune scrub, and northern dune scrub. In Monterey, the species occurs on coastal strand, close to the high tide line, but protected from wave action. Habitat also occurs in recent bluff scrub, and open, sparsely vegetated dunes. The species has high exposure to strong wind, salt spray, and occasional wave action from storms and high tides. The substrate is loose sand lacking in organic matter and minerals.

Menzies' wallflower occurs in ten isolated populations along the Monterey Peninsula from Pt. Piños to Cypress Pt. Extant Monterey County populations have recorded occurrences in Pacific Grove, Asilomar State Park, Spyglass Hill, Pt. Piños Lighthouse, Signal Hill Road, Bird Rock Road (east of 17 Mile Drive) and Spanish Bay Golf Course. The Mendocino County populations range from Ten Mile River south to Ft. Bragg. Many of the populations are found at MacKerricher State Park. The largest recorded population of 1,426 acres occurs at the Ten Mile River site in Mendocino County. The MacKerricher State Park Ten Mile Dunes Restoration Plan has been completed. Menzies' wallflower was revegetated after an archaeological dig that took place in the park.

Yadon's wallflower (*Erysimum menziesii* ssp. *yadonii*) is restricted to four populations in the vicinity of the Marina Dunes near Salinas River in Monterey County. The flower petals are rich yellow. This subspecies occurs in coastal dunes, foredunes, and coastal strand.

Protection of Menzies' and Yadon's wallflower populations in Monterey County is afforded by land use planning policies. The Monterey County LUP has established policies allowing for only resource-dependent uses within habitats known to support rare and endangered species. The LUP also recognizes dune habitat, in general, as an environmentally sensitive habitat, with or without rare and endangered species. Resource-dependent uses are allowed within environmentally sensitive habitat if such uses will not cause significant disruption of habitat values. For proposed land divisions or developments, the County requires the protection of environmentally sensitive habitat through deed restrictions or dedications of permanent conservation easements.

For populations on lands in the Cities of Marina and Pacific Grove, LUPs provide for the protection and restoration of native dune habitat and vegetation and the habitat of recognized rare and endangered species. The City's policies specify that primary habitat areas for sensitive species be protected and preserved. Development within secondary or support habitat areas is allowed, so long as it does not significantly impact primary habitat areas. Where development is proposed on parcels containing rare and endangered species, parcel owners are required to develop and execute a management plan which will protect the identified plant species. Populations within the dune system at the former Ft. Ord and will be addressed under re-use plans for this facility.

Many comprehensive studies have been completed for The Marina Dunes of Monterey County. The DPR conducted a population enhancement project at Marina and Asilomar State Beaches in Monterey County during a period from July 1985 through July 1988. Habitat restoration for Yadon's wallflower at Marina State Beach has resulted in an increase from less than 100 plants in 1985 to over 7,000 in 1994 (the last year for which numbers are available), and habitat restoration is continuing. DPR also has a Management and Recovery Plan for Asilomar State Park. In 1986, there were 200 Menzies' wallflower plants at Asilomar, and in 1998, there were over 8,000 due to habitat restoration and protection activities. Habitat protection measures such as boardwalks, fences, and signs

have been implemented at Marina State Beach and Asilomar State Park to reduce recreational use. The Pebble Beach Company has established endangered species management areas where Menzies wallflower establishment experiments are being monitored at Spanish Bay.

Humboldt Bay wallflower (ssp. *eurekense*) occurs on coastal dunes and foredunes around Humboldt Bay in Humboldt County. It grows on flanks or crests of dunes, open sand areas, sparsely vegetated dunes, and the borders of lupine scrub. The species can tolerate some sand movement. The associated vegetation community is composed of low-growing shrubby and herbaceous species. Common associate species are beach sagewort, dune goldenrod, coast buckwheat, yellow sand verbena, beach pea, and seashore bluegrass. This subspecies is distinguished from the other subspecies due by its more dentate leaves, longer stems, and longer narrower fruits. The leaves are not as fleshy as those of Menzie's wallflower and the flowers are light yellow.

Five occurrences are recorded from the Lanphere-Christensen Dunes Preserve, northwest of Mad River Slough, north of Manila (Samoa Peninsula), U.S. Coast Guard Station (Samoa Peninsula), and the South Spit (Humboldt Bay). The subspecies has also been mapped as occurring in 12 stands in three subpopulations on the Samoa Peninsula. The Humboldt Bay wallflower population at The Nature Conservancy Lanphere-Christensen Dunes Preserve is managed by controlling yellow bush-lupine and European beachgrass. An EPA-mandated study (the Menzies Wallflower Research Program) funded by Louisiana-Pacific Corp. and Simpson Timber Co., administered by Humboldt State University and implemented cooperatively with TNC, has resulted in the development of habitat management measures that include removal of non-native plants, restoration, and habitat protection activities. A National Sciences Foundation project implemented by Michigan State University and TNC focused on the demographics and genetics of the subspecies. The County and City of Eureka have several policies relating to the protection of sensitive resources.

The Humboldt County Local Coastal Program prohibits vehicles above the wave slope except in the Samoa Dunes Recreational Area. Vehicles are allowed on privately-held lands in and around the City of Eureka and there has been only partial enforcement of the local ordinance, and ORVs continue to have an impact. The County has recently adopted a management plan for the north and south spits of Humboldt Bay; the north spit area supports the two listed species. The plan designates certain areas for vehicular access on the beach and dunes as well as vehicle-free zones. This plan addresses access on public lands as well as access to/from adjacent BLM lands (Samoa and Manila dunes), private lands and the Lanphere-Christensen Dunes Preserve. The plan recommends management actions to restore degraded dune habitat areas, including removal of invasive, non-native plant species, fencing of rare plant habitat areas and limiting public access, however, the recommendations of the plan remain unfunded. Recovery objectives for these species will require the prevention of habitat loss and degradation through the implementation of these codes and ordinances.

The Eureka Dunes Protected Area, an 80-acre site on the North Spit of Humboldt Bay, is owned by the city of Eureka and managed by TNC. The development of the Eureka Dunes Habitat Mitigation Bank Phase II Enhancement Plan was funded by the State Coastal Conservancy and developed by TNC. However, management has been limited to fencing sensitive habitat and protection from ORVs, while the site faces severe threats from exotic species invasions. The BLM has two small restoration projects to reduce the threat of lupine and beachgrass. They have fenced 37 acres of habitat on the Samoa Peninsula.

In 1998, USFWS analyzed the results of a survey conducted by TNC in 1997 of the plants (*E. m.* ssp. *eurekense*) on the North Spit of Humboldt Bay. That population had increased 43% since 1988. The increase was not uniform, and some populations had declined during the 9-year period. An endemic fungus known as white crucifer rust, which infests Menzies' wallflower around Humboldt Bay, was seen to decrease over the 9-year period. A complete census of the North and South Spits will be conducted again in 2004. In 1998, a previously unknown population of approximately 500 plants was found on the Elk River spit in Humboldt County. OHV tracks and invasive species are present on the site. The population does not appear to be infected with white crucifer rust.

Santa Cruz wallflower

Erysimum teretifolium

State: Endangered 1981
Federal: Endangered 1994

General Habitat:

Ben Lomond wallflower is endemic to pockets of sandstone soils in Santa Cruz County. It is found in open areas referred to as "sand parklands" within northern maritime chaparral and maritime coast ponderosa pine forest. The best populations are found on ridgelines where underlying fossilized sand dollar beds inhibit the growth of all but herbaceous perennials and annuals. Ben Lomond wallflower is associated with other listed species: Ben Lomond spineflower, Zayante band-winged grasshopper, and Mount Hermon June beetle.

Description:

Ben Lomond wallflower is a short-lived perennial plant, or occasionally an annual, of the mustard family (Brassicaceae). Seedlings form a basal rosette of leaves which then wither as the main stem develops. Flowers are deep yellow and clustered in a terminal spike. Petals are 0.5 to 1.0 inch long. The fruit is a slender capsule, 4.0 inches in length and covered with three-parted hairs. Characteristics that separate this plant from other wallflowers include simple, narrowly linear leaves that have small marginal teeth and a purplish cast.

Status:

Historical and continuing threats to the Ben Lomond wallflower include the direct removal and fragmentation of habitat by sand quarrying, residential development, and recreational impacts. Fire suppression is also changing Ben Lomond wallflower's habitat in the sandhills by allowing the growth of other plant species that shade out the wallflower.

Ben Lomond wallflower is known from 17 populations in the vicinity of Ben Lomond, Scotts Valley, Felton, Bonny Doon, and Glenwood in Santa Cruz County. Only three populations are protected. One population occurs at Quail Hollow Ranch County Park, which is jointly owned by the County of Santa Cruz and the California Department of Fish and Game. The population near Bonny Doon is on the Bonny Doon Ecological Preserve owned by California Department of Fish and Game. One population is located near Olympia Quarry, operated by RMC Lonestar, is within a conservation easement. The remainder of populations are on private land. The majority of these populations have not been monitored for five to ten years.

Research is ongoing to investigate the relationship between the listed species and exotic annual plant species, all of which respond positively to disturbance. Under natural conditions, disturbance can enhance diversity by creating openings that favor the persistence of native species adapted to disturbance. However, colonization by non-native species directly and indirectly affects the distribution and survivorship on sensitive native plants. For example, in the absence of fire, ponderosa pine increases in cover to the exclusion of the wallflower and Ben Lomond spineflower.

An experiment testing the effects of shade, leaf litter, and proximity to trees on the germination, survivorship, growth, and reproduction of the endangered species indicated that leaf litter has an over-riding negative effect on the demographic success of both the spineflower and Ben Lomond wallflower. Fire enhanced native plant cover and the population growth of the two endangered plants directly by removing accumulated litter that inhibits establishment and survivorship. This experiment also showed that fire disproportionately reduced exotic plant cover and indirectly facilitated endangered plant performance. A separate experiment showed that small-scale soil disturbance such as trails and gopher activity, increased native plant cover and the demographic performance of the two endangered species by the same direct and indirect mechanisms.

In 1998, USFWS released a recovery plan on Santa Cruz wallflower and Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*), the two previously mentioned insect species, and Scotts Valley polygonum (*Polygonum hickmanii*). Specific recovery actions for Ben Lomond wallflower include: 1) a Habitat Conservation Plan with the County of Santa Cruz that minimizes disturbance from sand mining and residential development; 2) Development and implementation of management plans for State-owned units (Quail Hollow Ranch County Park and Bonny Doon Ecological Reserve); 3) Conduct research focusing on causes of reproductive failure and how to increase reproductive success; and 4) Manage for reduction of succession of woody species into occupied habitat. Current projects involving the wallflower include implementation of recovery strategies outlined in the recovery plan. Critical Habitat for the Zayante band-winged grasshopper was designated in 2002. The critical habitat designation also includes habitat for the Ben Lomond wallflower.

The Santa Cruz sandhills ecosystem is also the focus of an intensive, coordinated land acquisition program. Acquisition funds are provided by the federal government and property is purchased from willing sellers. Acquisition priorities are set by a consortium of state and federal agencies, local government representatives, conservation organizations, and local landowners. The goal is to acquire and consolidate acreage supporting the unique sandhills ecosystem.

Pine Hill flannelbush

Fremontodendron decumbens

State: Rare 1979
Federal: Endangered 1996

General Habitat:

Pine Hill flannelbush grows on reddish clay soils derived from gabbro. It is found in chaparral and black oak woodland of Pine Hill and on a few Sierra Nevada foothill ridges within one mile of Pine Hill in El Dorado County. Three State and federally listed rare plants grow in the same general areas as this species: El Dorado bedstraw, Pine Hill ceanothus, and Layne's butterweed.

Description:

Fremontodendron californicum ssp. *decumbens* is a low-growing, many-branched, spreading shrub of the cacao family (Sterculiaceae) growing to 4 feet tall. Dense star-shaped hairs cover the leaves and the younger twigs and branchlets. Its leaves shallowly or deeply lobed. Pine Hill flannelbush produces flower buds in late winter. Showy copper-orange flowers appear from late April to early July.

Status:

Fremontodendron californicum ssp. *decumbens* only occurs in the central part of the Pine Hill formation within 1.25 kilometers (2 miles) of Pine Hill. Fire is needed to maintain habitat for this species. Preservation of the pollinating fauna (native solitary bees) and dispersal fauna (ants) is also important to the survival and recovery of *F. californicum* ssp. *decumbens*. The total population is estimated to comprise only 500 individuals. Habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance (all mainly due to

urbanization) are the major threats facing the gabbro soil plants. Proposed residential or commercial development within the Pine Hill formation threatens most of the remaining sites within the Pine Hill formation and adjacent serpentine in western El Dorado County,

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 acres have been preserved.

Pine Hill flannelbush is a shrub that persists through a fire cycle and requires fire for seed germination. It cannot establish seedlings without fire, and reproduction from seed is likely necessary to maintain genetic diversity and establish plants at new locations within the boundaries of the current populations. Recovery of the gabbro soil plants is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. A high priority recovery task for *Fremontodendron californicum* ssp. *decumbens* is the collection and banking of seed in Center for Plant Conservation certified botanic gardens. Assuming recovery criteria are met, *Fremontodendron californicum* ssp. *decumbens* could be downlisted after two natural fire cycles (approximately 60 years).

Mexican flannelbush

Fremontodendron mexicanum

State: Rare 1982
Federal: Endangered 1998

General Habitat:

Mexican flannelbush occurs in southern mixed chaparral and Tecate cypress woodland in Cedar Canyon on Otay Mesa in San Diego County. It is usually scattered along dry canyon bottoms with sycamore and toyon.

Description:

Mexican flannelbush, a member of the cacao family (Sterculiaceae), is a stiff, robust, evergreen tree-like shrub with bright orange flowers. Leaves are lobed, the undersides covered with dense yellowish hairs. Mexican flannelbush is distinguished from California flannelbush by its orange sepals with basal pits that generally lacking long hairs, and shiny black, smooth seeds that lack outgrowths. It flowers between March and August.

Status:

Mexican flannelbush is known primarily from historic collections. Only two occurrences are extant. Its historic range includes Baja California Norte, Mexico. Occurrences of Mexican flannelbush are owned by BLM and private landowners. At the present time, there are no specific management plans for this species. This species is adapted to fire and resprouts from the base and the effects of fire on seed germination are not known. In 2003, the huge Otay Fire burned a large area of south-central San Diego County including Cedar Canyon where a large stand is located. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 60% of habitat suitable habitat for the flannelbush burned during the fire. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of Mexican flannelbush.

Mexican flannelbush is a showy plant that is used as a drought-tolerant ornamental shrub in gardens. It is often sold as a hybrid with California flannelbush ("California Glory") or Pine Hill flannelbush. Potential hybridization of horticultural stock with native Mexican flannelbush could adversely impact the species. Habitat loss and fragmentation and alteration of natural fire regimes are ongoing threats to this species.

Roderick's fritillary *Fritillaria roderickii*

State: Endangered 1979
Federal: None

General Habitat:
This showy wildflower is found in heavy clay soils in the oak woodland community near Boonville and in coastal prairies near sea bluffs south of Point Arena, Mendocino County. It is associated with checkerbloom, beach strawberry, iris, and gumplant.

Description:
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.

Status:
Roderick's fritillary is known from approximately seven occurrences, one of which is believed to be extirpated. One is in the Boonville Cemetery, with approximately 340 plants at last count reported to the DFG (1992). One, near the coast and privately owned with a portion in a CALTRANS right-of-way, was partially destroyed during work to improve State Highway 1; some plants were transplanted in 1985 during construction. None of those plants survived. CALTRANS now works to avoid impacts to the plants within its right-of-way at this location. Another population, first reported in 1992 from private land and consisting of 1000 plants, had declined sharply by 1998. The DFG's most recent information for the majority of populations dates from the late 1980s and early 1990s. There are no management plans for the species. Threats to this species include bulb collecting, prolonged grazing, and habitat conversion. Current taxonomic treatments place *Fritillaria roderickii* as a synonym under *Fritillaria biflora.*

Striped adobe lily *Fritillaria striata*

State: Threatened 1987
Federal: None

General Habitat:
Striped adobe lily grows on heavy clay soils in open annual grasslands and blue oak woodlands of the southern Sierra Nevada foothills of eastern Tulare and Kern counties. It is associated with montia, fiddleneck, blue dicks, and soap plant.

Description:
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.

Status:
At least 18 extant populations are known. The known populations are scattered throughout the range of the species. All populations occur on private land.

Conversion of habitat for agricultural uses has eliminated at least four populations of striped adobe lily. Expansion of citrus orchards threatens three populations at lower elevations on the slopes of Lewis Hill near Frazier Valley. Although heavy grazing has negatively impacted some populations, light grazing and avoidance during the flowering period appears to benefit the species. Road maintenance activities and urbanization threaten other populations. Striped adobe lily is protected in the Sierra Los Tulares Land Trust Lewis Hill Preserve near Porterville, Tulare County. San Joaquin adobe sunburst (*Pseudobahia peirsonii*), another listed species, also occurs within the preserve. Cattle grazing is used as a management tool on the preserve which is protected by a conservation easement.

Borrego bedstraw

Galium angustifolium* ssp. *borregoense

State: Rare 1979
Federal: None

General Habitat:

Borrego bedstraw is found primarily on north-facing steep walls and rocky slopes of canyons and on hillsides in Anza-Borrego Desert State Park in eastern San Diego County. Associate species include sugar bush, California buckwheat, white sage, staghorn cholla, agave, and California juniper.

Description:

Borrego bedstraw is a slender, low-growing perennial in the madder family (Rubiaceae) with wiry, square stems that are woody at the base and with a pyramidal cluster of yellowish flowers.

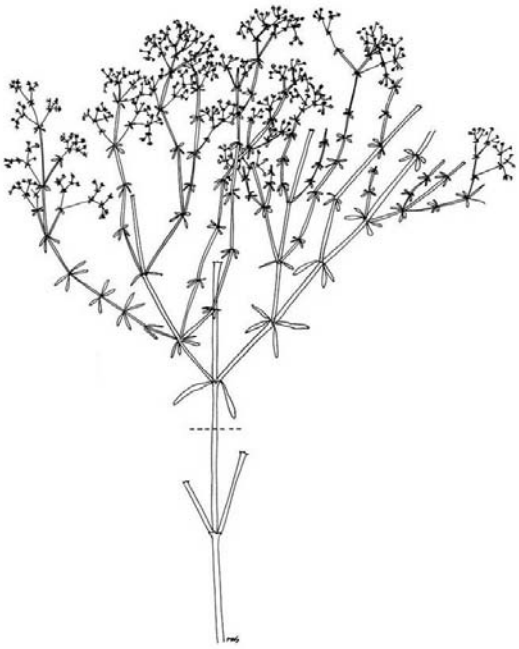


Illustration by Mary Ann Showers, DFG

Culp Valley habitat. Image courtesy of John Crossley at http://www.americansouthwest.net

Status:

Surveys conducted in the spring of 1998 by the DPR as part of the preparation of a Resource Inventory for Anza-Borrego Desert State Park found Borrego bedstraw at 22 locations, primarily within the Culp Valley - Hellhole Canyon region, the Granite Mountain region, and the Pinyon Mountain area. Additional studies are needed to better understand the ecology and reproductive biology of Borrego bedstraw. Continued monitoring of the known populations would help provide information necessary for the development of a management strategy. Within Anza-Borrego Desert State Park, there are moderate threats to approximately one-third of the known populations from camping, hiking and vehicular activities. Although historical records are lacking, it is probable that this subspecies has always been rare. Habitat in which *Galium angustifolium* occurs is being threatened by foxtail chess, an invasive annual grass.

Box bedstraw *Galium buxifolium*

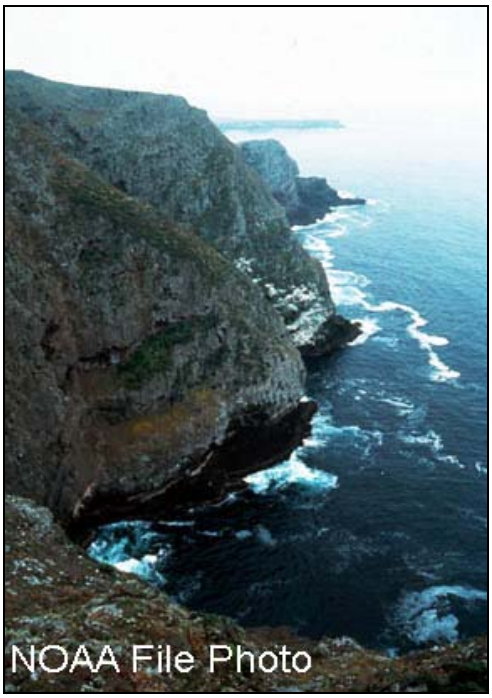
State:	Rare	1979
Federal:	Endangered	1997

General Habitat:

Box bedstraw grows on north-facing, relatively moist rocky bluffs in coastal bluff scrub on San Miguel Island or in closed-cone pine forest plant communities on Santa Cruz Island. Associated species include island buckwheat, San Miguel Island locoweed, giant coreopsis, and bush monkeyflower.

Description:

A member of the madder family (Rubiaceae), box bedstraw is a rounded subshrub growing up to two feet tall, with numerous leafy branches. Its leaves have conspicuous lateral veins and hairs on the lower surface. Its small pale yellow flowers bloom from March to July, and its fruits are distinguished by a covering of tiny, upward-curving hairs.



Status:

Box bedstraw is endemic to the Channel Islands, found only on Santa Cruz and San Miguel islands. Santa Cruz Island is owned and managed by TNC and NPS. San Miguel Island is owned by the Navy and managed by NPS. Box bedstraw is known from ten occurrences on the two islands. The seven extant occurrences on Santa Cruz Island were last monitored in the 1980s. The largest of the populations had fewer than 50 plants. One occurrence has been extirpated. The two occurrences on San Miguel Island were monitored in 1998. At that time, the occurrences contained 300 and 121 individuals, respectively. Five historic locations on San Miguel Island were also surveyed by NPS in 1998, but no plants were found. These occurrences are presumed to be extirpated.

Current management of Santa Cruz Island is divided between TNC and NPS who coordinated to develop the Santa Cruz Island Primary Restoration Plan. This plan is designed to protect the unique natural and cultural resources of Santa Cruz Island and to initiate recovery of the island ecosystem. Eradication of feral pigs and control of fennel are two principal components of this plan. Elimination of feral pigs and the massive infestation of fennel are anticipated to create new sites that would be colonized by native species, including box bedstraw. The expansion of listed species into previously unoccupied habitat now dominated by weeds is one of the principal goals of the 2001 USFWS Recovery Plan for the Channel Island plants. Box bedstraw occurs adjacent to a fennel treatment area. The use of fire or herbicides in the control of fennel would be closely monitored to ensure that box bedstraw is not adversely affected.

El Dorado bedstraw *Galium californicum ssp. sierrae*

State:	Rare	1979
Federal:	Endangered	1996

General Habitat:

El Dorado bedstraw occurs only on gabbro-derived soils underlying chaparral and black oak or live oak woodland. It is restricted to the Pine Hill geologic formation in northern central and southern El Dorado County. Four other State and federally listed plants occur on the gabbro soil formation: Stebbins' morning glory, Pine Hill ceanothus, Pine Hill flannelbush, and Layne's butterweed.

Description:

El Dorado bedstraw is a member of the madder family (Rubiaceae). It is a softly hairy perennial herb with four narrow leaves at each node. Pale yellow flowers, which are clustered at the tips of stems, appear in May and June. Minute hairs cover the fleshy fruit. El Dorado bedstraw can be distinguished from other subspecies of *G. californicum* by its very narrow leaves.

Status:

El Dorado bedstraw is known from approximately ten occurrences. The largest population of this species, consisting of thousands of individuals, occurs in colonies in the black oak woodland on Pine Hill where rural development, fire wood harvesting, and large scale clearing of the woodland understory for fuel load management threaten this population. The majority of the second largest population, also in the thousands, was destroyed for a development project in Cameron Park. The project was approved in the late 1980s and was recently built out with no mitigation for impacts to rare plants. A few small colonies, typically 50 to 200 individuals, of the bedstraw have been discovered in the last several years in the community of Shingle Springs. They receive some protection from deed restrictions, but it is unknown whether these restrictions will be sufficient to protect these colonies in the long-term, particularly as they become more isolated as surrounding habitat is developed.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (Senecio layneae), and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 areas have been preserved.

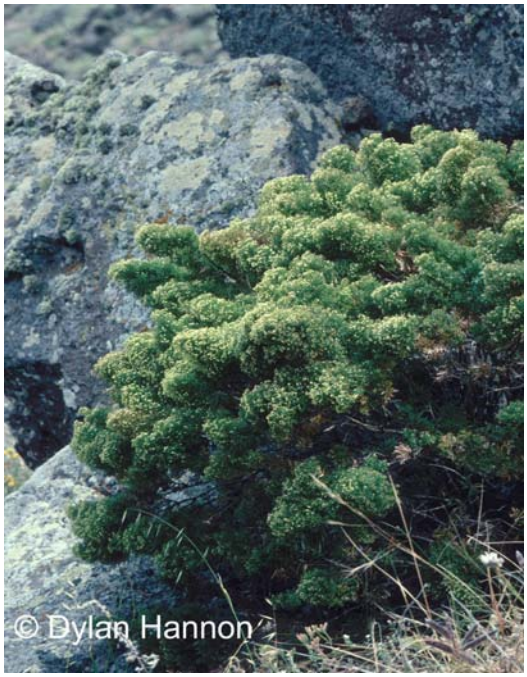
It is hoped that easements can be obtained to protect: 1) a greater proportion of the bedstraw population on Pine Hill, 2) portions of two populations in the Cameron Park-Shingle Springs area, and 3) a population near the south fork of the American River, but the outcome of these efforts remains to be seen. A special preserve in the southern portion of the Pine Hill formation has been established to protect El Dorado bedstraw; planning of this 60-acre preserve has been complicated by uncertainty in precise species localities and the subdivision of the area into small parcels with various owners. The location of the preserve will be determined in the future pending confirmation of localities of the species and availability of willing sellers.

Recovery under the Recovery Plan is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. The response of El Dorado bedstraw to fire is not known at this time. A high priority recovery task for *Galium californicum* ssp. *sierrae* is the collection and banking of seed in Center for Plant Conservation-certified botanic gardens. Collections are prudent to guard against extinction of the species from chance catastrophic events and to provide potential material for enhancement efforts in existing populations, repatriations (returns to locations formerly occupied), and/or introductions to new sites. Directed surveys for *Galium californicum* ssp. *sierrae* will need to be conducted in the Cameron Park area to refine the location of the *Galium* specialty preserve, and northwest of Salmon Falls and at Martel Creek to verify historical or reported locations. Assuming recovery criteria are met, *Galium californicum* ssp. *sierrae* could be downlisted after 60 years.

San Clemente Island bedstraw

Galium catalinense ssp. acrispum

State: Endangered 1982
Federal: None



General Habitat:

San Clemente Island bedstraw grows on steep, rocky cliffs and slopes overlooking the sea, or in adjoining canyons on San Clemente Island.

Description:

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.

Status:

San Clemente Island bedstraw is endemic to San Clemente Island, the southernmost of the eight Channel Islands.

Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation before the distribution of several rare plants were determined. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. Steep, rocky slopes offered the only refuge for San Clemente Island bedstraw. Erosion of canyon slopes, caused in part by loss of vegetation, has eliminated some of the cliff refuges.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. Current management may result in a move toward population stability for San Clemente Island bedstraw. DFG has no recent information on the status of this plant.

Sand gilia *Gilia tenuiflora ssp. arenaria*

State: Threatened 1987
Federal: Endangered 1992

General Habitat:

Sand gilia occurs in sandy soils of dune scrub and maritime chaparral habitat in the coastal dunes of Monterey County. This species is typically associated with dune scrub vegetation in sites with protection from strong winds and salt spray. The species is adapted to some levels of disturbance and is usually tolerant of small amounts drifting sand. Dune scrub species include silver beach lupine, beach sagewort, coast buckwheat and mock heather. Sensitive species found growing with sand gilia include State-listed endangered Menzies' wallflower and the federally threatened Monterey spineflower.

Description:

Sand gilia is a short, sticky-haired annual herb in the phlox family (Polemoniaceae). It has an erect central stem with a basal rosette of leaves, and produces purple funnel-shaped flowers with narrow petal lobes and a purple throat. Sand gilia is distinguished from the other three subspecies of *G. tenuiflora* by its relatively large fruit capsules and stamens which are only slightly exerted from the corolla. Sand gilia is known to locally intergrade with *G. tenuiflora* ssp. *tenuiflora* at the more inland areas of its distribution at Ft. Ord.

Status:

Sand gilia species is known from approximately 30 populations in the dunes and stabilized inland dunes along Monterey Bay. The populations occur on public and private land. Seeds have been collected for seed banking by the Rancho Santa Ana Botanic Garden and for individuals conducting research or restoration. An experimental population at the Spanish Bay golf course was not successful. Overall, the species is threatened by the degradation of suitable habitat from encroachment of invasive, non-native plant species, commercial and/or residential development, sand mining, and trampling by equestrians and pedestrians. ORV activities have historically degraded habitat for the species.

Known populations of sand gilia on lands within Monterey County jurisdiction are addressed under Policy 2.3 of the North County Land Use Plan (LUP). Under the LUP only resource-dependent uses are allowed in coastal dunes or in habitats known to support rare or endangered species. To ensure that land uses on property adjacent to these sensitive resources, the County requires the protection of environmentally sensitive habitat through deed

restrictions or dedications of permanent conservation easements.

Populations of sand gilia within the City of Marina are similarly protected. Implementation of the City's LUP provides for the protection and restoration of native dune habitat and vegetation and the habitat of recognized rare and endangered species. Primary habitat areas for sensitive species are protected and preserved. If development in these areas is proposed, the parcel owner is required to prepare and implement a management plan which will protect the identified plant species. Development within secondary or support habitat areas is allowed, so long as it does not significantly impact primary habitat areas. The City of Sand City's LUP specifies the intent to protect and preserve endangered species habitat. The City is developing an HCP for a portion of its planning area that will protect a small area of occupied habitat for Monterey spineflower and sand gilia.

DPR has implemented management actions for populations of sand gilia on state park system lands in the Monterey Bay area. These activities include control of invasive, non-native species (non-native grasses and iceplant), mitigation and monitoring of human use impacts, altering visitor use patterns, and the restoration of the native vegetation of the dunes. DPR has also incorporated fencing and boardwalks that impede trampling by equestrians and hikers and has implemented dune restoration activities at Marina, Asilomar, and Salinas River State Beaches.

A substantial number of populations and individuals are found on Fort Ord. Base closure of Ft. Ord has resulted in the transfer of management of some of the habitat for this species to the BLM, University of California, and the California Department of Parks and Recreation to be managed as open space. A sand gilia restoration plan has been prepared by DPR to increase the Ft. Ord coastal population by 14,000 to 18,000 individuals as part of an effort to restore 700 acres of coastal dune habitat. The Navy is undertaking a dune restoration project that will restore native dunes and create native habitats in degraded areas at the Naval Postgraduate School. One of the main objectives of the restoration effort is to eradicate non-native plant species such as iceplant and ripgut brome. The population dynamics of sand gilia is being studied by Dr. Laurel Fox at Fort Ord, now a research and teaching facility administered as one of the University of California Natural Reserves. Dr. Fox found that rainfall profoundly influences seed germination, seedling survival, and reproduction.

In 2002, Salinas River National Wildlife Refuge released its *Comprehensive Conservation Plan.* Sand gilia populations on the preserve represent the northernmost documented population of the species. Management objectives include removal of exotic species and restoration of dune scrub vegetation. By 2010, develop habitat management strategies to preserve and enhance populations of high-priority special-status species on the Refuge. The impacts of public use on special status species will also be monitored. These strategies will include detailed prescriptions for habitat management, protocols to monitor the status of these species, and methods to evaluate the effectiveness of management actions.

Boggs Lake hedge-hyssop

Gratiola heterosepala

State: Endangered 1978
Federal: None

General Habitat:

Boggs Lake hedge-hyssop is found in shallow waters or moist clay soils of vernal pools and lake margins in scattered sites from Modoc County south to Fresno County. One population is known from Lake County, Oregon. South of San Joaquin County, it has not been reported from any valley floor vernal pools, but it does occur in five vernal pools in the Fresno County-Madera County Table Mountain complex near Friant. Bogg's Lake hedge-hyssop also co-occurs with a number of other listed species, including species of Orcutt grass (slender, Sacramento, hairy and San Joaquin Valley), Greene's tuctoria, succulent owl's-clover, and many-flowered navarretia. It is also associated with bractless hedge-hyssop (*Gratiola ebracteata*).

Description:

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. It blooms from April to June.

Status:

When first described in 1954, Boggs Lake hedge-hyssop was known only from Boggs Lake in Lake County, and until the late 1980s, from only a limited number of occurrences in vernal pool habitat in the State. Surveys of vernal pool habitat in recent years have located many additional occurrences of this species, and it is now known from more than 80 occurrences. The distribution of Bogg's Lake hedge-hyssop populations is patchy throughout its range, even in areas of suitable habitat. Uneven distribution and abundance may be due to artificial or natural factors, including historic land management practices (e.g., disking or land leveling) and site characteristics such as soil types and landforms. Due to the brief survey window for finding Bogg's Lake hedge-hyssop, and because the plants are small and inconspicuous, it is likely that other undiscovered populations exist.

Boggs Lake hedge-hyssop occurs in vernal pools on private land and on lands owned and managed by agencies and organizations including the DFG, BLM, DPR, TNC, and USFS. In addition, many of the known sites occur at the edges of reservoirs and stock ponds, which should be considered temporary habitat at best. Although the known number of occurrences of Boggs Lake hedge-hyssop has increased as more surveys have been conducted, both the quality and quantity of available habitat have declined during the same time period as vernal pools have been removed for agricultural and urban development and damaged by overgrazing, invasion by weedy species, and off-road vehicle traffic. Populations have also been disturbed or extirpated by hydrologic alteration and by discing and grading. For example, populations in Modoc County are threatened by competition from Medusa-head (*Taeniatherum caput-medusae*). Similarly, populations on USFS or BLM lands may be impacted by logging activities, fire suppression activities, herbicide drift, road construction, grazing and trampling, and recreational activities. In addition to external threats, small populations of Boggs Lake hedge-hyssop with few individuals are threatened by random extinction events. Populations undergoing rapid declines with limited recovery may presage such an event.

There is no formalized management strategy for Boggs Lake hedge hyssop. Critical habitat designations as part of the FWS Vernal Pool Recovery Plan will afford the species some protection when it occurs with a federally-listed species. Information on life history and microhabitat requirements is currently lacking. Information about its adaptation to environmental perturbations is also needed. Focused studies could identify potential threats to the species as well as methods to ensure its survivorship. Such studies include an assessment of grazing regimes and its relationship to reproductive success; demographics; pollination ecology; genetic analyses of disjunct populations; and reserve criteria.

Orcutt's hazardia *Hazardia orcuttii*

State: Threatened 2002
Federal: None

General Habitat:

Orcutt's hazardia is associated with clay soils in Diegan coastal sage scrub, mixed chaparral, or southern maritime chaparral on coastal hills and mesas in San Diego County and Baja California, Mexico. All known occurrences are found in a relatively frost-free zone within 8 miles of the coast and below 650 feet elevation.

Description:

Orcutt's hazardia is a perennial evergreen shrub in the sunflower family (Asteraceae). Growing from approximately two to six feet tall, it has open woody branches, small leathery leaves, and yellow flowers that bloom from August to October.

Status:

The entire worldwide distribution of Orcutt's hazardia consists of approximately fourteen populations scattered along 175 miles of coastline between Encinitas, California and Colonet, Mexico.

The status of Orcutt's hazardia in Baja California, Mexico is unknown. The species occurs entirely in a region of northern Baja that is highly impacted, fragmented and rapidly developing, with massive land conversion occurring, and there are no formally protected populations of Orcutt's hazardia in Baja California.

In California, Orcutt's hazardia is restricted to one natural population, approximately 37 miles north of the nearest Baja population. This population, consisting of approximately 600 individuals, is restricted to a four-acre mesa top at the western edge of the Manchester Mitigation Bank (Manchester), at Lux Canyon in Encinitas, San Diego County, California. The Department holds a conservation easement on the land, and the Center for Natural Lands Management (CNLM) holds the title and manages the property. Although this population occurs on protected land, it is still threatened by recreational use of the area, invasion by weeds, fire, and the small population size and small habitat area. The population currently appears to be stable, but due to the small size of the population, and proximity to a residential neighborhood, risk of extirpation due to chance events is high.

Recently, efforts began to establish additional populations of Orcutt's hazardia in San Diego County. Seed was collected from Manchester in 2001 for propagation. Approximately 250 new plants were planted on the eastern

edge of the mesa at Manchester in January, 2003. In April 2003, 50 plants were planted at another property owned and managed by CNLM, Kelly Ranch, near the eastern end of Agua Hedionda Lagoon, in Carlsbad, California. The new populations, if successful, will help guard against extirpation of the species from California if a wildfire or other chance event were to eliminate the natural population. Efforts to identify additional suitable sites for establishment of new populations are on-going. In addition, research on the life history and ecological requirements of the species began in 2003.

Orcutt's hazardia is considered a Narrow Endemic under the San Diego Multiple Habitat Conservation Program (MHCP). The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. The Encinitas population of Orcutt's hazardia is considered both a major population and critical location for this species. Approximately 70% of nearby suitable habitat will be conserved under the MHCP. Specific guidelines in the MHCP for Orcutt's hazardia include managing all conserved populations to control edge effects; implementing fire management plans to promote regeneration while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities; enhancing declining populations through adaptive management; restoring damaged habitat.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County; however, Orcutt's hazardia was not affected by these fires.

Algodones Dunes sunflower

Helianthus niveus ssp. tephrodes

State: Endangered 1979
Federal:

General Habitat:

Algodones Dunes sunflower occurs on stabilized to partly stabilized sand dunes in the Algodones Dunes system of Imperial County. It is associated with a number of sensitive species including Peirson's milkvetch, an endangered species, sand food, Wiggins' croton, and giant Spanish needle.

Description:

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. Plants form long tap roots and can grow up to one meter in height. Algodones Dunes sunflower is distinguished from the related gray desert sunflower (*Helianthus niveus* var. *canescens*) by is soft white hairs. Hairs of the gray desert sunflower are stiff and bristly.

Status:

Algodones Dunes sunflower is restricted to the Algodones Dunes system of southeastern Imperial County. The dune system is under the ownership of BLM. A portion of the Algodones Dunes is designated the North Algodones Dunes Wilderness under the California Desert Protection Act and is closed to OHV activity. Nearly 75 percent of the dune system remains open to OHVs, however, which poses a major threat to the species. Recreational OHV activity has destroyed a large portion of the vegetation in areas of the Algodones Dunes open to public use. Management needs include focusing on enforcing laws regarding illegal off-road vehicular use and initiate planning strategies that allow for plant conservation. Research needs include understanding abiotic/biotic influences on population dynamics.

BLM initiated a monitoring study of the special status plants of the Algodones Dunes in 1998. Data were collected in spring and summer of 1998, 1999, and 2000. The monitoring study was initiated to better understand the effects of management, particularly off-highway vehicle (OHV) use, of the dunes, which has remained relatively unchanged since 1977. The information from the monitoring will be used, along with other information, to develop a new Recreation Area Management Plan for the dunes. Abundance measurements of Algodones Dunes sunflower suggest that it appears to maintain itself after establishment through years of below normal precipitation. Its abundance was higher in 1998 than in 1977, and it maintained the 1998 level of abundance in

1999 and 2000. The higher abundance in 1998 was entirely the result of increases in the open area. The species declined in abundance in the closed area between 1977 and 1998; like the rest of the dunes the 1998 closed area values were maintained into 1999 and 2000. The disparate response of this species in the closed and open areas may be due to differential rainfall amounts in the northern and southern dune areas or to other unknown factors. Except for 1977 the responses in the open and closed areas were parallel.

Red Rock tarplant *Hemizonia arida (Deinandra arida)*

State: Rare 1982
Federal:

General Habitat:
Red Rock tarplant occurs in Mojave Desert scrub in open moist sites in the El Paso Mountains on the western Mojave Desert. It is associated with California buckwheat, burro bush, burro weed, and senna.

Description:
Red Rock tarplant is a resinous annual in the sunflower family (Asteraceae). It is branched and mildly odorous. This species possesses yellow ray and disk flowers. Red Rock tarplant can be differentiated from other similar species by the combination of yellow anthers, absence of bracts on all seeds, a solid, not hollow, stem, and soft, hairy leaves. Current taxonomic treatments classify *Hemizonia arida* as *Deinandra arida.*

Status:
Red Rock tarplant is known from five occurrences. The species is a local endemic to Red Rock Canyon and adjacent south-draining canyons of the Mojave Desert in Kern County.

Red Rock tarplant is well protected by DPR and is not currently significantly threatened. According to DPR, populations are stable or increasing and their prospects for survival appear excellent. Red Rock Canyon State Park has established two natural preserves to protect Red Rock tarplant, and rock barriers, signs, and patrols have been established to restrict OHVs from tarplant habitat. The Park also controls tamarisk which can colonize habitat for the tarplant.

Red Rock tarplant is threatened by disruption of its habitat by OHVs, mineral exploration, and competition from tamarisk, a non-native tree that invades desert wetlands. It is also subject to herbivory during the dry summer and fall months when other green food is scarce.

Otay tarplant

Hemizonia conjugens
(Deinandra conjugens)

State:	Endangered	1979
Federal:	Threatened	1998

General Habitat:

Otay tarplant grows on clay soils in grassland, coastal sage scrub, and maritime succulent scrub. Its distribution is strongly correlated with soils having a clay content of 25% or more. Species with which it is associated include California sagebrush, bush mallow, California buckwheat, species of sage, sugar bush, jojoba, and opuntia. The historic range of the species is in San Diego County from the Mexican border north to the Spring and Paradise Valleys, east to Otay Lakes Reservoir.

Description:

Otay tarplant is a member of the sunflower family (Asteraceae). It is an aromatic, glandular, and much-branched herbaceous annual with mostly solitary, yellow flower heads. Its leaves are deep green to gray green and covered with soft shaggy hairs. Otay tarplant occurs within the range of two other tarplants (*Hemizonia fasciculata* and *H. paniculata*). It can be distinguished from these species by the number of ray flowers, black anthers, and ridges on the bracts of the flower head (phyllaries). Current taxonomic treatment classifies this species as *Deinandra conjugens.*

Status:

Otay tarplant is known from approximately 30 occurrences. It has a limited distribution consisting of at least 25 historical populations near Otay Mesa in southern San Diego County and one population in Estado de Baja California, Mexico, near the United States border. Three of the 25 historic populations of Otay tarplant are considered to be extirpated. At the time the species was listed in 1998, FWS estimated that 70 percent of the suitable habitat for this species within its known range had been lost to development or agriculture. In the June 2001, FWS proposed critical habitat designation for the Otay tarplant. The habitat was designed to ensure that self-sustaining populations of the tarplant would be maintained. Final critical habitat was designated in December 2002.

Otay tarplant is covered under HCPs in San Diego County: the San Diego Gas and Electric Company HCP, the City of San Diego Subarea Plan, and the County of San Diego Multiple Species Conservation Plan (MSCP). The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Otay tarplant is considered to be a narrow endemic species under the MSCP and 66 percent of the major populations will be conserved. The City of Chula Vista Subarea MSCP and the Sweetwater Authority HCP also include Otay tarplant. The City of Chula Vista's draft Subarea Plan conserves several large population areas in a configuration that will maintain connectivity within and among these populations. Under the Chula Vista Subarea Plan, preserve design provides for 100 percent conservation of major populations of Otay tarplant in the Otay River Valley and varying degrees of conservation in the Wolf Canyon area, Rollings Hills Ranch, Bella Lago, and the San Miguel Ranch. Additional areas supporting the tarplant will be including in mitigation banks. Management of these

populations will take into account the extreme fluctuations of plant numbers annually.

In 2003, the huge Otay Fire burned a large area of south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, a small portion of Otay tarplant critical habitat burned during the fire. The impacts of the Otay fire were analyzed according to personal communications; areas around Proctor Valley and Otay Lakes had burned but that Otay Mesa and Marron Valley had not burned. Post-fire monitoring will be necessary to determine if there will be any long-term effects of the fire on Otay tarplant.

Gaviota tarplant

Hemizonia increscens ssp. villosa (Deinandra increscens ssp. villosa)

State:	Endangered	1990
Federal:	Endangered	2000

General Habitat:

Gaviota tarplant occurs at the ecotone between grassland and coastal sage scrub in coastal Santa Barbara County. It grows only on sandy loam soils of the Milpitas-Positas-Concepcion series that have a subsurface clay layer. Associate species include coyote brush, California sagebrush, purple needlegrass, and wild oats.

Description:

Gaviota tarplant is a summer flowering annual plant in the sunflower family (Asteraceae). It is gray-green and soft-hairy, 12 to 35 inches tall with stems branching near the base. It has yellow ray and disk flowers. The foliage is aromatic. Current taxonomic treatment now classifies this species as *Deinandra increscens* ssp. *villosa.* The two other subspecies of D. increscens, grassland tarweed (ssp. increscens) and leafy tarplant (ssp. foliosa), differ from Gaviota tarplant by their stiff-bristly, deep green foliage.

Status:

Until several years ago, populations of Gaviota tarplant were only known from marine terraces in the vicinity of Gaviota. However, new occurrences have been found at approximately seven new locations ranging westward from Gaviota along the coast and in the Santa Ynez Mountains to Point Arguello. One disjunct population occurs just south of Point Sal on Vandenberg Air Force Base.

Most of the habitat for Gaviota tarplant lies on the north side of Highway 101 on private lands owned by the petroleum industry. A few colonies occur on the south side of Highway 101 on land owned by California Department of Parks and Recreation. Most of the other populations west of Gaviota are located on private land; certain petroleum companies have leased land for their facilities and access to them at Government Point, just east of Point Conception. Two populations, one near Point Arguello and one near Point Sal, are located on Vandenberg Air Force Base.

In 1989, when the species was first proposed for State listing, DFG recommended several recovery and management actions including: (1) research on the reproductive biology and habitat requirements so that essential habitat could be more clearly defined and protection requirements could be formulated; (2) working with Santa Barbara County and private landowners to establish a long-term monitoring program and protected status for Gaviota tarplant; and (3) working with Santa Barbara County and private landowners to assure that future impacts

to Gaviota tarplant would be avoided or adequately mitigated. In their role as the lead permitting agency for the California Environmental Quality Act, Santa Barbara County has worked with DFG and the petroleum industry over the past decade to develop a strategy to mitigate for impacts to the tarplant resulting from oil and gas activities in the Gaviota area. At least two decommissioning efforts will be undertaken in the near future in areas where Gaviota tarplant has been found within the last three years. These include the decommissioning of Texaco's Hollister Ranch facility pipelines that stretch from Gaviota west to Saint Augustine, and Unocal's production facilities from Point Conception east to the Cojo Marine Terminal. The County will be working with DFG, FWS, and the California Coastal Commission to ensure appropriate measures are taken to conserve the *D. increscens* ssp. *villosa*, as well as other federally listed wildlife species that occur in these areas. Unocal is proposing to restore disturbed areas and contribute towards DFG's Gaviota Tarplant Ecological Reserve, which was established to compensate for impacts resulting from previous oil and gas activities along the Gaviota Coast.

Critical habitat for the Gaviota tarplant was designated in 2002. The primary constituent elements of critical habitat are: (1) Sandy soils associated with coastal terraces adjacent to the coast or uplifted marine sediments at interior sites up to 3.5 miles inland from the coast; and (2) Plant communities that support associated species, including needlegrass grassland and coastal sage scrub communities, particularly where species of needlegrass, California sagebrush, coyote bush, sawtooth golden bush, and California buckwheat occur. Military lands at Vandenberg AFB were not included in the designation of critical habitat. FWS can exclude these lands if measures to ensure conservation of the tarplant are implemented on the military lands. The Air Force has developed a Draft Integrated Natural Resources Management Plan (INRMP) for Vandenberg. Although measures to provide for the conservation of Gaviota tarplant are not currently included in the draft INRMP, the Air Force has committed to incorporate into their INRMP, and implement, specific measures that will address the conservation of the tarplant and its habitat at Vandenberg AFB. Based on this commitment, FWS determined that lands on Vandenberg Air Force Base should be excluded from critical habitat designation because the benefits of exclusion outweigh the benefits of inclusion and will not cause the extinction of the species.

Santa Susana tarplant

Hemizonia minthornii (Deinandra minthornii)

State: Rare 1978
Federal: None

General Habitat:

Santa Susanna tarplant grows in crevices of sandstone bluffs and outcrops in chaparral and coastal sage scrub in the Santa Susana and Santa Monica Mountains of Los Angeles and Ventura counties. It is associated with black sage, California sagebrush, California buckwheat, and bush mallow.

Description:

Santa Susana tarplant is a perennial subshrub in the sunflower family (Asteraceae) with slender ascending stems, sticky leaves, and yellow flower heads.

Status:

Santa Susanna tarplant is known from more than 25 occurrences of varying size; however one-fourth of these have not been seen in many years and their status is unknown. Land ownership is both private and public (LADWP, Santa Monica Mountains Conservancy, and Rancho Simi Park and Recreation District). Its occurrence in Thousand Oaks is limited to the North Ranch Open Space.

Santa Susana tarplant appears to be locally common within its limited geographic range around Santa Susana Pass. The species' affinity for steep, rocky terrain has afforded some protection for its habitat. Populations in the Santa Monica Mountains are far more localized and isolated. Threats to this species include loss of habitat due to development (housing, road, golf course, etc.), recreational activities, and grazing. Current taxonomic treatment classifies Santa Susanna tarplant as *Deinandra minthornii.*

Mojave tarplant *Hemizonia mohavensis (Deinandra mohavensis)*

State: Endangered 1981
Federal: None

General Habitat:

Mojave tarplant generally occurs in ephemeral drainages and riparian corridors surrounded by coastal sage scrub and chaparral in San Diego, San Bernardino, Kern, and Riverside Counties. It is found in grassy swales and seeps on the arid slopes of the Peninsular Range, (including the San Jacinto Mountains). It typically occurs in clay, silty, or gravelly soils along low gradient stretches of intermittent drainages. Associated riparian species include willow, sycamore, ash, deer grass, and rush. Peak flowering is from August through October.

Description:

Mojave tarplant is a sparsely branched, aromatic, sticky annual herb of the sunflower family (Asteraceae) with yellow flower heads arranged in compact clusters. Despite early floras that described the species as growing to 18 inches in height, it actually can be up to four feet in height in good conditions.

Status:

Mojave tarplant was thought to be extinct for more than 50 years when it was rediscovered in 1994 at several sites within the Peninsular Ranges. Today, Mojave tarplant is known from approximately 15 highly localized populations on private land, and in Cleveland National Forest and San Bernardino National Forest. Five-rayed tarplants at Red Rock Canyon that were previously reported as Kellogg's tarplant (*Hemizonia kelloggii)* may actually be Mojave tarplant.

The distribution of Mojave tarplant appears highly discontinuous. Most known sites are within the belt of desert edge chaparral and the others are on arid coastal facing slopes where rainfall and fog are infrequent. The species is locally common, but only in a few very restricted habitat patches. Populations fluctuate in response to environmental conditions. All the known extant populations are relatively small, occupying a total area of no more than two to three square miles. Within this small area, the actual size of occupied habitat is even smaller. Populations are very strongly restricted to low damp areas and are seldom found more than several feet from the bottom of a drainage way or a seep. It is possible that additional populations remain to be discovered within the range of the species.

Mojave tarplant is included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Within the Plan Area, Mojave tarplant is restricted to low sand bars in river beds, along stream channels and in ephemeral grassy areas in riparian scrub and chaparral at elevations between 850 m to 1,575 m in the San Jacinto Mountains Bioregion. Seven of the eight recorded occurrences of this species are within MSHCP Conservation Area. Conservation for this species will be achieved by inclusion of at least 80,160 acres of suitable habitat and five known localities (six records at four localities within the San Jacinto Mountains and Foothills and one record

Marin western flax

Hesperolinon congestum

State: Threatened 1992
Federal: Threatened 1995

General Habitat:

It is found on serpentine ridges covered with bunchgrass from Marin County to San Mateo County and in a serpentine chaparral association in Marin County. In San Mateo County it is associated with purple needlegrass, squirreltail, soap plant, clarkia, and fountain thistle. In Marin County, it is associated with Tiburon Indian paintbrush, Tiburon mariposa lily, native grasses, and soap plant on Ring Mountain, and with gumplant, buckwheat, and brodiaea on Bolinas Ridge.

Description:

Marin western flax, also known as Marin dwarf-flax, is a delicate annual plant in the flax family (Linaceae), with congested clusters of small rose to whitish flowers. It has slender, threadlike stems, 4-16 inches tall. The leaves are linear. Flowers bloom from May to July. Sepals are hairy and the five petals are rose to whitish. The anthers are deep pink to purple. This helps distinguish Marin dwarf-flax from California dwarf-flax, found in the same geographic area, which has white to rose anthers, as well as hairless sepals. Two other species that are found in the same region are small-flower dwarf-flax and slender dwarf-flax. They differ from Marin dwarf-flax in having hairless sepals and a long, open inflorescence.

Status:

Marin western flax is known from approximately 20 occurrences. Residential development and road and freeway construction have eliminated five of the historically known populations of Marin western flax. Existing threats include residential and recreational development, foot traffic and competition with nonnative species (non-native annual grasses, goat grass, broom, pampas grass, and yellow star thistle). Serpentine outcrops in the San Francisco Bay area are limited and at least 20 percent of those outcrops have already been eliminated as plant habitat due to development. The pressure to build more houses, roads, and other facilities for humans is great. Serpentine habitats also have been fragmented by the construction of roads. Habitat fragmentation increases the risks of extinction due to chance events such as fire, flood, landslide, pest or disease outbreaks, severe drought, or other natural or human-caused disaster.

Extensive searches of suitable habitat have been conducted with very limited results. No management plan for this species has been developed. In San Francisco, Marin dwarf flax has been collected historically at Laurel Hill Cemetery (1912), on Mt. Davidson, Lone Mountain, Inspiration Point, and above Baker Beach. The populations at Laurel Hills, Mt. Davidson, and possibly Inspiration Point have been extirpated. Only the Baker's Beach population persists. The National Park Service has initiated efforts to preserve this population and is in the process of developing a management plan for the species through consultation with the U.S. Fish and Wildlife Service. In San Mateo County, a population is protected within a County Park; another population occurs on San Francisco Water District land. NPS, which manages two occurrences within the Golden Gate National Recreation Area in San Francisco, is restoring one historical site by eradicating eucalyptus and other non-native trees. Research is needed to determine appropriate habitat management practices to conserve Marin western flax. Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.

Lake County western flax

Hesperolinon didymocarpum

State: Endangered 1981
Federal: None

General Habitat:

This member of the flax family (Linaceae) is known only from serpentine soils in the Big Canyon drainage north of Middletown, Lake County. The surrounding plant community includes grassland and chaparral.

Description:

Lake County western flax is an erect, narrow-stemmed, annual herb with widely spreading branches and open inflorescences of white to pink flowers. It is associated with other species of *Hesperolinon* and can hybridize with them.

Status:

Lake County dwarf flax is currently known from six occurrences in a six square mile area. All occurrences are on private property and subject to moderate to heavy cattle grazing. Grazing reduces seed production in some populations. Increased grazing or other land use changes, such as reservoir or pond construction, could seriously endanger Lake County western flax. Because it is limited in distribution and occurs in small populations, Lake County western flax is also in danger due random extinction events. DFG has no recent information on the status of this plant.

Santa Cruz tarplant

Holocarpha macradenia

State:	Endangered	1979
Federal:	Threatened	2000

General Habitat:

Santa Cruz tarplant is known from grasslands and prairies found on coastal terraces below 400 feet in elevation. Historically, it has been documented from Monterey County north to Marin. It typically grows on deep loam and sandy loam soils with a subsurface clay component, which hold moisture longer into the growing season compared to the surrounding sandy soils. Currently known Santa Cruz tarplant populations are frequently associated with non-native grasses. Native associates include rushes, California oatgrass, and other tarplants. At some locations, the plant is found with other rare species, including the state-endangered San Francisco popcorn flower and the federally-endangered Ohlone tiger beetle.

Description:

Santa Cruz tarplant is an aromatic and glandular annual herb in the sunflower family (Asteraceae), growing four to 20 inches tall. Small plants may produce a single yellow daisy-like flower head on a single stem, while larger plants have a rigid main stem and lateral branches that grow to the height of the main stem and produce many flowers. The leaves are linear and larger at the base of the plant (up to five inches), getting smaller as they go up the stem. Santa Cruz tarplant produces numerous (40 to 90) central disk flowers, many more than any related species.

Status:

Santa Cruz tarplant was once found in most San Francisco Bay Area counties and south to Monterey County. Its distribution has been severely reduced due to the destruction and alteration of coastal prairie habitat, primarily due to urban development and land management practices that favor competing, invasive, non-native species. All natural populations in the counties surrounding San Francisco Bay have been extirpated. The last remaining native population in this area, known as the Pinole Vista population, consisting of 10,000 plants, was eliminated in 1993 by commercial development. Santa Cruz tarplant is currently known from approximately 13 native and 8 experimentally seeded populations in Contra Costa, Monterey, and Santa Cruz Counties. Seven native occurrences are located near the cities of Santa Cruz and Soquel, and six are located near Watsonville. Some of the native populations may represent separate, fragmented patches of what historically was a single, larger population. The eight experimentally seeded populations are located at Wildcat Canyon Regional Park in Richmond, Contra Costa County. Very recently, three additional population introductions were attempted in Santa Cruz and Monterey counties, but were unsuccessful.

In 1982, seed salvaged from a development site in Pinole was introduced to 22 sites in Wildcat Canyon Regional Park and onto East Bay Municipal Utilities District (EBMUD) lands. These introduction sites have been monitored fairly regularly for the past 17 years by EBRPD, EBMUD, CNPS volunteers, and DFG staff. Although a number of populations did well for a few years, only eight have persisted, and only one has consistently supported large numbers of individuals. In 2002, this population supported almost 30,000 plants, the largest it has been since the initial seeding. Artichoke thistle, a noxious weed, has been a problem at Wildcat, and began encroaching on several of the Santa Cruz tarplant sites. EBRPD has been implementing an artichoke thistle control program.

Most recent surveys at the thirteen natural populations found 10,000+ plants at three of the populations, 1001-10,000 plants at four populations, and 1000 or fewer plants at four populations. Two populations had no standing plants. The number and location of standing plants in a population can vary greatly from year to year due to a number of factors, including rainfall, temperature, soil conditions, disturbance factors, and the extent and nature of the seed bank. Each population is comprised of not only the standing plants each year, but a persistent soil seed bank which can be very large and often covers an area much greater than the visible population of standing plants. The seed bank is very important to the species' year-to-year and long-term survival, and the extent of seed bank reserves is variable from population to population.

Management activities can affect the health of the populations and influence the balance between the number of plants and the extent of seed bank reserves. In many areas the disturbance factors with which coastal California grassland vegetation evolved, including large mammal disturbances, Native American burning practices for the past 10,000 years, and cattle grazing for about the past 250 years, have been removed. This has lead to an increase in live vegetation, an increase in litter, and a reduction of soil disturbance. As a result, the abundance of non-native species has increased, and the species richness and abundance of native species has decreased. This trend has led to the decline of many native species, including Santa Cruz tarplant. Active management is required to reverse the trend. Several studies on Santa Cruz tarplant's demography, life history, and potential management techniques have recently been conducted by researchers at UC Berkeley and UC Santa Cruz, partially funded through a USFWS Section 6 Grant.

Burning, mowing, grazing and scraping habitat have been utilized to mimic the natural disturbance regimes with the hope of enhancing populations at several sites, with variable results. Results indicate that management activities that result in the removal of thatch cover and expose areas of bare ground are most effective. Recent research on using grazing as a tool to manage grasslands found that response to disturbance varied from site to site, and a matrix of different disturbance regimes must be created to maintain native grassland species. Where habitat is still intact, management favorable to the species can reverse decline of this species and allow seeds in the dormant seed bank of the species to germinate and grow. The ability to provide appropriate management for the remaining occurrences of Santa Cruz tarplant will be pivotal in the recovery of the species.

The USFWS designated 2902 acres of critical habitat for the species in Contra Costa, Santa Cruz, and Monterey counties on October 16, 2002.

Tahquitz ivesia *Ivesia callida*

State: Rare 1992
Federal:

General Habitat:
This member of the rose family (Rosaceae) is found on near vertical slopes of decomposing granitic outcrops in the San Jacinto Mountains of Riverside County. Tahquitz ivesia is associated with sugar pine, white fir, canyon live oak, mountain mahogany, Parish's silene, and California fuchsia.

Description:
Tahquitz ivesia is a spreading dwarf perennial, with glandular, hairy, divided leaves, and small white flowers on a short flowering stalk.

Status:
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 are unlikely due to the relative inaccessibility of the rocky habitat of Tahquitz ivesia. 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 USFS is aware of the populations. DFG monitored both occurrences in 1988. A 1994 field survey found the plants to be thriving and stable.

Burke's goldfields *Lasthenia burkei*

State: Endangered 1979
Federal: Endangered 1991

Niall McCarten, DFG File Photo

General Habitat:
Burke's goldfields is restricted to vernal pools and swales and is known only from southern portions of Lake and Mendocino counties and from northeastern Sonoma County. It is associated with Sonoma sunshine and Sebastopol meadowfoam.

Description:
Burke's goldfields is an erect, herbaceous annual in the Sunflower Family (Asteraceae). It has with narrow opposite leaves and small heads of yellow flowers. This species can be easily confused with other goldfields (*Lasthenia*). It can be separated from similar members of the genus by other species by the type of bristles on the seed.

Rick York, California Native Plant Society

Status:
Historically, 39 populations were known from the Cotati valley, 2 sites in Lake county, and one site in Mendocino County. The occurrence in Mendocino County is most likely extirpated. It is currently reported from about 20 populations. 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. Less than 30 percent of its historic occurrences remain. The species has been nearly extirpated in the Windsor area, although it had previously been quite extensive there. Gully erosion at Manning Flat in Lake County is destroying the habitat there.

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. In order to resolve the conflicts with land use and wetland resources a Vernal Pool Task Force was formed. Composed of federal, state, and local agencies, local development and agricultural interests, and local environmental groups, the Task Force developed a Vernal Pool Ecosystem Preservation Plan. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan identifies areas for wetland and rare species protection, and areas wetland creation, restoration, or enhancement. This plan is currently being implemented.

To date, more than 23 separate properties, ranging in size from 1 acre to 174 acres, have been placed under the jurisdiction of DFG in cooperation with local agencies, such as the Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), for the protection of vernal pool species. Burke's goldfields is protected at the DFG Laguna de Santa Rosa Ecological Reserve. Burke's goldfields was known to occur at the DFG's Todd Road Ecological Preserve in Santa Rosa, but has not been seen in several years, possibly due to the cessation of grazing and subsequent invasion by non-native annual grasses. A grazing plan is being developed by the Department.

Research on the vernal pool plants is ongoing, funded primarily by FWS Section 6 grants. For example, projects examined the biological and logistic characteristics of the reserve properties, developed a management framework for recovery of the listed plants, designed and installed a long-term mowing/phytomass removal experiment to improve habitat quality, and conducted trials for intensive management techniques, e.g. fire and herbicide. This scientific approach has been used to develop practical, large-scale prescriptions that can directly affect recovery of the listed plants and improve native plant cover in vernal pool and adjacent upland habitats. These prescriptions gain wider applicability when supported by experimental data from multiple years with variations in climate and plant cover.

Beach layia *Layia carnosa*

State: Endangered 1990
Federal: Endangered 1992

General Habitat:

Beach layia is restricted to coastal sand dunes from Santa Barbara to Humboldt Counties. In northern California, it occurs in northern dune scrub community; in Monterey County, the species occurs in the central dune scrub community. It generally occurs behind the northern foredune community, occupying sparsely vegetated open areas on semi-stabilized dunes. The species will also occur in open areas, such as along trails and roads. The cover of associated vegetation protects the species from sand dune movement and erosion. Associated species include coast buckwheat, beach pea, beach sagewort, dune bluegrass, dune goldenrod, sand verbena, and beach-bur.

Description:

Beach layia is a small, succulent annual herb in the sunflower family (Asteraceae). It has low spreading branches and heads of small white to pink ray flowers and yellow disk flowers. The leaves and branches have sticky glands that allow sand to adhere to the plant. Beach layia can spread to more than 15 inches across. Several characteristics distinguish *L. carnosa* from other similar species: fleshy leaves, inconspicuous flower heads with short, white ray flowers and yellow disk flowers, and bristles around the top of the one-seeded fruit.

Status:

This plant is known to occur on five dune systems along the California coastline: in northern Santa Barbara County, on the Monterey Peninsula, at Point Reyes in Marin County, and in two dune systems in Humboldt County. Beach layia has been extirpated from at least four historic sites, and was assumed extirpated from Santa Barbara County until discoveries of two occurrences roughly 300 yards apart on Vandenberg Air Force Base. A new occurrence with 10-15 plants was discovered in 1999 on NPS land in Humboldt County. Beach layia is now known from 20 occurrences, 12 of which are at Point Reyes National Seashore. At various sites the species occurs with other State-listed plants, including Menzies' wallflower *(Erysimum menziesii)* and Tidestrom's lupine *(Lupinus*

tidestromii). Threats include residential development, grazing, trampling, OHVs, and encroachment by non-native plants. Beach layia has shown a steady decrease in numbers since 1989 on the Lanphere-Christensen Dunes in Humboldt County, and habitat for the species is being lost to invasion by ice plant, European beachgrass, and non-native annual grasses. The species is addressed in the 2001 *Draft Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula*.

Counties in which beach layia occur have implemented various management and conservation practices to preserve this plant and its habitat. Within Monterey County jurisdiction, Policy 2.3 of the North County Land Use Plan (LUP) relates to environmentally sensitive habitats. The Monterey County LUP has established policies allowing for only resource-dependent uses within habitats known to support rare and endangered species. Land uses adjacent to locations of environmentally sensitive habitats are required to be compatible within the long-term maintenance of the resource. For proposed land divisions or developments, the County requires the protection of environmentally sensitive habitat through deed restrictions or dedications of permanent conservation easements.

On lands in the City of Marina, implementation of the City's LUP policies will provide for the protection and restoration of native dune habitat and vegetation and the habitat of recognized rare and endangered species. The City's policies specify that primary habitat areas for sensitive species be protected and preserved. Development within secondary or support habitat areas are allowed, so long as it does not significantly impact primary habitat areas. Where development is proposed on parcels containing rare and endangered species, parcel owners are required to develop and execute a management plan which will protect the identified plant species. For populations on lands in the City of Sand City, the City's LUP specifies the intent to protect and preserve endangered species habitat. Protective measures will need to be developed and implemented for beach layia and other sensitive plants.

As part of the Marin Countywide Plan, conservation zones and sub-zones have been established for coastal areas that include populations of beach layia. Successful recovery will include the reduction of habitat loss through the conformance of the restrictions and review procedures that have been adopted for each zone. Conservation zones are subject to a development review checklist that requires conservation measures, such as clustered development, dedicated open space easements and undeveloped greenbelt areas. Point Reyes National Park is in the process of developing monitoring protocols for beach layia. Their objective is to establish baseline population data and to use this information to assess changes in population dynamics over time.

In Humboldt County, the County and City of Eureka have several policies relating to the protection of sensitive resources. The Humboldt County Local Coastal Program prohibits vehicles above the wave slope except in the Samoa Dunes Recreational Area; however, vehicles are allowed on privately-held lands in and around the City of Eureka. The County has recently adopted a management plan for the north and south spits of Humboldt Bay; the north spit area supports beach layia. The plan designates certain areas for vehicular access on the beach and dunes as well as vehicle-free zones. This plan addresses access on public lands as well as access to/from adjacent BLM lands, private lands and the Lanphere-Christensen Dunes Preserve. The plan recommends management actions to restore degraded dune habitat areas, including removal of invasive, non-native plant species, fencing of rare plant habitat areas and limiting public access.

TNC's Lanphere-Christensen Dunes Preserve is fenced and patrolled to control trespass by ORV users. Dune restoration activities at the Preserve, including removal of European beach grass, have allowed native dune species to flourish. After initiating restoration in 1992, native plant cover increased 47% by 1997 without the assistance of active re-planting. TNC is also conducting native plant restoration activities on the North Spit of Humboldt Bay. One population on the Samoa Peninsula occurs on land managed by the BLM and the City of Eureka. BLM manages the property and has fenced an area for the protection of beach layia.

San Francisco lessingia

Lessingia germanorum

State: Endangered 1990
Federal: Endangered 1997

General Habitat:

This species occurs in unvegetated openings of stabilized sand dunes or in sandy soils derived from the erosion of sandy coastal deposits. San Francisco lessingia is adapted to disturbance and may have been an early colonizer in secondary blow-outs in dune succession. Associate species include dune gilia, coast fiddleneck, dune evening-primrose, and sand-mat.

Description:

San Francisco lessingia, a member of the sunflower family (Asteraceae), is a slender, annual herb with clusters of lemon-yellow flowers. Plants develop a low, spreading bushy appearance following the development of basal leaves. Flowers usually open during the summer, with peak flowering in August and September.

Status:

Historic collections of San Francisco lessingia are all from the San Francisco area, including northern San Mateo County. San Francisco lessingia is known from six sites in San Francisco, including one experimental population. The species is also known from a population in Daly City on San Bruno Mountain. The Daly City population was discovered in 1989. The San Bruno Mountain Habitat Conservation Plan was adopted before San Francisco lessingia was listed and does not include or protect the Daly City site on which the plant occurs.

Loss of habitat and alteration of ecological processes that support that habitat are the principal threats to San Francisco lessingia. Another ongoing threat to the species is colonization of remaining habitat by invasive non-native species including ice plant, rip gut brome, and veldt grass. Volunteer efforts have also contributed to ongoing weed removal and the restoration of native dune scrub habitat. At the Presidio, the NPS has been actively managing habitat for the species, and the populations are increasing in both suitable habitat area and population size.

San Francisco lessingia is one of the species included in the USFWS' 2003 *Draft Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula.* The recovery strategy for San Francisco lessingia is based

primarily on protecting and expanding the existing populations within native coastal dune scrub vegetation, followed by active reintroduction and expansion of San Francisco lessingia in unoccupied, restored or enhanced habitat within its historic range. According to the Recovery Plan, neither protection of existing populations nor restoration and reintroduction projects would alone be sufficient to recover the species in the long-term. Recovery of San Francisco lessingia will requires that appropriate vegetation composition, structure, and dynamics be established and maintained on suitable dune topography. In particular, areas of diverse dune topographic relief and exposure are needed for a mosaic of dune scrub and patches of bare or sparsely vegetated dune sand (blowouts) in various stages of recolonization by native dune scrub vegetation. The ecological and physical processes that maintain these features operate only at relatively large spatial scales compared with the small remnant patches of San Francisco lessingia at the time of listing. Thus, any preserves established for this species will need to be of adequate size to provide suitable habitat and a dynamic dune/dune scrub system, as well as buffer the effects of surrounding aras. San Francisco lessingia reserves are proposed at dune complexes in the Presidio, at the Daly City site, and at remnant dunes of Sutro Heights and Sunset Heights.

Congdon's lewisia *Lewisia congdonii*

State: Rare 1982
Federal: None

General Habitat:
It grows on moist, shaded, north-facing slopes of metamorphic rock in the chaparral and oak woodland plant communities of the Merced River Canyon in Mariposa County, and along the Kings River Canyon in Fresno County. Associated species include Yosemite onion, selaginella, brodiaea, and shooting star.

Description:
Congdon's lewisia, a perennial member of the purslane family (Portulacaceae), has a basal rosette of semi-succulent leaves and produces rose-colored flowers.

Status:
Fewer than ten occurrences of Congdon's lewisia are known. The majority of occurrences are inaccessible on cliff faces and talus slopes. Populations near roads may be subject to herbicide spraying, road improvement and maintenance, and trash dumping although not documented in field surveys. Additional field surveys may result in the discovery of new populations in suitable habitat between the presently known, scattered occurrences.

In 1994, a multi-agency MOU for the conservation and protection of sensitive species in the Merced River Canyon was signed by the DFG, USFS, BLM, CALTRANS, and PG&E. The MOU specifies guidelines for highway and power line maintenance and repair, notification requirements, species monitoring, and annual reviews. The MOU emphasizes protection measures for State listed endangered Merced clarkia (*Clarkia lingulata*) but also improves protection for Congdon's lewisia and other species.

Congdon's lewisia is considered to be a sensitive plant by Yosemite National Park and BLM. It is also available in the horticultural trade.

Mason's lilaeopsis *Lilaeopsis masonii*

State: Rare 1979
Federal: None

General Habitat:

Mason's lilaeopsis grows in tidal zones, on mud-banks and flats along sloughs and rivers, in freshwater marshes, brackish marshes, and in riparian scrub, that are, in some way, influenced by saline water. This species is semi-aquatic and is usually found on saturated clay soils that are regularly inundated by waves and tidal action. It often grows with other rare plants such as delta mudwort, Suisun Marsh aster, and delta tule pea. Mason's lilaeopsis occurs in the northeastern portion of San Francisco Bay, in Alameda, Contra Costa, and Napa counties, as well as in Suisun Bay and the Sacramento-San Joaquin river delta, in Solano, San Joaquin, and Sacramento counties.

Description:

Mason's lilaeopsis is a minute, turf-forming, perennial plant in the carrot family (Apiaceae). The thread-like leaves with obscure internal cross-walls are tufted on creeping stems. The inflorescences are few- to several-flowered umbels of tiny white or maroon flowers. It spreads by rhizomes. Mason's lilaeopsis is a colonizing species on newly deposited or exposed sediments. It blooms April through November.

Status:

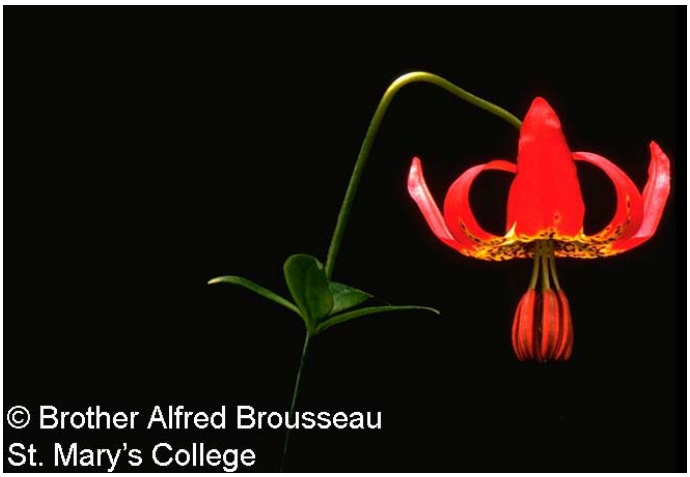
The known distribution of Mason's lilaeopsis extends from the margins of the Napa River in Napa County, east to the channels and sloughs of the Sacramento-San Joaquin Delta in Contra Costa, Solano, Sacramento, Yolo, and San Joaquin counties. Mason's lilaeopsis is threatened by erosion, bank and channel-stabilization, flood-control projects, widening of Delta channels for water transport, dredging and dumping of spoils, boat wake overwash, recreation (e.g. fishing trails), and in some areas, by water hyacinth. Currently, approximately 145 occurrences of Mason's lilaeopsis are recorded, some as small as one square foot, although DFG does not know how many of these still exist. Continuing threats include levee maintenance and construction. Although much of the habitat is privately owned, several State and federal agencies have jurisdiction over the Delta waterways. The DFG owns one site in Solano County.

Western lily *Lilium occidentale*

State: Endangered 1982
Federal: Endangered 1994

General Habitat:

Western lily grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral ponds and small channels. It also grows in coastal prairie and scrub near the ocean where fog is common. In California, this showy lily is known from near the southern perimeter of Humboldt Bay, Humboldt County, and from several sites approximately 90 miles to the north in Del Norte County. The range of the species extends north to Coos County, Oregon. Herb and grass associates include Pacific reed grass, sedge, gentian, and California pitcher-plant. Common shrub associates are wax-myrtle, Labrador tea, huckleberry, and salal. Tree associates include coast pine, Sitka spruce, and Port Orford cedar.



Description:

Western lily, a perennial in the lily family (Liliaceae), grows from a short unbranched, rhizomatous bulb, reaching a height of up to 5 feet. Leaves grow along the unbranched stem singly or in whorls and are long and pointed. The nodding flowers are red to deep orange, with yellow to green centers in the shape of a star and spotted with purple. This species can be distinguished from similar native lilies by the combination of nodding red flowers with yellow to green centers in the shape of a star, highly backward-curved petals, stamens closely surrounding the pistil, and an unbranched rhizomatous bulb.

Status:

Western lily has an extremely restricted distribution within two miles of the coast from Hauser, Coos County, Oregon to Loleta, Humboldt County, California. This range encompasses approximately the southern one-third of the Oregon coast and the northern 100 miles of the California coast. Historically, western lily was known from about 58 occurrences in California and Oregon. The plant is currently known from seven widely separated regions along the coast, and occurs in approximately 30 small isolated, densely clumped populations. Of the 16 populations reported from California, five have not been seen in over 20 years. Human activities such as draining of wetlands, clearing of land, elimination of beaver, and stabilization of moving sand areas have interrupted the natural processes of bog and wetland creation. As late-stage bogs and coastal scrub go through succession to forest, lily

habitat is eliminated with little new habitat being created. Western lily has also been impacted by bulb collecting livestock grazing, and extensive browsing by native mammals. Another significant threat is the loss of genetic variability due to small population size. Research has shown that populations below an effective size of about 5,000 western lily individuals will generally maintain insufficient adaptive genetic variability for long-term evolution in response to a changing environment, and those below 500 individual plants will experience accumulation of mildly deleterious mutations due to random drift, expression of inbreeding depression, and crossing incompatibility due to loss of genes.

In California, degradation of soils by agricultural plowing over the past century and a half may have been the largest single factor contributing to loss of habitat. The potential for future development continues to pose a serious threat to the species throughout its range, and is likely to increase. By far the largest known western lily population is partly on private land near Crescent City, California, much of which has been subdivided. This population is being impacted by grazing and residential development on surrounding lands. The western lily occurs in early successional bogs or coastal scrub on poorly drained soils, usually those underlain by an iron pan or poorly permeable clay layer. Young plants almost always establish under shrub cover, but the lily is shaded out if the canopy cover is greater than 50 percent or shrubs are over six feet high. There is some indication that western lily populations have been maintained in the past by periodic fires, perhaps set by Native Americans. Charcoal is abundant in the soil at several of the Oregon populations, indicating past fires. Fires are now rare events in these areas.

In 1997, the *Draft Recovery Plan for Western Lily* was developed by the USFWS Oregon State office. Under recovery criteria presented in the plan, the western lily can be downlisted to threatened when at least 20 viable populations are protected and managed to assure their continued existence. The 20 populations must be distributed among six recovery areas, roughly in proportion to their original relative abundances. For the purposes of this plan, a viable population includes at least 1,000 flowering plants, and a population structure indicating stable or increasing plant numbers. Management actions need to ensure recovery include on-site conservation that manages habitats to maintain to prevent or reverse encroachment by trees and shrubs.

Using Section 6 funds, a research project with California State University, Humboldt was initiated in 1998 to evaluate two vegetation management techniques, controlled late season grazing and manual removal, and to develop strategies for maintaining and expanding suitable habitat for the western lily. In 1999, the DFG formed a western lily working group to share information and develop recovery goals with the USFWS, the BLM, the Oregon Department of Agriculture, the Oregon DPR, TNC, local counties and cities and other interested parties. The Section 6 vegetation management project was implemented at the DFG Table Bluff Ecological Reserve and the Crescent City Marsh Wildlife Area.

Monitoring data for the populations at Table Bluff show that western lily has exhibited a dramatic decline in total of number plants, particularly juveniles, probably as a result of deer browsing. The greatest increase in seedlings occurred in plots where deer were excluded. Chemical treatments to remove brush were not successful in increasing population size. The low to moderate intensity grazing treatments appeared to be successful in reducing vegetation cover and creating conditions favorable to the establishment and survivorship of the lily. The population of western lily at the Crescent City Marsh Wildlife Area also declined over the same period of time. No single cause could be identified. Continued annual monitoring of western lily in the experimental plots is recommended. Continued monitoring of the vegetation structure is also recommended.

In addition to habitat manipulation to benefit the species, researchers at Berry Botanic Garden in Oregon implemented a reintroduction experiment in the fall of 1996 on BLM land in Oregon. This project was designed to examine the effects of propagule type (bulbs, new and old seeds) and substrate surface at time of planting (intact ground cover, versus bare ground) on emergence and subsequent plant and population growth rates. Areas in which ground cover was left intact supported higher emergence rates than did the areas in which ground cover was removed. Propagule type, but not ground cover treatment affected leaf area: bulbs emerged in significantly

higher rates than did either new or old seeds, and plants from bulbs were larger than plants from both old and new seeds, which did not differ from one another in size. In the first two years, source population affected emergence, but not leaf area, a pattern reversed in 1999. The experiments showed that, over the first four years, bulbs had higher survival than plants seeded directly. Initial results showed that plants grown from old seed survived better during the first year than those grown from new seed. This trend, however, reversed in subsequent years and using bulbs may be a more successful way to establish new plants.

Pitkin Marsh lily *Lilium pardalinum ssp. pitkinense*

State: Endangered 1978
Federal: Endangered 1997

General Habitat:

Pitkin Marsh lily is restricted to freshwater marshes in the vicinity of Sebastopol and Cunningham in Sonoma County. It occurs in moist soil in grassland under oaks and is associated with California dogwood, western azalea, Bigelow sneezeweed, blue-eyed grass, sedges, and rushes. It is also associated with several sensitive species including white sedge and Pitkin Marsh Indian paintbrush.

Description:

Pitkin Marsh lily is a large 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. This species is distinguished from the more common leopard lily (*Lilium pardalinum* ssp. *pardalinum*) by its shorter petals and anthers.

Status:

Pitkin Marsh lily is known from three occurrences in the vicinity of Sebastopol and Cunningham, only two of which have been seen recently. These occurrences are on private land near fresh water marshes in the vicinity of Sebastopol and Cunningham. The owners of one property have denied researchers access to the population there since 1975. It is presumed that the plants still exist there, but there is no way of determining the number of individuals remaining. The second known site was nearly destroyed by development in 1960s, but approximately 200 plants remain. A major subdivision is planned in the surrounding area, but a "conservation easement" agreement between the California Department of Fish and Game and the landowner will help to preserve this population. At the third known site, where this had once been a common species, only two plants remain. This loss was due in part to wetland filling, but was primarily because of the removal of plants and bulbs for horticultural use. Owners of the latter two sites entered into voluntary protection agreements with The Nature Conservancy in 1989.

In 1998, the Cunningham Marsh Conservation Easement was established to protect marsh habitat and uplands from a proposed subdivision development on adjacent land. Cunningham Marsh contains a suite of sensitive plants and listed species, including Pitkin Marsh lily. Under the easement agreement, DFG has jurisdiction over preservation of the 19-acre site; the Milo Baker Chapter of CNPS assumed responsibility for monitoring and

maintaining the Pitkin Marsh lily population within the easement. It was hoped that removal of the extreme grazing pressures, a condition of the 1998 conservation easement agreement, would allow some of these native plants to recover. However, removal of cattle from the marsh facilitated invasion by non-native grasses, and Himalayan blackberry has taken over the entire riparian corridor, forming large, dense thickets. Without removal of these aggressive competitors, it is doubtful that the sensitive and rare species will be able to reestablish populations. In 2002, California Native Plant Society members participated in vegetation clearing at the Cunningham Marsh Preserve. Volunteers removed invasive velvet grass, cut back crowding shrubs, and installed or repaired animal exclosures around Pitkin Marsh lilies there. A similar project in 2001 appeared to help the lilies to thrive.

The Sonoma County Department of Planning has designated the marshes in which this species grows as "critical habitat." This designation requires that any construction must be separated from the wetland boundaries by a minimum of 50 ft although the requirement for a 50-ft setback can be waived if the setback would make the land unsuitable for construction.

Habitat loss due to urbanization is a primary threat to the Pitkin Marsh lily. Changes in hydrologic regime and the resultant change in vegetation, introduction of non-native species, land clearing and draining operations, cattle grazing, and horticultural bulb collecting have impacted all Pitkin Marsh lily populations. Pitkin Marsh lily is maintained by the Berry Botanic Garden as part of the Center for Plant Conservation National Plant Collection.

Baker's meadowfoam *Limnanthes bakeri*

Stephen P. Rae, DFG File Photo

State: Rare 1978
Federal: None

General Habitat:
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, Ukiah, and Little Lake Valley near Willits. It is associated with other species of meadowfoam, popcornflower, rushes, and sedges.

Description:
Baker's meadowfoam is an herbaceous annual in the false mermaid family (Limnanthaceae) with dissected leaves and funnel-shaped flowers of white or cream

Stephen P. Rae, DFG File Photo

Status:
Approximately 20 occurrences of Baker's meadowfoam are known. Population numbers range from fewer than 10 plants to millions. All populations are on private land. The owners of several sites are cooperating in the conservation of this species. The greatest potential threats to this plant are residential development, alteration of local drainage patterns and hydrology, and agricultural conversion. An occurrence at Covelo was destroyed by development.

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. Through an MOU between the DFG and CALTRANS, completed in 1997, a study resulted in the analyses of genetic variation between and within populations and assessed germination, dormancy, population size, and vigor of Baker's meadowfoam populations. Previously unknown populations were also discovered as a result of the study. Results are being used to evaluate impacts caused by the proposed realignment of State Highway 101 around the City of Willits in Little Lake Valley, which supports most Baker's meadowfoam populations. The 2001 Mendocino County Regional Transportation Plan Draft Program Environmental Impact Report found that three of the four alternatives proposed would impact populations of Baker's meadowfoam. The City of Willits has proposed a new wastewater treatment facility much needed for environmental protection of the wetlands from the current marginal treatment facility. This too would impact the Baker's meadowfoam.

Point Reyes meadowfoam

Limnanthes douglasii var. sulphurea

State: Endangered 1982
Federal: None

General Habitat:

This species occurs primarily in vernally moist depressions in open, rolling coastal prairies and meadows. It occurs in Marin and San Mateo Counties. It is associated with rushes, buttercup, horsetail, and cinquefoil. Much of its habitat is dominated by non-native annual grasses.

Description:

Point Reyes meadowfoam, a member of the false mermaid family (Limnanthaceae), is an herbaceous annual with three- to five-lobed leaves and bell-shaped, yellow flowers.

Status:

Point Reyes meadowfoam is known from 11 occurrences. All but one of these occurrences is within Point Reyes National Seashore in Marin County. The remaining population is on private property near Pescadero in San Mateo County. Population numbers fluctuate on an annual basis making an assessment of overall population size difficult. Intensive cattle grazing and related habitat degradation are the principal threats to the populations within Point Reyes National Seashore while road grading or maintenance could impact the population in San Mateo County. Point Reyes meadowfoam seed is available in the horticultural trade.

Butte County meadowfoam ***Limnanthes floccosa ssp. californica***

State: Endangered 1982
Federal: Endangered 1992

General Habitat:

Butte County meadowfoam is restricted to ephemeral drainages (swales), vernal pool depressions in swales, and occasionally around edges of isolated vernal pools. It generally occurs on level to gently sloping terrain on poorly drained soils with shallow soil layers impermeable to water infiltration. The habitat associated with Butte County meadowfoam is characterized by saturated soils and pools with a short lived inundation period. Butte County meadowfoam is found more often within the swale system between vernal pools than in the pools themselves. It is associated with other vernal pool plants such as goldfields, blennosperma, and tidy-tips.

Description:

Butte County meadowfoam is a small, densely-hairy annual in the false mermaid family (*Limnanthaceae*). Its stems are less than 10 inches long; leaves divided into five to 11 leaflets. The white flowers have dark yellow veins at the base of each of the five petals that generally appear in late March through April. The plant is largely self-pollinating because the sepals are partially fused by cottony hair that prevents the flowers from fully opening.

Status:

Butte County meadowfoam is known from 11 extant occurrences. Two remaining locations have been extirpated. It has never been extensive in its range. The species is restricted to a narrow 25-mile strip along the eastern flank of the Sacramento Valley from central Butte County to the northern portion of the City of Chico. Its habitat is highly fragmented, with populations clustered in central Butte County near the type locality and in and near the City of Chico. All known populations are subject to urban or commercial development, road maintenance activities, conversion of agricultural lands to other uses, and/or road widening or realignment, e.g. widening of Highway 149 by Caltrans. Intensive grazing and non-native invasive species also impact Butte County meadowfoam and its habitat.

Loss of any populations may represent a significant loss of the total amount of genetic variability for the species. Butte County meadowfoam is extremely vulnerable to chance catastrophes and is exceedingly poorly equipped to escape them by seed dispersal to other sites. Researchers identified four genetically distinct races of Butte

County meadowfoam. They found that 96 percent of genetic diversity in Butte County meadowfoam existed among populations and that little variability was evident within populations. An average regeneration time (germination, growth, seed production) for the meadowfoam was estimated at two years and that a seed would be transferred between populations once every 100 to 200 years. Although considerable morphological variability has been observed within populations, it apparently is attributable to differences in environmental response by plants of the same genetic makeup. To ensure long term survivorship of the species and its genetic component, conservation of the species throughout its range is absolutely essential.

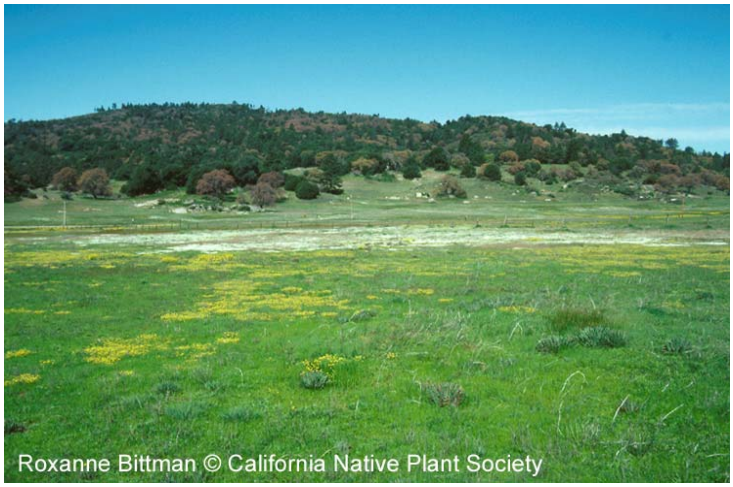
Under its original design, the Highway 149 project would have impacted vernal pools and Butte County meadowfoam. This project will expand Highway 149 from two lanes to a four-lane expressway between Highway 70 and Highway 99. Twelve subpopulations of the meadowfoam have been identified within the project area. The alternative to avoid Butte County meadow was ultimately selected as the preferred alternative.

In the September 2002, FWS issued a proposed rule to designate critical habitat for four vernal pool crustacean species and vernal pool plants. That rule was finalized in August 2003, but excluded Butte County from critical habitat designation. It is not known how this decision will affect long term conservation of Butte County meadowfoam. A recovery plan has not been written for this species and it is not yet included in any large habitat conservation planning effort. Butte County is preparing a Habitat Conservation Plan (HCP) that would regulate impacts on habitats within the county. Until the county HCP is completed, mitigation of individual projects for impacts to the Butte County meadowfoam may not result in the conservation of the species in large preserves. Smaller habitat areas normally set aside on a project by project basis are often not viable preserves, lacking protection for the hydrologic features or surrounding upland habitat essential for vernal pools.

Some land acquisition to protect Butte County meadowfoam has occurred. In 2002, the U.S. Bureau of Reclamation, Central Valley Project Conservation Program, provided funds to acquire 264 acres of vernal pools supporting Butte County meadowfoam and vernal pool invertebrates. In 2003, the Dove Ridge Conservation was certified by the USFWS for mitigation for projects in Tehama and Butte Counties. The 2,400-acre conservation bank contains over 200 acres of vernal pool habitat that support Butte County meadowfoam, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp.

Parish's meadowfoam ***Limnanthes gracilis var. parishii***

State: Endangered 1979
Federal: None



General Habitat:

This species is known from the montane meadows of northern and eastern San Diego County, as well as the Santa Rosa Plateau region in western Riverside County. It is a plant of moist habitats, often growing in vernal pools, wet meadows, and near springs and seeps. Its habitat is dominated primarily by annuals and herbaceous perennials rather than grasses. It is associated with downingia, buttercup, delphinium, and blennosperma.

Description:

Parish's meadowfoam is a small, herbaceous annual in the meadowfoam family (Limnanthaceae) with wide-spreading branches, divided leaves, and white bowl-shaped flowers that fade to pink.

Status:

Parish's meadowfoam is known from fewer than 30 occurrences, many of which have not been observed in more than ten years. The occurrences are centered primarily in Cuyamaca Valley and the Laguna Mountains in eastern San Diego County, Palomar Mountain in Cleveland National Forest in northern San Diego County, and on the Santa Rosa Plateau Preserve in Riverside County. A significant amount of habitat for Parish's meadowfoam was probably lost in Cuyamaca Valley in the 1880s with the construction of Cuyamaca Dam and the permanent inundation of Cuyamaca Lake over a portion of what previously had been a vernal lake.

DPR established the Cuyamaca Meadows Natural Preserve within Cuyamaca Rancho State Park in 1990 to provide additional protection to Parish's meadowfoam habitat as well as habitats for other rare species found in that portion of the State Park. In 1996, following two years of extended negotiations, the DFG entered into an agreement with USFWS, Helix Water District, Lake Cuyamaca Recreation and Park District, DPR and USFS to protect Parish's meadowfoam, State-listed endangered Cuyamaca Lake downingia (*Downingia concolor* var. brevior), and State-listed rare Cuyamaca larkspur *(Delphinium hesperium* ssp. *cuyamacae)*.

The MOU identifies particular actions to be taken by each of the signatory land managers to preserve and protect the populations of Parish's meadowfoam on their lands. Grazing, highway maintenance activities, and recreational and trail development are threats to Parish's meadowfoam. This agreement was entitled "Conservation Agreement for the Preservation of Cuyamaca Lake Downingia (*Downingia concolor* var. *brevior*) and Parish's Meadowfoam (*Limnanthes gracilis* ssp. *parishii*)." The Conservation Agreement addresses threats to both species and recovery actions through a combination of measures. These measures address impacts resulting from alteration of hydrology in the Cuyamaca Valley, grazing, recreational activities, and off-road vehicle (ORV) access over the majority of the range of these two plant species. Because implementation of the measures in this

conservation agreement significantly reduces the risks to Cuyamaca Lake downingia and Parish's meadowfoam, FWS concluded that federal listing was not warranted.

In 2003, the huge Cedar Fire burned a large portion of central San Diego County including the Cuyamaca Mountains and the area around Cuyamaca Lake. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 13% of suitable habitat was burned during the fire. However, the ability to precisely locate vernal pool complexes within the fire perimeter was limited. Botanists visiting Cuyamaca Lake during the spring in 2004 found a dense carpet of wildflowers covering the meadows at the lake. Few of the grasslands supporting vernal pools burned with a high intensity and impacts to sensitive species found in these pools were not severe.

Parish's meadowfoam is a covered species under the Riverside County Multiple Species Habitat Conservation Plan. It is restricted to the vernal pools on the Santa Rosa Plateau within the planning area. The MSHCP proposes to protect the watershed of the Santa Rosa Plateau to ensure conservation of the vernal pool species on the plateau.

Parish's meadowfoam is one of the focal species identified by the South Coast Wildlands Project (SCWP). SCWP is a non-profit organization dedicated to ensuring functional habitat connectivity across the South Coast Ecoregion which extends from San Diego County into Baja California, Mexico. Their mission is to protect, connect, and restore the rich natural heritage of the South Coast Ecoregion by establishing a system of connected wildlands.

Sebastopol meadowfoam *Limnanthes vinculans*

State: Endangered 1979
Federal: Endangered 1991

General Habitat:

Sebastopol meadowfoam grows in seasonally wet meadows, pastures, and vernal pools, primarily in the drainage of the Laguna de Santa Rosa in Sonoma County. Sebastopol meadowfoam often occurs with two other State and federally listed endangered plants: Burke's goldfields and Sonoma sunshine.

Description:

Sebastopol meadowfoam is a small annual herb in the False Mermaid Family (Limnanthaceae). It has bowl-shaped white flowers. Although the first leaves are narrow and undivided, leaves on the mature plant have three to five undivided leaflets along each side of a long stalk (petiole). The shape of the leaves distinguishes Sebastopol meadowfoam from other members of the *Limnanthes* genus.

Status:

Limnanthes vinculans is currently reported from about 30 occurrences. Populations occur on privately owned lands as well as lands owned by CALTRANS, the U.S. Army, and the City of Santa Rosa. DFG protects populations at its Laguna de Santa Rosa Ecological Reserve and one of its nearby extensions. The majority of occurrences, however, are on private land within five miles of the City of Santa Rosa. Primary threats to the species consist of activities that result in the destruction of the plants or hydrologic changes in their habitats. Such activities include urbanization, industrial development, agricultural land conversion, off-highway vehicle use, horseback riding, trampling by grazing cattle and road widening.

Housing development, agriculture, waste water irrigation, and long-term intensive livestock grazing have contributed to the decline and demise of most of the area's pools. In some cases pools spared in development projects in the Santa Rosa Plain area are declining in viability as a result of being within "postage-stamp" reserves surrounded by homes. Altered hydrology due to lawn irrigation, increased refuse, and foot traffic have contributed to site quality reduction in some areas. Agriculture (including discing, vineyards, and orchards) has destroyed or damaged other vernal pool areas. Only a few moderately-sized viable vernal pool areas remain in the region. The floristic quality of the remaining pools has declined in some areas due to long-term intensive grazing.

In order to resolve the conflicts with land use and wetland resources a Vernal Pool Task Force was formed. Composed of federal, state, and local agencies, local development and agricultural interests, and local environmental groups, the Task Force developed a Vernal Pool Ecosystem Preservation Plan. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan identifies areas for wetland and rare species protection, and areas wetland creation, restoration, or enhancement. This plan is currently being implemented.

To date, more than 23 separate properties, ranging in size from 1 acre to 174 acres, have been placed under the

jurisdiction of DFG in cooperation with local agencies, such as the Sonoma County Agricultural Preservation and Open Space District (SCAPOSD), for the protection of vernal pool species. Sonoma sunshine is protected with the DFG Todd Road Reserve contains 75 acres of vernal pools and associated uplands. A portion of the Carinalli Property near Laguna de Santa Rosa (150 acres) and a recent acquisition of an adjacent 75 acres both contain some vernal pool habitat and have been acquired under the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. 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 Sonoma sunshine (*Blennosperma bakeri*).

Approved mitigation focuses on preservation and restoration of existing habitat. Some recent acquisitions and approved preservation banks protect Sebastopol meadowfoam, although the remaining populations continue to be significantly threatened by urban development and agriculture. Conservation easements have also been used to protect Sebastopol meadowfoam. For example, landowners donated a conservation easement over their seven acres in the Cunningham Marsh area of Sebastopol to the Sonoma Land Trust. Sebastopol meadowfoam occurs in vernal pools on this property.

In 1993, Rancho Santa Ana Botanic Garden created 30 small vernal pools as part of their plant display as well as part of a long term gene flow study by the Garden's Research Department and Endangered Species Program. Artificial vernal pools have also been created by the University of California's Botanic Garden. Because these pools require careful tending it has been concluded that recreated pools are not self-sustaining and therefore not a viable option to replace the loss of naturally occurring vernal pools. Although creation of vernal pools is used as a management or mitigation tool in the Santa Rosa area, the long term success or failure of these created pools cannot yet be determined.

Research on the vernal pool plants is ongoing, funded primarily by FWS Section 6 grants. For example, projects examined the biological and logistic characteristics of the reserve properties, developed a management framework for recovery of the listed plants, designed and installed a long-term mowing/phytomass removal experiment to improve habitat quality, and conducted trials for intensive management techniques, e.g. fire and herbicide. This scientific approach has been used to assess practical, large-scale prescriptions that can directly affect recovery of the listed plants and improve native plant cover in vernal pool and adjacent upland habitats. These prescriptions gain wider applicability when supported by experimental data from multiple years with variations in climate and plant cover.

One ongoing study has examined several treatments, mowing, fire, and selective herbicides, to improve vernal pool habitat. Mowing and phytomass removal was initiated in 2000 as a practical way to improve native vegetation and water quality and reduce fire hazard. The treatment was repeated in 2001. No treatment effects were detected, possibly due to low levels of precipitation and the short duration of the treatment (only two years). In 2002, large patches of Sebastopol meadowfoam appeared in plots that had been mowed and mulched as well as mowed and raked where none had been before. A similar positive effect was observed in 2001 after a wildfire had burned a portion of one of the study sites in 2000: Sebastopol meadowfoam was dense and extensive in the burned area. Future studies may elucidate genetic variability within and between populations of Sonoma sunshine, Burke's goldfields, and Sebastopol meadowfoam.

San Clemente Island woodland star

Lithophragma maximum

State:	Endangered	1982
Federal:	Endangered	1997

General Habitat:

San Clemente Island woodland star occurs in moist habitats primarily on north-facing slopes in nearly inaccessible canyons on the east side of San Clemente Island, the southernmost of the eight Channel Islands. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island woodland star is a rhizomatous, perennial herb in the saxifrage family (Saxifragaceae), with basal, three-lobed leaves. Each plant produces two or three stout flowering stems, 16-24 inches tall, and each flowering stem produces 20 or more white to pinkish bell-shaped flowers that bloom from April to June.

Status:

This species is extremely rare and was thought to be extinct until it was rediscovered in 1979. Today, about 200 plants are thought to remain in the wild, all in deeply incised canyons on the southeastern portion of San Clemente Island.

Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. Inaccessible areas such as deeply incised canyons were likely the only refuge from these animals. Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program.

A propagation program may be needed to achieve recovery for this species.

San Clemente Island bird's-foot trefoil

Lotus argophyllus var. adsurgens

State: Endangered 1979
Federal: None

General Habitat:

This subspecies grows on marine terraces in the cholla phase of maritime desert scrub vegetation on San Clemente Island, the southernmost of the eight Channel Islands. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island bird's-foot trefoil is an erect, shrubby perennial with crowded silvery leaves, short fruits, and small yellow-orange flowers. It is a member of the pea family (Fabaceae).

Status:

San Clemente Island bird's-foot trefoil is endemic to San Clemente Island. Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation before the distribution of several rare plants were determined. Intense grazing by goats reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. San Clemente Island bird's-foot trefoil inhabits only a few sites on the southern tip of San Clemente Island. Each site has fewer than 50 individuals. DFG has no current information on the status of this species.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range, but military operations have only occasionally directly affected this plant. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program.

Recent research found a low degree of hybridization between *Lotus* species on San Clemente Island. Although hybridization was not extensive, it may still pose a long-term threat to the survival of San Clemente Island bird's-foot trefoil.

Santa Cruz Island bird's-foot trefoil

Lotus argophyllus var. niveus

State: Endangered 1981
Federal: None

General Habitat:

This subspecies is found only on Santa Cruz Island, the largest of the Channel Islands. It grows on rocky slopes, stony flood plains, and dry canyon streambeds in coastal sage or chaparral plant communities.

Description:

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).

Status:

Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%). In 1997, TNC drafted operating principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. Long-term grazing by sheep had degraded much of the native vegetation on Santa Cruz Island, and weedy exotic plants became established. TNC initiated a program to remove feral sheep from the island, which has been successful. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Feral pig eradication efforts will likely begin in late summer, 2003.

As a result of the elimination of sheep grazing, Santa Cruz Island bird's-foot trefoil populations have recovered, especially on high ground within floodplain areas. DFG has no recent information on the population numbers or status of individual populations of this plant.

San Clemente Island lotus

Lotus dendroideus var. traskiae

State: Endangered 1982
Federal: Endangered 1977

General Habitat:

San Clemente Island lotus grows on open, grassy north-facing slopes at canyon mouths and on hillsides at several sites on San Clemente Island, the southernmost of the eight Channel Islands. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island lotus, also known as San Clemente Island broom, is a perennial subshrub in the pea family (Fabaceae). It has erect, glabrous branches, leaflets usually in threes, and yellow or red-tinged flowers.

Status:

The extent of the historic distribution of San Clemente Island lotus is unknown. Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. There are about 30 known occurrences of San Clemente Island lotus.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. Many populations have increased slightly in size since the removal of the feral animals. Recent research found a low degree of hybridization between *Lotus* species on San Clemente Island. Although hybridization was not extensive, it may still pose a potential long-term threat to San Clemente Island lotus.

Mariposa lupine

Lupinus citrinus var. deflexus

State: Threatened 1990
Federal: None

Dan Hamon, DFG File Photo

Dan Hamon, DFG File Photo

General Habitat:

Mariposa lupine grows on decomposed granitic sands on ridgetops and hillsides in openings in foothill woodlands from 1,400 to 1,900 ft in elevation on the western slope of the Sierra Nevada in southwestern Mariposa County, south of the town of Mariposa. It is associated with foothill pine, Mariposa manzanita, Sierra whitethorn, and sky lupine, harlequin lupine.

Description:

Mariposa lupine is an erect, diffusely-branched annual herb belonging to the pea family (Fabaceae). They are short, hairy to hairless, and have palmately compound leaves. The six to nine leaflets are about one-third as wide as they are long and are linear or spatula-shaped with blunt tips. White flowers that may have pink or lavender tips appear from April through May.

Miriam Warner, DFG File Photo

Dan Hamon, DFG File Photo

Status:

The six occurrences of Mariposa lupine occur on private lands in Mariposa County over 15 sq mi area. Two of the six occurrences grow with *Calyptridium pulchellum*, a Federal threatened species. Four of the six occurrences are protected by a voluntary landowner agreement with TNC. Mariposa lupine had been proposed for listing by FWS in 1994, but the proposal was withdrawn in 1998. At the time of the proposed rule, FWS cited threats from urbanization and, potentially, overgrazing. Subsequently, the Service was not been able to verify that overgrazing occurs at the grazed sites where Mariposa lupine occurs. Continued or future urbanization may threaten at least two occurrences of this species.

Milo Baker's lupine *Lupinus milo-bakeri*

State: Rare 1978
State Threatened 1987
Federal:

General Habitat:

Milo Baker's lupine 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. Associated species include blackberry, wild grape, and poison oak. Much of its habitat is dominated by non-native weeds.

Description:

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.

Status:

Approximately a dozen known occurrences of this species are known; most are in Mendocino County. Four occurrences in Mendocino County populations have been extirpated. This species is threatened primarily by highway maintenance activities including herbicide application and road widening. Milo Baker's lupine occurs on private land and on Caltrans highway rights-of-way. Information is needed on the status of this plant.

Nipomo Mesa lupine *Lupinus nipomensis*

State: Endangered 1987
Federal: Endangered 2000

General Habitat:

Nipomo Mesa lupine is restricted to dry sandy flats within stabilized, coastal back dune habitat in the southwestern corner of San Luis Obispo County, west of Nipomo Mesa. Nipomo Mesa lupine occurs in two types of habitat: high quality and degraded. The high quality habitat areas are situated in dune swales and contain both native annuals and widely spaced individuals of mock heather. The degraded areas have been either physically degraded or invaded by non-native weedy species. Nipomo Mesa lupine requires pockets of bare sand, probably indicating a low tolerance for competition.

Description:

Nipomo Mesa lupine is an annual herb in the pea family (Fabaceae). It is hairy, with decumbent stems growing 4-8 inches tall, leaves with 5-7 leaflets, and pink flowers.

Status:

Nipomo Mesa lupine is known from one extended population, made up of 5 occurrences and fewer than 700 plants. At least three historically known populations have been extirpated, including the type-locality. The general trend for this species has been one of decline.

The central portion of the species' distribution is occupied by UNOCAL's Santa Maria Refinery; all occurrences are found within one mile of the refinery. Principle threats include facility disaster, continued coastal development, OHV activity, and expansion of introduced weedy plants, particularly veldt grass and ice plant. All but one existing occurrence are on private land and remain unprotected.

A program of dunegrass and veldt grass removal within the Guadalupe Dunes began in 1999. This effort, conducted by the Land Conservancy of San Luis Obispo County, has improved areas of Nipomo Mesa lupine habitat, helping to stabilize the declining occurrences. More recently, the USFWS has committed to sponsoring a seed conservation program in collaboration with the Center for Plant Conservation. In addition, they are initiating efforts to determine whether suitable habitat for the lupine occurs on the Guadalupe-Nipomo National Wildlife Refuge, located just south of the known population, in the first phase of an effort to introduce and establish new lupine populations there.

Father Crowley's lupine

Lupinus padre-crowleyi

State: Rare 1981
Federal: None

General Habitat:

Father Crowley's lupine is associated decomposed granite in Great Basin scrub and open conifer/sagebrush vegetation on the eastern slope of the Sierra Nevada in Inyo County. It is associated with big sagebrush, bitterbrush, Jeffrey pine, white fir, buckwheat, and spurred lupine. This species also occurs in avalanche chutes with quaking aspen and lodgepole pine, as well as with water birch and quaking aspen in a riparian zone along a creek.

Description:

Father Crowley's lupine is a bushy herbaceous perennial in the pea family (Fabaceae). It is covered with gray, spreading hairs and has creamy white flowers. Its leaves are divided into seven to eight leaflets.

Status:

There are six reported occurrences of Father Crowley's lupine. Two occurrences have not been observed since 1950 and the remainder dates from the 1980s. Four of the reported populations consist 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. In 1998, the Inyo National Forest collected seed from a population of Father Crowley's lupine for propagation and outplanting in the area of a former airstrip that was being restored. DFG has no recent information on the status of this species.

Tidestrom's lupine

Lupinus tidestromii var. tidestromii

State:	Endangered	1987
Federal:	Endangered	1992

General Habitat:

Tidestrom's lupine occurs on partially stabilized coastal dunes of the Monterey Peninsula in Monterey County, near Dillon Beach in Marin County, at Point Reyes National Seashore, and an isolated colony near the mouth of the Russian River in Sonoma 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 beach layia *(Layia carnosa).*

Description:

Tidestrom's lupine is a prostrate perennial herb with whorls of light blue to lavender flowers, black-spotted pods, and bright yellow roots. The fan shaped leaves have 3-5 narrow leaflets, each less than 1 inch long. The stems and leaves have short hairs. Bright yellow roots, prostrate habit, small leaflets and dense hairs on the foliage distinguish clover lupine from lupines of coastal dunes (e.g. *Lupinus variicolor, L. littoralis, L. chamissonis, L. arboreus*). Some botanists distinguish between Pt. Reyes clover lupine (*L. tidestromii* var. *layneae*) and Tidestrom's lupine (*L. tidestromii var. tidestromii*). The *Jepson Manual* treats *L. tidestromii* as a single, variable species, called Tidestrom's lupine.

Status:

There are approximately 18 extant, natural occurrences of the species, one introduced occurrence, and two extirpated, historical occurrences of Tidestrom's lupine. One population of Tidestrom's lupine on private property, Lawson's Landing in the Tomales Dunes in Marin County, disappeared in the early 1990s due to overgrazing, according to the botanists familiar with the site.

In 1996, the DFG held a recovery workshop for seven coastal plants, including Tidestrom's lupine. At the workshop, participants discussed current threats, including residential development, trampling, and OHVs. In addition to these threats, non-native species such as ice plant (*Carpobrotus edulis*) and European beach grass (*Ammophila arenaria*) threaten Tidestrom's lupine at all occurrences. For example, the southernmost population is located at Pebble Beach in Monterey County. Several of the occurrences on the Monterey Peninsula are on

remnant dunes in the yards of private residences. One population is surrounded by golf course where the dunes are being overrun by ice plant. Local botanists do not consider this population to be viable.

Another significant threat to Tidestrom's lupine on the Monterey Peninsula is hybridization with silver bush lupine (*Lupinus chamissonis*). Silver bush lupine does not naturally occur on the Monterey Peninsula. It was introduced at Asilomar State Beach and Conference Grounds in the early 1970s by a horticulturist employed by the operator of the conference grounds. He also planted it on several residential properties in the dunes between Pt. Pinos and Cypress Pt. as part of "dune restoration" landscaping projects. In about 1988, the Pebble Beach Company introduced silver beach lupine into the Spanish Bay Resort dunes, as part of their golf course dune revegetation project. Hybrids between these two species were first observed about 12 years ago in areas at Asilomar occupied by both Tidestrom's and silver bush lupines. In the last five years there was an explosion of these hybrid-like plants. Both the silver bush lupine and the hybrid-like plants are very invasive, encroaching readily into areas occupied by Tidestrom's lupines.

Two years ago, researchers hired by DPR confirmed through isoenzyme profile assay analysis and taxonomic analysis that the new plant is a hybrid between silver bush lupine and Tidestrom's lupine. In 1999, plant pathologists used thin layer electrophoresis to screen lupine samples and identify the off-type lupine plants. This study has now been expanded to include areas where Tidestrom's lupine and silver bush lupine naturally occur together (Pt. Reyes and Goat Rock Dunes). Besides developing a photographic key, a Monterey botanist and local expert is preparing a taxonomic key to aid in the identification of the different lupines. Supervised crews are hand-pulling the hybrid plants on state park land as well as at Spanish Bay. Private property owners who have silver bush lupines on their property are also being contacted to request their permission to remove silver bush lupines and replace them with other appropriate natives. Although many hybrid plants have been removed, constant monitoring will be required to remove new seedlings and to limit the expansion of the silver bush lupine hybrid.

NPS has started a dune restoration program at Point Reyes National Seashore, which will benefit the seven Tidestrom's lupine occurrences there. Over summer 2001 and 2002, Point Reyes National Seashore initiated the first stages of a three-year coastal dune restoration project which includes removal of European beachgrass and iceplant. These nonnatives form a thick mat that excludes native plants and animals, such as the western snowy plover. Restoration targets 30 acres near Abbotts Lagoon, a site that harbors the largest dune remnants in the park and is one of the prime attractions for park visitors.

The USFWS completed a recovery plan for Tidestrom's lupine and six other coastal plants in 1998.

Laguna Mountains aster ***Machaeranthera asteroides var. lagunensis***

State: Rare 1979
Federal: None

General Habitat:
Laguna Mountains aster occurs on dry, sandy loam soils in openings of Jeffrey pine/black oak forest in a localized area of the southern Laguna Mountains in San Diego County. It is associated with Wright's buckwheat, yarrow, bedstraw, penstemon, and California brome.

Description:
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.

Status:
This species is restricted to a small area near the community of Mount Laguna and Wooded Hill. A fire in 1989 may have promoted an expanded population. The sole reported occurrence of this species is on Cleveland National Forest land. USFS has developed a management strategy to reduce or eliminate threats to this species. Threats include heavy grazing, which prevents seed set, recreational activities, and roadside maintenance. Fencing to exclude cattle, and light soil disturbance to stimulate colonization by seedlings, have been suggested as management measures for this species. CNPS reports of this plant in Baja California have not been verified.

In 2003, the huge Cedar Fire burned a large area of central San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 21% of habitat suitable for Laguna Mountains aster burned during the fire. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of Laguna Mountains aster.

San Clemente Island bush mallow

Malacothamnus clementinus

State:	Endangered	1982
Federal:	Endangered	1977

General Habitat:

San Clemente Island bush mallow is found on sedimentary rock walls and ridges of San Clemente Island, the southernmost of the eight Channel Islands off the coast of southern California. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island bush mallow, a member of the mallow family (Malvaceae), is a rounded, evergreen shrub with numerous ascending branches, large leaves that are lobed and hairy, and inflorescences of crowded, pink flowers.

Status:

San Clemente Island bush mallow is endemic to San Clemente Island. Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. The surviving populations of San Clemente Island bush mallow are restricted to cliffs and steep slopes that isolated them from feral goat and pig browsing. The total population of San Clemente Island bush mallow is so small that it remains critically endangered.

Currently, the U.S. Navy manages San Clemente Island. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. The Navy currently uses the island as a bombing and gunnery range. One canyon containing San Clemente Island bush mallow habitat is in an area used as a bombing impact zone, resulting in increased erosion and potentially posing a direct threat to the plants.

San Clemente Island bush mallow is grown at Santa Barbara Botanic Garden as part of their Island Display. It is also cultivated horticulturally and sold as a garden plant.

Santa Cruz Island bush mallow

Malacothamnus fasciculatus var. nesioticus

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Santa Cruz Island bush mallow grows on a dry, south-facing canyon slope on the west end of Santa Cruz Island in coastal sage scrub vegetation.

Description:

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 rose-colored flowers. Genetic studies confirm that Santa Cruz Island bush mallow is a distinct variety in the mallow family (Malvaceae).

Status:

Santa Cruz Island bush mallow, endemic to Santa Cruz Island, is known from four occurrences. Santa Barbara Botanic Garden has been conducting research on the life history and ecological requirements of the species since 1994. Their studies suggest that the plant is a long-lived rhizomatous perennial, with most recruitment occurring by means of offshoots from underground rhizomes, and little to no recruitment occurring from seed. Genetic analysis has demonstrated that each occurrence is made up of a number of shrubs; however, these shrubs represent a much smaller number of clones. The Central Valley population contains 19 individual shrubs, consisting of only three genotypes or three clones; while a second population, consisting of about 50 individuals, represents 10 clones.

Research by the Santa Barbara Botanic Garden indicates that feral pigs are the greatest threat to the long-term survival of the species. Soil loss and habitat alteration also threaten the populations. Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%). In 1997, TNC drafted operating principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Feral pig eradication efforts began in late summer, 2003.

SBBG maintains an *ex situ* population of this species, including plants from all four populations, which provides information on the growth rates of the plants, and serves as a source of seed for conservation and recovery efforts. The USFWS completed a recovery plan for Santa Cruz Island bush mallow and twelve other island plants in 1999.

Rock lady *Maurandya petrophila*

State: Rare 1982
Federal:

General Habitat:
Rock lady is found in the transition zone of the mixed desert scrub and creosote bush scrub plant communities in canyons in the Grapevine Mountains in Inyo County. It grows as scattered individuals in limestone rock crevices of steep canyon walls.

Description:
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

Status:
Rock lady is endemic to Death Valley National Park where it occurs in Titus and Fall Canyons. Only 26 individuals were documented in 1998; however approximately 700 individuals have now been located by National Park Service botanists. Suitable habitat for this species exists in other canyons and additional plants may be found. Several plants in Titus Canyon were damaged recently flames from an illegal campfire. Park Service staff removed the fire remains and cleared the site. Little is known of the ecology or population biology of rock lady.

The genus *Maurandya* is now classified as *Holmgrenanthe.*

Willowy monardella

Monardella linoides ssp. viminea

State: Endangered 1979
Federal: Endangered 1998

General Habitat:

Willowy monardella is found along drainages and floodplains in coastal sage scrub or riparian scrub. In California, it occurs primarily in the Miramar area of San Diego County. One population occurs near Arroyo Jatay in northern Baja California, Mexico. Associate species include California buckwheat, coast live oak, sycamore, California sagebrush, and mule fat.

Description:

Willowy monardella is an aromatic perennial subshrub in the mint family (Lamiaceae) with erect stems from a woody base. The leaves of this species are narrow. Pale white to rose-colored flowers are borne in dense terminal heads subtended by greenish-white, often rose-tipped bracts. This taxon can be distinguished from other members of the genus by its gray-green, hairy stem and its conspicuously gland-dotted flower bracts. Plants found in the vicinity of Otay Mountain, including the plants located during the survey, are morphologically distinct from populations in the Kearny Mesa area and may represent a distinct taxon.

Status:

About half of all known occurrences of willowy monardella in California have been extirpated. Willowy monardella is currently known from approximately 14 extant occurrences in California. The population in Baja California is threatened by land use practices. For example, coastal scrub vegetation in northern Baja California is being grazed, burned to increase grass production, and rapidly converted to row-crop agriculture or condominiums, campgrounds and resort housing.

The majority of extant sites in California are on private or Department of Defense lands, have few plants, and have not been observed in many years. A few occurrences; under the jurisdiction of the City or County of San Diego. Because willowy monardella occurs in washes and floodplains, it is highly vulnerable to changes in drainage patterns and hydrology, instream gravel mining, and flood control projects. Other threats include OHV activities, fire suppression, development of habitat, dumping, highway construction, and invasion of non-native species. Changes in hydrology also result in siltation and changes in native vegetation, such as invasion by willows, that constitute additional threats to this species.

Early attempts to translocate this plant as part of mitigation for highway construction have all failed. Another attempt at reintroduction was started in 2001 in Switzer Canyon. Willowy monardella was extirpated from Switzer Canyon as a result of changes brought about by the surrounding development. Three one-gallon size plants were installed on a sandy bank north of the creek, about 2 feet above the creek bottom. The plants were fenced to reduce rabbit predation. The status of this project is not known.

This species is covered in the San Diego Multiple Species Conservation Plan (MSCP). The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Willowy monardella is considered to be a narrow endemic species under the MSCP and 100 percent of the major populations will be conserved. This species is known from City of San Diego MSCP lands in a number of localities, most of which are in the central part of the City.

Most of the known localities were monitored by City staff or by volunteer efforts in 2001 and 2002. These localities include Sycamore Canyon, Lopez Canyon, and Marron Valley. In 2001, surveys found 247 clumps of plants: 1) two flowering clumps along a drainage in the southeast corner of lower Otay Lake on lands conserved for watershed management; 2) sixty-six clumps along drainages in the Marron Valley within a City of San Diego mitigation bank; 3) eight flowering clumps of willowy monardella in Lopez Canyon, which is highly disturbed and subject to erosion from adjacent urban development; and 4) 170 flowering clumps in Sycamore Canyon population within open space proposed for preservation. Monitoring in 2002 found a total of 302 flowering, non-flowering, and dead or dormant plants: 1) two flowering clumps at lower Otay Lake; 2) 103 plants in Marron Valley - 57 flowering, 41 non-flowering, and five dead or dormant; 3) 44 willowy monardella in Lopez Canyon, including seven flowering, 36 non-flowering, and one dead or dormant; and 4) 153 plants in Sycamore Canyon including 39 in flower, 89 non-flowering, and 25 dead or dormant plants.

Working with the Friends of Los Peñasquitos Canyon (Friends) and the California Native Plant Society (CNPS), the City of San Diego secured a grant from the U.S. Fish and Wildlife Service and the DFG to restore the hydrology of Lopez Canyon for the protection and reestablishment of willowy monardella. Currently the City and the Friends are collecting seed from various populations occurring on publicly owned land. In 2001, the Friends constructed gabion walls to prevent undercutting of the alluvial benches on which the willowy monardella occurs. The seed and other source material will be used to establish new populations. The Friends and the CNPS have already partnered to reduce other threats to the mint, including controlling exotic weeds and caging it to prevent herbivory of the rare flowers and seed by wildlife. In addition, both groups have been conducting annual censuses of the plants for about seven or eight years. The City's MSCP staff has joined the groups in surveying these plants in the last several years. The Friends and CNPS have also helped survey other known and potentially new populations of this plant on the County's Goodan Ranch, the City's General Dynamics Open Space, Marine Corps Air Station Miramar, and the Otay area.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 6% of habitat suitable for willowy monardella burned during the fires. The impacts of the Otay fire were analyzed according to personal communications; areas around Proctor Valley and Otay Lakes had burned but that Otay Mesa and Marron Valley had not burned. Post-fire monitoring will be necessary to assess any long-term effects of the fire on willowy monardella.

The City of San Diego is currently soliciting proposals to develop a fire management plan for the Marron Valley MSCP Cornerstone Lands. Based on an assessment of resources and issues, the Marron Valley Fire Management Plan (FMP) will identify and prioritize measures to preserve biological resources during fire prevention and control activities onsite. The Fire Management Plan will be approval by the City of San Diego and the DFG and funded by

DFG. The FMP will outline methods for fire suppression while maintaining responsibility for species and habitat protection in the event of a fire.

Few-flowered navarretia

Navarretia leucocephala ssp. pauciflora

State: Threatened 1990
Federal: Endangered 1997

General Habitat:

Few-flowered navarretia occurs in drying vernal pools on volcanic substrate, usually volcanic ash, in the north coast ranges of Lake and Napa counties. Volcanic ash vernal pools have always been a rare habitat in California.

Description:

Few-flowered navarretia is a small, annual herb in the phlox family (Polemoniaceae). This plant grows 1-4 inches in height, either unbranched or with a few short, spreading branches. Its stems are white with purple streaks. The tiny white or pale blue flowers occur in clusters and bloom in June.

Status:

Few-flowered navarretia is primarily threatened by degradation or loss of its vernal pool habitat. Damage or destruction of vernal pool habitat happens quickly and easily due to the extremely crumbly nature of the soil and the dependency of the pool upon an intact durapan or impermeable subsurface soil layer. Degradation of vernal pool habitat can lead to the invasion of non-native species such as star thistle, which compete with native species for water, sunlight, and space. Further information is needed on the effect of competition on few-flowered navarretia.

Few-flowered navarretia is known from six sites in Lake and Napa counties. Five of those sites are on private land, and several are threatened with habitat loss and degradation. The current status of few-flowered navarretia at these sites is unknown.

The sixth site occurs on the DFG's Loch Lomond Ecological Reserve. However, the plants at this location appear to be the result of hybridization with another state-listed species, many-flowered navarretia *(Navarretia leucocephala* ssp. *plieantha)*. Further information is needed on the extent and effect of hybridization at this site.

This species is included in the USFWS Vernal Pool Recovery Plan.

Many-flowered navarretia

Navarretia leucocephala ssp. plieantha

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Many-flowered navarretia is found in dry meadows, along the margins of volcanic ash vernal pools and lakes and in open wet ground in forest openings in Lake and Sonoma counties.

Description:

Many-flowered navarretia, a member of the phlox family (Polemoniaceae), is a prostrate, spiny annual herb with widely spaced, narrow leaves, forming mats that range from 2-8 inches wide. From May to June, heads of small white to blue flowers bloom at the ends of stems.

Status:

Many-flowered navarretia is known from only a few locations in Lake and Sonoma counties. Historically, about eight sites for many-flowered navarretia were known: two are now protected, four are on private land, and two have been extirpated. The status of the four occurrences on private land is unknown. The primary threat to this species is degradation or loss of vernal pool habitat. Damage or destruction of vernal pool habitat happens quickly and easily due to the extremely crumbly nature of the soil and the dependency of the pool upon an intact durapan or impermeable subsurface soil layer. Off-highway vehicle use has resulted in the destruction of plants and habitat at several sites in Lake County. Attempted drainage of a pool in Lake County containing many-flowered navarretia resulted in the invasion of two competitive weeds, yellow star-thistle (*Centaurea solstitialis*) and medusahead (*Taeniatherum caput-medusa*).

One occurrence is protected at the DFG's Loch Lomond Ecological Reserve in Lake County. DFG provided fencing at this site to prevent off-highway vehicle entry into the area. However, the plants at this location appear to be the result of hybridization with another state-listed species, few-flowered navarretia *(Navarretia leucocephala* ssp. *pauciflora)*. Further information is needed on the extent and effect of hybridization at this site. TNC and DFG own another Lake County occurrence, at Boggs Lake. In 1997, surveys revealed a large population of many-flowered navarretia, perhaps because it was a good rainfall year.

This species is included in the Vernal Pool Species Recovery Plan currently being finalized by the USFWS.

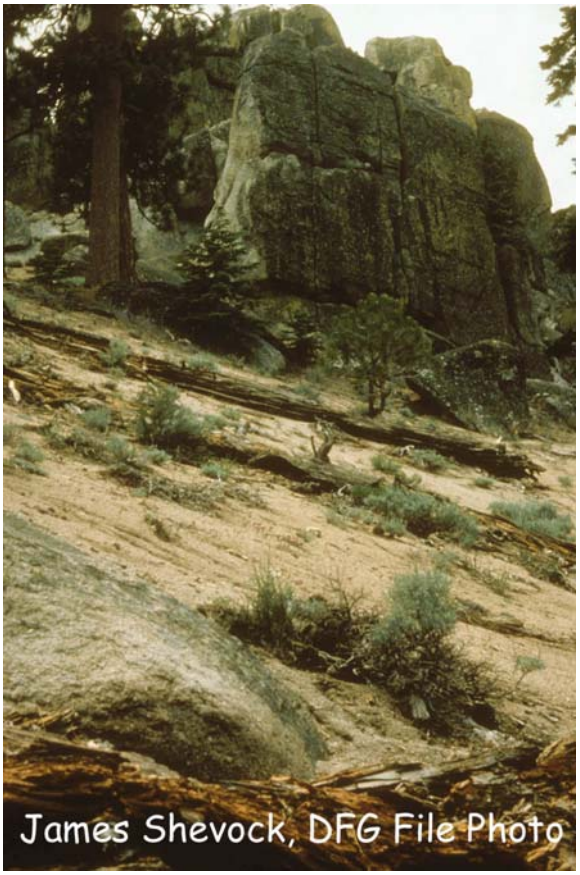
Twisselmann's nemacladus

Nemacladus twisselmannii

State: Endangered 1979
Federal: Threatened 1997

General Habitat:

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. It occurs on steep slopes with sulphur flower buckwheat, ivesia, lupine and monkeyflower.



Description:

Twisselmann's nemacladus is an inch-high, gray, hairy annual herb with basal leaves in rosettes, and small, short stemmed, white flowers.

Status:

Twisselman's nemacladus is known from two occurrences on Sequoia National Forest lands. The populations are relatively inaccessible with no visible threats. One occurrence is within the Domeland Wilderness Area. DFG has no recent information on the status of this plant.

Colusa grass *Neostapfia colusana*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

This grass occurs only on the mud of large or deep vernal pools in Merced, Stanislaus, Solano, and Yolo counties. Associated species in some locations include State and federally listed hairy Orcutt grass and San Joaquin Valley Orcutt grass. Other associated species include dove weed, coyote thistle, blue-curls, popcornflower, and goldfields.

Description:

Colusa grass is a coarse, pale green, sticky, aromatic annual member of the grass family (Poaceae). Its loosely folded, clasping leaves, and thick, cylindrical terminal spikes of flowers are characteristic of the species.

Status:

Colusa grass has been extirpated at its type locality in Colusa County and at many other sites. Most of the remaining populations continue to be variously threatened by agricultural land conversion, herbicide contaminated runoff, and competition from introduced weedy species that tend to displace Colusa grass. Conversion of habitat to agricultural use eliminated the first-discovered population in Colusa County and at least 7 populations have been eliminated in Merced and Stanislaus counties. All populations exist on private lands, with the exception of one found on Castle Air Force Base in Merced County and one on McClellan Air Force Base in Yolo County. Two populations are currently protected at the Jepson Prairie Preserve in Solano County and at the Flying M Ranch in Merced County, where conservation easements protect some of the large vernal pools.

Heavy grazing and trampling, agricultural conversions, and competition from introduced weedy species are ongoing threats. Protection measures for this species are expected to be included in the FWS California vernal pool species recovery plan. Critical habitat has been proposed for Colusa grass and other vernal pool species. The proposal is still under review by FWS. Colusa grass is a covered species in the Habitat Conservation Plan for the Natomas Basin in Sacramento and Sutter Counties.

Amargosa nitrophila *Nitrophila mohavensis*

State: Endangered 1979
Federal: Endangered 1985

General Habitat:

Amargosa nitrophila is found in open alkali flats and 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. It is associated with salt grass, Tecopa bird's-beak, shadscale, and western nitrophila.

Description:

Amargosa nitrophila is a small, erect perennial in the goosefoot family (Chenopodiaceae). This compact plant has smooth, pinkish stems with rounded, opposite leaves which clasp the stems and minute rose-colored flowers at the base of the leaves. It flowers during the late spring. It is distinguished from western nitrophila by its shorter stature and smaller, overlapping leaves.

Status:

Amargosa nitrophila is known from two occurrences in California and one in Nevada. The species listed as Critically Endangered in Nevada and is listed as a Special Status Species by BLM. Maintenance of natural hydrological regimes is essential to this species' survival. Threats to this species include mining exploration, water pumping for mining activities, road maintenance, trash dumping, and development of adjacent property.

Personnel from the Soil Ecology and Restoration Group (SERG) at San Diego State University are conducting a study of the hydrologic and biologic parameters of Amargosa nitrophila and the threatened Ash Meadows gumplant in the Lower Carson Slough area of Death Valley. The study includes the determination of water usage by both plant species, i.e., ground water versus overland water flow; a survey of potential habitat for the species; mapping of the perimeters of each such occurrence using a Global Positioning System (GPS); developing a complete list of all vascular plants occupying the areas of occurrence; and an assessment of the physiological tolerance of the species to desiccation. SERG will develop guidelines for propagation and transplantation of nursery stock and long term management practices for the two species.

Dehesa nolina *Nolina interrata*

State: Endangered 1979
Federal: None

Stephen P. Rae, DFG File Photo

General Habitat:
Dehesa nolina occurs in open mixed chaparral and chamise chaparral in a limited area of southwestern San Diego County and adjacent Baja California, Mexico. Most populations occur on ultramafic soils derived from gabbro and metavolcanic rocks. Associate species include chamise, manzanita, and Parry's tetracoccus. When found on clay soils derived from gabbro, it is often associated with other rare plants such as Gander's butterweed (State – Rare), chocolate lily, felt-leaved monardella, and San Diego thornmint (State – Rare; Federal –Threatened).

Description:
Dehesa nolina is a large, yucca-like perennial with rosettes of long, flat leaves and tall, much-branched flower stalks to approximately five feet in height. The white male and female flowers occur on separate plants. Dehesa nolina does not flower every year and may require fire or other disturbance to induce flowering.

Edward S. Ayensu
Courtesy of the Smithsonian Institution

Status:
Dehesa nolina is known from five occurrences in San Diego County and three small occurrences in Baja California Norte. In Baja California, the species ranges as far south as Ensenada (Rancho de la Cruz). One population is about 16 km (10 mi) northeast of La Mision. Both of these disjunct Mexican populations have fewer than 25 individuals each. Another population has recently been discovered in Mexico closer to the United States border, and it appears to be of comparable size to the other Mexico population.

About two-thirds of all populations, and 90-100 percent of all major populations, are protected on reserve lands owned and managed by The Nature Conservancy (TNC) at McGinty Mountain and by the California Department of Fish and Game (CDFG) at Sycuan Peak. The protection afforded by the establishment of the Sycuan Ecological Preserve occurred subsequent to the proposal to federally list the species. This proposal was subsequently dropped due to the protection afforded the species at McGinty Mountain and Sycuan Peak. The few remaining populations are small and are on private lands. Populations on private lands are protected under provisions of the San Diego County MSCP that require avoidance of narrow endemic species to the maximum extent possible. The County's Biological Mitigation Ordinance requires encroachment to be limited to 20 percent of the population on site for impacts that cannot be avoided. Dehesa nolina is covered by the MSCP based on conservation of 100 percent of the McGinty Mountain population, 90-100 percent of the Sycuan Peak, and 80-100 percent of the Dehesa Peak population under this plan. At least 1,000 individuals, associated with mafic chaparral were recorded on McGinty Mountain, with a large population to the southwest of the saddle of the mountain. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

The habitat in which it occurs is adapted to fire and Dehesa nolina sprouts vigorously following fire. Near the Dehesa School, a series of fires have left stands of this Nolina in disturbed annual grassland. This species reproduces primarily asexually and form large clones. For example, one of the Dehesa Valley populations is considered to be a single female clone that has an extent of one-quarter acre or more. Consequently, the exact number of individual plants is not known and would be difficult to determine without genetic analysis.

Studies are needed to determine the role of wildfire management and/or prescribed burning with respect to reproduction in populations of Dehesa nolina and the sexual demography of the major populations. Wildfire has been noted to induce mass flowering in populations of Dehesa nolina and related species, but fire frequency and its role in establishment and perpetuation of the species has not been studied. Fire suppression and alteration of natural fire periodicity, season, and intensity may have various adverse effects on this species. Fire suppression measures are intensified in undeveloped areas near population centers. The natural period between fires in these areas may be altered. Fire suppression activities may also affect the vegetation. High fire frequencies prevent young plants from reaching reproductive maturity and will result in population declines or extirpation once the underground seed bank has been depleted. In other cases, the reduced frequency of fire due to fire suppression programs can adversely affect the viability of plant populations by reducing genetic diversity.

In 2003, the huge Otay Fire burned a large area of south-central San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 25% of suitable habitat in the foothills east of El Cajon and north of Alpine burned during the fire. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of Dehesa nolina.

Dehesa nolina is threatened by development and collecting for the nursery trade. The species is considered Vulnerable by IUCN and has been listed on Appendix I of CITES since 1983.

Eureka Dunes evening-primrose

Oenothera californica ssp. eurekensis

State:	Rare	1978
Federal:	Endangered	1978

General Habitat:

Eureka Dunes evening-primrose is endemic to the Eureka Valley in Inyo County. It grows in flat to gently sloping sand areas bordering larger desert sand dunes, at 2860-3840 ft elevation.

Description:

Eureka Dunes evening-primrose is a perennial herb in the evening primrose family (Onagraceae). During wet years, the plants develop from the roots, forming dense rosettes of leaves. When a leafy flower shoot is covered by windblown sand, roots sprout from the sides and a new rosette of leaves forms at the tip. The large, showy flowers, blooming from April to July, are white and fade to red with age, producing abundant, long-lived seeds. After setting seed, the stems break off and the plants grow from the roots again during the next wet year.

Eureka Dunes evening-primrose is associated with two other plant species endemic to the Eureka Dunes, Eureka Valley dunegrass (*Swallenia alexandrae*), although the grass generally grows much higher on the dunes, and Eureka milkvetch (*Astragalus lentiginosus* var. *micans*).

Status:

Eureka Dunes evening-primrose is known from several occurrences, all confined to the southern portion of Eureka Valley within Death Valley National Park. The populations vary tremendously based upon rainfall: in 1997, only 20 individuals were observed around the main dunes; in 1998, a high rainfall year, extensive fields of evening-primrose were observed around the entire main dune system.

The closure of the dunes to OHVs in 1976 greatly reduced the primary threat to the species, sand disturbance and destruction of plants by OHVs. However, occasional illegal OHV activity still occurs, and a new, legal recreational activity, sandboarding, now poses similar threats. Expansion of Russian thistle, a non-native invasive species that became established on the dunes during the period of intense disturbance by OHVs prior to closure to such vehicles, also threatens the habitat. The plant populations currently appear to be stable; however, increased recreational use of the dunes could quickly degrade the habitat.

Eureka Dunes evening-primrose is covered under the 1982 USFWS Eureka Valley Dunes Recovery Plan.

Objectives of the plan include protecting the species from human threats, and conducting adequate monitoring of remaining populations. Implementation of the first objective has been quite successful through the closure of the dunes to OHVs. The second objective is not currently being implemented.

In 1998, the USFWS withdrew the proposed rule to list *Astragalus lentiginosus* var. *micans* (shining milk-vetch) as threatened, based on the *de facto* protection it already receives because of the overlap of its habitat with Eureka Dunes evening-primrose and Eureka Valley dune grass, making the protection of these State- and Federally-listed dune species and their habitat essential also to the protection of this rare milk-vetch.

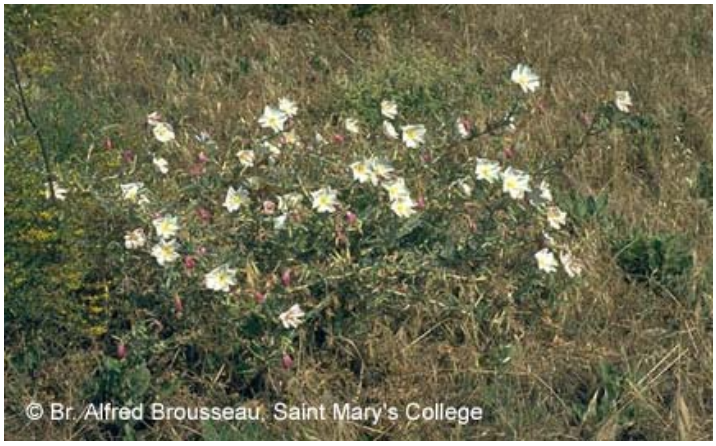
Antioch Dunes evening-primrose

Oenothera deltoides ssp. howellii

State: Endangered 1978
Federal: Endangered 1978

General Habitat:

Antioch Dunes evening-primrose occurs in loose sand in semi-stabilized dunes along the San Joaquin River near Antioch in Contra Costa County and at Brannan Island State Recreation Area. Its habitat at the Antioch Dunes unique and constitutes a remnant of a unique dune system. Vegetation consists of scattered native herbaceous plants and grasses on the dunes. Common native plants in the dunes include elegant clarkia, California poppy, California croton, gumplant, deerweed, California matchweed, and silver bush lupine. The Contra Costa wallflower, a federally-listed endangered species, occurs here as well. Many of the plants that comprise the unique stand have desert affinities.



Description:

Antioch Dunes evening-primrose is a short-lived perennial plant in the Evening-primrose Family (Onagraceae). It forms large, highly-branched clumps with drooping stems and grayish toothed or divided leaves. The leaves have numerous short hairs. The white flowers bloom from March to September. Petals are about one inch long, and the stamens are yellow. This species can be confused with *Oenothera deltoides* ssp. *cognata*, which grows in the Oakley area southeast of the Antioch Dunes. Leaves in the latter species are rarely toothed.

Status:

The Antioch Dunes evening-primrose is restricted to two areas, the Antioch Dunes National Wildlife Refuge (Refuge), the native site, and Brannan Island State Recreation Area where seed were introduced in 1969. The historic range of the species is not known. The Refuge, which consists of 55 acres of stabilized sand dunes, was established in 1980. Along with the adjacent 12 acres of Pacific Gas and Electric Company (PG&E) land, the site is a relict of what was once a larger dune system that hosted a unique assemblage of plants, insects, and reptiles. The Refuge provides protection and critical habitat for three endangered species: Lange's metalmark butterfly (*Apodemia mormo langei*), Contra Costa wallflower (*Erysimum capitatum* ssp. *angustatum*), and Antioch Dunes evening-primrose (*Oenothera deltoides* var. *howellii*). The Final Comprehensive Conservation Plan for the Antioch Dunes National Wildlife Refuge was released by the USFWS in 2002.

The evening-primrose has been continuously monitored at the Refuge since the 1980s. From 1984 to 1991, the

total evening-primrose population was estimated to range from 4,300-5,800 individuals. In 1992, the USFWS observed a dramatic decline to 1,200 individuals and began outplanting evening-primrose seedlings. In 1997, the evening-primrose population reached a low of 455 individuals. This marked the 11th year of general decline in the number of evening-primrose at the Refuge since 1986. In 1998, the downward trend in the evening-primrose population ended and increased to 785 individuals. Evening-primrose plantings in December 1997 were probably a bigger factor in this increase than natural reproduction. The evening-primrose is still declining, and outplanting continues today.

A number of management strategies for the evening-primrose are presented in the Refuge Conservation Plan. These include 1) propagation and outplanting on the Refuge to prevent extinction until the populations are self-sustaining; 2) hand weeding or raking a 1½ foot radius around each outplanted evening-primrose to improve germination rates; 3) continuing research to determine the best means to optimize seed production, viability, germination, seedling survival, and reproduction; and 4) outplanting evening-primrose grown from the seed of plants at the Brannan Island SRA or the Regional Parks Botanic Garden at Tilden Regional Park to encourage genetic diversity.

Antioch Dunes evening-primrose was transplanted to Brannan Island State Recreation Area in 1969. Brannan Island is located about 16 miles north of the Refuge along the Sacramento River, Jackson Slough, and Three Mile Slough. The evening-primrose was planted on dredge spoils on the southern part of Brannan Island. This site now supports a self-sustaining population of the evening-primrose. The area surrounding the original planted evening-primrose has been fenced although plants have established outside of the fenced area. Plants are now seen at the edges of pathways and along the beach. The new locations are not aligned with the existing population and prevailing winds on the island; seeds, therefore, were not likely to have been distributed by wind. DPR staff believe that rabbits have spread the seed through their digestive tracts. Park personnel have noted that the evening-primrose seem to do better in these areas of disturbance. Antioch Dunes evening-primrose has also been grown at the East Bay Regional Parks Botanic Garden at Tilden Regional Park in Berkeley since 1970, and introduced to Point Reyes National Seashore, and Brown's Island in the Delta. Of these sites, the evening-primrose persists only at Tilden Regional Park.

The principal threats to the Antioch Dunes evening-primrose include loss of ecosystem function, loss of habitat, habitat fragmentation, and decreased genetic diversity. Although considerable evidence indicates that the dunes were stabilized in historic times with the "blowout areas" supporting the evening-primrose, the major threat to the evening-primrose is the invasion of nonnative vegetation such as yellow starthistle and ripgut brome. A reservoir of moving sand is essential to maintain the dynamic ecology of the dunes, as moving sand opens areas for the establishment of seedling plants.

Nonnative vegetation leads to lower germination and seedling survival rates and has been identified as the leading problem for the endangered species and the dune ecosystem habitat at Antioch Dunes.
Because the evening-primrose prefers disturbed sites with nearly pure sand, it is vulnerable to encroachment from nonnative weedy species. No evening-primrose seedlings were found around mature plants that were surrounded by weed species. However, seedlings were found near about 40 percent of mature plants that were not surrounded by weed species. Nonnatives compete with the evening-primrose seedlings for water and light, resulting in reduced seedling germination and survival. Removal of nonnative weeds around adult evening-primrose plants enhanced germination rates. Weeds also have a negative impact on seedling germination success because they stabilize the dunes.

The positive relationship between disturbance and seedling survivorship has been demonstrated for plants grown under cultivation. Evening-primrose seedlings germinated more readily in sand when the sand was disturbed and turned over. Strategies to introduce a disturbance regime to the Antioch Dunes, while limiting weed invasion, are essential to the survivorship of the evening-primrose and other similarly-adapted plants.

Weed control activities have been somewhat successful at controlling non-native grasses and starthistle. The Refuge then conducted its first prescribed burn in 1997 and burned about 12 acres total. The goal was to burn this acreage for three constructive years to kill the nonnative weeds and reduce their seed bank. Persistent starthistle was spot treated with Round-up®. As of 1999, the treated areas had been burned for three consecutive years and were recently replanted with native vegetation. The burned areas showed promising though mixed results. Although the evening-primrose and other native plants responded positively. Non-native weeds such as filaree and vetch quickly reestablished in the burned areas. Vetch is now being controlled with herbicide. Starthistle has been effectively controlled through three years of prescribed burning. During firebreak construction, Refuge staff found that the native plants, including the evening-primrose, responding more favorably to open space created by scraping (by bulldozer) than by burning.

Mammals are known to eat evening-primrose. Although the specific animal has not yet been identified, it is presumed to be a subterranean animal, probably a rodent. The animal eats roots, leaving evening-primrose severed at the tap root, effectively killing the plant. There has also been evidence of mammals eating the above ground portions of the plant. Three insect predators have been identified for the evening-primrose. One is a moth that feeds on growing tips but does not seem to limit the evening-primrose's ability to be self-sustaining. Another moth grazes in the interior of evening-primrose stems, but also does not have a major effect. However, a leaf eating beetle, reduces plants to skeletons in early summer, and does present a potential threat to the sustainability of the evening-primrose population.

Ongoing research is examining pollinators of the Antioch Dunes evening-primrose and pollination ecology as possible factors relating to low seed production. Although not known from the Antioch Dunes until 1983, hawk moths have been observed visiting the evening-primrose. Hawk moths are reported as pollinators of other species of evening-primrose, but their role in pollinator of the Antioch Dunes evening-primrose has not been documented. Researchers believe that bees are the actual pollinators of this species. Studies are needed to determine the phenology and pollinators of this evening-primrose.

Researchers have examined the seed bank of this species and found it to be lower than that of other endemic species in the Antioch Dunes. The absence of a large seed reservoir potentially makes the evening-primrose highly susceptible to random extinction events. Potential factors that may limit evening-primrose reproduction include low genetic variation and limited pollinators. Seed production was not considered a limiting factor for evening-primrose reproduction. Researchers also studied the seed bank dynamics, seed production, and seedling demography to assess the limitations on evening-primrose growth. They found that more than half the ovules produced failed to become seeds because effective pollinators were not available. Their work also indicated that substrate makeup and exposure were not critical to evening-primrose seed germination, though competition with ripgut brome for light and moisture was. Although substrate makeup was not critical for seedlings to germinate, they found that evening-primrose only reached reproductive maturity on sandy soils. Evening-primrose produced many viable seeds, but seed output production over two years ranged from 26 percent to 37 percent of the maximum. Other factors, such as weather and pre-dispersal seed predation, also contributed to lowered seed production, but lack of pollinators was believed to play a prominent role.

The USFWS is continuing to propagate the evening-primrose. During seed collection, no more than five percent of the seeds are collected from Refuge plants for propagation. These seeds are grown in a nursery during the fall for planting on the Refuge in the winter. In the 1999-2000 season, the USFWS propagated and planted 835 evening-primrose to augment the wild population. In 2000, the USFWS completed construction of an additional greenhouse at the San Francisco Bay National Wildlife Refuge Complex to accommodate an increased quantity of endangered plant propagation. The new greenhouse is dedicated to the propagation of endangered plants of Refuge. With its increased capacity, the Refuge will be able to meet its endangered plant restoration needs in-house.

Bakersfield cactus *Opuntia basilaris* var. *treleasei*

State: Endangered 1990
Federal: Endangered 1990

General Habitat:

This species grows on coarse, cobbly, well-drained granitic sand on bluffs, low hills, and flats in the valley and foothills of Kern County. It is a characteristic species of the Sierra-Tehachapi Saltbush Scrub plant community, but populations near Caliente are in Blue Oak Woodland and the Cottonwood Creek population is in riparian woodland. Many sites for Bakersfield cactus support a dense growth of red brome and other non-native annual grasses. Sand Ridge is characterized by sparse vegetation and a preponderance of native species such as California filago and yellow pincushion.

Description:

Bakersfield cactus is a succulent member of the cactus family (Cactaceae) with large, showy magenta flowers that bloom from March through June. It is perennial fleshy flattened with gray-green pads. The pads of Bakersfield cactus vary in outline from rounded, heart-shaped, or diamond-shaped to nearly cylindrical. A single plant may consist of hundreds of pads, which originate both at ground level and from the tips of other pads. The pads and fruits are dotted with eye-spots, which are rounded structures that contain barbed bristles. Tiny leaves are produced on the youngest pads of beavertail cacti, but are quickly shed. The dry fruits are the size and shape of small eggs and may contain grayish-white seeds. Seed production is not common.

Status:

Bakersfield cactus once formed extensive colonies in the area around Bakersfield, extending up the Kern River Canyon to the northeast, through the Caliente Creek drainage to the southeast, and to the Tejon Hills, about 20 miles to the south. Much of the historical habitat for the species has been destroyed by impacts associated with human activities. Of the more than 40 occurrences of this species, over 14 are extirpated.

This variety grows in dense patches with many of its leaves overlapping with those of adjacent plants, making accurate individual counts difficult. This plant is measured as collections of pads that all appear to root at the same location or clusters to deal with this difficulty.

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, OHV activity, dumping, and sand mining have contributed to the decline of this species and destruction of its habitat throughout its range. Dense stands of non-native grasses compete with Bakersfield cactus. In wet years, these invasive grasses cover the cactus, and when dry, greatly increase the likelihood and destructiveness of wildfires. The grasses may reduce vegetative reproduction of the cactus by preventing broken pads from contacting and rooting in the soil. In 1995, extensive die-back in some populations was discovered, perhaps caused by high rainfall during the winter of 1994-1995.

In 1997, three important areas of Bakersfield cactus habitat were acquired as mitigation under the Metropolitan Bakersfield HCP. These parcels are being managed for Bakersfield cactus. Protection measures for Bakersfield cactus are included in the USFWS *Draft Recovery Plan for Upland Species of the San Joaquin Valley, California*, completed 1998. Bakersfield cactus will be covered under the proposed Kern County Valley Floor Habitat Conservation Plan. It is also addressed in the Bureau of Reclamation Central Valley Project endangered species conservation program.

California Orcutt grass *Orcuttia californica*

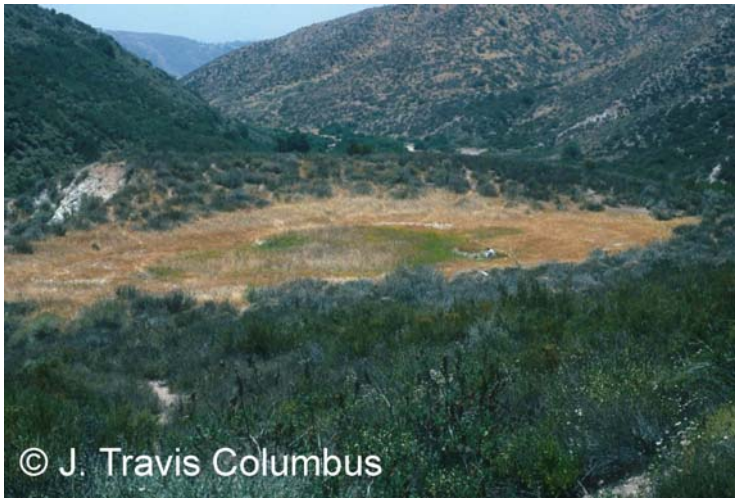
State: Endangered 1979
Federal: Endangered 1993

General Habitat:

California Orcutt grass occurs in volcanic terrace and vernal pool systems from Ventura County south to Baja California, Mexico. California Orcutt grass is restricted to deep pools in the vernal pool system in association with woolly marbles, navarretia, and mouse-tail.

Description:

California Orcutt grass is a bright green, aromatic, and densely tufted annual grass in the Grass Family (Poaceae). During the wet season, California Orcutt grass produces a set of aquatic leaves that float on the pool surface. After the pools dry in the summer, a new set of foliage emerges and lasts for one or two months until flowering and fruiting are complete. California Orcutt grass blooms from April through June and appears to be strongly adapted to wind pollination. After dying, California Orcutt grass remains intact and upright until falling apart in heavy rains. Seeds formed the previous summer are then released. Seeds can remain dormant for at least three to four years, germinating in the spring only after flooding of the vernal pools.



Status:

California Orcutt grass is declining throughout its range. Vernal pools supporting California Orcutt grass are threatened by destruction and fragmentation from urban and agricultural development, pipeline construction, alteration of hydrology and flood plain dynamics, excessive flooding, off road vehicle activity, trampling by cattle and sheep, weed abatement, fire suppression practices (including discing and plowing), and competition from alien plant species. Maintaining adequate vernal pool diversity to allow for population dynamics is critical to this species. California Orcutt grass was once found in the volcanic terrace and vernal pool system in Ventura, Los Angeles, Riverside, and San Diego Counties in southern California. Of the 30 known locations for this species, at least half represent historic or extirpated sites.

The number of individual California Orcutt grass plants varies annually in response to the timing and amount of rainfall and temperature. It found in deeper portions of vernal pools and less frequently on pool margins. Pools that have prolonged flooding appear to support larger colonies of California Orcutt grass than do shallower pools.

Studies of other *Orcuttia* species indicate that the number of seeds produced per plant is highly variable within a population and variation in seed production between seasons can vary by two- or three-fold. Researchers have found that optimal seed germination occurs when seed are covered by fungus and under conditions of low oxygen (anaerobic conditions).

California Orcutt grass is found in southwestern California from eastern Ventura County east through Los Angeles County to Riverside County, and south to San Diego County from near sea level over 2000 feet. California Orcutt grass is known from a single vernal pool complex in Ventura County, a vernal pool complex at Cruzan Mesa and in Plum Canyon in Los Angeles County, and several vernal pool complexes in San Diego County. Four of these populations in San Diego County are on Otay Mesa. An additional two populations on Otay Mesa have been extirpated and at least four additional populations in the Los Angeles basin have also been extirpated. A report of California Orcutt grass from the vicinity of Newhall, Los Angeles County, has not been verified.

California Orcutt grass is also known from three vernal pool sites in Riverside County: Upper Salt Creek west of Hemet, Skunk Hollow, and the Santa Rosa Plateau. On the Santa Rosa Plateau, this species is found in two of the five vernal pools on Mesa de Colorado and in four of the six vernal pools on Mesa de Burro. This species is also known to occur in Murrieta and near Menifee. Historic sites were mapped at Salt Creek west of Menifee and at Murrieta Hot Springs. A mapped locality west of the Santa Rosa Plateau, possibly in Tenaja Canyon and a recently mapped population at the intersection of Borel Road and Benton Road require verification. California Orcutt grass has been recorded from several locations in northwestern Baja California, Mexico, primarily in the vicinity of Cabo Colnett and at Valle de las Palmas.

Protection measures for California Orcutt grass are provided in the USFWS *Recovery Plan for Vernal Pools of Southern California*, released in 1998. This species is covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border, the San Diego Multiple Habitat Conservation Program NCCP, and in the Western Riverside MSHCP. In 1998, San Diego was awarded $43,000 for the restoration of degraded vernal pools in Otay Mesa. A vernal pool restoration plan was completed and approved, and work began to restore over 17,000 square feet of vernal pool surface area on a 2.5 acre parcel.

California Orcutt grass conservation objectives are included in the 2003 Western Riverside MSHCP. The objectives require inclusion of at 6600 acres of suitable habitat in a minimum of three known locations of California Orcutt grass within the conservation planning area and annual surveys in areas of suitable habitat. In addition, watersheds at three vernal pool complexes would be protected. At the current time, Core Areas for California Orcutt grass in the Western Riverside Plan Area are located within the upper Salt Creek drainage west of Hemet and on the Santa Rosa Plateau. A Core Area is a block of habitat of sufficient size and configuration to support a sensitive species. This species can be difficult to detect as the vernal pools it inhabits may receive enough water to germinate and grow the plants only two or three times a decade. Therefore, surveys conducted during years of rainfall inadequate to germinate the species may not result in detection. Competition with other vernal pool species may also be a significant factor in the distribution of California Orcutt grass.

The Skunk Hollow vernal pools in Riverside County receive protection by inclusion in a reserve established within an approved mitigation bank in the Rancho Bella Vista Habitat Conservation Plan Area. Management actions undertaken in the Skunk Hollow watershed benefit the endangered Riverside fairy shrimp, threatened spreading navarretia, and California Orcutt grass, all of which are included as protected species under the HCP.

Additional protection for California Orcutt grass in Los Angeles County came with the proposal to designate the Cruzan Mesa vernal pools as a Significant Ecological Area (SEA). The proposed SEA is at the southeastern end of the Liebre Mountains, north of the Santa Clara River, and southeast of Bouquet Canyon. The proposed SEA boundaries encompass the watershed and drainages of the Cruzan Mesa and the Plum Canyon vernal pools as a single ecosystem within the SEA. The Cruzan Mesa vernal pools lie within an elevated, closed basin atop an

eroded foothill between Mint and Bouquet canyons while the Plum Canyon vernal pool is situated in a basin formed by a landslide. The proposed SEA supports a number of sensitive plant and animal species in addition to California Orcutt grass, including the federally threatened prostrate navarretia, federally endangered Riverside fairy shrimp, western spadefoot toad, and possibly also the federally threatened California gnatcatcher.

Specific management practices are recommended for the proposed Cruzan Mesa Vernal Pools SEA. These include a prohibition on development that alters the ground surface within the watershed of the pools; limiting development to areas in which the pools are not located; maintaining viable populations of the sensitive species found in the SEA; retaining connectivity between Cruzan Mesa and Plum Canyon vernal pools; and, establishing buffers around the sensitive habitats.

San Joaquin Valley Orcutt grass

Orcuttia inaequalis

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

San Joaquin Valley Orcutt grass is found in naturally occurring, widely scattered vernal pool complexes in Fresno, Madera, Merced, Tulare, and Stanislaus counties in the northeastern San Joaquin Valley. It is primarily endemic to larger vernal pools that range in area from 1,500 sq ft to 12.1 ac in size and 12 in to 22 in deep. These pools form on acidic soils that vary in texture from clay to sandy loam on a variety of geological surfaces. The impermeable layer at historical or extant pools includes iron-silica cemented hardpan, basalt from ancient volcanic flows, and alluvium derived from volcanic tuff. San Joaquin Valley Orcutt grass is associated with Colusa grass, Boggs Lake hedge-hyssop, and succulent owl's-clover, all of which are State listed as endangered.

Description:

San Joaquin Valley Orcutt grass is a small, aromatic, tufted annual in the grass family (Poaceae). The plant has several stems 2 to 6 inches tall, ending in a spike-like inflorescence. The foliage is grayish, with soft, straight hairs. At maturity, the spikelets of the plant are aggregated into a dense, hat-shaped cluster. This feature separates San Joaquin Valley Orcutt grass from other members of the genus *Orcuttia*. Although San Joaquin Valley Orcutt grass is geographically isolated from all other members of the genus, it closely resembles the endangered Sacramento Orcutt grass (*Orcuttia viscida*).

Status:

San Joaquin Valley Orcutt grass is known primarily from a 36-mile-long strip in Fresno, Merced, and Madera counties where the species has declined due to agricultural conversion, such as to vineyards, and urban development. The species has declined mainly due to severe habitat loss caused by agricultural and urban development. Because the human population of the Central Valley is growing rapidly, numerous populations of Orcutt grasses, including San Joaquin Valley Orcutt grass, have been extirpated and continue to be threatened by

urban development projects. It is the only Orcutt grass restricted to the San Joaquin Valley. Of the 50 occurrences of San Joaquin Valley Orcutt grass currently reported in CNDDB, 30 occurrences are presumed extant; 17 are considered extirpated; and three others are possibly extirpated because the habitat has been lost. Of the occurrences that are presumed to still be extant, two are in Fresno County, seven are in Madera County, 23 are in Merced County, and one is in Tulare County. This species has been extirpated from Stanislaus County where it was once known from seven occurrences. Two populations of San Joaquin Valley Orcutt grass occur on federal land: a natural population managed by BLM and a translocated population on BLM land. Of the known populations on private land, five are protected through conservation easements with The Nature Conservancy (TNC) on the Flying M Ranch in Merced County. In Fresno County, TNC also protects the Table Mountain site.

The regional study area for the U.C. Merced campus harbors 23 (77 percent) of the 30 extant occurrences of San Joaquin Valley Orcutt grass. These 23 occurrences are located exclusively on rangelands and are concentrated in the central eastern portion of the study area, primarily at the Flying M and Ichord Ranches and the Smith Trust lands. The three newly discovered occurrences at the Ichord Ranch were found in three large vernal pools in widely separated locations. Numerous large vernal pools were identified during the 2001 surveys of the study area as providing potentially suitable habitat for San Joaquin Valley Orcutt grass. Most of these sites are located in the central and southern portions of the survey area (from the Flying M Ranch south) rather than the hilly terrain in the northern portion of the study area. The hilly terrain generally precludes the development of large vernal pools. Only three pools at one ranch (Ichord) were, however, found to support the species. Poor hydrologic conditions during the survey period may have limited detection of San Joaquin Valley Orcutt grass and additional surveys should be undertaken during a season with higher rainfall.

The specific vernal pool features that determine the suitability for San Joaquin Valley Orcutt grass germination, growth, and successful reproduction are unknown. Conserving a broad distribution San Joaquin Valley Orcutt grass across its geographical and elevational distribution would protect a mosaic of habitat types both between and among vernal pools that is essential to long-term survivorship of the species. The Critical Habitat document provides specific habitat components that constitute critical habitat for San Joaquin Valley Orcutt grass. These elements include: 1) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths; and 2) The associated watershed(s) and hydrologic features, including the pool basin, swales, and surrounding uplands that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool inundation, water quality, and soil moisture for germination, growth and reproduction, and dispersal. Although critical habitat units were designated in Butte, Tehama, Solano, Sacramento, Merced, Mariposa, Madera, Fresno, and Tulare Counties in the proposed Critical Habitat document, Butte, Sacramento, Solano, Merced, and Madera Counties were excluded from the final designation (August 2003) due to economic considerations.

Protection measures for this species are expected to be included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*.

Hairy Orcutt grass *Orcuttia pilosa*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Hairy Orcutt grass occurs in vernal pools formed on alluvial fans, high and low stream terraces, and tabletop lava flows in Butte, Glenn, and Tehama counties in the Sacramento Valley and Stanislaus and Madera counties in the San Joaquin Valley. Occupied pools range in surface area from 0.05 to 12.1 acre, with a median area of 1.54 acre. Hairy Orcutt grass is found on both acidic and saline-alkaline soils, in pools with an iron-silica cemented hardpan or claypan. Associated species include coyote thistle, wooly marbles, and two other State-listed grasses: Colusa grass and Greene's tuctoria.

Description:

Hairy Orcutt grass is a small, tufted annual in the grass family (Poaceae). The plant has several stems 2-8 inches tall, each stem ending in a long, spike-like inflorescence. Foliage is grayish, with soft, straight hairs. Hairy Orcutt grass flowers from May through September. This species and slender Orcutt grass (*Orcuttia tenuis*) grow together over a portion of their respective ranges but are readily distinguished. Slender Orcutt grass has fairly slender stems that often branch from their upper nodes. Spikelets are evenly spaced, not densely crowded. Hairy Orcutt grass stems branch only from lower nodes. Upper spikelets are densely crowded.

Status:

Hairy Orcutt grass inhabits vernal pools in rolling topography on remnant alluvial fans and stream terraces in the Central Valley. The historical range includes the eastern margins of Sacramento and San Joaquin Valleys from Tehama County south to Stanislaus County and through Merced and Madera counties at an elevation range of 180 ft to 405 ft. Only 27 of the 40 known populations exist, including a new population in Merced County which was found in 2001 and a transplant population. More than one third of the remaining populations occur in Tehama County. Others are in Butte, Glenn, Madera and Stanislaus counties. Conversion of vernal pool habitat to irrigated agriculture, vineyards, or orchards, or to urban uses has been the primary factor leading to decline in this species. Urbanization, agricultural land conversion, a highway expansion projects, discing, off-highway vehicle use, and

competition from nonnative weeds continue to threaten most of the remaining populations. Populations at the Nature Conservancy's Vina Plains Preserve and the various State and federal locations are partially protected.

Conserving a broad distribution of hairy Orcutt grass across its geographic and elevation distribution provides a mosaic of habitat types both between and among vernal pool species occurrences across the full extent of its range and is essential to conservation of the species. For example, the vernal pool types and soils associated with the six areas of concentration of hairy Orcutt grass differ greatly across the geographic range of the species; this variability leads to differences in species composition and environmental conditions among hairy Orcutt grass occurrences.

The USFWS Critical Habitat document includes specific habitat components that constitute critical habitat for hairy Orcutt grass. These elements include: 1) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths; and 2) The associated watershed(s) and hydrologic features, including the pool basin, swales, and surrounding uplands that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool inundation, water quality, and soil moisture for germination, growth and reproduction, and dispersal. Although critical habitat units were designated in Butte, Tehama, Solano, Sacramento, Merced, Mariposa, Madera, Fresno, and Tulare Counties in the proposed Critical Habitat designation, Butte, Sacramento, Solano, Merced, and Madera Counties were excluded from the final designation (August 2003) due to economic considerations. One exception to this rule is the Vina Plains, which occurs partly in Butte County, was included in the critical habitat designation.

The Vina Plains Unit in Tehama and Butte Counties supports over 25 of the known occurrences of hairy Orcutt grass on approximately 19,300 acres. This area represents only one of two sites that have been placed in protected status under ownership or stewardship by TNC or conservation agreements. The second unit, the Turlock Unit encompasses approximately 48,600 acres in Stanislaus and Merced Counties. Fewer than 60 acres in this unit are owned by BLM or DPR; the remainder is in private ownership. A portion of habitat within Merced County is included within the University of California, Merced Campus study area and proposed NCCP. Although no new populations of hairy Orcutt grass were found during 2001 field surveys, a new a new occurrence was reported during the season from a large vernal pool at a proposed mitigation bank site in the southern portion of the study area. Because field surveys did not cover the entire study area and because of poor hydrologic conditions, it is possible there are additional occurrences of the species in the study area. Occurrences would most likely be found in the central and southern ranchland portions of the study area where most large vernal pools are concentrated. Additional targeted surveys are warranted during a season with higher rainfall. Surveys should target the large pools mapped with GPS and aerial photo interpretation during the 2001 surveys as well as sites identified through other sources.

Protection measures for this species are expected to be included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan.*

Slender Orcutt grass *Orcuttia tenuis*

State: Endangered 1979
Federal: Threatened 1997

General Habitat:

Slender Orcutt grass occurs in vernal pools at 3,000 to 3,600 feet in blue oak woodland, oak-juniper woodland, and Jeffrey pine forests of northern California. Vernal pools in which it grows are classified as Northern Volcanic Ashflow and Northern Volcanic Mudflow vernal pools.

Impervious layers range from iron-silica hardpan to bedrock. It is reported from Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama, and Sacramento counties. Associated species include wooly marbles, coyote thistle, popcorn flower, and downingia, as well as listed species such as Boggs lake hedge-hyssop, many-flowered navarretia, and Greene's tuctoria.

Description:

Slender Orcutt grass is a weakly-tufted and sparsely-hairy annual grass in the Grass Family (Poaceae). It grows to about two to six inches in height and branches only from the upper half of the stem. The flower stem comprises more than half of the plant's height, and the spikelets are more or less evenly spaced along the inflorescence. The flowering period is from May to July. Slender Orcutt grass and hairy Orcutt grass can be found growing together in some vernal pools, but are readily distinguished from each other.

Status:

Slender Orcutt grass is restricted to northern California and has the largest geographic range of any of the Orcutt grasses. Seeds germinate under water and the plant matures as water evaporates. Optimal germination of slender Orcutt grass is achieved through stratification followed by warm days and mild nights. Peak flowering of this species typically occurs in May in the Central Valley but not until June or July on the Modoc Plateau. Unlike hairy Orcutt grass (*Orcuttia pilosa*) and Greene's tuctoria (*Tuctoria greenei*), slender Orcutt grass is not likely to die when pools are flooded by late spring or summer rains. Conversely, drought has been known to cause 100

percent mortality. The main habitat requirement for slender Orcutt grass is standing water of sufficient quantity and duration to drown out most competition and supply its physiological requirements for prolonged inundation, followed by a period of gradual (becoming total) desiccation. Seeds germinate in the spring while under water, and plants send up long, floating leaves. As the pool dries, plants put out shorter terrestrial leaves, and then flowering stalks. Slender Orcutt grass plants generally mature later than other vernal pool annuals, so often they are the only vegetation still green by mid-summer on the vernal pool bed. As an annual, it depends on seed set to replenish the seed bank for continued survival.

Similar to other vernal pool annuals, slender Orcutt grass populations can vary greatly in size from year to year. Fluctuations of up to four orders of magnitude have been documented in Lake and Shasta counties. At the Vina Plains Preserve, the single population ranged in size from 1,000 to 147,700 individuals during the five times it was reported over a 13 year period. However, slender Orcutt grass populations do not always fluctuate in size. Among five populations of slender Orcutt grass studied from 1973 to 1979, two in the Dales area remained at the same order of magnitude for the entire period. None of the other five species of Orcutt grass included in the study remained stable for the duration of the research.

In the mid 1980s, slender Orcutt grass was known from only 18 localities in Lake, Sacramento, Shasta, and Tehama counties. An additional 34 occurrences were discovered in the 1980s, and 27 new occurrences were found in the 1990s as a result of intensive surveys. Slender Orcutt grass is currently found in five general areas of concentration from south Sacramento County to the Modoc Plateau and west to Lake County with an elevation range from near 90 feet to 3500 feet. The wide ranging distribution of slender Orcutt grass has lead to a large diversity of vernal pool habitat types for the species.

A variety of factors have contributed to the continued decline of slender Orcutt grass including off-road vehicle use, intensive livestock grazing, altered hydrology, and competition from other plants. Off-road vehicle use in vernal pools is a particular problem near Redding and in forested areas of the Modoc Plateau. Although moderate levels of livestock grazing in spring are compatible with slender Orcutt grass, overstocking, summer grazing, and trampling pose threats to several occurrences. However, grazing may be necessary to control aggressive non-native species. Altered hydrology contributes to the decline of slender Orcutt grass by creating conditions unsuitable for its germination, growth, or reproduction, and by promoting the growth of competing plant species.

Protection measures for slender Orcutt grass are included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan* although critical habitat has not been designated for this species throughout its range. Critical habitat is proposed to encompass the range of vernal pool types inhabited by the species, as well as its geographic range. Orcutt grass is found in five general areas and the vernal pool types and soils associated with the areas of concentration differ greatly across the range of the species and leads to different species compositions and environmental conditions among slender Orcutt grass occurrences.

Critical habitat includes acreage in Lake, Plumas, Lassen, Shasta, Modoc, and Siskiyou Counties. All occurrences, except those in Lake County, are within the volcanic plateau of northeastern California and are located at higher elevations and experience colder climatic conditions than in any other area throughout the species range. Lassen National Forest has 18 known occurrences of slender Orcutt grass; occurrences are known from all three ranger districts. Under the Sierra Nevada Forest Plan, vernal pools containing slender Orcutt grass are managed according to the "Orcuttia tenuis Species Management Guide." Under this guidance, all populations will be protected from direct disturbance by Forest Service and BLM management activities. Disturbance is identified as excessive grazing, vehicle traffic within vernal pools, and hydrologic manipulation within the pools. When necessary, fencing will be the primary method of protection. Specific protocols pertain to all earth moving projects within the drainage area to allow unchanged drainage into the vernal pools. All populations are monitored and unoccupied vernal pools are inventoried to detect new populations.

Bogg's Lake in the Clear Lake Area of Lake County encompasses about 4,200 acres and represents the western extent of the range of slender Orcutt grass and some of the last remaining vernal pool habitats in Lake County. Isolated and peripheral populations such as this may have genetic characteristics essential to the overall long-term conservation of the species. The unit is over 84 miles from the nearest units to the north and west. Critical habitat was not designated in the southeast portion of the Sacramento Valley. This area supports the southern extent of the species and is over 100 miles from the nearest occurrence. It includes the rapidly developing urban areas near Mather Field along Laguna Creek and Dry Creek, as well as areas near Galt and Elk Grove.

Sacramento Orcutt grass *Orcuttia viscida*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Sacramento Orcutt grass has been found in Northern Hardpan and Northern Volcanic Mudflow vernal pools where it occurs on high terrace sites at elevations of 150 to 270 ft. This grass is restricted to several vernal pool complexes in either blue oak woodland or valley grassland communities in Sacramento County. Sacramento Orcutt grass grows in relatively large, deep vernal pools.

Description:

Sacramento Orcutt grass is a blue-green, tufted, sticky aromatic annual plant in the grass family (Poaceae) with flowers crowded into bristly heads. The stems are erect or spreading, 1 to 4 in long and do not branch. The inflorescence occupies the upper part of the stem and consists of between 5 and 15 spikelets (groups of individual flowers). Sacramento Orcutt grass is particularly sticky even when young. Although Sacramento Orcutt grass is geographically isolated from all other members of the genus, it most closely resembles the threatened San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*). Sacramento Orcutt grass flowers in May and June.

Status:

Sacramento Orcutt grass is restricted to Sacramento County and is known only from eight extant occurrences, one of them an introduction. Five occurrences are concentrated into a single small area east of Mather Field. Two other occurrences are adjacent to each other: Phoenix Field Ecological Reserve and the introduced occurrence at Phoenix Park Vernal Pool Preserve. The majority of these occurrences are unprotected.

The species has declined mainly due to severe habitat loss caused by agricultural and urban development. Because the human population of the Central Valley is growing rapidly, numerous populations of Orcutt grasses, including Sacramento Orcutt grass, have been extirpated and continue to be threatened by urban development projects. Sacramento Orcutt grass was extirpated from its historic occurrence between Orangevale and Folsom by urban development. The species was extirpated from one pool near Grant Line Road by changes in hydrology - pool depth was increased artificially to provide a longer-lasting water source for livestock, which created conditions unsuitable for persistence of Sacramento Orcutt grass.

Extant occurrences at the Phoenix Field Ecological Reserve and the Phoenix Park Vernal Pool Preserve have been degraded by off-road vehicles and alterations to natural drainage patterns. The remaining pools where Sacramento Orcutt grass grows are subject to a wide variety of factors that threaten the species survival. Urban encroachment and the associated increase in human activities, is the primary factor. Competition from native plants such as spikerush (*Eleocharis* sp.) and manna grass (*Glyceria* sp.) could displace Sacramento Orcutt grass. Livestock grazing during the growing season, or overstocking during winter grazing, may degrade habitat for Sacramento Orcutt grass; however, grazing may be useful in providing control of competing plants if appropriate timing and stocking rates can be determined.

Protection measures for slender Orcutt grass are included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*. In 2003, the USFWS designated approximately 740,000 acres in 30 California counties and one Oregon county as critical habitat for 15 vernal pool animals and plants. However, all lands in Butte, Madera, Merced, Sacramento, and Solano counties were excluded due to the potential economic effect of critical habitat designation in those areas. No critical habitat was therefore designated for Sacramento Orcutt grass.

Primary constituent elements of critical habitat for Sacramento Orcutt grass were proposed in the Draft Critical Habitat document. These elements were 1) vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths that sustain germination, growth, and reproduction; and 2) the associated watersheds and hydrologic features that support the pools. Areas that currently support Sacramento Orcutt grass would have comprised the three units of critical habitat: Phoenix Field and Phoenix Park; southeast Sacramento County in the vicinity of Mather Field; and at Rancho Seco.

The Phoenix Field and Phoenix Park area is situated within the City of Fair Oaks and encompasses 72 acres. The pool complex is bounded by urban development except for the east side, which is adjacent to Folsom Lake State Recreation Area. It supports two of the eight remaining occurrences of the species and represents the northern extent of the species range. The Phoenix Field Ecological Reserve and Phoenix Park occurrences are affected by excess runoff from lawns, baseball fields, and roads; by herbicide and fertilizer applied in adjacent areas, and by dumping of landscape waste. Another threat at the Phoenix Field Ecological Reserve is invasion of garden plants. Recreational activities such as rollerblading biking, and horseback riding also are damaging the Phoenix Park occurrence. A management plan for Phoenix Field Ecological Reserve is being preparing using Section 6 grant funding from the USFWS.

The Southeastern Sacramento Valley area is located south and east of Mather Airport and Regional Park in the urban areas of the Cities of Sacramento and Rosemont. This area is highly significant to the long-term survivorship of Sacramento Orcutt grass because the vernal pool system is relatively undisturbed, maintains a hydrologic regime, and includes interconnected vernal pools, swales, and uplands. The majority of the lands included within this unit are privately owned, including the Sunrise Douglas mitigation area, where several occurrences of Sacramento Orcutt grass are known to occur. Other vernal pool habitats in this area have been identified by the Sacramento Valley Open Space Conservancy, the CNPS, and TNC as excellent examples of vernal pool grasslands, supporting a rich and diverse community of vernal pool endemic plants and animals within Sacramento County. Vernal pool habitats in this unit are threatened by urbanization from the expanding cities of Sacramento and Elk Grove. Conversion to intensive agriculture, particularly vineyards, is also a significant threat

to Sacramento Orcutt grass habitat in this area. Other sensitive vernal pool species located within this area include vernal pool tadpole shrimp, vernal pool fairy shrimp, California linderiella, slender Orcutt grass (*Orcuttia tenuis*), legenere (*Legenere limosa*), Bogg's Lake hedge-hyssop (*Gratiola heterosepala*), and western spadefoot toad.

The area centered on Rancho Seco and represents the southern range of Sacramento Orcutt grass. This unit includes relatively undisturbed, hydrologically intact vernal pool habitats. The majority of land within this unit is privately owned. Some vernal pool areas are protected in this unit on The Nature Conservancy's Howard Ranch Preserve and Schneider property near Meiss Road. The Clay Station Mitigation Bank and the Borden Ranch mitigation site are located within this unit, as well as a number of smaller conservation areas including the Rancho Seco Preserve and the L.V. Island Preserve. Approximately 600 acres in this area are owned by the DFG, and 7,736 acres by TNC. An additional 11 acres of private land are protected by easements or agreements. Urban expansion and conversion to vineyards threaten existing vernal pool habitats throughout the Rancho Seco area. Vernal pools in this area also provide habitat for the vernal pool tadpole shrimp and the vernal pool fairy shrimp. Other sensitive species found within this unit include Bogg's Lake hedge-hyssop, Henderson's bent grass, legenere, Sanford's arrowhead, pincushion navarretia, dwarf downingia, California tiger salamander, western spadefoot toad, and California linderiella.

Sacramento Orcutt grass is targeted for protection in the developing Sacramento County HCP, which should result in protection of the remaining populations in the County.

Baja California birdbush

Ornithostaphylos oppositifolia

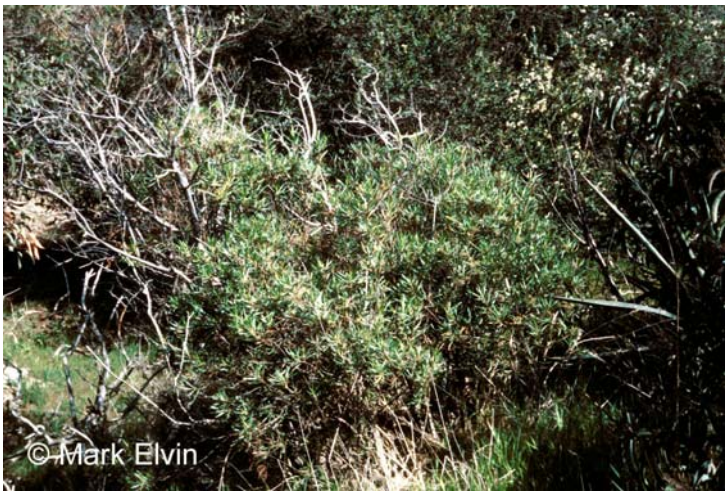
State: Endangered 2001
Federal: None

General Habitat:

In California, Baja California birdbush occurs on a mesa and adjacent slopes, which support a mixture of coastal sage scrub and chaparral species and can be characterized as maritime chaparral. The plants grow in cobbly loam soil. Associate species include coast white lilac, black sage, chamise, flat-topped buckwheat, California sagebrush, and bush mallow.

Description:

Baja California birdbush is a rigidly-branched, erect shrub in the Heath family (Ericaceae) with leathery, narrow leaves and reddish-brown bark that peels to expose white or gray-green stems. The small greenish-white flowers bloom in clusters from January to April, and small red fruits are generally present from May to August. The species is long-lived, has low reproductive rates, and grows slowly, reaching a height of up to 6 feet.



Status:

Baja California birdbush is known from only one location in the United States, just north of the U.S. - Mexico border on a mesa and adjacent slopes in the Tijuana Hills in San Diego County. The species is also known from northwestern Baja California Norte, Mexico.

A total of 103 Baja California birdbush shrubs have been documented at the sole U.S. population. No seedlings have been observed. Threats include fragmentation of habitat by dirt roads and trails, brush clearing and cutting and soil compaction associated with illegal border crossings and U.S. Border Patrol activities, and, possibly, a fire frequency that is too high. This population occurs within an area proposed for construction of the U.S. Border Patrol's Border Fence project, which is still in the planning stages, and may include cutting the mesa to fill an adjacent gulch. It is likely that some of the birdbush plants will be destroyed during construction. DFG is working with the federal agencies involved to determine appropriate mitigation and conservation measures. Baja California birdbush is in cultivation at several locations in California. Attempts to propagate new plants from seeds and cuttings have met with little success.

Lake County stonecrop *Parvisedum leiocarpum*

State: Endangered 1990
Federal: Endangered 1997

General Habitat:

Lake County stonecrop grows in shallow soils of vernal pools or on rock outcrops that are seasonally wet and dry out in late spring. Lake County stonecrop has always been rare and occurs only in a few sites in Lake County. The populations range in elevation from 1,300 to 2,600 feet. It is associated with goldfields, few-flowered navarretia, popcorn flower and downingia.

Description:

Lake County stonecrop is a diminutive, succulent annual in the stonecrop family (Crassulaceae). The plant has reddish stems 1-2 in. tall, small and narrow fleshy leaves. The leaves fall off before the plant flowers. Pale yellow flowers bloom in April and May. Two rows of tiny, bell-shaped flowers are crowded on a curving flowering stem. Each flower has five small petals. The species is now known as *Sedella leiocarpa.*

Status:

Lake County stonecrop is currently known from three sites on private property. None of these sites have been visited since the 1980s and the status of the plant is not known. The three populations of this plant are found in Lake County within a 10 mile radius from Seigler Springs near Lower Lake. The existing sites have been impacted by OHV use, alteration of hydrology, trampling, trampling, and cattle grazing. Conversion of private lands to vineyards is an immediate threat. Information about vernal pool hydrology, as well as ecological and biological information regarding germination and growth requirements for this plant is lacking.

Dudley's lousewort ***Pedicularis dudleyi***

State: Rare 1979
Federal: None

General Habitat:

This member of the figwort family (Scrophulariaceae) grows in shaded conditions in maritime chaparral, coastal redwood, and mixed evergreen forest communities of San Luis Obispo, Monterey, and San Mateo counties. It had been reported from Santa Cruz County based on a collection from the 1800s. It is associated with star flower, snowberry, iris, clintonia, and violet.

Description:

Dudley's lousewort is a low-growing, perennial herb with mostly compound, basal leaves. It produces a head of pink, irregular-shaped flowers.

Status:

There are 11 known occurrences of Dudley's lousewort. The majority of these are within Los Padres National Forest or on DPR land. Two occurrences are located on the Hearst Ranch. A collection of *Pedicularis* from Fort Hunter-Liggett, tentatively identified as this species, was determined to be a collection of a pale red-flowered *Pedicularis densiflora*.

Dudley's lousewort is a Forest Service Sensitive Species and it is a riparian species of concern on the Los Padres National Forest. The species is vulnerable to trampling and trail maintenance activities. There is potential for occurrences to be affected by logging, road building, and development projects. Invasive species could also constitute a threat to Dudley's lousewort.

Permanent management programs for this species are needed. DFG has no recent information on the status of this plant.

White-rayed pentachaeta

Pentachaeta bellidiflora

State:	Endangered	1992
Federal:	Endangered	1995

General Habitat:

Historically, white-rayed pentachaeta was known from serpentine bunchgrass and native prairie habitat from Marin to Santa Cruz counties. Serpentine soils provide a harsh environment for plant growth due to their low calcium-magnesium ratio; lack of essential nutrients such as nitrogen, potassium, and phosphorous; and high concentrations of heavy metals. However, species such as white-rayed pentachaeta have adapted to serpentine soils and require them to survive.

Description:

White-rayed pentachaeta is a small annual plant in the sunflower family (Asteraceae) that grows from three to seven inches tall. It has few erect, unbranched stems, which grow from a slender taproot, and narrow, alternate leaves. Each flower head has many yellow disk flowers surrounded by five to 16 white to purple ray flowers. The flowers bloom from March to May.

Status:

Most historical occurrences of white-rayed pentachaeta within Marin, San Mateo, and Santa Cruz counties are believed to have been extirpated by urbanization and off-road vehicle use. Suitable habitat remains at two San Mateo County locations, but the species has not been seen at either site in many years. The species is now known from only one confirmed location in San Mateo County. This population was bisected by the construction of California Interstate 280 in the late 1960s. The largest portion of the population occurs on land administered by the San Francisco Water District. A small remnant remains to the east of Interstate 280, in Edgewood County Park.

Population sizes vary from year to year due to local rainfall and competition from non-native plants. The species is also threatened by proposed trail construction. Due to the small size of the population and limited occupied area, it is also extremely vulnerable to random natural events such as a disease outbreak or increased insect predation.

In 1997, this species was the subject of a recovery workshop conducted by the DFG in cooperation with USFWS. Participants discussed the need for permanently protecting and managing the existing populations, as well attempting to reintroduce populations into suitable protected habitat. Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.

Lyon's pentachaeta *Pentachaeta lyonii*

State:	Endangered	1990
Federal:	Endangered	1997

General Habitat:

Habitat for Lyon's pentachaeta consists of sparsely vegetated openings in grassland, coastal sage scrub, and chaparral on red clays often of volcanic origin. It typically occupies pocket grassland sites at the ecotone with scrublands, and the edges of roads and trails. Soils on which Lyon's pentachaeta occurs often have a cryptobiotic crust on the surface. Lyons' pentachaeta is associated with Turkish rugging, Catalina mariposa lily, purple needlegrass and annual members of the Phlox Family. Lyon's pentachaeta is found only in Los Angeles and Ventura Counties.

Description:

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 in late spring from April to June. It is distinguished from other species of *Pentachaeta* by pubescent phyllaries (flower head bracts), the number of bristles on the seed, and reddish branches originating from the upper portion of the plant. The ray flowers are typically curled, and the leaves are narrow and linear with long hairs on the leaf margins. There are no other members of the genus in the region.

Status:

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. It occurs in a highly fragmented landscape where the majority of occurrences have been extirpated. According to the USFWS, Lyon's pentachaeta is known from five population areas in the Santa Monica Mountains and the western Simi Hills. The East unit consists of one occurrence; the Mulholland crest unit has three occurrences; the Central unit has seven occurrences; the Conejo Ridge unit has seven occurrences; and the North unit has four occurrences. Five occurrences are known to exist on public agency lands managed by the NPS, the Las Virgenes Municipal Water District, and the Conejo Open Space Conservation Agency. Population numbers vary greatly with seasonal precipitation. Since the publication of the Proposed Rule (to list the species), three occurrences on public lands (Stunt Ranch, Malibu Creek State Park, and Arroyo Sequit) appear to have become extirpated, although the status of the population at the Stunt Ranch following a wildfire is not known. The remaining locations are privately owned. Populations on the Palos Verdes Peninsula and on Santa Catalina Island have not been seen for many years and focused searches in areas of suitable habitat in the general area of the original population by the Catalina Island Conservancy failed to locate the plant in 2001. Lyon's pentachaeta had last been seen on Santa Catalina Island in the 1930s. Lack of adequate land buffers, increases in invasive plant species such as wild oats and yellow star thistle, fuel clearance, loss of suitable habitat for population expansion, fragmentation of habitat connectivity, and lack of management of competing vegetation threaten most of these populations. Several populations have been severely damaged in recent years by geotechnical trenching, vegetation fuel clearance, and bulldozing.

A detailed study of the ecological requirements of Lyon's pentachaeta was funded by three Federal Section 6 grants in the 1990s. In studying the ecology and distribution of Lyon's pentachaeta, researchers hypothesized that the species maintain populations on undisturbed "safe sites," such as on ridgetops or in areas of shallow soils where there is little competition from invasive plants. It is from these refugia that Lyon's pentachaeta expands into disturbed sites following removal of the shrub canopy. Intensive field studies at two large populations focused on documenting the density and cover of Lyon's pentachaeta; pollinator identification and observation of behavior; quantification of pollen on observed insect visitors; and the effect of pollen exclusion on flower development and seed set. In addition, the responses of plants to different substrates, levels of soil moisture, and shading were studied.

At both study sites, Lyon's pentachaeta occurred in areas where bare ground made up more than 60% of the plots. There was also significant correlation with soil depth and pentachaeta density at both study sites. Although Lyon's pentachaeta can grow on shallow soils, higher densities were recorded on deeper soils. Deeper soils also extended the growing season. Nine species of insects were observed visiting flowers. Digger bees were the most common visitors and likely were important pollinators. Lyon's pentachaeta pollen was collected from six of the seven bees captured and in one case comprised 90% of the pollen load. There was a highly significant difference in seed development between bagged and unbagged flowers. Viable seed were not produced on plants with bagged flowers indicating that Lyon's pentachaeta requires cross-pollination with another plant (self-incompatible). Soil moisture had a minimal effect on survivorship of Lyon's pentachaeta, although soil type (alkaline limestone vs. acidic soils derived from volcanics) and shading had significant effects on the plants. Lyon's pentachaeta is incapable of establishing on limestone soils and grows poorly if shaded by overstory plants.

Lyon's pentachaeta is shade-intolerant and often found on disturbed sites where overtopping vegetation has been removed or reduced. Lyon's pentachaeta is able to maintain populations for extended periods of time without disturbance through soil storage of seeds (seed bank). Although the species does not tolerate most forms of intensive disturbance, selective shrub removal coupled with control of invasive plants and minimal soil disturbance may expand its populations. Germination experiments indicate that Lyon's pentachaeta does not produce deeply dormant seed stimulated by fire and that it is not a "fire follower" or fire-dependent species.

A 2000 Master's thesis project at the University of California, Santa Barbara examined predictive modeling of endangered plant species in the Santa Monica Mountains. In collaboration with Santa Monica Mountain National Recreation Area scientists, the researcher developed a knowledge base that represented a predictive model of the habitat for Lyon's pentachaeta. A habitat classification tree was used as the predictive tool. The results of analysis of the *Pentachaeta* model identified 26 out of 41 known sites and identified 526 possible "Habitat Assessment Units" of species habitat. The classification tree models identified 2,044 sites that belong to the "very suitable set of solutions" for *Pentachaeta lyonii*. This type of analysis will allow NPS staff to focus surveys, as well as prioritize management in potentially suitable habitat for Lyon's pentachaeta.

Protection measures for Lyon's pentachaeta are provided in the USFWS *Draft Recovery Plan for Six Plants from the Mountains Surrounding the Los Angeles Basin, California*, released in 1999.

Yreka phlox *Phlox hirsuta*

State: Endangered 1987
Federal: Endangered 1998

General Habitat:

Yreka phlox is an endemic serpentine plant whose distribution is limited to four populations located near Yreka in Siskiyou County. It occurs at elevations from 2,800 to 4,400 feet in association with incense cedar, Jeffrey pine, juniper, rabbitbrush, and in the general vicinity of Yreka, Siskiyou County.

Description:

Yreka phlox is a low perennial subshrub in the Phlox Family (Polemoniaceae). The species grows from a woody base to about two to six inches high and is hairy throughout. Leaves have glands on the margins and are crowded on short stems. The pink to purple flowers appear from April to June. Several other species of phlox may occur within the range of Yreka phlox. Of these, showy phlox has notched petal lobes and grows taller than Yreka phlox. Northern phlox is also larger than Yreka phlox and blooms later, from June to August. The stems of spreading phlox lay on the ground and lack glands on the leaves.

Status:

Yreka phlox is a narrow endemic known only from the vicinity of Yreka, California. It is currently known to occur at four locations, which are generally referred to as the "China Hill," "Soap Creek Ridge," "Cracker Gulch," and "Jackson Street." In addition, the locality information from a single 1930 collection indicates a possible historical location in the vicinity of Etna or in the vicinity of Echo Mill, near Soap Creek Ridge. Intensive surveys have been conducted in potential habitat (defined as the presence of suitable soils) on Klamath National Forest and Bureau of Land Management lands within the Redding Resource Area. No new populations of Yreka phlox have been discovered.

The China Hill occurrence is located on an open ridge and adjacent slopes approximately one mile northeast of downtown Yreka. Yreka phlox occurs on the main ridge and its adjacent slopes. Slopes vary from approximately 20-50%, and aspects are variable. Important components of the vegetation include rabbitbrush, several species of buckwheat, and native perennial grasses such as Idaho fescue and wildrye. Other plants commonly observed at the site include woolly sunflower, bitter root, silverleaf phacelia, small onion, and spring gold. The shallow soils support scattered western junipers and buckbrush. An estimated 1,000 to 3,000 plants are scattered over approximately 47 acres based on a spring 2001 survey and mapping effort by DFG and Timber Products Company staff, who employed very accurate Global Positioning System (GPS) technology. Approximately 55 to 60 percent of this occurrence is on parcels owned by the City of Yreka, while the remainder is situated on several privately held parcels that are currently zoned for residential development.

The threat of development at the China Hill site was a primary factor in the decision by the USFWS to list the phlox as Endangered in 2000. Securing protection for the China Hill occurrence is essential to the conservation and recovery of this species, according to the draft Yreka Phlox Recovery Plan currently in preparation. In the 1990s, three parcels on China Hill that supported the phlox were donated to the City of Yreka. Recent collaboration between the City, the DFG, and the WCB led to the purchase of two additional properties supporting Yreka phlox in 2002. Purchase of another property is pending. These properties are now owned by the City and are managed for the conservation of the phlox. Two important properties that support the phlox remain in private ownership and remain subject to development. Although not known to support the phlox, an additional parcel is also important to site conservation and management because it is adjacent to the phlox occurrence and is accessed by a road that bisects the occurrence.

The Soap Creek Ridge occurrence includes at least 14 discrete clusters of plants and is located approximately five to six miles southwest of Yreka. The entire occurrence has been estimated to contain as many as 5,000 to 10,000 plants over 584 acres. The phlox occurs on lands owned and managed by private landowners, industrial timber companies, and the USFS. The predominant plant community is Jeffrey pine woodland, with incense cedar, Douglas-fir, and sometimes Garry oak present in the overstory. The shrub layer is much more developed than the China Hill site, and includes buckbrush, birch-leaf mountain mahogany, and Fremont's silk tassel.

The Cracker Gulch is located on the south side of State Highway 3 in the Yreka Creek drainage. Vegetation is similar to that of Soap Creek Ridge. Cracker Gulch is estimated to contain 200 to 300 Yreka phlox plants. Land ownership at this site includes a small ranch and timberland owner and an industrial timber company. The Highway 3 occurrence is partially on U.S. Forest Service lands on the Klamath National Forest, partially within a State highway right-of-way, and partially privately owned. The occurrence along Highway 3 has been disturbed in the past by logging and road construction. Although selective logging has resulted in roads and bulldozer trails through the site, logging activities are not currently considered to be a significant threat to considered to Yreka phlox because of site-specific protection measures included in timber harvesting plans. The USFS has no activities planned that may pose a threat in this area. The realignment of Highway 3 over 30 years ago impacted part of this occurrence. The area has since been designated by Caltrans as an Environmentally Sensitive Area, which provides limited protection in that it requires consideration of a sensitive species occurrence in project planning and maintenance activities. The area within the right-of-way consists of five small subpopulations with approximately 100 plants, occupying less than two acres along 2.5 miles of the highway.

The Jackson Street occurrence is located on a privately-owned parcel near the west-central edge of Yreka, in the Little Humbug Gulch drainage. A professional botanist, who visited the site in 1997 or 1998, indicated the presence of Yreka phlox at that time. However, no verified collections have been made from the site. Because access is restricted by the landowner, the current extent and condition of the occurrence is unknown.

Federal Section 6 Recovery Land Acquisition funds, along with State matching funds, are being used to purchase these three properties at China Hill from willing sellers. Public acquisition of these parcels will preclude future residential development on these properties; prevent indirect impacts to phlox plants that occur on parcels already owned by the City from potential development; provide a small buffer on the western edge of the occurrence; permit the City to effectively manage vehicle and other use within the area; and provide the public an opportunity to observe and enjoy a locally endemic species in perpetuity.

The City of Yreka has made a commitment to manage the site for Yreka phlox, which will effectively ensure the conservation of the China Hill occurrence. Because the properties are relatively undisturbed, little or no active restoration is necessary. The City generally practices a "hands off" or passive management approach to the Yreka phlox on the China Hill parcels that it currently owns. This approach has been effective in conserving and protecting the phlox because there are few substantial threats to the plant at this occurrence. Proposed public uses of the site will include passive natural resource related activities such as nature study, photography, and

hiking. The City will also encourage scientific and educational use. Long-term management of the site may include the addition of fencing and other improvements along the private access road to the properties. Because it is not gated or locked, unrestricted access has resulted in unauthorized use of the properties, including City-owned parcels, by off-road vehicles. In addition, specific management recommendations may be developed and implemented pursuant to the Yreka Phlox Recovery Plan.

Yreka phlox pollination ecology is currently being studied with Section 6 funding. A minimal number of scientific studies have been conducted on this plant species and no studies have been completed on any aspect of its pollination biology. An understanding of the pollination biology of an endangered flowering plant species can greatly assist efforts directed toward its successful recovery or preservation. Information from this study will contribute to the draft recovery plan being prepared for this species. Principal objectives of this study are to 1) determine the importance of insect pollinators in the reproduction of Yreka phlox; 2) identify which insects serve as important pollinators for this phlox species; and 3) compare fruit set between phlox flowers exposed to pollinators and those from which pollinators have been excluded.

San Francisco popcornflower *Plagiobothrys diffusus*

State: Endangered 1979
Federal: None

General Habitat:

San Francisco popcorn flower is restricted to vernally-moist areas in the coastal prairie of San Mateo, Santa Cruz, and Alameda Counties. The grassland is largely composed of non-native grasses such as wild oats, wild barley, rattlesnake grass, and bromes. Native grasses include California oat grass and purple needlegrass. It is associated with other listed species including the Santa Cruz tarplant and Scotts Valley spineflower.

Description:

San Francisco popcornflower is a member of the Borage Family. It is a low, herbaceous annual, with narrow leaves and a branched flower stalk of white flowers. Some collections of this plant appear to be very similar to *Plagiobothrys reticulata.*

Status:

San Francisco popcornflower is restricted to coastal grasslands in San Mateo, Santa Cruz, and Alameda Counties. It is first described from a locality near Mountain Lake in the Presidio of San Francisco. The type locality was altered during the construction of Highway 1 and is now a popular neighborhood park. San Francisco popcornflower has not been seen at the type locality since the 1930s. It is currently known from 11 occurrences. Proposed development, non-native plant invasion, and recreational use of its grassland habitat are the principal threats to the species.

One population of San Francisco popcornflower is in joint public ownership under the University of California Natural Reserve System and DPR. This population is vulnerable to disturbance by recreational activities such as horseback riding and biking. A portion of a population on Moore Creek Uplands was purchased by the City of Santa Cruz and WCB in 1998. A management plan for that property will be developed by the DFG, City of Santa Cruz, and the Land Trust of Santa Cruz County. The remaining portion of that population is on private land. The City of Santa Cruz is also developing a management plan for Pogonip, a city park and the location of another population. A prominent feature within Pogonip, the Main Meadow consists of a remnant of coastal terrace

prairie. Although it is dominated by non-native grassland species, areas of native coastal prairie support San Francisco popcornflower, as well as the rare Santa Cruz clover and the federally-listed Ohlone tiger beetle. A population in the City of Scotts Valley is included in a grassland preserve, established by the Scotts Valley Unified School District to protect the listed Scotts Valley spineflower and Scotts Valley polygonum. Non-native grasses dominate this site which was established following construction of the adjacent high school. A population has been reported in Redwood Regional Park in the East Bay Regional Park District, but has not been confirmed.

Calistoga popcornflower

Plagiobothrys strictus

State: Threatened 1990
Federal: Endangered 1997

General Habitat:

This species grows in swales adjacent to active geysers and hot springs. These seasonal wetlands are underlain by a gravelly loam intermixed with clay, and water tables are close to the surface. Concentrations of boron, arsenic, and sulphates are high in these soils and a unique flora has evolved in them. Calistoga popcorn flower is associated Brewer's milkvetch, goldfields, and Napa blue grass, a state and federally listed species.

Description:

Calistoga popcornflower is a small, erect annual herb in the borage family (Boraginaceae). It has slender stems with narrow leaves. Small white flowers appear in March to April in a slender, unbranched inflorescence. The fruit is a minute, egg-shaped nutlet with wart-like projections on the back and no prickles. The ranges of several other species of popcornflower overlap that of Calistoga popcornflower and occur in similar habitats, but do not resemble Calistoga popcornflower.

Status:

Calistoga popcornflower is restricted to two sites near the town of Calistoga. Only two of the three known occurrences of Calistoga popcornflower ever known still remain. These are near the town of Calistoga in Napa County. Both remaining occurrences are on privately owned land and are not protected. Historically, the range of this plant has been diminished by the development of recreational hot springs and the growth of the town of Calistoga. Alteration of the hot springs hydrology, early season mowing prior to flowering or setting of seed, airport maintenance, and residential and commercial development continue to threaten this species. Although both occurrences were still extant in 1997, they are small and at risk of extirpation by random events such as a severe disease outbreak or other natural or human-caused events.

North Coast semaphore grass

Pleuropogon hooverianus

State: Threatened 2002
Federal: None

General Habitat:

North Coast semaphore grass is found in partial shade in seeps, springs, and marshy ground in meadow openings within mixed evergreen-hardwood forest or woodland. Canopy species include coast live oak, redwood, douglas-fir, and madrone. Associated species include sedges, rushes, and blue wild-rye. North Coast semaphore grass is endemic to northwestern California and is known only from Marin, Sonoma, and Mendocino counties.

Description:

North Coast semaphore grass is a tall perennial bunchgrass, with flowering stems greater than 36 inches in height. The flower spike is 8 to 9 inches long, bearing 7 to 9 widely-spaced linear clusters of flowers (spikelets). The spikelet stems are erect to ascending although they bend downwards occasionally.

Status:

Historically, this grass was reported from 23 locations (occurrences) in Marin, Sonoma, and Mendocino Counties. Several of those occurrences were found to a closely-related species or found to be duplicate reports of an already known site. Six locations date from the early 1900s to 1940s, have not been observed since then, and are believed to be extirpated. Another occurrence was last seen in 1981 and is also believed to be extirpated. North Coast semaphore grass is currently known from eight disjunct sites in these counties. Estimates of total occupied habitat are 14 to 18 acres.

Existing populations are all on privately-owned lands. All are threatened by one or more types of land management activity, including invasion by non-native plants, alteration of hydrologic conditions, routine ditch maintenance, or herbicide spraying. Populations could also be lost through large-scale conversion of habitat to vineyard or other intensive land use, or due to random natural and anthropogenic events, for example wildfire and fire suppression activities.

The Department is working with five landowners to implement conservation measures for North Coast semaphore

grass. In Marin County, management activities will include weed removal and conservation seed collection. A portion of the population along a county road will be protected by modifying road maintenance activities and through an education program for road maintenance staff.

Several populations of plants occur in Mendocino County. One population is located within a vineyard. Herbicide application and mowing to create a firebreak were the two principal threats to North Coast semaphore grass at this site. Department staff met with the property owner in February 2002. As a result of that meeting, the owner agreed to suspend herbicide application and to delay mowing until plants flowered and set seed. At the request of the landowner, the Department conducted subsequent surveys at the vineyard and found that North Coast semaphore grass was quite extensive at this site and was not in immediate jeopardy. Seed has been collected from this site and placed in conservation storage.

Three new populations were discovered on Mendocino Redwood Company land during pre-harvest rare plant surveys. Timber harvest, under approved Timber Harvest Plans, will occur in the next few years. Mendocino Redwood Company has flagged the major colonies of plants and created a buffer around each of the sites. In addition, staging areas, timber piles, and haul roads will be located away from the populations. North Coast semaphore grass will be one of the species covered under a NCCP currently in preparation. Department staff also met with the owner of the third major population in Mendocino County. The landowner is interested in long-term conservation of the species at this site.

The Sonoma County population is still in jeopardy. A small portion of this population occurs along a public road where it is mowed for roadside maintenance. A portion of this population near the road was sprayed with herbicide in 2002 although damage to the grass appeared to be minimal. The Department is continuing to work with county road maintenance staff to minimize impacts. The majority of the site, however, is in a meadow that is mowed by the property owners for fire suppression.

A number of management activities could benefit North Coast semaphore grass, and could be formalized in voluntary conservation agreements and strategies with willing landowners. These activities could include selective control of aggressive weeds; removal of native trees and shrubs invading meadows where the grass grows; and prescriptive grazing to remove thatch and reduce competition from non-native grasses. Other management activities include systematic surveys of potential habitat for additional populations, research to quantify ecological requirements of this plant, research to determine the number of genotypes found in native populations, annual monitoring and maintenance of existing populations, and seed collection of all populations for long-term storage in a seed germplasm bank. A public education program could also be implemented so that landowners are aware of the significance and potential value of this grass.

Napa blue grass *Poa napensis*

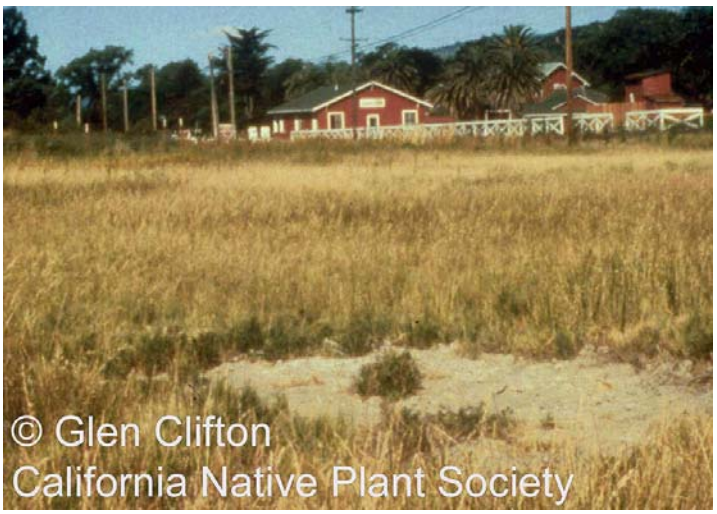
State:	Endangered	1979
Federal:	Endangered	1997

General Habitat:

This rare grass is known from just two sites near Calistoga in Napa County where it is found in grasslands and moist, alkaline meadows fed by hot springs. It is associated with Brewer's milkvetch, Parry's tarplant, and Calistoga popcornflower, a State-listed Threatened species.

Description:

Napa blue grass is a tufted, perennial bunchgrass in the grass family (Poaceae). Its leaves are very narrow, folded and stiffly erect. Basal leaves reach eight inches long while flowering stems reach 27 inches in height. Flower clusters are pale green to purple and appear in May. Napa blue grass most resembles ocean bluff bluegrass but differs in leaf and flower form and habitat.



Status:

Napa blue grass is only known from two populations in the vicinity of Calistoga. Both are on private land and are not protected. Historically, the range of this plant has been diminished by the development of recreational hot springs and the growth of the town of Calistoga. Alteration of the hot springs hydrology, early season mowing prior to flowering or setting of seed, airport maintenance, and residential and commercial development continue to threaten this species. Although both occurrences were still extant in 1997, they are small and at risk of extirpation by random events such as a severe disease outbreak or other natural or human-caused events.

San Diego mesa mint

Pogogyne abramsii

State:	Endangered	1979
Federal:	Endangered	1978

General Habitat:

San Diego mesa mint is restricted to vernal pools within grasslands, chamise chaparral, and coastal sage scrub on the mesas of western San Diego County. It is often associated with toothed downingia and the state- and federally-endangered San Diego button-celery.

Description:

San Diego mesa mint, a member of the mint family (Lamiaceae), is a small, aromatic, herbaceous annual with opposite leaves, reaching one foot in height. As the plant matures and flowers, the vegetation develops a reddish tinge. The two-lipped, violet to reddish-purple flowers have white or yellow throats. Following inundation of the pools, this mint often blooms profusely, sometimes blanketing pool basins with flowers. Typical bloom time is May to July.

Status:

Most of the approximately 35 known, extant occurrences are on DOD lands. Protection measures for San Diego mesa mint are provided in the USFWS *Recovery Plan for Vernal Pools of Southern California*, released in 1998. The San Diego National Wildlife Refuge Vernal Pools Unit provides habitat for several listed species including the San Diego mesa mint, San Diego button celery, and California Orcutt grass, as well as two species of vernal pool fairy shrimp.

The pools at the Marine Corps Air Station Miramar, California, which represent 80% of the remaining pools in San Diego County, support San Diego mesa mint, San Diego button celery, and the San Diego fairy shrimp. While under Navy ownership, Navy resource managers and local scientists used aerial photographs and field inspections to identify sites at Miramar where vernal pools once existed but had been damaged before the Navy bought the

land. Thirty-three of the pools were then restored, by carefully excavating fill material without damaging the hard clay underneath. Seeds, soil, and other fill material were then added to the restored pools. The soils, which had been collected from vernal pools in an off-base area that was about to be developed, held seeds from the mesa mint and button celery, as well as eggs from the fairy shrimp. Both seeds and eggs often lie dormant for months or even years awaiting the next rainfall. This successful project added significant vernal pool habitat without impacting the military mission.

San Diego mesa mint receives protection under the Multiple Species Conservation Program (MSCP) of southern San Diego County. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. San Diego mesa mint is considered to be a narrow endemic species under the MSCP. The City of San Diego prepared a Subarea Plan under the MSCP to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. Management directives for this species require specific measures to maintain and increase populations, reduce or eliminate threats to the species, and address ecological relationships of the species.

San Diego mesa mint is one of several vernal pool species targeted for conservation on Del Mar Mesa. Numerous vernal pools occur on Del Mar mesa. Del Mar Mesa has been the subject of biological study for many years, particularly the unique type of vernal pools that are found there. Unlike other vernal pools in San Diego County, those on Del Mar Mesa Preserve are almost exclusively found within chaparral habitats, versus other pools that may occur in coastal sage scrub or grasslands. Vernal pools located away from existing roads and trails in the chaparral vegetation are the least disturbed and weedy. A portion of the vernal pools on Del Mar mesa have been damaged by road grading, off-road vehicle traffic, and creation of new trails by mountain bikes. Levels of damage to the pools range from pools that are undisturbed relatively to pools that have been nearly eliminated by past road grading and associated vehicle traffic. Pools that have been the most severely impacted are located in and adjacent to roads and unauthorized trails through the DFG vernal pool preserve area and along the graded access roads west of the preserve. In some cases vernal pools along the graded roads have been bisected and formerly contiguous sections of pools are now divided by the access road. The DFG owns 81 acres within the Preserve.

The Del Mar Mesa Preserve was established to protect the sensitive biological resources in the area. A management plan was developed for the Preserve in accordance with the MSCP and the Subarea Plan. Protection will include directing all activities to less sensitive areas when possible. A detailed vernal pool restoration and enhancement plan is outlined in the Subarea Plan. Enhancement would involve restoring the natural hydrology to disturbed pools, removal of exotic plants, and the reintroduction of plant propagules for San Diego mesa mint, San Diego button celery, and spreading navarretia. If restored pools have the hydrologic conditions suitable for the San Diego fairy shrimp, seed for vernal pool plants could also be introduced.

In 2003, the huge Cedar Fire burned a large area of central San Diego County. The fire burned through valleys that contain major stream courses and down onto sedimentary mesas at the Miramar Marine Corps Air Station. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 34% of habitat suitable for San Diego mesa mint, including eleven vernal pool complexes, burned during the fire. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on the Miramar Marine Corps Air Station, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on San Diego mesa mint.

This species is also included in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Santa Lucia mint *Pogogyne clareana*

State: Endangered 1979
Federal:

General Habitat:
Santa Lucia mint is known only from the tributaries of the Nacimiento River on the Hunter-Liggett Military Reservation in the Santa Lucia Mountains, Monterey County. It grows in sandy to gravelly banks of winter-wet, summer-dry stream banks and vernal pools, often in mixed oak woodland. Associate species include deer grass, rush, spikerush, dense flower willowherb, meadow barley, and other riparian herbs.

Description:
This member of the mint family (Lamiaceae) is a delicate, strong-scented, herbaceous annual, with low-spreading branches, reaching 16 inches in height. It has dense, narrow, head-like clusters of deep pink flowers that bloom from May to July.

Status:
All populations of Santa Lucia mint are on Hunter-Liggett Military Reservation, which is owned and managed by the Department of Defense. Access to areas with suitable habitat for the species is restricted to security patrols, for purposes of fire management and occasional recreational activities. Recent surveys conducted by the Santa Barbara Botanic Garden raised the number of known occurrences to over 50, of which 20 supported colonies with 10 to 1000 individuals, 20 supported colonies of 1000 to 10,000 plants, and 9 sites supported over 10,000 plants. The newly discovered occurrences greatly increase the number of plants known, but do not increase the range for the species.

Several of the populations occur near dirt roads, and are vulnerable to dust during the flowering season, as well as erosion and compaction from vehicles. Disruption of drainage systems also represents a potential threat to some populations. All occurrences may be vulnerable to livestock grazing, feral pigs, military activities, road maintenance, frequent wildfires, trampling, and OHVs, although all known sites currently seem to be doing well.

A management plan should be developed and implemented to help protect the populations of Santa Lucia mint. Emphasis should be placed on working cooperatively with the Army to secure known occurrences and prevent their accidental destruction by military activities or by lack of management.

Santa Lucia mint is currently included in the Santa Barbara Botanic Garden's Conservation Collection.

Otay Mesa mint *Pogogyne nudiuscula*

State: Endangered 1987
Federal: Endangered 1993

General Habitat:

Otay mesa mint is restricted to vernal pools on Otay Mesa, located in southwestern San Diego County and extending into Baja California Norte, Mexico. It generally grows on gravelly clay loam soils in association with Orcutt's brodiaea, San Diego goldenstar, and the state- and federally-endangered San Diego button-celery. While some colonies are associated with chamise chaparral, most occur in open grasslands with mima mound topography.

Description:

A member of the mint family (Lamiaceae), this small, aromatic, annual herb has a branched and somewhat spreading habit. Its two-lipped, lavender flowers bloom after the rainy season when pools begin to dry down, from May through early July.

Status:

Otay mesa mint is highly endangered. Although once considered widespread near Balboa Park, Mission Valley, and University Heights, urbanization has destroyed those occurrences. Approximately six occurrences of Otay Mesa mint remain in California. Most of these are privately owned and highly threatened by urbanization, including expansion of airports, landfills, road construction (I-905), and residential and commercial building; livestock grazing; agricultural conversion; and activities around the second International Border crossing with Mexico. Additional threats to remaining habitat include off-road vehicular activities, trash dumping, and invasion of non-native species.

The USFWS provided a management strategy in their 1998 *Recovery Plan for Vernal Pools of Southern California*. Their plan includes stabilization of populations through habitat management and expansion of existing populations. Monitoring and restoring populations are critical plan elements. Restoration efforts need to address the reestablishment of abiotic and biotic characteristics such as soil and water quality, hydrology, nutrient cycling, species diversity, reproductive mechanisms and species and interactions.

This species is covered in the San Diego Multiple Species Conservation Plan (MSCP). The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Otay Mesa mint is considered to be a narrow endemic species under the MSCP; 91 percent of its major populations will be conserved. The Otay River Special Area Management Plan (SAMP) is currently being prepared. When completed, the comprehensive plan will be used to guide permitting and protection of aquatic resources while protecting that provides for natural resource protection and reasonable economic growth within geographic areas

of special sensitivity. This comprehensive planning effort is to be used to assist the federal, state and local regulatory agencies with their decision making and permitting authority to protect aquatic resources. Preserves established under the Otay River Watershed Management Plan will also protect California Orcutt grass.

In 2003, the huge Otay Fire burned a large area of south-central San Diego County. Two vernal pool complexes along the Otay River and in Proctor Valley burned during the fire. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on Marine Corps Air Station Miramar, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on Otay mesa mint.

Otay mesa mint is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Scotts Valley polygonum

Polygonum hickmanii

State	Endangered	2004
Federal	Endangered	2003

General Habitat:

Scotts Valley polygonum occurs is endemic to Scotts Valley, Santa Cruz County, California, approximately seven miles from the coast, at an elevation of 700-800 feet. It is found in grassland habitat of gently sloping to nearly level, fine-textured, shallow sandy loam soils, underlain by outcrops of Santa Cruz mudstone and Purisima sandstone. Pockets of these shallow, well-draining soils are often referred to as "rock outcrops." Scotts Valley polygonum occurs with several sensitive species, including the federally-listed Scotts Valley spineflower, the State-listed, Endangered San Francisco popcorn flower, the federally-listed endangered Ohlone tiger beetle.

Description:

Scotts Valley polygonum is a small, erect, taprooted annual plant in the buckwheat family (Polygonaceae), growing 1-2 inches tall. The linear leaves are 0.04-0.06 inch wide, 0.2-1.4 inch long, and sharply pointed at the tip. The single white flowers, with bright orange or pink anthers, bloom from late May to August.

Status:

Scotts Valley polygonum is known from only two occurrences, less than one mile apart and occupying a total area of less than one acre. Thorough surveys of potentially suitable habitat throughout Scotts Valley and surrounding areas have not located any additional populations. This species was first discovered in 1990 and little is known about its historical range and distribution. The two occurrences of Scotts Valley polygonum are located on three privately-

owned parcels. At each occurrence the Scotts Valley polygonum plants are grouped in one or more discrete patches located within distinct areas of thin-soiled habitat. Each patch of plants ranges in size from 25 ft^2 to 1500 ft^2. Since its discovery, the total number of plants observed in any given year has ranged from 200-400 plants to almost 3500 plants.

Scotts Valley polygonum is threatened by direct and indirect impacts due to development, including the destruction of plants and/or their habitat, habitat fragmentation, changes in surface hydrology, and soil siltation. Illegal OHV use has created trails through polygonum habitat, resulting in furrows and erosion of the outcrops on which the polygonum grows. In addition, non-native plants have invaded and now dominate habitat areas that once may have supported Scotts Valley polygonum.

A housing development is currently being planned for one of the sites. The project configuration has not yet been finalized. It would eliminate one patch of plants although the remaining six patches would be set aside as open space. One patch of Scotts Valley polygonum plants is located adjacent to playing fields at Scotts Valley high school. Although it is located in the high school "preserve area", which is currently fenced to protect the rare species that occur there, the long-term conservation of this habitat area is not guaranteed. Road construction for a recycled wastewater facility also removed habitat for the polygonum, and provides access for OHV users.

Scotts Valley polygonum is highly vulnerable to any modification or destruction of habitat due to the limited size of the populations and small number of plants. Long-term survivorship of the species will depend on preservation of a matrix of occupied and potentially suitable habitat so that the species would survive random natural disturbance and respond to varying levels of environmental perturbation.

Hickman's cinquefoil

Potentilla hickmanii

State:	Endangered	1979
Federal:	Endangered	1998

General Habitat:

Hickman's cinquefoil is known from seepage areas and other wet sites in coastal prairies or open forested areas in San Mateo and Monterey Counties. Associate species include the native grassland species California oatgrass and needlegrass, while non-native grasses appear to be competitors.

Description:

Hickman's cinquefoil is an herbaceous, slender-stemmed perennial member of the rose family (Rosaceae) that dies back to a woody taproot every year. Its leaves are divided into many leaflets, and numerous yellow flowers bloom from April to August.

Status:

Historically, there were four occurrences of Hickman's cinquefoil, one in coastal San Mateo County and three sites on the Monterey Peninsula. In 1995, a population of Hickman's cinquefoil was discovered in San Mateo County. This population, a portion of which is located within a proposed construction zone of the State Highway 1 Devil's Slide Bypass, was estimated to consist of 2,000 to 3,000 individuals. In 1997 a decision was made to route Highway 1 through a tunnel, thus avoiding the population, which remains on private land. No other measures have been implemented to protect this population.

Currently, only one of the Monterey peninsula populations, at Indian Village in Pebble Beach, is extant. It has been reduced to as few as 14 individuals, and most recent surveys in 1999 found fewer than 40 individuals. In 1995, the Del Monte Forest Foundation, owners of the property, relocated volleyball and horseshoe areas to reduce impact to the population. Surveys were conducted in 1995 to identify suitable sites in the area for establishment of additional populations. Clones and seedlings were planted in several locations in the vicinity of Indian Village in 1998; at one site there was no survival, and at the other 64% were surviving in 2000. Related research showed that competition from other plants strongly suppresses the survival and reproductive performance of Hickman's cinquefoil. Further research is needed on habitat preferences and tolerances, effects of competition and herbivory, limits on pollinators and seed dispersal, and genetic analysis.

In 2002 the USFWS released a draft recovery plan for Hickman's cinquefoil and four other Monterey County plants.

Hartweg's golden sunburst

Pseudobahia bahiifolia

State: Endangered 1981
Federal: Endangered 1997

General Habitat:

Hartweg's golden sunburst is a very rare species that inhabits upland sites in valley and foothill annual grasslands, typically in association with undulating mima mound topography formed on acidic soils. The species usually grows most densely on the upper third of the mounds, mostly on their north and northeast aspects. North aspects of larger knolls and shaded creek banks however, are also inhabited. Population sizes fluctuate significantly with the season's precipitation. Annual grassland with which it is typically associated is dominated by annual fescues, filaree, smooth cat's ear, upland popcorn-flower, and California plantain. It occurs in Fresno, Madera, Merced and Stanislaus counties, with historic, now-extirpated locations in Sutter and Yuba counties.

Description:

Hartweg's golden sunburst is a diminutive annual member of the sunflower family (Asteraceae). This species possesses mostly unbranched stems that reach two to eight inches in height. It possesses tiny, alternately arranged, narrowly elongate, woolly leaves. Single, small yellow-rayed sunflower heads are produced from March through April. The genus *Pseudobahia* is most easily distinguished in the field from the widespread and common goldfields (*Lasthenia*) by its woolliness and alternately arranged leaves.

Status:

Historically, Hartweg's golden sunburst was scattered but locally abundant in valley and foothill grasslands of the Central Valley from Yuba County south to Fresno County. Only 15 extant occurrences are now known. Five of the historical occurrences of Hartweg's golden sunburst have been extirpated, including the type-locality in Yuba County. This species is now only known from a two general areas, including a concentration of occurrences near the Fresno-Madera county line, and from an aggregation of occurrences in northeastern Merced and southeastern Stanislaus counties. All occurrences are situated at approximately 500 feet elevation. Nearly all the occurrences in southeastern Stanislaus County are found on acidic Amador soils of the Valley Springs Formation developed from weathered rhyolitic tuff. Little else is known about the ecology of this species. Development of habitat is the most significant threat to the species. Additional threats include competition from non-native grasses, incompatible grazing practices, mining, and conversion of habitat to agriculture.

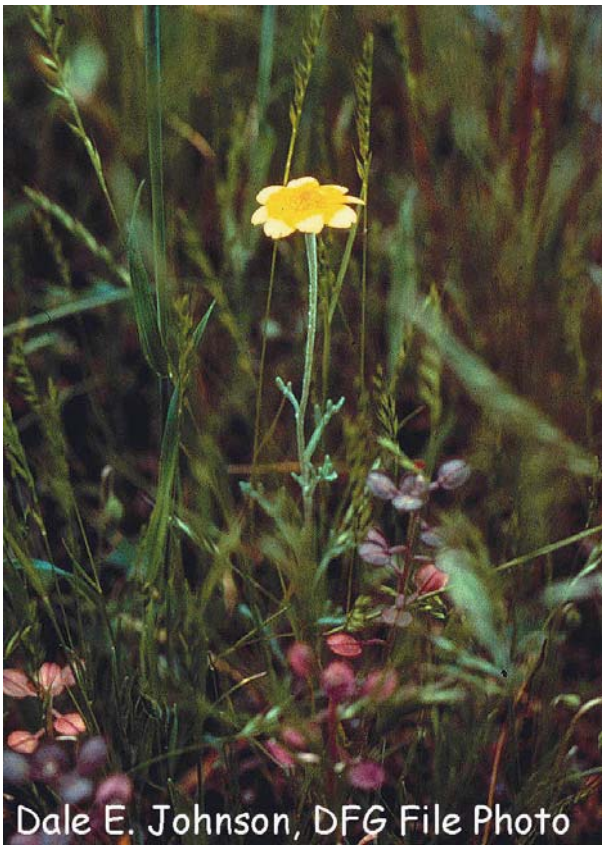
The species occurs within the proposed footprint of the University of California Merced campus. As part of the planning process for the proposed campus and related, *Eastern Merced County Natural Community Conservation*

Plan Habitat Conservation Plan, focused upland surveys were conducted between April 5 and May 5, 2001. These surveys concentrated primarily rock outcrops, sandy slopes and weathered clay deposits in the Ione and Valley Springs Formations with which Hartweg's golden sunburst is known to be associated. Four occurrences (16 populations) were discovered during the 2001 surveys.

Hartweg's golden sunburst was previously known within the U.C. Merced regional study area from one occurrence recorded in the CNDDB at the Kelsey Ranch, east of Snelling. This occurrence, representing two small separate colonies, was first discovered in 2000 during preliminary ranchland surveys. Both colonies were found on the north and northeast slopes on the uppermost portions of closely spaced mima mounds. These colonies are associated with acidic Amador and Hornitos clay soils of the Valley Springs and Ione formations. Interestingly, both colonies were found just below the contact zone for these two formations (on Ione Formation) and this zone might apparently provide some unique qualities in terms of hydrology or soil composition. During the 2001 surveys, two additional occurrences were found at the Kelsey Ranch, one consisting of a single colony and the second consisting of four colonies. Also, two occurrences comprising a total of nine colonies were discovered at the adjacent Richards Ranch. Given the overall rarity of the species, this represents a significant portion of its known occurrence. The regional study area is therefore very important in terms of the statewide conservation of the species.

San Joaquin adobe sunburst

Pseudobahia peirsonii



State:	Endangered	1987
Federal:	Threatened	1997

General Habitat:

San Joaquin adobe sunburst is restricted to heavy adobe clay soils on the grassy valley floor and rolling foothills of the eastern San Joaquin Valley. It is concentrated in three major locations: east of Fresno in Fresno County, west of Lake Success in Tulare County, and northeast of Bakersfield in Kern County. Its habitat is dominated by non-native annual grasses. Native species that occur with San Joaquin adobe sunburst include blue dicks, blow wives, fiddleneck, and bird's-eye gilia.

Description:

San Joaquin adobe sunburst is a small annual herb in the sunflower family (Asteraceae). It grows 4 to 18 inches tall and is loosely covered with white, wooly hairs. Its alternate leaves are twice divided into smaller divisions. Flower heads, which appear in March or April, are solitary at the ends of the branches.

Status:

San Joaquin adobe sunburst is known from approximately 30 occurrences. Conversion of natural habitat to residential development is the major current threat to the species. Other threats include flood control, competition from non-native grasses, incompatible grazing practices, road maintenance activities, conversion of habitat to agriculture, transmission line maintenance, and recreational activities.

The largest historically known population of San Joaquin adobe sunburst has been reduced by a residential development in Fresno County east of Clovis. The species occurred as four subpopulations at the site. Mitigation for the project included protection of the two subpopulations with the highest density of plants, and an attempt was made to create a new subpopulation in 1993 from seeds and topsoil salvaged from a high density subpopulation that was destroyed. In 1994 and 1995, a few plants of San Joaquin adobe sunburst were seen at both the preserved and transplanted subpopulations, but no plants were seen in 1996 and 1997. The status of this population is unknown.

The second-largest historically known population of San Joaquin adobe sunburst occurs within the Redbank-Fancher Creek Flood Control Project area, in Fresno County east of Clovis. Redbank Reservoir was constructed several years ago by the Fresno Metropolitan Flood Control District to temporarily detain water during floods. This project was predicted to impact approximately 40 percent of this population of San Joaquin adobe sunburst. The current status of this population is unknown. A population in Tulare County east of Porterville is threatened by a proposal to raise the water level of Lake Success.

Sierra Los Tulares Land Trust, a non-profit land conservation organization, has protected a population of San

Joaquin adobe sunburst at its Lewis Hill Preserve, just north of Porterville. The preserve also contains a population of fragrant fritillary (*Fritillaria liliacea)*, a sensitive species. Grazing is used as a management tool at the preserve.

Species such as San Joaquin adobe sunburst that have very small populations are vulnerable to decline and extinction due to the increase of deleterious genes in the population or to random catastrophic events such as floods, attack by insects, disease outbreaks, or extended droughts.

Gambel's watercress

Rorippa gambellii

State: Threatened 1990
Federal: Endangered 1993

General Habitat:

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. It is found in San Luis Obispo and Santa Barbara Counties. Associate species include cattail, willow, bur-reed, and sedge. It is also associated with marsh sandwort, a listed species.

Description:

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.

Status:

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 known from Mexico is thought to have been extirpated. Of the eight known locations of Gambel's watercress in California, only five small populations remain in San Luis Obispo and Santa Barbara Counties. The San Luis Obispo populations occur at Little Oso Flaco Lake and Oso Flaco Lake and are reported from Black Lake Canyon. There is also a population on Vandenberg Air Force Base in northern Santa Barbara County. Encroachment of willows and non-native plants, such as German ivy, into wetland areas threaten the marsh habitat of this species. Eucalyptus trees and drilling of water wells in the immediate watershed are serious threats to the habitat of this species in Black Lake Canyon. Oso Flaco Lake is within the Oceano Dunes State Vehicular Recreation Area (SVRA). OHV use in proximity to the lakes is a threat to vegetation of the dune and lake system.

The Land Conservancy of San Luis Obispo County has prepared a management plan for Black Lake Canyon that addresses Gambel's watercress. In addition, TNC recently purchased a conservation easement in the Nipomo Dunes that includes a large dune lakes complex. This area, which has not been surveyed by botanists for half a century, will be surveyed to determine if other populations exist and if potential habitat is available for establishment of experimental populations of this species. Beginning in 1993, research into demography, general ecology, and recovery options has been conducted by University of California, Santa Barbara researchers. During 1999, researchers recovered seeds from the known occupied locations for propagation and planting. A cooperative effort to establish more populations of this species at Vandenberg Air Force Base is in progress. Protection measures for Gambel's watercress are included in the USFWS *Recovery Plan for Marsh Sandwort (Arenaria paludicola) and Gambel's watercress (Rorippa gambellii)* completed in 1999.

Tahoe yellow cress

Rorippa subumbellata

State: Endangered 1982
Federal: None

General Habitat:

Tahoe yellow cress is found only along the margins of Lake Tahoe in El Dorado and Placer counties and in Nevada's Douglas and Washoe counties. The plants have an extremely narrow elevation range of 6,222 to 6,230 ft., growing only within the eight foot band between the high and low water line. The plant has most frequently been observed growing on a sandy substrate. Some of the largest, most persistent, and vigorous Tahoe yellow cress populations are associated with sand beaches near the mouths of streams, suggesting a dependency upon mesic substrate conditions.

Description:

This member of the mustard family (Brassicaceae) is a profusely branching, somewhat fleshy, herbaceous perennial, usually less than 4 inches tall. Its low growing branches, reaching up to 8 inches in length, bear wavy or deeply lobed leaves, and sulfur yellow flowers are clustered together at the ends of short branches. Reproduction occurs sexually, with seeds transported via wind or water, and clonally, through creeping rootstocks. Small plants, often observed among the "bathtub" ring of beach wrack in late spring and early summer, could originate from floating rootstocks well as floating seeds or fruit.

Status:

Since it was first described in 1941, Tahoe yellow cress has been collected or observed at 51 locations around the lake. Not all known occurrences have been occupied at the same time; the locations of the plants and number of occurrences vary from year to year, with the greatest number of occupied sites observed in one year being 48, and the fewest being 7. The most recent survey, 2002, found 48 occupied sites. An estimated 20,301 "individuals" were counted, up from 6,136 in 2001. Stem counts per site ranged from a low of one (Kahle/Nevada Beach) to a high of 14,434 (Upper Truckee East). Over 1,100 plants were found at new or expanded sites, nearly eight times more plants than the 2001 survey (146 plants). This increase may be a function of lower lake elevation and the intensive nature of the survey.

Generally, suitable habitat is considered to be composed of at least 30 percent sand; however, based on 2002 survey results, it is apparent the species is adapted to a broader range of habitat conditions (e.g., such as cobbles and rock substrates) than previously thought. Composition of sandy substrate ranged from less than 5 percent to 100 percent. Nineteen percent of the Tahoe yellow cress occupied sites had less than 30 percent sandy

substrate; however, the majority of sites (70 percent) had greater than 50 percent sandy substrate.

Tahoe yellow cress presence appears to be cyclical and mostly related to lake level fluctuation. More populations are observed in dry years with low lake levels; existing populations appear to increase, and new populations are sometimes found in previously inundated areas as well. Conversely, in wet years with high lake levels, fewer populations are observed; there is less available habitat, and previously existing occurrences are sometimes inundated. Studies have also found that soil saturation during the spring and summer inhibits vegetative growth and delays the onset of flowering. In addition to being sensitive to changes in lake level, the populations are also vulnerable to threats due management of habitat. Land management and maintenance practices of private individuals and public agencies, including removal of organic matter and debris by raking, recreational activities, and even attempts at ecological restoration have impacted Tahoe yellow cress directly by uprooting seedlings and adult plants and indirectly by altering the sand, the natural community, and hydrology of its habitat.

The 2002 Conservation Strategy for Tahoe Yellow Cress found that the major contributors to the current status of Tahoe yellow cress are: 1) Alterations in lake level dynamics caused by construction and operation of the Truckee River outlet dam and reservoir; 2) destruction of actual and potentially suitable habitat by the construction of some types of structures; 3) high levels of recreational activity associated with beaches and dunes; 4) disturbance of the sand by public and private property maintenance activities; 5) and possibly random environmental events. The Conservation Strategy, a cooperative effort to be implemented by a task force made up of 14 federal, state, and local agencies and private interest groups, including DFG, outlines a number of management goals including: 1) Protect occupied habitat and potentially suitable habitat that does/could support natural populations; 2) improve Tahoe yellow cress populations; 3) promote conditions that favor a positive metapopulation dynamic; 4) conduct research that directly supports management and restoration; 5) Revise and continue the monitoring program for Tahoe yellow cress; and 6) implement an interagency adaptive management framework.

The population dynamic of Tahoe yellow cress, with fluctuations in population size, disappearance/extirpation, and reappearance/recolonization, is referred to as a "metapopulation dynamic." Recovery of Tahoe yellow cress will depend on restoration of its metapopulation dynamics at local and landscape levels. Such a program must increase the number and size of Tahoe yellow cress occurrences and work towards reestablishing the vital processes of dispersal, genetic exchange, population growth, and colonization so that the species will maintain itself into the indefinite future. At times, the persistence of populations depends on the availability of microhabitat refuges: less accessible areas, enclosures, or adjacent parcels that are often sub-optimal as habitat, but provide the only relief from anthropogenic disturbance such as recreational impacts. The optimum number of occupied sites necessary to ensure the survival of the species is unknown.

Currently, the Upper Truckee meadows population is protected by the California Tahoe Conservancy, and fencing around the area has been increased. Plants are been propagated for experimental reintroductions and research. An experimental introduction at three sites on U.S. Forest Service land in 1988 had a survival rate after 5 years of 12 to 43%. Researchers have found that the small seeds have very high germination rates and readily establish in the greenhouse. Studies conducted by the National Forest Genetics Electrophoresis Laboratory at the University of California, Davis have found that Tahoe yellow cress has very low levels of genetic variability. Further research and other conservation efforts are currently being pursued.

Small-leaved rose *Rosa minutifolia*

State: Endangered 1989
Federal: None

General Habitat:
Small-leaved rose grows in the maritime succulent scrub plant community of Southern California and Baja California, Mexico.

Description:
Small-leaved rose is a densely spiny, low-growing shrub in the rose family (Rosaceae). It has slender, gray shoots, small compound leaves, and showy rose-pink flowers.

Status:
In the United States, this species was known from a single population, discovered in 1985 on private property on Otay Mesa in southwestern San Diego County. The species is documented from Baja California, Mexico, where it has been reported from more than 20 sites. The current number of extant stands in Baja California is not known.

The Otay Mesa population of small-leaved rose was once a large, healthy thicket occupying an area of approximately 100 square yards. The population appeared to represent a large clone, or single genetic individual. A major residential and commercial subdivision approved by the City of San Diego resulted in the elimination of the existing population in 1997. Cuttings taken from the original population were translocated to adjacent habitat as mitigation for loss of the original population. The sole U.S. population of this species is included in the San Diego Multiple Species Conservation Plan (MSCP) and will be protected under agreement with the California Terraces residential development. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. The MSCP incorporated conditions of DFG 2081 permit ("take permit") issued as part of the California Terraces project. These conditions required conservation, propagation, and translocation of the rose to a preserve on Otay Mesa. A number of years following establishment of these replacement populations will be needed before a reasonable assessment of the translocation efforts can be made, although several hundred cuttings are surviving to date. Small-leaved rose is also covered in the San Diego Gas &

Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Development of the coastal plain in western Baja California is rapidly converting much of the Mexican habitat for small-leaved rose to farmland and other commercial or residential uses. An effort is underway, however, to conserve the rich biological diversity of border region of California and Baja California. The Las Californias Binational Conservation Initiative proposes a binational conservation vision for the border region. Small-leaved rose and a suite of other sensitive species would be conserved under the preserve system envisioned by the Initiative project.

Adobe sanicle *Sanicula maritima*

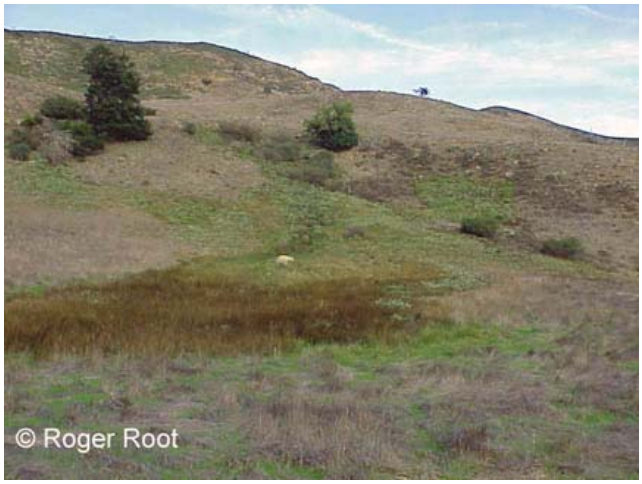
State: Rare 1981
Federal: None

General Habitat:
This member of the carrot family (Apiaceae) is found in wet to dry clay soils of coastal prairie and coastal sage scrub plant communities. Its distribution is centered in the coastal hills of San Luis Obispo and Monterey counties, with one historical record from the San Francisco area. Associated species include meadow barley, hedge nettle, buttercup, blue-eyed grass, and rush.

Description:
Adobe sanicle grows as a stout, aromatic, perennial herb with large basal leaves, smaller upper leaves, and yellow flowers in head-like clusters.

Status:
Adobe sanicle formerly occurred in coastal areas from the San Francisco Bay area south to San Luis Obispo County. Of the twelve historical occurrences of adobe sanicle, one is presumed extirpated, and eight are privately owned and have not been documented in twenty or more years. The three remaining occurrences are publicly owned: one in the Los Padres National Forest; one in Andrew Molera State Park; and one at Laguna Lake Park, owned by the City of San Luis Obispo. Until its discovery at Laguna Lake Park, adobe sanicle was known to exist only at two sites in southern Monterey County and from sites on the Hearst Ranch near Arroyo de la Cruz in northwestern San Luis Obispo County.

Adobe sanicle grows in moist soil on a gently sloping spring-fed swale in a grassland area. Prior to 1996, the area had been grazed and the sanicle plants were not observed due to trampling and cropping. With the cessation of grazing, adobe sanicle and other species grew back. The population was estimated at 100 individuals although an actual count was not possible since taller plants obscured the leaves of the adobe sanicle. Adobe sanicle grows in the same type of habitat as does Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*), a listed species, also known from Laguna Lake Park. The species occurs in the Irish Hills Natural Reserve, owned and operated by the City of San Luis Obispo.



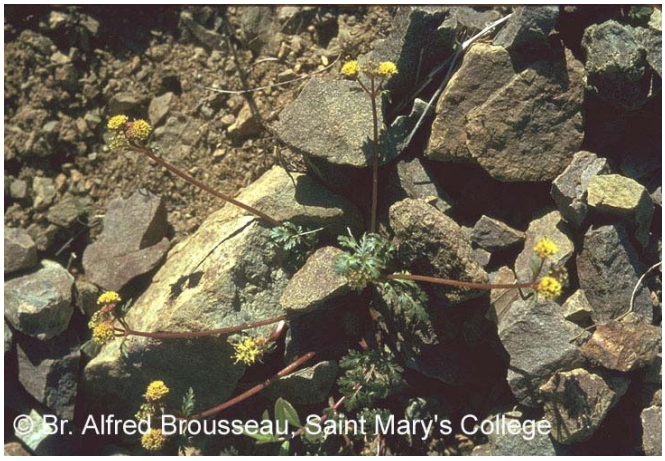
DFG has no recent information on the status of this plant. Adobe sanicle would benefit from protection of both the privately and publicly owned occurrences. Studies to determine its ecological requirements would also aid efforts to protect this plant.

Rock sanicle *Sanicula saxatilis*

State: Rare 1982
Federal:

General Habitat:
Rock sanicle is endemic to Contra Costa and Santa Clara counties. It is found on rocky soil, rock outcrops, and talus slopes, usually within the chaparral plant community, often surrounded with oak and foothill pine. Associate species include sickle-leaf onion, common phacelia, violet, and Brewer's rock-cress.

Description:
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.



Status:
About 10 occurrences of rock sanicle are known, in Mount Diablo State Park in Contra Costa County, and in the vicinity of Mount Hamilton in Santa Clara County. Because the populations of this species are located largely on protected land, and occur in habitat areas that are generally remote and experience little disturbance, the status of this species appears to be stable.

Rock sanicle occurs on the main and north peaks in Mount Diablo State Park. Several populations are made up of a number of colonies along trails; these appear stable and receive few impacts from hikers. Primary threats include parking and radar station development.

In the vicinity of Mount Hamilton, rock sanicle is found both on privately owned land and on property of the University of California's Lick Observatory. These populations are located in remote areas and so receive little impacts.

Gander's butterweed *Senecio ganderi*

State: Rare 1982
Federal: None

General Habitat:
Gander's butterweed usually grows in the understory of mature mixed chaparral, or in open areas of recently burned chaparral. It is found in the very southwestern part of Riverside County and the foothills of western San Diego County, and its habitat is limited to areas of gabbro soils on Lawson, Sycuan, and Tecate Peaks; Barber, Black, El Cajon, and McGinty Mountains; and Magee Ridge.

Description:
Gander's butterweed is a member of the sunflower family (Asteraceae). This basal-leaved, perennial herb has compact, yellow-orange flower heads and leaves suffused with purple.

Status:
Fewer than fifteen occurrences of Gander's butterweed have been reported. Some occurrences are in undisturbed, protected sites, while others exist in areas threatened by residential development. A cooperative preserve on McGinty Mountain managed by the DFG, The Nature Conservancy, San Diego County Department of Public Works, and the Environmental Trust protects the known population there. As of 1999, DFG and WCB had worked successfully with private landowners to acquire 1,270 acres of habitat to protect the population on Sycuan Peak. Cleveland National Forest manages the Barber Mountain, Black Mountain, El Cajon Mountain, and Lawson Peak populations. Recent efforts to protect the largest populations should help stabilize the population trend and greatly reduce further loss of habitat.

Studies are needed to determine the role of wildfire management and/or prescribed burning with respect to establishment and reproduction in populations of Gander's butterweed. Information from these studies will be crucial to the development of recovery strategies for Gander's butterweed and essential for management of the species in the actual and proposed reserves. This species is covered in the San Diego Multiple Species Conservation Plan (MSCP), which should ensure that 90 to 100 percent of the populations within the southwestern portion of San Diego County will be preserved. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican border.

In 2003, the huge Otay Fire burned a large area of south-central San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 40% of habitat suitable for Gander's butterweed burned during the fire, with direct impacts to at least one population. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of this species.

Layne's ragwort *Senecio layneae*

State:	Rare	1979
Federal:	Threatened	1996

General Habitat:

Layne's ragwort occurs on gabbro- and serpentine-derived soils of chaparral and black oak and interior live oak woodlands in the vicinity of Pine Hill in western El Dorado County, in the Red Hills of Tuolumne County, and in Yuba County. Associated species in El Dorado County include four other State listed plants: Stebbins' morning glory, Pine Hill ceanothus, Pine Hill flannel-bush, and El Dorado bedstraw.

Description:

Layne's ragwort is a perennial herb with basal leaves and reduced stem leaves and yellow flowers in small heads. The flowers have five to 10 rays arranged in an irregular pattern around the central disk flowers. It is a member of the sunflower family (Asteraceae).

Status:

Layne's ragwort is currently known from approximately 43 occurrences. The majority of occurrences are in El Dorado County. Population size records vary from 10 to over 1,000 individuals. Observations suggest that Layne's ragwort is an early successional species that occupies temporary openings on gabbro or serpentine soils and is eliminated as vegetation grows up around it. More information is needed on the reproductive biology and demography of this species. Habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance (all mainly due to urbanization) are the major threats facing *Senecio layneae* in western El Dorado County. Proposed residential or commercial development within the Pine Hill formation threatens most of the remaining sites within the Pine Hill formation and adjacent serpentine in western El Dorado County, and either directly or indirectly will adversely affect most of the range of the gabbro soil plants. Although mitigation for impacts to habitat occurs when the El Dorado County approves discretionary projects, the forms of protection that can be conducted on relatively small individual parcels is unlikely to result in long-term viability of the colonies located on these sites. Rural property owners clear native understory vegetation, graze livestock, or build access roads and outbuildings under ministerial permits, resulting in unregulated losses of Layne's ragwort.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed, and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve is being expanded around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements, and if the program continues to receive support from local public agencies. The Recovery Land Acquisition Fund, provided to the Department by the USFWS to acquire land to protect listed species, has been used for several purchases. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*),

which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 areas have been preserved.

In the northern portion of the gabbro soil formation, approximately 2,079 acres have been purchased and transferred to the DFG, BLM, or El Dorado County. This area includes a population of Stebbins' morning glory. A prescribed fire on nearby property held by BLM appears to have rejuvenated a dwindling population on that site. In the southern portion of the gabbro soil formation, approximately 454 acres have been purchased and transferred to BLM or El Dorado County.

Recovery is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. Assuming recovery criteria are met, *Senecio layneae* could be delisted after 60 years.

Owens Valley checkerbloom

Sidalcea covillei

State: Endangered 1979
Federal: None

General Habitat:

This species is endemic to the Owens Valley in Inyo County. It occurs in moist, alkaline meadows with a high water table, and freshwater seeps, The meadows are often dominated by alkali sacaton and salt grass. Owens Valley checkerbloom is associated with Inyo star tulip, a sensitive species.

Description:

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.

Status:

Owens Valley checkerbloom is known from approximately 40 occurrences. The majority of these occurrences are on land owned by the Los Angeles Department of Water and Power; others are owned by BLM, Bureau of Indian Affairs, and private landowners. Historically, the species declined due to loss of wetland habitat from groundwater pumping and water diversions, as well as intensive grazing. Many populations are located in areas of livestock grazing. Moderate levels of grazing appear to be compatible with maintaining populations, particularly where livestock graze down competing vegetation. Field studies have shown that plants in grazed areas produced fewer flowers and fruits than in ungrazed areas. In areas of very heavy grazing, plants appear stunted and sometimes fail to bloom. At certain sites, moist meadow habitat supporting this species is being overtaken by an invasive peppergrass.

The *Los Angeles Dept. of Water & Power and EPA Lower Owens River Project Draft EIR/EIS* was released in November 2002. Under this plan, the existing populations of Owens Valley checkerbloom would be protected by rare plant exclosures on the Blackrock and Thibaut grazing leases. Grazing will be prohibited in the exclosures during the flowering period of the species (April-June). These populations have been subjected to grazing for decades and have persisted, despite removal of plants by grazing and trampling. A seasonal timing change in grazing is expected to improve the reproductive success and long-term survival of the checkerbloom populations.

Cuesta Pass checkerbloom

Sidalcea hickmanii ssp. anomala

State: Rare 1979
Federal: None

General Habitat:

Cuesta Pass checkerbloom is restricted to a small area of San Luis Obispo County on West Cuesta Ridge, in the vicinity of Sargent cypress forest. It grows on open, rocky serpentine slopes, sometimes near abandoned mine spoils and near roads, in chaparral and at the margins of cypress woodlands. This species is a typical "fire follower", with thousands of plants reported within the first two to three years following a fire, but relatively few plants remaining after five years. Common associates include leather oak, bishop manzanita, California-lilac, and Sargent cypress.

Description:

Cuesta Pass checkerbloom is a perennial herb in the mallow family (Malvaceae), with rounded basal leaves and deeply lobed stem leaves, and covered with grayish, star-shaped hairs. Its multiple, ascending stems reach three feet in length, and each stem bears numerous pinkish-lavender flowers above broad bracts from May to June.

Status:
Cuesta Pass checkerbloom is restricted Cuesta Ridge in San Luis Obispo County. This species is a typical "fire follower", with thousands of plants reported within the first two to three years following a fire, and the number of plants sharply declining thereafter. The population then lies dormant in a soil seedbank until germination is stimulated by the next fire event or other sufficient disturbance.

The Highway 41 wildfire of August 1994 burned tens of thousands of acres in Los Padres National Forest including the known population of the checkerbloom on West Cuesta Ridge. Prior to the fire, this population consisted of fewer than 50 individuals. Surveys after the fire in 1995 and 1996 revealed tens of thousands of checkerbloom plants extending throughout the Cuesta Ridge Botanical Area and beyond, including most of the serpentine soils on west Cuesta Ridge.

Some populations in the Los Padres National Forest are protected within the Cuesta Ridge Botanical Area. Populations on land managed by the California National Guard (Camp San Luis Obispo) are in restricted areas. Primary threats include potential mine reclamation activities, road and facility construction, and erosion at road cuts and adjacent trenches.

Parish's checkerbloom ***Sidalcea hickmanii ssp. parishii***

State: Rare 1979
Federal:

General Habitat:

Parish's checkerbloom occurs on dry, rocky slopes in chaparral and mixed coniferous forest at elevations between 3000 and 7000 feet San Bernardino, Santa Barbara, and San Luis Obispo counties. It appears most commonly in recently burned areas, and is also found in unvegetated openings such as along roads, trails, firebreaks, or small landslides.

Description:

Parish's checkerbloom is an herbaceous perennial in the mallow family (Malvaceae), with multiple stems emerging annually from a woody root crown. It is covered with coarse, gray hairs, and has rounded leaves with scalloped edges. Its elongated inflorescences of pinkish-lavender flowers bloom from June to August.

Flowers – Image of closely related species, Cuesta Pass checkerbloom (*Sidalcea hickmanii* ssp. *parishii*). Flower bracts distinguish the two subspecies.

Status:

Parish's checkerbloom is historically known from approximately fifteen locations in San Bernardino, Santa Barbara, and San Luis Obispo counties. The plant's emergence primarily following fire makes it difficult to accurately assess its distribution.

The earliest collections of this species are from San Bernardino County. Collections were made between the 1890's and 1924 at several locations in the San Bernardino Mountains. The species was not documented in this area again until 1981, when 20 plants were discovered near a historical collection location. A few years later these plants could not be relocated, but in 1995, two other small occurrences with a total of eight plants were found at the edge of a trail not far from the 1981 discovery. Despite focused surveys for this taxon in two small burns, and recent wide-ranging surveys conducted for a flora of the San Bernardino Mountains, no other occurrences have been located in San Bernardino County. Fire has been suppressed in most of the San Bernardino Mountains for over half a century, so it is possible a buried soil seedbank exists that is unexpressed.

In Santa Barbara County, Parish's checkerbloom is known from Big Pine Mountain, Sierra Madre Ridge, and McKinley Peak, all within the Los Padres National Forest. Collections in these areas were made in the 1930s, 1960s, and 1970s, in burned areas and along roads and fuel breaks. The Forest Service surveyed all known occurrences in 1993 and 1994. At that time, they located no plants at Big Pine Mountain, where historical collections were made after the last documented fire there in 1932. On Sierra Madre Ridge, four small

occurrences (between 13 and 25 plants) were found along roads and fuel breaks, corresponding to the general locations of past collections. Portions of Sierra Madre Ridge burned in 1921, 1932, and 1966. On McKinley Peak, about 600 individuals were located; this area burned in 1923 and 1966, and a controlled burn was conducted there in 1985.

In 1989, a small population of less than 20 Parish's checkerbloom plants, occupying less than one acre, was discovered in the Los Padres National Forest in San Luis Obispo County during a floristic survey. This area had last burned between 1921 and 1939. In 1996, the area burned in the "58" wildfire. In 1998, the Forest Service surveyed 315 acres of this burned area and mapped 3,000 to 5,000 Parish's checkerbloom plants occurring on approximately 80 acres in two locations. This discovery suggests that, while a few plants may continue to persist in openings and disturbed sites, a large persistent seedbank may remain viable in the surrounding soil for five or more decades.

Most known occurrences of the species are owned and managed by the USFS. Primary threats include livestock grazing and trampling, development or expansion of roads and facilities, recreational use, invasion of non-native species, and fire suppression or prescribed burns at the wrong time of year. In addition, road maintenance activities, such as pesticide spraying and mowing, and maintenance of an Air Force communication facility, impact the species. Parish's checkerbloom would benefit from a management plan and from studies designed to determine the effects of grazing and wildland fire suppression.

Kenwood Marsh checkerbloom

Sidalcea oregana ssp. valida

State: Endangered 1982
Federal: Endangered 1997

General Habitat:

Kenwood marsh checkerbloom, endemic to Sonoma County, occurs on the edges of freshwater marshes. It is known from only two occurrences, one in Kenwood Marsh and the other in Knights Valley. Associate species include willow, sedge, and rush.

Description:

Kenwood Marsh checkerbloom is a many-stemmed, perennial herb in the mallow family (Malvaceae), with rounded, deeply lobed stem leaves. Spike-like inflorescences of pink to mauve flowers bloom from late June through September.

Status:

Kenwood marsh checkerbloom is known from only two small occurrences in Sonoma County. Both sites are located on private land and have had the natural hydrology altered and habitat eliminated by nearby housing development, cattle grazing, and agricultural practices.

At the first site, located in Kenwood marsh, the quality of the habitat has been declining over the past several decades. Surveys in 1998 found 40 plants at this location. The fencing that once protected the site has been removed, and the marsh was partially bulldozed in 2002. The current status of the population is unknown. The second site is completely surrounded by vineyards. Surveys in 1998 found 50 plants at this location. The current status of this population is also unknown.

Primary threats to this species include trampling and reduced seed set resulting from cattle grazing, alteration of the hydrology due to water withdrawal related to adjacent urban development or vineyards, encroachment and competition with invading species such as Himalayan blackberry and yellow star-thistle, and potential conversion of habitat to urban development or vineyards. Due to the small number and size of the populations, the species is also susceptible to adverse impacts from random events.

There are currently no management agreements with the private landowners. Up-to-date information and conservation actions are needed to prevent further impacts to Kenwood marsh checkerbloom and its marsh habitat.

Bird-foot checkerbloom

Sidalcea pedata

State: Endangered 1982
Federal: Endangered 1984

General Habitat:

Bird-foot checkerbloom is restricted to moist meadows, sparsely vegetated drier meadow margins and forested areas 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 mustard.

Description:

Bird-foot checkerbloom is a slender, few-stemmed perennial in the mallow family (Malvaceae), with mostly basal leaves, growing to 16 inches tall. It has numerous pinkish-rose, dark-veined flowers that bloom along a spike-like raceme from May to July.

Status:

Bird-foot checkerbloom is a narrow endemic restricted to the Big Bear Valley in the San Bernardino Mountains of San Bernardino County in Southern California. It is estimated that 20 acres or less of wet meadow habitat now exists for the checkerbloom. Very little checkerbloom habitat is protected and its habitat is threatened by urban development. All of the unprotected habitat occurs on private property and most parcels have existing or proposed development plans. Bird-foot checkerbloom was historically known from approximately 13 occurrences. It was probably more widespread prior to construction of a dam in the 1890s that flooded much of its meadow habitat and created Big Bear Lake. The western portion of its range has been highly fragmented by urban development in the City of Big Bear Lake, while populations in the eastern portion around Baldwin Lake are in better condition. The chief threat to the species is loss of habitat from development, recreation, alterations in hydrology, intensive grazing, and excessive growth of competing vegetation. Although large fires burned in portions of San Bernardino County in 2003, the region around Big Bear and Baldwin Lakes, where the populations of bird-foot checkerbloom occur, were not affected.

Four of the 13 historical occurrences are believed extirpated. Most other occurrences are on privately owned land and have not been recently documented, although some privately owned occurrences are voluntarily protected through The Natural Conservancy's Registry of Natural Areas. Habitat protection is urgently needed for populations in the City of Big Bear Lake. Unmitigated losses of plants continue in this area.

Several occurrences are on property owned by the DFG (North Baldwin Lake Ecological Reserve), the City of Big Bear, and USFS. DFG carefully monitored protected populations from 1990 through 1994 and found that the numbers of adult plants and first year plants increased in years with more rainfall. In 1998, the USFWS released the recovery plan, which provides a strategy to address protection and recovery of the species. Additional habitat acquisition and protection is key to preventing further declines.

In 2002, the DFG funded a research project for bird-foot checkerbloom using federal Section 6 funding. The objective of this project is to develop a reserve design for the bird-foot checkerbloom. The principal task under this project examines the reproductive potential of this species in a fragmented environment. The breeding system, pollination biology, and recruitment success, were examined to answer critical questions about the biology and ecology of the checkerbloom so that the reserve design would be defensible. To elucidate the breeding system of the bird-foot checkerbloom, specific floral observations were made at four sites. All checkerbloom populations surveyed appeared to have a breeding system in which two forms of individual plants exist in the population: flowers with both male and female floral parts (hermaphrodite) and flowers in which the anthers are sterile (female only). The brief surveys of these populations suggest that male/female flowers are more common then females, but no quantitative data on frequency distributions were taken. This type of breeding system was not recognized in bird-foot checkerbloom prior to this project.

In general, the main kinds of insect visitors observed at all sites are bees, flies, butterflies, and beetles. At one, relatively undisturbed site, Bluff Lake, honey bees and bumblebees were the most common insect visitors to checkerbloom flowers. At the other sites, honey bees and bumble bees were rarely observed visiting the flowers. Counts of the relative abundance of floral visitors along transects at Bluff Lake suggest that individuals near the lower road that bisects the meadow receive fewer bumblebee visits than individuals away from the road in the interior of the meadow. Bird-foot checkerbloom occurs in larger, denser patches along the transects established within the interior of the meadow.

Experiments were conducted to determine if male/female flowers require insects for pollination or if self-pollination produces viable seed. An insect that is an effective pollinator of a species like bird-foot checkerbloom should visit both forms of flowers and frequently switch between male/female and female flowers. When male/female flowers were caged to prevent insect pollination, the findings suggested that insect pollinators are required for fruit and seed production in the male/female flowers. In assessing pollinator behavior, the study showed that about one-third of the pollinators moved between the two types of floral forms and over half of the moves were to consecutive male/female flowers.

This project is ongoing and will determine whether bird-foot checkerbloom is capable of self-pollination. In addition, flower longevity and the development of reproductive structures will be assessed. The results of this project will provide information needed to ensure survival of populations. The size of individual populations, the size of the meadow remnant, the presence of pollinators, the nature of the surrounding land use, and geographical location will be used to evaluate potential acquisitions and guide reserve design.

Scadden Flat checkerbloom *Sidalcea stipularis*

State: Endangered 1982
Federal: None

General Habitat:
Scadden Flat checkerbloom is endemic to Nevada County, California. It grows in a wet montane freshwater marsh habitat fed by local springs, which also supports many plants normally found at higher elevations. Associate species include broad-leaved cattail, rush, and fireweed.

Description:
Scadden Flat checkerbloom is a perennial herb in the mallow family (Malvaceae). It grows from elongated rhizomes and has basal leaves without lobes, and mauve flowers in densely branched inflorescences.

Status:
Scadden Flat checkerbloom is known from three small populations in Nevada County. The first population, in Scadden Flat near Grass Valley, occurs on private land and along the Caltrans right-of-way. A portion of the population was established through transplanting. The second population, in the vicinity of Peardale, occurs on private land directly next to the Caltrans right-of-way. The third population, located near Squirrel Creek, also occurs on private land. Primary threats to the species include highway widening, herbivory and trampling, and encroachment of Himalayan blackberry (*Rubus discolor*). Two of the three populations are thriving as of 2005; one could not be relocated. Himalaya blackberry remains the primary threat to plants along Squirrel Creek. The population at Scadden Flat is extensive, with 1000s of the stems visible.

Red Mountain catchfly *Silene campanulata* ssp. *campanulata*

State: Endangered 1982
Federal: None

General Habitat:

Red Mountain catchfly 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 and in the vicinity of Cook Springs, Colusa County. Among its associates in Mendocino County is McDonald's rock cress, which is State and federally listed as endangered.

Description:

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.

Status:

Originally Red Mountain catchfly was thought to be restricted to Red Mountain in Mendocino County, California, where subsurface and surface mining of nickel and cobalt threaten two populations. Since 1980, additional populations have been discovered. Beginning in 1993, as many as seven additional populations were documented. Examination of specimens from the entire range of *Silene campanulata* shows that there is overlap of taxonomic characteristics of *ssp. campanulata* (Red Mountain catchfly) and *ssp. glandulosa.* The presence of plants with intermediate traits warrants further study to determine if Red Mountain catchfly is a distinct species. The lack of documented threats to the newly discovered populations and the uncertain taxonomic status have led the USFWS to discontinue candidate status for this species.

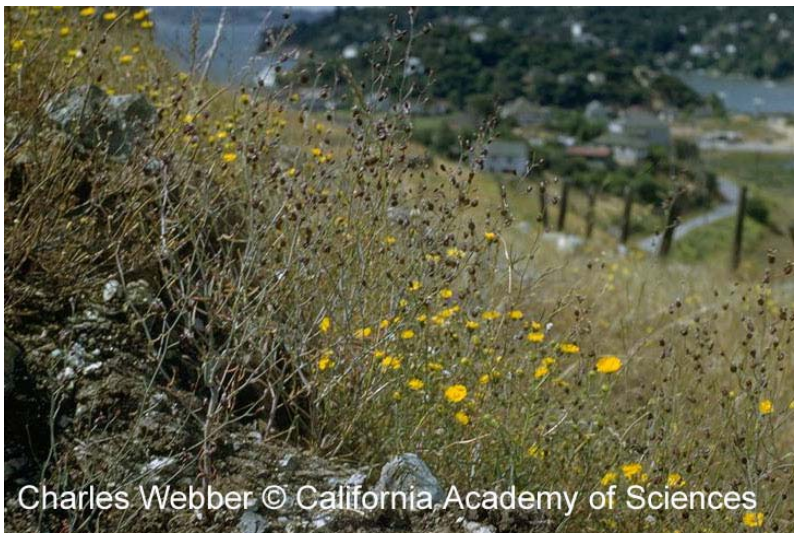
Tiburon jewelflower

Streptanthus niger

State: Endangered 1990
Federal: Endangered 1995

General Habitat:

Tiburon jewelflower is known from only two occurrences on the Tiburon Peninsula in Marin County. It grows on shallow, rocky, serpentine soils on south- or west-facing slopes within a native bunchgrass plant community. The serpentine soils provide a harsh environment for plant growth due to their low calcium-magnesium ratio; lack of essential nutrients such as nitrogen, potassium, and phosphorous; and high concentrations of heavy metals. However, species such as Tiburon jewelflower have adapted to serpentine soils and require them to survive. It is associated with Marin dwarf-flax, Tiburon Indian paintbrush, and wild onion.



Description:

Tiburon jewelflower is a simple to much branched, annual herb in the mustard family (Brassicaceae), and growing one to two feet tall. The flowers, which bloom in May and June, have dark purple sepals and narrow, white petals with light-purple centers. The long, narrow seed capsules open in late June, releasing seeds. Seedlings appear in March and April.

Status:

Tiburon jewelflower is an extremely narrowly-distributed species. Combined, the two occurrences cover approximately 12 acres of habitat. The two populations have fluctuated in size from 50 to 2,000 plants each over the past several years. Both occurrences are partially on private and publicly-owned lands. A portion of one population is within Marin County's Ring Mountain Preserve and Old St. Hilary's Open Space Preserve. The second population is within the Reed School District Open Space. This species was possibly once more widespread on the Peninsula; urban development has destroyed an estimated 40 percent of the potential habitat in the area. Pedestrian traffic, residential development, and road construction threaten both populations.

In 1997, DFG held two recovery workshops to address Tiburon jewelflower and 11 other plants known from serpentine habitats in the San Francisco Bay Area. Habitat loss to invasive species such as broom, pampas grass, and Himalaya berry, and loss of some habitat to a proposed residential development were identified as threats to

the two remaining populations. The workshop identified the development of habitat management methods to increase regeneration as a primary need. In 1998, plant numbers were up significantly from 1997, a very poor year for the species. Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.

Eureka Valley dune grass

Swallenia alexandrae

State: Rare 1981
Federal: Endangered 1978

General Habitat:

Eureka Valley dune grass is endemic to Death Valley National Park. It occurs in sand dunes in the Eureka Valley and west of Eureka Valley at the foot of the Saline Range in eastern Inyo County. It is often the only plant found on the higher slopes of the dunes, occurring at 2950-4200 ft elevation. Associated plant species include the Eureka Dunes Evening Primrose (*Oenothera californica* ssp. *eurekensis*), a listed species, and shining milkvetch. In addition, the blue-green weevil, an insect endemic to the Eureka Dunes, relies on the shade provided by Eureka Valley dune grass for survival.

Description:

Eureka Valley dune grass, a member of the grass family (Poaceae), is a stiff, branched, perennial grass, often forming tufts more than a meter wide, with spiny leaf tips and a woody base. The species grows from a long, branched, scaly rhizome, which spreads through the sandy substrate. Its dense root system catches and holds drifting sand, forming hummocks on the unstable upper dune slopes. It grows rapidly from March to November. Flowering stalks are 6-40 inches tall and have stiff lance like blades. Narrow clusters of small flowers bloom from April to June.

Status:

Eureka Valley dune grass is restricted to four dunes in the Eureka Valley and one dune in the Saline Range to the west of Eureka Valley. Prior to 1976, OHV activity in the Eureka Valley sand dunes represented a critical threat to the species. With the closure of the dunes to OHVs in 1976, sand disturbance and destruction of plants were greatly reduced. However, occasional illegal OHV activity still occurs, and a new, legal recreational activity, sand boarding, now poses similar threats. Expansion of Russian thistle, a non-native invasive species that became established on the dunes during the period of intense disturbance by OHVs prior to closure, also threatens the habitat. The plant populations currently appear to be stable; however, population size varies widely depending on seasonal rainfall.

Prior to the administrative transfer to the National Park Service in 1994, the BLM established the Eureka Valley

Area of Critical Environmental Concern and in 1982, the USFWS adopted the Eureka Valley Dunes Recovery Plan. Stemming from these, a voluntary joint conservation strategy is being developed by the USFWS and Death Valley National Park. The agreement targets actions over entire dune ecosystems to benefit sensitive plants and other species of special consideration including endemic beetles.

Research done under contract with the DFG, using federal Section 6 grant funds, revealed that although seed production in Eureka Valley dune grass is low and variable, seeds and plants are long-lived. Current research indicates that there is very little genetic variation in the species.

Slender-petaled thelypodium

Thelypodium stenopetalum

State: Endangered 1982
Federal: Endangered 1984

General Habitat:

Slender-petaled thelypodium is endemic to Big Bear Valley in San Bernardino County, growing in seasonally moist, alkaline clay soils associated with seeps, springs, and meadows. A large number of endemic species occur in the area, including the State and federally endangered pedate checkerbloom.

Description:

Slender-petaled thelypodium, a member of the mustard family (Brassicaceae), is a much-branched biennial herb with an open inflorescence. Stems spread from the base of the plant. Flowers are lavender, with narrow, linear petals.

Status:

Slender-petaled thelypodium occurs in the north, south and west end of Baldwin Lake, Eagle Point in the City of Big Bear Lake, and Upper Holcomb Valley. Populations at the North Baldwin Lake Ecological Reserve are protected by the DFG, and Upper Holcomb Valley is a USFS-designated Botanical Special Interest Area. The Big Bear Community Services District owns several populations around Pan Hot Springs (West Baldwin) and south Baldwin Lake and has cooperated with the DFG in providing protective management for some sites. The Eagle Point occurrence occupies a seven-acre meadow-pebble plain complex within a developing housing tract, and is partially protected through an open space designation. This site represents one of the few protected habitat areas for slender-petaled mustard, pedate checkerbloom, and other rare endemics on the west end of Big Bear Valley. The remaining occurrences are on private land and are not formally protected.

The USFWS released a recovery plan for this species in 1998.

Santa Ynez false-lupine

Thermopsis macrophylla var. agnina

State: Rare 1981
Federal: None

General Habitat:

Santa Ynez false-lupine is restricted to the Santa Ynez Mountains of Santa Barbara County. It occurs on gravelly to rocky substrates derived from sandstone in openings in the chaparral germinates well after fire.

Description:

Santa Ynez false-lupine, in the Pea Family (Fabaceae) is a large, herbaceous perennial with woolly stems and leaves and spikes of yellow flowers. It reaches a height of about six feet. Following fire, plants resprout from underground buds.

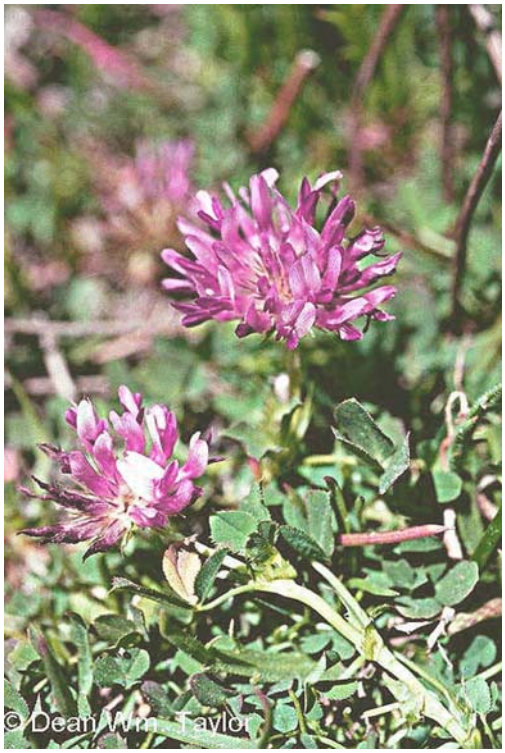
Status:

The eight known occurrences of Santa Ynez false-lupine are entirely within Los Padres National Forest. Four of the eight occurrences were last observed between 1955 and 1963, after a fire burned in the Los Padres National Forest in 1955. No plants have been located at these sites recently. In 1999, approximately 500 plants were observed at the type locality for the species; however, no seedlings were observed. The total number of plants is now estimated at 2,000 to 2,500 individuals. The majority of plants are dispersed primarily in a three-mile area, occurring as individuals or colonies of 3-150 plants. A small population of fewer than ten plants occurs approximately 15 miles away from the type locality. According to the Center for Plant Conservation, reports of other plants in the Santa Ynez Mountains have not been substantiated by recent surveys and reports of plants from other mountain ranges in California are based on misidentifications. Santa Ynez false-lupine is threatened by habitat disturbance and loss of plants along roads and mountain bicycle trails, as well as by illegal off-highway vehicle activity. Construction of fuel breaks also removes habitat. Since the species reproduces by seed following fire, alteration of natural fire cycles is another threat.

Research has shown that this species responds to fire by producing great numbers of seed and may depend on fire to maintain a sizable seed bank in the soil. However, researchers found low rates of recruitment and establishment from seed during the eight years following a controlled burn. Studies are being conducted by the Santa Barbara Botanic Garden on germination rates following short-term cold storage. Populations are monitored annually to estimate numbers, reproductive rates, and pollinator visitation. Research needs include genetic analysis within and among populations and an assessment of ecological factors that affect successful establishment from seed. Seeds have been collected for conservation storage.

Although recognized as a sensitive species by the USFS, Santa Ynez false-lupine lacks an active management program. A management plan that increases the number of plants and ensures a stable population structure is need.

Pacific Grove clover *Trifolium polyodon*



State: Rare 1979
Federal: None

General Habitat:
Pacific Grove clover occurs in moist grassland areas in the Monterey and Point Lobos area.

Description:
Pacific Grove clover is a low, annual herb in the pea family (Fabaceae). This small clover has muted purple flowers with lighter tips.

Status:
This species is known from 13 sites on the Monterey and Point Lobos Peninsulas, sites immediately inland from these areas, and from Fort Ord. The Fort Ord populations are owned and managed by the BLM. All of the remaining occurrences for Pacific Grove clover are in private ownership. In 1997, the DFG initiated recovery activities on the Monterey peninsula for the Pacific Grove clover, in cooperation with the landowners, the Del Monte Forest Foundation, and the Pebble Beach Company. Actions include mowing and weeding to reduce competition by weedy native and non-native plants.

Yearly monitoring of these populations, including a census of numbers of individuals and their seed production, is needed.

Monterey clover *Trifolium trichocalyx*

State: Endangered 1979
Federal: Endangered 1998

Mary Ann McCrary, DFG File Photo

General Habitat:

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 Bishop pine/Monterey pine/pygmy cypress plant community. Nutrient-poor ancient podzol-like soils in this habitat are poorly drained and underlain with hardpan. This species is a classic "fire follower", appearing in large numbers only after fire burns through its habitat, removing the vegetative cover. Within a few years following the fire the number of plants rapidly declines to zero, and the population persists only as a seedbank awaiting the next fire.

Beatrice F. Howitt © California Academy of Sciences

Description:

Monterey clover is a small, low-growing, branched, herbaceous annual with three wedge-shaped leaflets per leaf. Plants can be rather inconspicuous, with branches less than two inches long, but with favorable conditions branches can reach 8 to 12 inches. Its small, pale purple flowers bloom from April to June.

Status:

Monterey clover is a "fire follower": it persists for long stretches of time only as an "invisible" soil seedbank, and plants appear in an area only for a few years following a fire that has burned through the habitat, clearing vegetation. Because of this it is difficult to quantify the numbers and distribution of this species; distribution maps are likely a product of recent fire history. Better means to determine the distribution of this species must be established. Fire suppression activities have likely limited the survival and reproduction of this species. It is unknown how long the soil seedbank can persist. In the absence of fire, or a reasonable habitat disturbance alternative, this species could become extirpated and potentially rendered extinct.

Before the 1987 fire at Huckleberry hill, Monterey clover was known only from small occurrences at the Morse Botanical Reserve and near Highway 68 in the central portion of the Monterey peninsula. In spring 1988, much larger populations were identified along Costanilla Way and Los Altos Road and in the Morse Botanical Reserve. A small number of plants were observed near Highway 68 following a fire in 1990. Surveys in 1995 identified two occurrences of Monterey clover with a total of 22 plants along Costanilla Way.

As recommended in a 1995 recovery workshop that the DFG held in cooperation with USFWS, the DFG used federal Section 6 grant funds to investigate the distribution and population ecology of Monterey clover. Various techniques were applied to determine how soil samples may be used to establish the presence of a seed bank, and to understand germination cues needed by the species. Of 32 soil samples taken from Huckleberry Hill, only one Monterey clover seedling germinated. This indicates that either the seeds require specific germination cues, or

the seeds are sparsely or patchily enough disbursed that even the large samples collected (0.5 m wide x 0.5 m long x 5-10 cm deep) were insufficient to obtain seeds. An additional clearing experiment was conducted on 1m x 1m plots on Huckleberry Hill where a seedbank was expected. All above-ground vegetation was removed from the plots, but no Monterey clover seedlings emerged. Further research is necessary to understand germination requirements and establish tests to determine the presence of a seedbank.

In 2002 the USFWS released a draft recovery plan for Monterey clover and four other Monterey County plants.

Greene's Orcutt grass *Tuctoria greenei*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Greene's Orcutt grass grows in the dried bottom of vernal pools of the Central Valley. It is currently found in Butte, Merced, Shasta, and Tehama counties and is believed to be extirpated from Fresno, Madera, San Joaquin, Stanislaus, and Tulare counties. Associated species in some locations include several listed species such as hairy Orcutt grass, slender Orcutt grass, San Joaquin Valley Orcutt grass, and Boggs Lake hedge-hyssop.

Description:

This unusual member of the grass family (Poaceae), known as Greene's Orcutt grass or Greene's tuctoria, is a small, pale green, hairy, tufted annual. It has several to many stems growing two to six inches tall, each ending in a spike-like inflorescence that may be partly enfolded in the upper leaf.

Status:

About half of the approximately 40 known occurrences of Greene's Orcutt grass have been extirpated through habitat conversion to irrigated agriculture and intensive cattle grazing. Of the remaining occurrences, five are at The Nature Conservancy (TNC) Vina Plains Preserve. Fifteen others are privately owned, and only four of those have been observed within the past fifteen years. In 2000, one of the privately owned populations was proposed to be included in a mitigation bank.

Greene's Orcutt grass continues to be threatened by destruction of vernal pools for agriculture and urban developments. Additional threats to Greene's Orcutt grass include competition from weeds and cattle grazing in winter pasture. The primary threat to the populations at the TNC Vina Plains Preserve is competition from aggressive weeds, including orchard morning-glory, common devil's claw, and cocklebur. Because it grows in the margins of vernal pools, and germinates as the pool water is receding, whereas many other vernal pool plants are already established at this phase, it is particularly susceptible to livestock trampling and competition from nonnative weeds. Research is currently being conducted on the effects of grazing. Research has also shown that

germination is almost entirely dependent on a combination of anaerobic (lacking oxygen) conditions and light. It is suggested that in nature, such cues would be relatively specific to the uppermost soil substrate overlain by water. There is also some indirect evidence that fungi may play an important role in stimulating germination of this species.

Protection measures for this species are included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*. The USFWS designated critical habitat for Greene's Orcutt grass in August, 2003.

Crampton's Orcutt grass

Tuctoria mucronata

State: Endangered 1979
Federal: Endangered 1978

General Habitat:

Crampton's Orcutt grass grows in the clay bottoms of vernal pools of the Central Valley grassland. It is known from only three locations in Yolo and Solano counties.

Description:

A member of the grass family (Poaceae), this sticky, aromatic annual plant produces a dense spike of overlapping flower spikelets that emerge from the upper leaves.

Status:

Crampton's Orcutt grass has been declining at all three known locations during the past two decades. At the site where Crampton's Orcutt grass was first discovered in 1958, only four plants have been observed during the past 17 years. In 1985, 553 plants were found at this site, and in 1986, 100 plants were observed. The species then disappeared from the site for seven years, until surveys in 1993 found four plants. These were the last plants seen at this location; no plants have been located in the past ten years, despite extensive surveys. The cause of the decline of this population is unknown; possible causes are overcollection, changes in hydrology, displacement by other species, or a combination of these or other factors. The second population occurs in Solano County on private land. This population has steadily declined over the past two decades, from 763 plants in 1985 to only 38 plants in 2000. The third population occurs at a communications facility in Yolo County owned by DOD. Although it is the largest population, it has also declined by more than 80% over the past decade. In 1993 there were 10,000 plants at this location; in 1996, 2,700 plants; and in 2001, 1,993 plants. Competition with non-native species appears to be a threat at this site.

Research on this species is currently underway at Rancho Santa Ana Botanic Garden, where it is hoped that information collected from germination trials will provide the basis for reintroduction and enhancement of this species.

California vervain *Verbena californica*

State:	Threatened	1994
Federal:	Threatened	1998

General Habitat:

California vervain, also known as Red Hills vervain, is restricted to moderately mesic areas along intermittent or small, perennial streams underlain by serpentine rocks within the Red Hills area of Tuolumne County.

Description:

A member of the vervain family (Verbenaceae), California vervain is a tall, perennial herb with spikes of one to five small, light purple flowers.

Melanie Gogol-Prokurat, DFG File Photo

Melanie Gogol-Prokurat, DFG File Photo

Status:

California vervain is restricted to intermittent or small, perennial streams underlain by serpentine rocks within the Red Hills area of Tuolumne County. Approximately ten populations of California vervain are known; all are located within a band approximately one-half mile wide and five miles long.

Historical placer mining activities appear to have reduced the size of several California vervain populations. Some existing populations are threatened by recreational gold mining and by livestock grazing and trampling. The primary threat to the survival of the species is residential development, including habitat destruction and fragmentation, groundwater depletion, and decline in groundwater quality from septic system leachate. A major concern is that residential wells on or adjacent to California vervain habitat could lower the water table and dry up the moist areas that support the species.

Over half of the California vervain populations are located on BLM land within the Red Hills Management Area,

which has been designated an Area of Critical Environmental Concern (ACEC). As of 1999, only three populations remained on private land; however, these comprised approximately 85 percent of the total known plants. The Tuolumne County Land Trust has been working to protect the remaining populations of California vervain on privately owned land. Over the past five years, the Land Trust has successfully worked to acquire the second largest population, at Andrews Creek, which had previously been proposed for development. This land, which lies directly adjacent to the BLM Red Hills Management Area, was transferred to BLM after the acquisition. Protection of this large population was an important step in securing the long-term survival of California vervain.

The Tuolumne County Land Trust is continuing their efforts to secure protection for the remaining populations of California vervain and other associated rare species in the Red Hills area.

Big-leaved crown-beard *Verbesina dissita*

Meredith Osborne, DFG File Photo

State:	Threatened	1990
Federal:	Threatened	1996

General Habitat:

Big-leaved crown-beard 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. In California, big-leaved crown-beard is restricted to a few canyons in southern Laguna Beach, Orange County. Another native occurrence is found in Baja California Norte, Mexico, over 150 miles disjunct from the California occurrence.

Mary Ann Showers, DFG File Photo

Description:

Big-leaved crown-beard is a semi-woody, perennial shrub in the sunflower family (Asteraceae). It produces new stems each spring from rhizomes and grows up to three feet tall. Terminal clusters of bright yellow flowers appear in the late spring. After flowering and producing seed, the stems die down to the ground by mid-summer.

Status:

In California, only two big-leaved crown-beard populations exist. Each population consists of numerous "stands" of plants. The population areas are located two miles from each other and cover between 20 and 25 acres. The status of big-leaved crown-beard in California has continued to decline over the last decade, due primarily to destruction and modification of habitat. Small-scale residential development continues to fragment and destroy this species' habitat. Other threats include grading, fire break maintenance, vegetation fuel clearance zones, and competition with non-native species.

Habitat at one occurrence was subdivided into single family residential lots containing big-leaved crown-beard and/or its habitat. Plans for homes on several of these lots are currently in progress, and others are expected in the near future, which will likely lead to further decline of the species. Even if precautionary steps are taken during construction to avoid or minimize negative impacts on big-leaved crown-beard, the plants will be threatened by trampling, erosion, landscaping activities, changes in water regime, garden pesticide and/or herbicide use, and habitat fragmentation.

Populations in coastal Baja have been impacted by resort and residential development, as well as slash and burn practices. The current status of the Baja populations is unknown.

APPENDICES

APPENDIX 1. Federally-listed plant and animal species not listed under the California Endangered Species Act. For additional information on listed plants, please refer to http://www.dfg.ca.gov/whdab/pdfs/TEPlants.pdf. For listed animals: http://www.dfg.ca.gov/whdab/pdfs/TEAnimals.pdf.

Gastropods

Common Name	Scientific Name	Status	Date Listed
Morro shoulderband snail	*Helminthoglypta walkeriana*	FE	1/17/95
White abalone	*Haliotis sorenseni*	FE	6/28/01

Crustaceans

Common Name	Scientific Name	Status	Date Listed
Conservancy fairy shrimp	*Branchinecta conservatio*	FE	9/19/94
Longhorn fairy shrimp	*Branchinecta longiantenna*	FE	9/19/94
Riverside fairy shrimp	*Streptocephalus wootton*i	FE	8/3/93
San Diego fairy shrimp	*Branchinecta sandiegoensis*	FE	2/3/97
Vernal pool fairy shrimp	*Branchinecta lynchi*	FT	9/19/94
Vernal pool tadpole shrimp	*Lepidurus packardi*	FE	9/19/94

Insects

Common Name	Scientific Name	Status	Date Listed
Bay checkerspot butterfly	*Euphydryas editha bayensis*	FT	10/18/87
Behren's silverspot butterfly	*Speyeria zerene behrensii*	FE	12/5/97
Callippe silverspot butterfly	*Speyeria callippe callippe*	FE	12/5/97
Delhi Sands flower-loving fly	*Rhaphiomidas terminatus abdominalis*	FE	9/23/93
Delta green ground beetle	*Elaphrus viridis*	FT	8/8/80
El Segundo blue butterfly	*Euphilotes battoides allyni*	FE	6/1/76
Kern primrose sphinx moth	*Euproserpinus euterpe*	FT	4/8/80
Laguna Mountains skipper	*Pyrgus ruralis lagunae*	FE	1/16/97
Lange's metalmark butterfly	*Apodemia mormo langei*	FE	6/1/76
Lotis blue butterfly	*Lycaeides argyrognomon lotis*	FE	6/1/76
Mission blue butterfly	*Icaricia icarioides missionensis*	FE	6/1/76
Mount Hermon June beetle	*Polyphylla barbata*	FE	2/24/97
Myrtle's silverspot butterfly	*Speyeria zerene myrtleae*	FE	6/22/92
Ohlone tiger beetle	*Cicindela ohlone*	FE	10/3/01
Oregon silverspot butterfly	*Speyeria zerene hippolyta*	FT	7/2/80
Palos Verdes blue butterfly	*Glaucopsyche lygdamus palosverdesensis*	FE	7/02/80
Quino checkerspot	*Euphydryas editha quino*	FE	1/16/91
San Bruno elfin butterfly	*Incisalia (= Callophrys) mossii bayensis*	FE	6/1/76
Smith's blue butterfly	*Euphilotes enoptes smithi*	FE	6/1/76
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	FT	8/8/80
Zayante band-winged grasshopper	*Trimerotropis infantilis*	FE	1/24/97

Fish

Common Name	Scientific Name	Status	Date Listed
Chinook salmon - California coastal ESU*	*Oncorhynchus tshawytscha*	FT	11/15/99
Cowhead Lake tui chub	*Gila bicolor vaccaceps*	FPE	3/30/98
Lahontan cutthroat trout	*Oncorhynchus (= Salmo) clarki*	FT	7/16/75
Little Kern golden trout	*Oncorhynchus (= Salmo) mykiss whitei*	FT	4/13/78
Paiute cutthroat trout	*Oncorhynchus (= Salmo) clarki*	FT	7/16/95
Sacramento splittail	*Pogonichthys macrolepidotus*	Deleted	
Santa Ana sucker	*Catostomus santaanae*	FT	5/12/00
Steelhead - Northern California ESU*	*Oncorhynchus mykiss*	FT	8/7/00
Steelhead - Central California Coast ESU*	*Oncorhynchus mykiss*	FT	10/17/97
Steelhead - South/Central California Coast ESU*	*Oncorhynchus mykiss*	FT	10/17/97
Steelhead - Southern California ESU*	*Oncorhynchus mykiss*	FE	10/17/97
Steelhead - Central Valley ESU*	*Oncorhynchus mykiss*	FT	5/18/98
Tidewater goby	*Eucyclogobius newberryi*	FE	2/4/94

* Evolutionary significant unit

Amphibians

Common Name	Scientific Name	Status	Date Listed
Arroyo toad (= arroyo southwestern)	*Bufo californicus* (=*microscaphus*)	FE	1/17/95
California red-legged frog	*Rana aurora draytonii*	FT	5/20/96
California tiger salamander	*Ambystoma californiense*	FPT	5/23/03
Central California DPS*			
California tiger salamander	*Ambystoma californiense*	FPT	5/23/03
Santa Barbara County DPS*		FE	9/15/00
California tiger salamander	*Ambystoma californiense*	FPT	5/23/03
Sonoma County DPS*		FE	3/19/03
Mountain yellow-legged frog	*Rana muscosa*	FE	8/1/02
Southern California population			

* Distinct vertebrate population segment

Reptiles

Common Name	Scientific Name	Status	Date Listed
Green sea turtle	*Chelonia mydas*	FT	7/28/78
Island night lizard	*Xantusia riversiana*	FT	8/11/67
Leatherback sea turtle, leatherback	*Dermochelys coriacea*	FE	6/2/70
Loggerhead sea turtle	*Caretta caretta*	FT	7/28/78
Olive (=Pacific) Ridley sea turtle	*Lepidochelys olivacea*	FT	7/28/78

Birds

Common Name	Scientific Name	Status	Date Listed
Aleutian Canada goose **(RECOVERED)**	*Branta canadensis leucopareia*		
Arctic peregrine falcon **(RECOVERED)**	*Falco peregrinus tundrius*		

Common Name	Scientific Name	Status	Date Listed
Coastal California gnatcatcher	*Polioptila californica californica*	FT	3/30/93
Northern spotted owl	*Strix occidentalis caurina*	FT	6/22/90
San Clemente loggerhead shrike	*Lanius ludovicianus mearnsi*	FE	8/11/77
San Clemente sage sparrow	*Amphispiza belli clementeae*	FT	8/11/77
Short-tailed albatross	*Phoebastria albatrus*	FE	8/30/00
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	3/29/95
Western snowy plover	*Charadrius alexandrinus nivosus*	FT	4/5/93

Mammals

Common Name	Scientific Name	Status	Date Listed
Blue whale	*Balaenoptera musculus*	FE	6/2/70
Buena Vista Lake shrew	*Sorex ornatus relictus*	FE	4/5/02
Fin whale	*Balaenoptera physalus*	FE	6/2/70
Gray whale **(RECOVERED)**	*Eschrichtius robustus*		
Humpback whale	*Megaptera novaeangliae*	FE	6/2/70
San Miguel Island fox	*Urocyron littoralis littoralis*	FE	3/5/04
Santa Rosa Island fox	*Urocyron littoralis santarosa*	FE	3/5/04
Santa Cruz Island fox	*Urocyron littoralis santacruzae*	FE	3/5/04
Santa Catalina Island fox	*Urocyron littoralis catalinae*	FE	3/5/04
Pacific pocket mouse	*Perognathus longimembris pacificus*	FE	3/26/94
Point Arena mountain beaver	*Aplodontia rufa nigra*	FE	12/12/91
Right whale	*Balaena glacialis (includes australis)*	FE	6/2/70
Riparian woodrat	*Neotoma fuscipes riparia*	FE	3/24/00
San Bernardino kangaroo rat	*Dipodomys merriami parvus*	FE	9/24/98
Sei whale	*Balaenoptera borealis*	FE	6/2/70
Southern sea otter	*Enhydra lutris nereis*	FT	1/14/77
Southern sea otter South of Pt. Conception, CA	*Enhydra lutris nereis*	XP*	8/11/87
Sperm whale	*Physeter macrocephalus (=catodon)*	FE	6/2/70
Steller (=northern) sea lion	*Eumetopias jubatus*	FT	4/5/90

* Experimental Population, Non- Essential

Plants

Scientific Name	Common Name	Status	Date Listed
Alopecurus aequalis var. sonomensis	Sonoma alopecurus	FE	10/22/97
Ambrosia pumila	San Diego ambrosia	FE	7/22/02
Arabis hoffmannii	Hoffman's rock cress	FE	7/31/97
Arctostaphylos confertiflora	Santa Rosa Island manzanita	FE	7/31/97
Arctostaphylos glandulosa ssp. crassifolia	Del Mar manzanita	FE	10/7/96
Arctostaphylos morroensis	Morro manzanita	FT	12/15/94
Arctostaphylos myrtifolia	Ione manzanita	FT	5/26/99
Arenaria ursina	Big Bear Valley sandwort	FT	9/14/98
Astragalus albens	Cushenbury milk-vetch	FE	8/24/94
Astragalus brauntonii	Braunton's milk-vetch	FE	6/29/97

Scientific Name	Common Name	Status	Date Listed
Astragalus jaegerianus	Lane Mountain milk-vetch	FE	10/6/98
Astragalus lentiginosus var. coachellae	Coachella Valley milk-vetch	FE	10/6/98
Astragalus lentiginosus var. piscinensis	Fish Slough milk-vetch	FT	10/6/98
Astragalus tricarinatus	triple-ribbed milk-vetch	FE	10/6/98
Atriplex coronata var. notatior	San Jacinto Valley crownscale	FE	10/6/98
Calyptridium pulchellum	Mariposa pussypaws	FT	9/14/98
Camissonia benitensis	San Benito evening-primrose	FT	2/12/85
Castilleja cinerea	ash-gray Indian paintbrush	FT	9/14/98
Castilleja mollis	soft-leaved Indian paintbrush	FE	7/31/97
Ceanothus ferrisae	coyote ceanothus	FE	2/3/95
Chamaesyce hooveri	Hoover's spurge	FT	3/26/97
Chlorogalum purpureum var. purpureum	purple amole	FT	3/20/00
Chorizanthe pungens var. hartwegiana	Ben Lomond spineflower	FE	2/4/94
Chorizanthe pungens var. pungens	Monterey spineflower	FT	2/4/94
Chorizanthe robusta var. hartwegii	Scott's Valley spineflower	FE	2/4/94
Chorizanthe robusta var. robusta	robust spineflower	FE	2/4/94
Cirsium hydrophilum var. hydrophylum	Suisun thistle	FE	11/20/97
Cupressus goveniana ssp. goveniana	Gowen cypress	FT	8/12/98
Dudleya abramsii ssp. parva	Conejo dudleya	FT	1/29/97
Dudleya cymosa ssp. agourensis	Santa Monica Mtns. dudleya	FT	1/29/97
Dudleya cymosa ssp. ovatifolia	Santa Monica Mtns. dudleya	FT	1/29/97
Dudleya setchellii	Santa Clara Valley dudleya	FE	2/3/95
Dudleya verityi	Verity's dudleya	FT	1/29/97
Enceliopsis nudicaulis var. corrugata	Ash Meadows daisy	FT	5/20/85
Eremalche kernensis	Kern mallow	FE	7/19/90
Eriastrum hooveri	Hoover's woolly-star	Delisted	10/7/03
Erigeron parishii	Parish's daisy	FT	8/24/94
Eriogonum kennedyi var. austromontanum	southern mountain buckwheat	FT	9/14/78
Eriogonum ovalifolium var. vineum	Cushenbury buckwheat	FE	8/24/94
Gilia tenuiflora ssp. hoffmannii	Hoffmann's slender-flowered gilia	FE	7/31/97
Grindelia fraxino-pratensis	Ash Meadows gumplant	FT	5/20/85
Helianthemum greenei	island rush-rose	FT	7/31/97
Howellia aquatilis	water howellia	FT	7/14/94
Lasthenia conjugens	Contra Costa goldfields	FE	6/18/97
Lembertia congdonii	San Joaquin woollythreads	FE	7/19/90
Lesquerella kingii ssp. bernardina	San Bernardino Mountains bladderpod	FE	8/24/94
Malacothrix indecora	Santa Cruz Island malacothrix	FE	7/31/97
Malacothrix squalida	island malacothrix	FE	7/31/97
Navarretia fossalis	spreading navarretia	FT	10/13/98
Oxytheca parishii var. goodmaniana	Cushenbury oxytheca	FE	8/24/94
Phacelia insularis ssp. insularis	northern Channel Islands phacelia	FE	7/31/97
Piperia yadonii	Yadon's rein orchid	FE	8/12/94
Poa atropurpurea	San Bernardino blue grass	FE	9/14/98
Sibara filifolia	Santa Cruz Island rock cress	FE	8/8/97
Sidalcea keckii	Keck's checker-mallow	FE	2/16/00
Streptanthus albidus ssp. albidus	Metcalf Canyon jewel-flower	FE	2/3/95

Scientific Name	Common Name	Status	Date Listed
Suaeda californica	California seablite	FE	12/15/94
Taraxacum californicum	California dandelion	FE	9/14/98
Thlaspi californicum	Kneeland Prairie penny-cress	FE	2/9/00
Thysanocarpus conchuliferus	Santa Cruz Island fringepod	FE	8/31/97
Trichostema austromontanum ssp.	Hidden Lake bluecurls	FT	9/14/98
Trifolium amoenum	showy Indian clover	FE	10/22/97

APPENDIX 2
STATE AND REGIONAL HEADQUATERS OFFICES

For additional information, please go to the DFG website http://www.dfg.ca.gov/

1. Northern California - North Coast Region

601 Locust Street
Redding, CA 96001
Public Information: (530) 225-2300
Fax: (530) 225-2381
Counties: Del Norte, Humboldt, Lassen, Modoc, Shasta, Siskiyou, Tehama, Trinity

2. Sacramento Valley-Central Sierra Region 2

1701 Nimbus Road
Rancho Cordova, CA 95670
Public Information: (916) 358-2900
Fax: (916) 358-2912
Counties: Alpine, Amador, Butte, Calaveras, Colusa, El Dorado, Glenn, Nevada, Placer, Plumas, Sacramento, San Joaquin, Sierra, Solano, Sutter, Yolo, Yuba

3. Central Coast Region

7329 Silverado Trail
Napa, CA 94558
Mail: P.O. Box 47, Yountville, CA 94599
Public Information: (707) 944-5500
Fax: (707) 944-5563
Counties: Alameda, Contra Costa, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Luis Obispo, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma

4. San Joaquin Valley-Southern Sierra Region

1234 E. Shaw Avenue
Fresno, CA 93710
Public Information: (559) 243-4005 X 151
Fax: (559) 243-4022
Counties: Fresno, Kern, Kings, Madera, Mariposa, Merced, Stanislaus, Tulare, Tuolumne

5. South Coast Region

4949 Viewridge Avenue
San Diego, CA 92123
Public Information: (858) 467-4201
Fax: (858) 467-4299
Counties: Los Angeles, Orange, San Diego, Santa Barbara, Ventura

6. Eastern Sierra and Inland Deserts Region

3602 Inland Empire Boulevard, Suite C-220
Ontario, CA 91764
Public Information: (909) 484-0167
Fax: (909) 481-2945

Los Alamitos Administrative Office

4665 Lampson Avenue, Suite J
Los Alamitos, CA 90720
Fax: (562) 799-8427
Counties: Imperial, Inyo, Mono, Riverside, San Bernardino

7. Marine Region

20 Lower Ragsdale Drive #100
Monterey, CA 93940
Public Information: (831) 649-2870
FAX: (831) 649-2894
Counties: Entire coastline from Del Norte County south to San Diego County and Channel Islands

APPENDIX 3
Acknowledgments

The current report represents a new direction for DFG. Previous reports were disseminated as bound publications. The 2003 report is being distributed on-line on the DFG website as well as by CD to increase public awareness of the status of sensitive species in California. Many dedicated biologists contributed information and text to this report and helped prepare the document for on-line viewing. Many others kindly lent their images for use throughout the document or provided technical review. We wish to acknowledge their participation and thank them for their support and interest.

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APPENDIX 4. Photo Credits

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The majority of images are associated with individual species accounts. Some, however, are included in other sections of the report. Information about these images is provided below.

Front Cover and Section Dividers

Page	Image	Photographer
Front cover	Sandhill cranes	Don Getty
	Sierra Nevada bighorn sheep	Tom Stephenson, DFG
	Cuyamaca downingia	Christopher Christie
	San Francisco garter snake	CDPR File Photo
Invertebrates	Trinity bristle snail	DFG File Photo
Fish	Mojave tui chub	DFG File Photo
Amphibians	Santa Cruz long-toed salamander	Brad Alexander
Reptiles	Desert tortoise	Mark Bratton
Birds	California condor	USFWS File Photo
Mammals	San Joaquin antelope ground squirrel	B. Moose Peterson
Plants	Baker's larkspur	Doreen Smith

Report Summary

Page	Image	Photographer
3	Stebbin's morning-glory	Daniel Burmester, DFG
4	Xantus's murrelet	Debra Hamilton, DFG
5	Lyon's pentachaeta	Michael Charters
	Coast redwood forest	DFG File Photo
6	Succulent owl's-clover	John Game
	Sutter Buttes	Marc Hoshovsky, DFG
7	Morro Bay kangaroo rat	DFG File Photo
	Hermes copper	Dan Marschalek, DFG
8	Sacramento River	Wildlife Conservation Board

1. Introduction

Page	Image	Photographer
9	Yreka phlox	Pete Figura, DFG
	Mojave tui chub	DFG File Photo
	California red-legged frog	Gary Nafis
10	Morro Bay kangaroo rat	DFG File Photo
11	Dwarf golden star	Christopher L. Christie

Page	Image	Photographer
12	Coastal sage scrub	Brother Alfred Brousseau, St. Mary's College
	Orange-throated whiptail	Chris Brown, USGS
	California gnatcatcher	Arnold Small, USFWS
13	Coast horned lizard	USGS File Photo
	Vermillion flycatcher	Gerald and Buff Corsi, CAS
14	California tiger salamander	Gerald and Buff Corsi, CAS
	Contra Costa goldfields	John Game
	Bay checkerspot	T.W. Davis, CAS
15	Coachella Valley milkvetch	Kelly Amsberry, Oregon State University
	Desert pupfish	John Rinne

2. Planning for Conservation and Recovery

Page	Image	Photographer
16	San Diego planning map	San Diego County
	San Diego mesa mint	
	Coastal cactus wren	B. "Moose" Peterson
	California NCCP map	DFG File Photo
17	San Diego County planning map	
	Otay tarplant	Coralie Cobb
18	Coachella Valley fringe-toed lizard	Sam Stewart, Bon Terra Consulting
	Oak woodland	Tom Annese
	Lyon's pentachaeta	Michael Charters
19	Cuyamaca Lake downingia	Christopher L. Christie
	Beldings savannah sparrow	DFG File Photo
	Stephen's kangaroo rat	B. Moose Peterson
20	Munz' onion	Roxanne Bittman, CNPS
	Northern California NCCP map	DFG File Photo
	Vicinity Mt. Diablo	USEPA File Photo
21	Road, Mendocino County	Mary Ann Showers, DFG File Photo
	Placer County roadway	Placer County Planning Department
	Vernal pool flowers	DFG File Photo
	California tiger salamander	Gary Nafis
22	Coachella Valley	Gary Nafis
	Monitoring	NASA File Photo

3. Conservation Banking

Page	Image	Photographer
25	Vernal pool tadpole shrimp	Larry Serpa
	California red-legged frog	Dong Lin, CAS
	Burrowing owl	Mark Bratton
26	Hairy Orcutt grass	George W. Hartwell
	Giant garter snake	USGS File Photo
	Vernal pool fairy shrimp	Larry Serpa

4. Recovery Land Acquisition Program

Page	Image	Photographer
27	California dandelion	Roxanne Bittman, CNPS
	Kern primrose sphinx moth larva	T. W. Davies, CAS
	Lompoc yerba santa	Roxanne Bittman, CNPS

5. Recovery and Conservation

Page	Image	Photographer
30	California freshwater shrimp	Larry Serpa
	Brookside School students	Tyler Center for Ecoliteracy
31	Giant garter snake	USFWS File Photo
	California least tern	USFWS File Photo
32	Beldings savannah sparrow	USFWS File Photo
	California condor	USFWS File Photo
33	Sierra Nevada bighorn sheep	Tom Stephenson, DFG
	Peninsular bighorn sheep	Glenn and Martha Vargas, CAS
34	Riparian brush rabbit	Glenn Basey
	Yreka phlox	Pete Figura, DFG
35	Ventura marsh milkvetch	Mary Meyer, DFG
	Riparian brush rabbit	Heather Bell, USFWS
36	Otay tarplant	Coralie Cobb
	Yadon's piperia	John Game
37	Yreka phlox	Susan Cochrane Levitsky, DFG
	Vernal pool	Dr. Oren Pollak
	Tadpole shrimp	William Leonard
38	Alkali milkvetch	Carol Witham
	Sierra Nevada bighorn sheep	Tom Stephenson, DFG
39	San Francisco lessingia	NPS File Photo
	Alameda whipsnake	Gary Nafis
	El Dorado mule-ears	Steve Tyron
40	Southwestern willow flycatcher	Steve and David Maslowski, USFWS
	Colorado pikeminnow (squawfish)	USFWS File Photo
	Razorback sucker	DFG File Photo

6. Invasive Species Program

Page	Image	Photographer
41	New Zealand mud snail	DFG File Photo
	Water hyacinth	David R. Worley, Florida Dept. of Environmental Protection
	Caulerpa sp.	NOAA File Photo
42	Broom infestation	R.M. Breckenridge, CDFA
	Yellow star thistle; tocalote	Jo-Ann Ordano, CAS

7. Central Valley Project Conservation Program

Page	Image	Photographer
43	Riparian woodrat	DFG File Photo
	Shasta Dam	USBR File Photo
	Bakersfield cactus	Endangered Species Recovery Program Californinia State University, Stanislaus
44	Sacramento River	BLM File Photo

8. The Wildlife Conservation Board

Page	Image	Photographer
48	Centennial/Dressler Ranch	Jacques Etchegoyhen, California Rangeland Trust
	Children at creek	DPR File Photo
	California tiger salamander	Gerald and Buff Corsi, CAS
	Cosumnes River Preserve	BLM File Photo
49	Riparian habitat	DWR File Photo
	Black-necked stilt	George W. Hartwell
50	Oak woodland, near Mt. Diablo	USEPA File Photo
	Near Chico, Butte County	USFS File Photo
	Susan River Parkway, Lassen County	WCB File Photo
51	Redwood forest	NPS File Photo
	Western trillium	Gerald and Buff Corsi, CAS
52	Satellite imagery – San Francisco Bay	NOAA File Photo
	San Francisco Bay NWR	ABAG File Photo
	Hudeman Slough	ABAG File Photo
53	Soft bird's-beak	Tim Sullivan
	Saltmarsh harvest mouse	DWR File Photo
	Santa Cruz long-toed salamander	G. Nafis
	Oak woodland	Beatrice F. Howitt, CAS
54	Dune scrub vegetation, Morro Bay area	DFG File Photo
	Morro shoulderband snail	Bob Sloan
	Bridgeport Valley	NOAA File Photo
	Sage grouse	Dr. Lloyd Glenn Ingles, CAS
55	Stephen's kangaroo rat	Karen Kirtland Riverside County Integrated Program
	Rancho Jamul	DFG File Photo
	Hermes copper	Dan Marschalek, DFG

Compact Disk Label

Image	Photographer
Greater sandhill crane	B. Moose Peterson
Cuyamaca Lake downingia	Christopher Christie
Alameda whipsnake	G. Nafis

APPENDIX 5. TERMS AND ABBREVIATIONS USED IN TEXT

This report provides information on State-listed species. Species names are followed by both the State designation (see below) and the federal designation, if any, under the Federal Endangered Species Act. State designations are essentially the same as federal designations except that "Rare" is a State designation only. A number of California species have been placed on the Federal list but are not included on the State list. Those species are shown in Appendix 1.

State and Federal Designations

State Designations

Rare 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.

Threatened A native California bird, mammal, fish, amphibian, reptile or plant (species, subspecies or variety) 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).

Endangered A native California bird, mammal, fish, amphibian, reptile, or plant (species, subspecies or variety) 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, over-exploitation, predation, competition or disease (Section 2062, Fish and Game Code).

Candidate 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).

Federal Designations

Endangered Any species which is in danger of extinction throughout all or a significant portion of its range.

Threatened Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Proposed A species that has been proposed for listing as threatened or endangered in the Federal Register.

Candidate A species for which the U.S. Fish and Wildlife Service has on file sufficient information to support a proposal to list the species as endangered or threatened, but for which proposed rules have not yet been issued.

SPECIES STATUS

This report provides a statement of the current status of a species when that information is available. The statement reflects the current condition as compared to the condition of the species at the time of State listing and takes into consideration the distribution, abundance, and population health of the species.

For many species, this information is not known. Long-term monitoring of demographic trends and reproductive success, for example, has not been implemented or has been ongoing for too short a period of time to document current condition. For other species, the habitats to which they are restricted, such as cliff faces or desert springs, are not readily accessible. Some species, such as a number of annual plants, can have dramatic changes in population size and distribution in response to rainfall levels from one year to the next. Other plants may germinate in response to fire; they remain dormant as seed or vegetative parts until fire triggers germination or growth.

Terms used to describe species status are as follow:

Increasing: Since the date of State listing, the range, distribution, and/or number of individuals have measurably increased to levels that may allow for recovery of the species.

Stable to Increasing: Since the date of State listing, all populations are stable or increasing in total number of individuals and the range and/or distribution is stable to increasing in an identifiable portion of the total species range.

Stable: Since the date of State listing, enough populations of the species, over the appropriate range for the species, have been documented to have stabilized in number and distribution so that the species is no longer in a state of decline.

Stable to Declining: Since the date of State listing, some populations have been documented to be biologically stable, while other populations are decreasing in number and/or distribution.

Declining: Since the date of State listing, enough populations of the species, over the range for the species, have been documented to have decreased in number or distribution so that the biological stability of the species as a whole may be at risk.

Extirpated: Since the date of listing, the species has been documented to be extirpated throughout its historic range in California; all natural populations are gone. The species is thus extinct in California, though it may continue to exist elsewhere.

Unknown: DFG does not have sufficient information to determine the current status of the species.

ABBREVIATIONS AND TERMS USED IN THIS REPORT

ACEC	Area of Critical Environmental Concern (BLM)
ACOE	U.S. Army Corps of Engineers
BLM	Bureau of Land Management
BOR	Bureau of Reclamation
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CDF	California Department of Forestry and Fire Protection
CDFG	California Department of Fish & Game
CDPR	California Department of Parks & Recreation
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNPS	California Native Plant Society
CSU	California State University
CVPCP	Central Valley Project Conservation Program
CVPIA	Central Valley Project Improvement Act
DFG	California Department of Fish & Game
DOD	U.S. Department of Defense
DOE	Department of Energy
DPR	California Department of Parks & Recreation
DWR	Department of Water Resources
EBRPD	East Bay Regional Parks District
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESRP	Endangered Species Recovery Program
FESA	Federal Endangered Species Act

FGC	Fish and Game Commission
FHA	Federal Highway Administration
FWS	U.S. Fish and Wildlife Service
GIS	Geographic Information System
GPS	Global Positioning System
HCP	Habitat Conservation Plan
LADWP	Los Angeles Department of Water and Power
MHCP	Multiple Habitat Conservation Program
MOU	Memorandum of Understanding
MSCP	Multiple Species Conservation Plan
MSHCP	Multiple Species Habitat Conservation Plan
NCCP	Natural Community Conservation Plan
NMFS	National Marine Fisheries Service
NPS	National Park Service
NRCS	Natural Resource Conservation Service
OHV	Off-highway vehicle
PG & E	Pacific Gas and Electric
SFWD	San Francisco Water District
SWRCB	State Water Resources Control Board
TNC	The Nature Conservancy
TPL	Trust for Public Land
UC	University of California
USBR	Bureau of Reclamation
USFS	United States Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
WCB	Wildlife Conservation Board
WERC	Western Ecological Research Center (USGS)
WHR	Wildlife Habitat Relationships System (DFG)