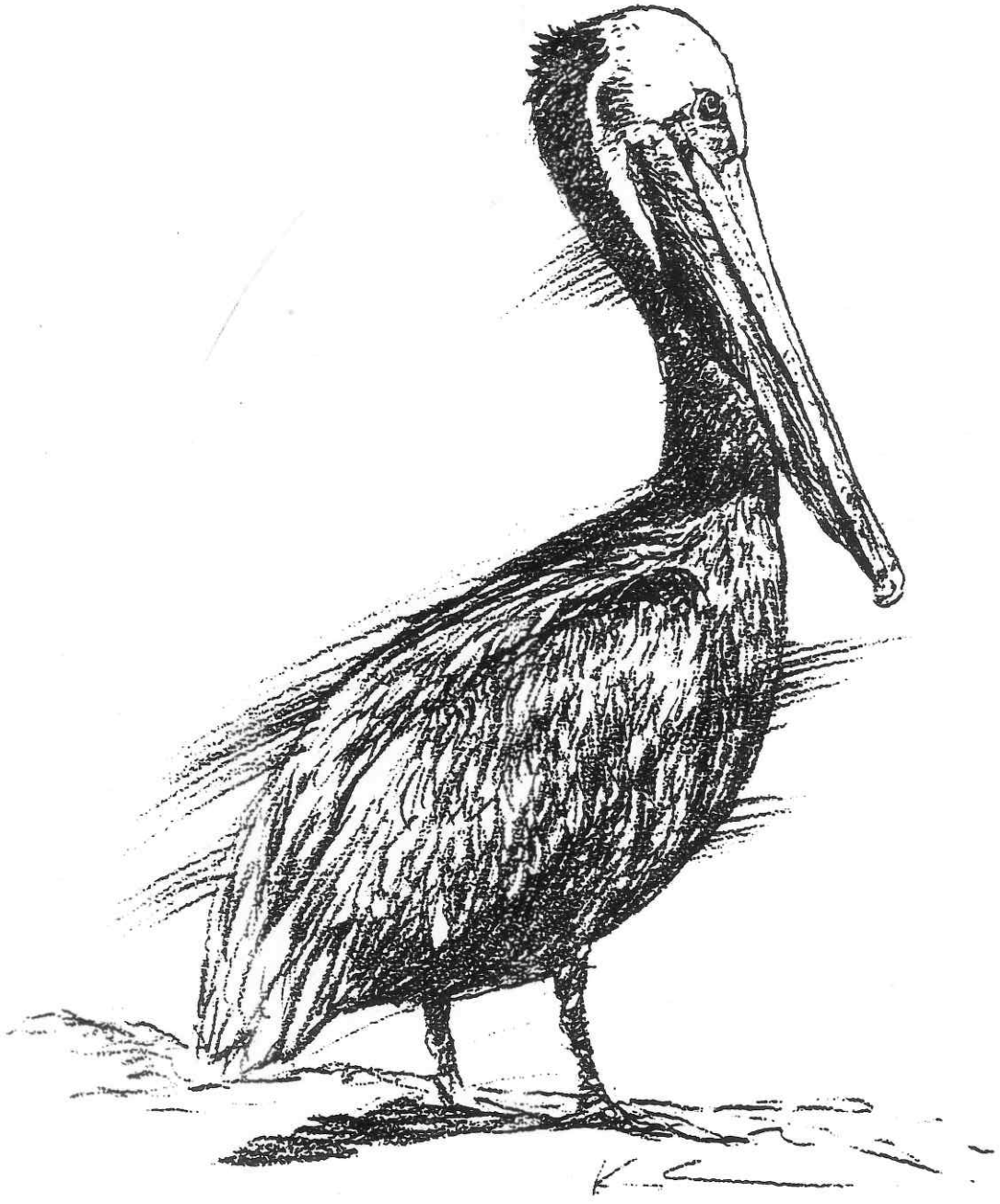
1990 ANNUAL REPORT
ON THE STATUS OF
CALIFORNIA'S STATE LISTED THREATENED AND ENDANGERED PLANTS AND ANIMALS



State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

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SUMMARY

This is the 1990 annual California Department of Fish and Game (DFG) report summarizing the status of 72 animals and 140 plants listed as threatened and endangered by the Fish and Game Commission. Legislation affecting endangered species, funding programs and habitat preservation programs are also reviewed.

In 1990 the Commission listed the willow flycatcher as an endangered species and rejected a DFG recommendation to list the Delta Smelt.

A few endangered species such as the bald eagle and peregrine falcon are on the road to recovery as their numbers have increased in response to active management programs and controls on pollutants. The captive breeding program for the California condor was successful in 1990 with an increase in the population to 40 birds. The captive population will probably reach 60 or more birds by the summer of 1991, keeping pace with plans for the reintroduction of California condors into southern California in the winter of 1991-92.

Many endangered species survive as small, fragmented populations, and under these conditions there is no certainty they will survive for long. For the second year, an analysis of the recent trends in populations of State-listed plants and animals was undertaken. Overall, 21 percent of California's listed plants and animals are stable (but are not necessarily safe) or increasing; however, 70 percent of the listed plant and animal species are declining, signaling further degradation in the health of California ecosystems. These declines result from the destruction and degradation of endangered species habitat through a variety of direct and indirect human impacts described in this report.

California commits more funds to endangered species protection than any other state, yet our effort has been inadequate to counter the demands that nearly 30 million residents place on our natural resources. We must redouble our commitment if we are to preserve our rich natural heritage -- the flora and fauna of California.

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

INTRODUCTION

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

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

CESA requires the DFG to review species listed as endangered or threatened by the Fish and Game Commission every five years to determine if the conditions that led to the original listing are still present and to ensure that the listing accurately reflects the most current status. Five-year reviews contain specific information including population trends, range, distribution, abundance, life history, factors affecting the ability of the population to survive and reproduce, the degree and immediacy of threats, the impact of existing management efforts, suggestions for future management and sources of information. The first set of 113 reviews were submitted to the Commission in July 1987, accompanied by a report summarizing the results. Sixteen reviews were submitted to the Commission in 1988, six in 1989, and eighteen in 1990.

CESA also requires the DFG to prepare an annual report summarizing the status of all State-listed endangered, threatened and candidate species for the Commission, the Legislature and the Governor. This fifth annual report describes California's endangered and threatened species, including 72 animals and 140 plants (see **Appendix A**).

Sixty-nine rare plants are also shown under the provisions of the earlier Native Plant Protection Act. 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 the Department of Fish and Game, Natural Heritage Division, 1416 Ninth Street, Sacramento, California 95814.

Species listed in this report do not comprise all California species that are threatened or endangered in a biological sense. The California Native Plant Society publishes an inventory of plants using DFG definitions and criteria for rare, threatened and endangered status. DFG's Natural Diversity Data Base maintains records on "special plants" from the inventory that may become State candidate species. Lists of bird, mammal, fish, reptile and amphibian "species of special concern" have been compiled by DFG, and the Data Base inventories these species and numerous other "Special Animals" that could become candidates. A preliminary assessment by DFG's biologists indicates that approximately 60 additional animals and 600 additional plants could presently meet the criteria for listing.

CESA (DFG Code sections 2050-2098) sets forth the procedure by which an interested person may petition the Commission to add or remove species from the list. Persons wishing to do so should contact the Fish and Game Commission, 1416 Ninth Street, Sacramento, California 95814. The petition format and the criteria for listing are described in Section 670.1, Title 14, California Code of Regulations. At the request of the Commission, in 1989 DFG began a revision of the petition form to list/delist threatened and endangered species to clarify the type of information needed to evaluate potential listings with the intention of improving the quality of petitions submitted to the Commission and expediting the DFG petition review process. The proposed revision was circulated to interested parties for review and was adopted by the Commission in early 1990.

In 1990 public access to information on threatened and endangered species was significantly advanced by the publication of California's Wild Heritage, a book containing species accounts and color photographs of all the State and Federally-listed animals in California. Copies are available through bookstores and from DFG at the above address. Thousands of copies will be distributed to PROJECT WILD instructors and environmental education instructors in 1991 through the implementation of the Endangered Species Education Act (SB 885).

LEGISLATIVE BACKGROUND AND FUNDING

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

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

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

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

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

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

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

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

Other State legislation to protect and restore endangered wildlife includes the Environmental Protection and Research Act of 1970, which created an Environmental Protection Fund from the sale of personalized automobile license plates. Through contributions to the Endangered Species Tax Check-off Program, DFG has received about $6 million since 1984 ($993,000 in 1990) for programs benefiting threatened and endangered species. Proposition 19, a bond act in 1984, provided $5 million for acquisition of threatened and endangered species habitat. Proposition 70, a bond act in 1988, will ultimately provide $131 million, much of it for threatened and endangered species habitat.

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

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

DFG and the U.S. Fish and Wildlife Service (USFWS) entered into a cooperative agreement in June 1976, under which DFG agreed to manage Federal and State-listed endangered, threatened and rare species and became eligible to receive Endangered Species Act grant-in-aid funds. Those funds totalled $448,000 for State fiscal year 1989-90 and were used for recovery of Federally-listed species.

The California Environmental Quality Act (CEQA), enacted in 1970, is intended to "ensure that the long-term protection of the environment shall be the guiding criterion in public decisions." Changes in 1983 added definitions for rare and endangered plants and animals, and language providing for their protection. As the trustee agency for State fish and wildlife resources, DFG reviews and comments on thousands of CEQA documents (such as environmental impact reports) annually. DFG's Environmental Services Division coordinates this process. The Environmental Services Division, with support from DFG staff in the regions, consults with State agencies when their activities may affect endangered and threatened species. A biological opinion, as specified in CESA, is prepared once DFG determines whether a State-sponsored or permitted project would jeopardize the continued existence of a State-listed endangered or threatened species. If jeopardy is found, the DFG then prepares reasonable and prudent alternatives so that jeopardy may be avoided. In 1990, 13 State

agencies initiated 48 formal consultations with DFG. Early informal consultation by State agencies with the DFG has resulted in an increasing number of projects for which listed species concerns are resolved without formal consultation. One experimental bank protection project on the Sacramento River received a jeopardy determination from DFG in 1990. A colony of the State-listed threatened bank swallow could be jeopardized by the project. The State lead agency subsequently abandoned the project.

HABITAT PRESERVATION AND ENDANGERED SPECIES MANAGEMENT

The key element in programs to preserve endangered species is the protection of natural ecosystems: the habitat (or suitable living space) without which California's flora and fauna cannot survive. The DFG land acquisition program has protected threatened and endangered species since 1970 through the establishment and management of 67 ecological reserves totalling more than 61,000 acres. The DFG also provides threatened and endangered species protection on 80 wildlife areas (388,801 acres) and 28 DFG marine refuges and reserves. To date, the DFG manages over 524,000 acres of land -- much of which provides some degree of protection for threatened and endangered species.

In 1990 the Wildlife Conservation Board added over 17,000 acres to the DFG lands inventory. These additions came through a variety of protection efforts including fee acquisition, conservation easements, leases, cooperative agreements and memoranda of understanding. These additions provide habitat protection for the San Joaquin kit fox, giant kangaroo rat, San Joaquin antelope squirrel, California hibiscus, Delta tule pea, Mason's lileaopsis, silver-leaved manzanita, Santa Cruz cypress, Santa Cruz wallflower and a host of other species.

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

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

Wildlife biologists, fisheries biologists and plant ecologists in these projects and the regions administer contracts for studies, review and prepare permits for studies and coordinate surveys and

inventories emphasizing status, distribution and abundance of plant and animal species of special concern and listed species. Using such information, they determine the ecological requirements and nature of threats to plants and animals, and they formulate plans for management and recovery. These biologists also coordinate endangered species conservation efforts with DFG's regional biologists and Environmental Services Division, and other State, Federal and local agencies.

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

The Department of Parks and Recreation actively protects endangered species on 16 State reserves (30,723 acres), 43 natural preserves (13,349 acres) and seven State wilderness areas (439,510 acres) within nearly 1.4 million acres of State Park lands. The USFWS, U.S. Forest Service, National Park Service and U.S. Navy manage numerous research natural areas and similar categories of lands which contribute toward endangered species preservation. Various local agencies such as the City of Palo Alto, City of Chico, City of Livermore, Santa Barbara County and East Bay Regional Park District protect and manage habitat for endangered species.

Private organizations, particularly The Nature Conservancy and the National Audubon Society (along with local chapters) are prominent in efforts to acquire endangered species habitat. The Nature Conservancy was instrumental in helping establish within the DFG's Natural Heritage Division a California Natural Diversity Data Base (CNDDB), whose purpose is to identify and catalog locality data for the rare, threatened and endangered native flora and fauna of the State, to enable government agencies and the public to better protect these native species and their habitat. A new computerized geographic information system, which became operational early in 1990, keeps track of about 20,000 locations of nearly 1,200 different plants, animals and natural communities in the CNDDB inventory.

PETITIONS AND LISTING ACTIONS UNDER THE CALIFORNIA ENDANGERED SPECIES ACT IN 1990

The Commission listed one species in 1990, rejected two petitions which were supported by the DFG and accepted two petitions for candidates which are currently under review by the DFG for a final recommendation. The Commission's actions are summarized below:

Listed

Willow flycatcher (*Empidonax traillii*)

Rejected

Chrorizanthe robusta var. *hartwegii* (Scotts Valley spineflower)
Delta smelt (*Hypomesus transpacificus*)

Candidate

Blennosperma bakeri (Sonoma sunshine)
Marbled murrelet (*Brachyramphus marmoratus*)

DEFINITIONS AND DESIGNATIONS

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

A native California species or subspecies of a bird, mammal, fish, amphibian, reptile or plant is a **candidate** when the Commission has formally noticed it as being under review by the DFG 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 (Fish and Game Code Section 2068).

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 (Fish and Game Code Section 1901).

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

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

Animals are listed by accepted common name. Plants are listed alphabetically by scientific name with common names shown in parentheses.

Abbreviations and technical terms used in this report are shown in **Appendix C.** Reviews of species that are listed by both the Commission and the USFWS are conducted in conjunction with the five-year review process of the U.S. Department of the Interior. Reviews of those species listed by the Commission before January 1, 1982 that are not listed by the Federal Government were undertaken and completed by July 1, 1987. Reviews of those species listed by the Commission after January 1, 1982 that are not listed by the Federal Government will be undertaken and completed within five years of the date the species was originally listed by the Commission. **Appendix D** lists species for which five-year reviews were completed in 1987, 1988, 1989 and 1990. Complete sets can be obtained from the Department of Fish and Game, Natural Heritage Division, 1416 Ninth Street, Sacramento, California 95814.

STATUS AND TRENDS

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

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

One index of the condition of State-listed species is the change or trend (increase or decrease) in the size and numbers of their remaining populations. Utilizing the species accounts contained within this report and five-year reviews (**Appendix D**) each plant and animal was assigned to the categories shown on **Table I**. This analysis indicates that 58.4 percent of California's State-listed animal populations are declining, and 74.6 percent of California's State-listed plant populations are declining. Why is this happening, given all the resources committed to tackling the problem?

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

Overlay this pristine scene with 30 million people along with the tremendous demands they place on our natural resources and the potential for major disruption of natural ecosystems is evident. Many of our most productive ecosystems (e.g., wetlands) have suffered losses ranging from 80 percent to 99 percent of their original acreage. As a result, California has more than twice as many Federally-listed endangered species (100) as any other western state and more than any state in the Nation. Florida is second with 69

species. According to the USFWS, California also has more species under consideration for Federal listing (957) than any other state.

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

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

While as a matter of law CESA prohibits the take of endangered species, implementation of the Act's legal prohibitions have been limited and inadequate. Local lead agencies do not generally consult with the DFG when projects will impact endangered species. The DFG has not had the administrative or legal resources to mount an effective enforcement program. In the absence of coordinated landuse planning and increased visibility for endangered species enforcement activity, local agencies and land owners will continue to implement projects which will further fragment wildlife habitat. Given current trends, we can expect many more species to decline and become listed in the next few years. State and Federal wildlife agencies have taken the initial steps to employ habitat conservation plans and other mitigation planning programs to permit urbanization activities while preserving the best remaining habitat. These few successful planning efforts must receive greater institutional support and community acceptance by both State and Federal governmental agencies.

Given the tremendous cost of recovery for any single species, there will be insufficient funding to address the needs of all listed species. Despite our best efforts, it is likely that species will continue to go extinct. Recognizing this dilemma, many wildlife advocates now support an approach which would supplement endangered species recovery programs with a broad-based approach aimed at ensuring the integrity of the best remaining examples of natural

ensuring the integrity of the best remaining examples of natural communities and ecosystems in order to conserve biological diversity and prevent other species from becoming endangered. The goals of biodiversity planning are to anticipate future patterns of development and modifications in land use, to identify gaps in our current network of wildlife preserves, to secure protection of new preserves and to develop new strategies on managed wildlands in order to save most of the remaining species and natural communities and retain the maximum biodiversity.

Impacts by alien (introduced) plants and animals continue to pose extremely serious threats to the survival of many native plants and animals. Many aliens such as salt cedar (Tamarix sp.) and Tilapia sp. (an African fish) may never be eradicated and can only be controlled at great expense on an area-by-area basis. Habitat for beach layia (Layia carnosa) has been reduced by invasions of ice plant and European dune grass. Tilapia sp. are thought to have caused the extinction of the High Rock Spring tui chub, a small native fish of Lassen County, in the past year. Range expansions of the alien red fox jeopardized populations of the light-footed clapper rail, California clapper rail and San Joaquin kit fox in 1990. Nonlisted bird species, including the burrowing owl, snowy plover, Caspian tern and many other ground-nesting water birds have been harmed by this newcomer as well. The California clapper rail population plummeted to about 300 birds in 1990 as a result of red fox predation which, if left unchecked, may cause the extinction of this species within a few years.

Captive breeding programs are in place for the California condor and the Morro Bay kangaroo rat and are being developed for the light-footed clapper rail, and off-site propagation programs have been proposed for many plant species. The role of captive breeding and reintroduction in the preservation of biodiversity has been questioned by those who point to the lack of cost-effectiveness and to the larger picture, the need to save intact ecosystems. It has been suggested that captive propagation provides false reassurances that endangered species problems are solvable through ex situ methods, that they erroneously view species as separate from their habitat, and that such programs may represent the path of least political resistance for government agencies avoiding controversies involving land and water use. Clearly, however, captive breeding programs have generated tremendous educational benefits by focusing public attention on wildlife conservation and heightening public awareness of larger environmental issues. It is likely that captive breeding will continue to be employed as a stopgap measure when time is short, when other strategies cannot immediately be brought into play and when such programs are part of comprehensive planning to protect and restore habitat.

In 1987 a report was prepared at the request of the California Senate Committee on Natural Resources and Wildlife. The purpose of that report, Sliding Toward Extinction, as stated was to:

"...inform the people of the State that biotic destruction is accelerating and may soon reach a crisis point. Decisive action is needed now to protect the habitats and species that are sliding toward extinction.

"California's threatened and endangered species are indicators of the State's environmental health. The quality of natural habitats is ultimately tied to the health of all Californians.

"Millions of acres of native grasslands, tidal marshes, vernal pools, oak and redwood forests have already been lost. In the pursuit of food, shelter, livelihood and pleasure, Californians have eliminated and altered a significant proportion of the State's wildlands.

"The issue is how to balance the needs and activity of a rapidly increasing human population -- 33 million predicted by the year 2000 -- with protection for the State's unique and exhaustible natural resources. Steps can be taken now to ensure that California's irreplaceable biological diversity survives in ways that sustain both the State's rich natural heritage and its economy. If we wait, conflicts will only accelerate."

The report recommended 14 measures, as follows, for ensuring the protection of California's remaining natural diversity.

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

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

TABLE I

1990 Trends Summary for State-listed Plants and Animals (Rare, Threatened and Endangered)

Trend[1/]

	Unknown	Increasing	Stable/ Increasing	Stable	Stable/ Declining	Declining	Extirpated
Plants	8(3.8)	3(1.4)	5(2.4)	37(17.7)	33(15.8)	123(58.8)	0(0)
Animals	15(20.8)	1(1.4)	5(6.9)	9(12.5)	20(27.8)	20(27.8)	2(2.8)

Unknown	Insufficient information to describe a trend.
Increasing	Significant progress toward recovery; remaining populations may be small but are secure and increasing; still meets the criteria for listing as threatened.
Stable/Increasing	Some progress toward recovery; populations may be small, but most are secure and some are increasing.
Stable	No change in status in recent years; populations may be unprotected, threatened and at critically low, unsafe levels.
Stable/Declining	Some populations are declining; significant threats have been identified, and adverse impacts have been documented in recent years.
Declining	Populations are declining; major losses have been documented in recent years.
Extirpated	All populations eliminated from California within recent years.

[1/]Number of species and percent of total in each category.

TABLE II

Frequency of Categories of Adverse Impacts
on State-listed Plants (1990)

Category of Impact	Frequency Cited
Development (residential, industrial, commercial)[1/]	80
Livestock Grazing[2/]	58
Off-road Vehicles (ORV or OHV)	45
Agriculture[3/]	43
Exotic Plants[4/]	30
Roads (construction and maintenance)[5/]	34
Trampling (by humans and equestrians)	20
Fire Management[6/]	15
Feral Animals (pigs, goats and introduced deer)	14
Mining (sand, gravel, clay, minerals)	13
Water Projects [7/]	10
Flood Control Activities[8/]	7
Collecting (horticultural use)	7
Landfills (and garbage dumping)	7
Energy Development (and associated activities including pipeline and powerline construction)	5
Water Quality Degredation	4
Logging	3
Vandalism	2
Climatic Effects	2
Hybridization	1
Disease	1

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

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

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

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

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

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

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

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

Table III

Frequency of Categories of Adverse Impacts
on State-listed Animals (1990)

Category of Impact	Frequency Cited
Development[1/]	31
Water Projects[2/]	28
Introduced Predators and Competitors[3/]	23
Agriculture[4/]	22
Livestock Grazing[5/]	18
Pesticides, Poisons, Contaminants (rodenticides, lead poisoning)	16
Flood Control[6/]	16
Human Disturbance (disruptance of breeding activities, e.g.)	15
Off-road Vehicles (ORV or OHV)	15
Exotic Plants (degradation of native plant communities supporting endangered animals)	13
Logging	8
Shooting	5
Energy and Mineral Development (oil extraction, power plants)	5
Disease	5
Hybridization	4
Climate (drought, natural flooding)	4
Collecting	4
Water Pollution	4

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

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

[3/]Examples include the nonnative red fox, African clawed frog, European starling and Tilapia ssp. (an African fish). Includes impacts on endangered species habitat by feral ungulates and impacts from human and livestock associated wildlife such as ravens and cowbirds.

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

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

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

MAMMALS

Mohave ground squirrel (Spermophilus mohavensis)

CA - Threatened FED - Candidate 2

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

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

The squirrel is designated as a category 2 (also called candidate 2) species in the January 6, 1989, Federal Register notice of review of vertebrate species. This means that the FWS currently has information which indicates that the squirrel may deserve to be proposed as Endangered or Threatened, but that conclusive data on biological vulnerability and threat are not available.

The first DFG five-year status report for the squirrel was written in 1987. In the report, the DFG recommended to the FGC that the Threatened classification be retained. Mohave ground squirrel survey guidelines were developed in 1988 and revised in 1989 and 1990 to help standardize field methods and results.

Management needs for the squirrel are as follows: protection of habitat which currently supports the squirrel through positive consideration of the species by federal agencies in review of proposed wild land alterations; permanent protection of habitat which supports the squirrel by establishing a series of preserves in public

ownership; determination of the status of the squirrel, in terms of distribution and numbers, throughout its range during one or two field seasons; periodic surveys (at least every three years) to repeat the status determination; studies to determine various aspects of the life history of the squirrel, including food habits and habitat use, throughout its range and in all occupied plant communities; preparation of a State management plan which would incorporate the elements of protection and restoration of habitat, the establishment of preserves, and surveys and studies; restoration of degraded habitats by controlling grazing and recreational vehicle use on public lands and by planting with preferred plants; and investigation of the impacts of rodenticides on the squirrel.

San Joaquin antelope squirrel (Ammospermophilus nelsoni)

CA - Threatened FED - Candidate 2

The San Joaquin antelope squirrel is one of five species of antelope squirrels. Members of the genus Ammospermophilus are confined to arid grasslands and shrublands in the southwestern U.S. and northern Mexico. A. nelsoni is considered to be monotypic. The species is omnivorous with a diet consisting primarily of grass and forb seeds and insects. Insects, especially grasshoppers, are eaten when available and may be an important component of the diet in summer months. Antelope squirrels are fossorial animals that are not seen above ground when ambient temperatures drop below 10°C, but these diurnal animals have been observed all hours of the day when temperatures are in excess of 42°C. The general active period during spring and summer months coincides with air temperatures of 20° to 30°C (68° to 86°F). Burrows used by this species are either dug by them or by other rodents including giant kangaroo rats (Dipodomys ingens).

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

Habitats of antelope squirrels consist of grasslands with moderate shrub cover which includes such species as salt bush (Atriplex spp.), ephedra (Ephedra viridis), bladder pod (Isomeris arborea), goldenbush (Haplopappus spp.), snakeweed (Gutierrezia californica) and others. Low density populations have also been located in iodine bush (Allenrolfea occidentalis) and spiny salt bush (Atriplex spinifera) dominated habitats with alkaline soils. Antelope squirrel populations of moderate density have also been found in areas lacking shrubs, but

containing populations of giant kangaroo rats. Recent surveys indicate that 80 percent of the original geographic range of A. nelsoni has been converted to agricultural developments. No prime habitat remains within the remnant habitats of the San Joaquin Valley. Populations now exist primarily in marginal habitats of the low foothills and mountains of the western edge of the valley. Significant populations exist only in western Kern County at Elk Hills and on portions of the Carrizo and Elkhorn plains.

Populations in the northern part of the range are found only in the Panoche and Kettleman Hills and appear to have low densities. Home range sizes of San Joaquin antelope squirrels on the Elkhorn Plain range from 5 to 20 ha, with a mean of 14.4 ha. Densities in good habitat in the Elkhorn Plain area are generally 4 animals per ha, and are lower in most other areas. This is in the low range of densities reported in the literature. Loss of habitats to agricultural developments and other habitat altering causes continue to threaten antelope squirrel populations throughout their range (see Table III). Rodenticide use is common in the entire range of the species, poses a significant threat and may be responsible for major population declines (see Table III). Over-grazing by livestock may be the single greatest long-term threat to populations due to habitat degradation, erosion and consequent lowering of carrying capacity (see Table III). Populations of this animal are considered to be declining (see Table I).

Studies supported by the Endangered Species Tax Check-off funds to refine data on population abundance, distribution, habitat relationships and the impact of livestock grazing were completed in 1989. The final report was completed in early 1990. No recovery plan has been written for this species, but the animal is being considered in southern San Joaquin Valley regional planning efforts involving state and Federal agencies, industries and local governments. Habitat for this species is protected and preserved to varying degrees at Elkhorn Plain Ecological Reserve and the Carrizo Plain Reserve, certain lands administered by the BLM, mitigation lands at Semi-tropic Ridge and certain preserve lands of TNC. Additional lands are being acquired using funds earmarked for mitigation of project-induced habitat losses in portions of the southern San Joaquin Valley. Habitat inventories carried out by the staff of the California Energy Commission have identified a number of suitable habitat areas for this species, and this information is being used to assist in acquisition and protection programs.

Morro Bay kangaroo rat (Dipodomys heermanni morroensis)

CA - Endangered FED - Endangered

This rodent, like all kangaroo rats, has long hind legs, small front legs and feet and a white belly. It is considered to be the darkest of all kangaroo rats in color. The lack of a complete white hip

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

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

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

Management needs include devising and implementing an annual scheme of vegetation management on the Pecho area, in order to retard the maturation of the coastal dune scrub habitat; continued monitoring of small mammal communities on the study plots at Pecho and continued

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

Giant kangaroo rat (Dipodomys ingens)

CA - Endangered FED - Endangered

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

Historic population distribution and abundance is difficult to deduce because of the spotty distribution of colonies. However, it is estimated that about 1,303,700 acres of habitat of varying quality

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

Giant kangaroo rats require native annual grassland and shrubland habitats with sparse vegetative cover and soils that are well-drained, fine sandy loams with slope generally less than 10 percent. Areas of low annual precipitation and infrequent flooding are preferred by this species for establishment of permanent colonies. Recent DFG studies have documented dense populations on the Elkhorn Plain Ecological Reserve, eastern San Luis Obispo County, in habitat consisting of Arabian grass (Schismus arabicus) and ephedra (Ephedra viridis). Habitat is protected and preserved to varying degrees at Elkhorn Plain, Carrizo Plain Natural Heritage Reserve, certain BLM lands, certain TNC reserves and certain state and federal lands within the remnant range of the giant kangaroo rat. The third year of a five year study to investigate the impact of livestock grazing on giant kangaroo rats and other wildlife inhabiting the Elkhorn and Carrizo plains in eastern San Luis Obispo County was completed in 1989. In addition to gathering data on population density and habitat use, a successful attempt to translocate a small colony from the Elkhorn Plain to the Carrizo Plain was made. Tax check-off funds support this research, and DFG staff are assigned to develop conservation programs for the giant kangaroo rat.

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

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

Stephens' kangaroo rat (Dipodomys stephensi)

CA - Threatened FED - Endangered

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

The major threat to the continued existence of the Stephens' kangaroo rat is the destruction or degradation of its habitat. The population trend is considered to be declining (see Table I) due to loss of habitat in all portions of the range. Adverse-impact categories (see Table III) include water projects; development; agriculture; pesticides, poisons and contaminants; livestock grazing; exotic plants; and off-road vehicles.

There is no active habitat management, but habitat has been protected through the establishment of the San Jacinto Wildlife Area (SJWA) and Lake Mathews Ecological Reserve (LMER) in Riverside County. The kangaroo rat was classified as a federal Endangered species on 31 October 1988. The first DFG five-year status report for the kangaroo rat was written in 1987. In the report DFG staff recommended that the kangaroo rat be reclassified to Endangered from Threatened. The DFG is participating in development of an HCP for the Stephens' kangaroo rat in Riverside County by serving on an advisory committee established by the county board of supervisors. The county's

consultant has prepared a short-term HCP, which was submitted by the county to the FWS in September 1989. This HCP, which was accepted by the FWS, will be in effect for two years while the long-term HCP is being prepared by the consultant. Using Endangered Species Tax Check-off funds, the DFG contracted for a field study in 1988 to determine the current distribution of the kangaroo rat and to determine relative abundance as an indication of habitat quality. In 1989, also using Tax check-off funds, the DFG contracted for a study to establish study plots on the SJWA and LMER which may be used to annually monitor the population status of the kangaroo rat. On the plots the contractor gathered baseline population data for the kangaroo rat and developed field methods which will be usable by qualified field biologists to assess kangaroo rat population status in subsequent years.

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

Fresno kangaroo rat (Dipodomys nitratoides exilis)

CA - Endangered FED - Endangered

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

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

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

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

Loss of habitat and subsequent extirpation of resident Fresno kangaroo rat populations due to agricultural conversion of native habitats is the principal cause of mortality and population decline (see Table III). It was recognized by early researchers of this subspecies that Fresno kangaroo rat populations could be exterminated by agricultural cultivation. It was estimated that between 1974 and 1982 habitat decreased from 14,618 acres to 10,353 acres. About 932 acres of habitat for this subspecies exists on the Alkali Sink Ecological Reserve in Fresno County. However, many more acres on several other preserves and sensitive management programs will be necessary in order to ensure population viability of the Fresno kangaroo rat on public lands. While no total population estimate for the subspecies is available it has been estimated that about 167 acres of Alkali Sink Ecological Reserve habitat was capable of supporting 394 to 662 individuals. However, recent surveys funded by DFG have failed to locate extant populations on these lands. Review of existing management programs may be necessary in order to reestablish viable populations in suitable habitat. To ensure genetic fitness of a

population, additional blocks of suitable habitat in excess of 800-2,800 acres will be required for preserves. Securing additional preserves of sufficient size must be the principal recovery strategy for this species. A recovery plan for the Fresno kangaroo rat is currently being written by the USFWS. Tax check-off monies are being used to support staff assigned to develop research and management programs for the Fresno kangaroo rat. Recent research has been supported by Section 6 federal funds.

Tipton kangaroo rat (Dipodomys nitratoides nitratoides)

CA - Endangered FED - Endangered

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

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

Total population numbers during historic times are difficult to estimate due to lack of appropriate data collected during that era. However, a crude estimate of historic population based on today's density data and the estimated extent of former range is about 17,164,800 individuals. Today approximately 190,200 individuals, about 1 percent, remain. This population is considered to be declining (see Table I). All of this habitat and population loss leading to the endangerment of the Tipton kangaroo rat was caused by the tremendous increase in conversion of native arid grassland and shrubland communities of the southern San Joaquin Valley to intensive, irrigated agricultural crops (see Table III). The completion of water delivery systems associated with the Central Valley Project prompted much of this agricultural expansion (see Table III).

Tipton kangaroo rats are limited to arid land communities of the valley floor in the Tulare Basin in level to nearly level terrain at

an elevation of 200 to 300 feet. Woody shrubs such as Atriplex spinifera, A. polycarpa, Allenrolfea occidentalis, Haplopappus acradenius and Prosopis juliflora are sparsely scattered over the terrain with scant to moderate ground cover of grasses and forbs. Soils are typically fine-textured and alkaline. Tipton kangaroo rats sometimes colonize areas that are flooded in winter and spring. Favored areas may include seepweed (Suaeda fruticosa) shrublands which are flooded seasonally or where alkaline water lies close to the surface of the soil year-round. Kangaroo rats in these areas either drown or escape to higher ground during floods (see Table III).

Continued agricultural expansion into the remaining native habitats of the southern San Joaquin Valley threatens the Tipton kangaroo rat with extinction. Remnant habitats in southeastern Kings, southwestern Tulare and northwestern Kern counties could be cultivated by the year 2000, thereby eliminating the habitat of this subspecies.

No recovery plan is specifically anticipated for the Tipton kangaroo rat; however, cooperative efforts of state and federal agencies working with local governments and industries hope to protect and preserve some habitat through sensitive regional planning. Participants in this effort include DFG, USFWS, TNC, California Energy Commission and appropriate city and county governments.

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

Tax check-off funds are used to support DFG staff assigned to develop research and management programs involving Tipton kangaroo rats. On August 25, 1988 the FGC accepted the petition prepared by DFG to list the Tipton kangaroo rat as Endangered and noticed the subspecies as a candidate as provided in the California Endangered Species Act. On February 3, 1989 the FGC designated the Tipton kangaroo rat as an endangered species.

Salt-marsh harvest mouse (Reithrodontomys raviventris)

CA - Endangered FED - Endangered

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

The major threat to the mouse is destruction and degradation of its habitat. The population trend is considered to be declining (see Table I) due to loss of habitat through development of residential, commercial and industrial uses in wetlands, flood control and mosquito abatement activities, and freshwater encroachment caused by increased sewage treatment plant discharge. Over 3,600 acres of nontidal wetlands in south and central San Francisco Bay, much of it habitat for this species, have been filled or degraded since the mid-1970's. Since 1982, hundreds of acres of nontidal salt marsh in the South Bay have been disced. The impact of the alien red fox and the impact of rodenticide use on the salt-marsh harvest mouse are unknown. Adverse-impact categories (see Table III) include development, agriculture, exotic plants and flood control, and may include introduced predators and competitors and pesticides, poisons and contaminants.

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

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

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

Amargosa vole (Microtus californicus scirpensis)

CA - Endangered FED - Endangered

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

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

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

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

Sierra Nevada red fox (Vulpes vulpes necator)

CA - Threatened FED - Candidate 2

The Sierra Nevada red fox is one of 12 recognized North American subspecies of Vulpes vulpes. The Sierra Nevada red fox is distinguished from members of the introduced lowland population of red foxes by its slightly smaller size and darker colored fur. The Sierra Nevada subspecies exhibits cross, silver and black color phases whereas the lowland subspecies does not. Sierra Nevada red foxes are rarely sighted and apparently very secretive by nature. They inhabit remote areas of the State where chance encounters with humans are uncommon. Relatively little is known of the life history of the Sierra Nevada red fox but it is assumed that its habits are similar to those of other red foxes insofar as choice of dens, hunting tactics and breeding behavior are concerned. The subspecies is known to inhabit vegetation types similar to those for marten (Martes americana) and wolverine (Gulo gulo). Sierra Nevada red foxes probably eat a variety of foods which, in their habitats, would include marmots, ground squirrels, mice, woodrats, pikas, hares, birds, insects and berries. Reproductive behavior is assumed to be the same as for other red foxes with four to five pups born after a 51-52 day gestation period. Sierra Nevada red foxes inhabit a variety of habitats in the subalpine and alpine zones of the Cascade Mountains and the Sierra Nevada in California. It is assumed that, like its lowland counterparts, the Sierra Nevada red fox is an adaptable and opportunistic animal able to exploit a variety of natural environmental conditions in order to survive. Without intensive study, however, much about the habits and ecology of this animal remains unknown. The population trend of this animal is unknown.

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

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

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

No management plans for this species have been prepared, partly because of the difficulty in collecting data and limited financial resources. A position in the Nongame Bird and Mammal Section having lead responsibility for Sierra Nevada Red Fox research and management programs is supported by the California Endangered Species Tax Check-off Funds. Greater effort needs to be expended by concerned agencies to acquire the necessary biological information upon which to base management and recovery plans. Management needs include reduction or elimination of logging adjacent to mountain meadow habitats; reduction of intensive recreational use of certain areas with known or suspected fox populations; reduction or elimination of livestock grazing in mountain meadows; and investigation of life history and habitat requirements of the Sierra Nevada red fox. Habitat that is set aside as designated wilderness is protected from such destructive uses as logging and certain developments. However, certain disturbances such as livestock grazing and recreational uses may have adverse impacts on Sierra Nevada red foxes (see Table III). The nature and significance of these disturbances, along with the answers to several other research questions concerning this subspecies, remains unknown.

San Joaquin kit fox (Vulpes macrotis mutica)

CA - Threatened FED - Endangered

The kit fox (Vulpes macrotis) is the smallest canid species in North America. The San Joaquin kit fox is the largest of the four or five recognized subspecies 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 9- 12 inches at the shoulder. The slender-built animals are characterized by relatively long legs and large, conspicuous ears. Adult males weigh about 5 pounds, and adult females weigh about 4.6 pounds. Pelage color differs with season, being tan to buffy gray dorsally in summer and silver gray dorsally in winter. Ventral coloration is white year-round. The long bushy tail is black-tipped, and the insides of the ears are covered with white hairs. Kit foxes attain adult size and pelage at about five months of age.

Historic range of the San Joaquin kit fox included most of the San Joaquin Valley from the vicinity of Tracy, San Joaquin County

southward to southern Kern County. By 1930 this range may have already been reduced by 50 percent and kit foxes that formerly occupied portions of their northern, northeastern and eastern range were restricted to the southern and western parts of the valley. Kit foxes occur in the remaining native vegetation associations of the valley floor and surrounding foothills from southern Kern County north to Los Banos, Merced County. Depending on extent of agricultural development, distribution is spotty within this broad range. In addition, smaller, less dense populations may be found further north and in the narrow corridor between Interstate 5 and the Interior Coast Range from Los Banos to Contra Costa County. Portions of Monterey, Santa Clara, San Benito and Santa Barbara counties are also included in the range of the San Joaquin kit fox.

Studies and information from various sources indicate that a density of one kit fox per square mile in suitable habitat is a reasonable figure to use to estimate populations based on known acreage of habitat, although densities can range from less than one to over six foxes per square mile. A reasonable population estimate is about 7,000 animals in the 14 counties included within the range. Based on lost habitat and range, a population decline of about 20- 43 percent has been estimated (see Table I).

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

About 82,000 acres of grassland/shrubland habitat has been acquired on the Carrizo Plain Natural Heritage Reserve and additional habitat acquisition is anticipated for that area and portions of the southern San Joaquin Valley, particularly in the Semi-tropic Ridge area of northern Kern County. Kit fox habitat exists on other public lands managed for a variety of purposes where the habitat is subjected to a range of compatible and incompatible uses. Such areas include lands administered by the BLM, Department of the Army, Department of Energy, USFWS, Department of Water Resources and DFG. A revised recovery plan is currently being prepared by the USFWS. Additional regional planning efforts, particularly in the southern portion of the kit fox

range, are anticipated to assist in the recovery of the kit fox. Tax check-off funds are used to support DFG's efforts in developing research and management programs benefiting the San Joaquin kit fox.

Island fox (Urocyon littoralis)

CA - Threatened FED - Candidate 2

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

The known threats to the species are habitat loss or degradation and direct interaction with feral cats. The population may be stable on San Miguel, Santa Rosa, Santa Cruz and San Nicolas islands. It is almost certainly declining on Santa Catalina Island. The situation on San Clemente Island is unknown. The population trend is considered to be stable (see Table I). Adverse-impact categories (see Table III) include development and introduced predators and competitors.

The fox is designated as a category 2 (also called candidate 2) species in the January 6, 1989, Federal Register notice of review of vertebrate species. This means that the FWS currently has information which indicates that the fox may deserve to be proposed as Endangered or Threatened, but that conclusive data on biological vulnerability and threat are not available.

The first DFG five-year status report of the fox was written in 1987. In the report, the DFG recommended to the FGC that the Threatened classification of the fox be retained. Management activities for the fox include reduction and attempted elimination of feral cats on San Nicolas Island, reduction and attempted elimination of deer, feral pigs and feral goats on San Clemente island; and population studies on San Miguel, San Nicolas and San Clemente islands. A two-year study of the status of the fox on Santa Catalina and San Clemente islands was begun in 1989, using Endangered Species Tax Check-off funds.

Management needs for the fox are as follows: elimination or significant reduction of exotic mammals (both herbivores and carnivores) on all islands occupied by the fox; preparation of a State management plan which would incorporate the elements of exotic mammal elimination or reduction and of surveys and studies of the fox; and surveys on each of the islands except San Miguel and San Nicolas to

determine the status of the population, investigate various life history factors and describe threats to its continued existence.

Wolverine (Gulo gulo)

CA - Endangered FED - Candidate 2

The wolverine is the second largest member of the weasel family; only the sea otter (Enhydra lutris) is larger. The wolverine resembles a small, short-legged bear with a coarse shaggy coat and a bushy tail. The coat is heavy and dark brown with two broad, light-colored bands extending from the shoulder to meet at the base of the tail. Wolverines typically weigh 35-60 pounds and measure 35-45 inches long, including a 6-10 inch tail. They stand about 14-18 inches at the shoulder. Their jaws are very powerful and are adapted to crush and shear frozen meat and bones. Sexes appear similar except that males are 25-35 percent larger than females. The wolverine is a tireless hunter and scavenger, sometimes ranging great distances within a home range that may encompass several hundred square miles. Wolverines subsist on a variety of foods including small and medium sized mammals, birds, insects, berries and fungi. Carrion, especially in the form of large ungulates, is believed to be an important component of the diet, particularly during winter. Wolverines have litters of one to five young, with two to four being most common. Birth of young takes place in dens of various configurations of rocks, hollow logs and vegetation.

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

Regardless of the difficulties involved in the study of this species, basic population, ecological and habitat relationships data are needed in order to develop management plans to ensure the continued survival of wolverines in California. No management plans for this species has

been prepared, partly because of the difficulty in collecting data and limited financial resources. No state or federal land use planning documents address the habitat needs of wolverines at the present time. Wolverines are not given adequate consideration for protection of habitat or protection from disturbances in the several forest plans that have been drafted by the USFS to date. Established wilderness areas within the State preserve many acres of habitat, and additional areas have been proposed for wilderness designation, but none have been established in California during the past eight years. Wolverines may be subject to habitat loss due to logging and over-grazing by livestock. They may also be affected by human disturbance including use of ORV's and snowmobiles in remote "wilderness" areas (see Table III). A position in the Nongame Bird and Mammal Section having lead responsibility for wolverine research and management programs is supported by the California Endangered Species Tax Check-off fund.

Guadalupe fur seal (Arctocephalus philippii townsendi)

CA - Threatened FE - Threatened

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

California bighorn sheep (Ovis canadensis californiana)

CA - Threatened

The California bighorn sheep is on of three mountain sheep subspecies found in California and eight found in North America. Both sexes have horns, the female with 10 to 12 inch goat-like horns and the male with massive horns which may grow to make a full curl as viewed from the side, thus the name bighorn sheep. Mature males may be 40 inches tall at the shoulder and weigh around 200 pounds. The female is about 30 percent lighter. Bighorn habitat requirements include steep open terrain free of competition from other grazing ungulates. The historic distribution in California was the east slope of the Sierra Nevada Mountains from Walker Pass to Sonora Pass, and the lava rim rock areas of northeastern California.

Since this subspecies was listed as rare in 1972, it has increased from 195 animals in two indigent herds to five herds totaling about 300 animals. This increase resulted from five trapping projects removing surplus animals from the Baxter herd and relocating them to suitable habitat. In January 1988 the entire reintroduced herd (65 bighorn) in the Warner Mountains died. The cause was determined to be a bacterial pneumonia believed to have been contracted from a contact with a stray domestic sheep. All Sierra Nevada bighorn herds are being monitored, including the reintroduced Lee Vining herd. Suitable reintroduction habitat has been identified. A re-evaluation of the habitat and reintroduction potential is currently being performed, taking into account the recent losses and potential conflicts with livestock grazing.

Peninsular bighorn sheep (Ovis canadensis cremnobates)

CA - Threatened

The peninsular bighorn sheep is one of three mountain sheep subspecies found in California and eight found in North America. As with all wild sheep, the males have large curling horns, and the females have small horns with a slight curve. Mature rams weigh as much as 180 pounds, and ewes weigh about 140 pounds. Peninsular bighorn uses the open desert slopes, found mostly below 4,000 feet elevation, from the San Gorgonia Pass south and extending into Mexico. Their historic range is much the same as the present range. However, their numbers have declined. When the subspecies was listed as rare in 1972, their estimated population was 1,100 animals. The current estimate is about 450-600 animals. The problem has been a very low lamb survival over much of their range since 1977. There is an ongoing study by the Bighorn Institute in the Santa Rosa Mountains to determine the cause of high lamb mortality. A Santa Rosa Wildlife Habitat Management Plan has been developed jointly by the BLM and DFG. The population is being monitored by making helicopter herd composition counts. The DFG has acquired over 41 square miles of bighorn habitat that was held in private ownership. A number of water developments have been made to benefit bighorn. Over 100 feral cattle have been removed from within the Anza Borrego Desert State Park in an effort to improve conditions for peninsular bighorn sheep. Livestock are a possible source of disease contributing to the high lamb mortality.

BIRDS

California brown pelican (Pelecanus occidentalis californicus)

CA - Endangered FED - Endangered

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

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

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

Adverse-impact categories (see Table III) include development; pesticides, poisons, and contaminants; human disturbance; and disease.

Population numbers are well-known because the SCB breeding colonies are surveyed almost every year. The breeding population had been generally increasing through the 1986 and 1987 breeding seasons but then suffered a precipitous decline in 1988 to about 2900 breeding pairs from about 7200 in 1987. In 1989 the breeding population increased to about 6000 pairs and then fell to about 2400 pairs in 1990. These dramatic changes from one year to the next illustrate the need to base management decisions for the SCB population on data from more than a five-year period (the period specified in the federal recovery plan; see below). The Los Coronados breeding colony has gradually declined to the point of virtual extirpation, probably due to human disturbance.

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

Management needs include revision of the recovery plan to eliminate the concept of mean productivity for a five-year evaluation period of CBP status and substitute the concept of minimum productivity; revision of the recovery plan to provide for a recovery evaluation period of at least 10 years to replace the current five-year period; revision of the recovery plan to provide for productivity values higher than the current 0.7 and 0.9 as numerical thresholds for reclassification of the CBP to Threatened and for delisting, or to justify the current values; revision of the recovery plan to evaluate current factors which make the CBP vulnerable to extinction in the SCB as a breeding species or at least susceptible to continued endangerment; providing Section 6 funds to the DFG annually for a breeding season survey of SCB nesting populations, in order to obtain data on number of nesting attempts and productivity; providing Section 6 funds to the DFG to undertake recovery plan tasks on pollution monitoring and correlation of annual fishery data to CBP productivity in the SCB, as well as other priority 1 and 2 tasks; development by

the FWS of a formal international cooperative program between the United States and Mexico to protect CBP nesting colonies in Mexico; construction by the DFG of a new outer levee and islands in the salt ponds at the Moss Landing Wildlife Area, and management of water levels in the ponds to protect roosting pelicans; employment of a biologist to exclusively conduct CBP breeding season surveys in the Channel Islands; a wider protection zone around the Anacapa Islands; and prohibition of aircraft over Anacapa.

California condor (Gymnogyps californianus)

CA - Endangered FED - Endangered

The California condor is North America's largest land bird; its wing span exceeds nine feet. Adults are black with a pink-orange head, and there is a white patch under each wing. It is the only living representative of this genus. Condors formerly were widespread in western North America from British Columbia to Baja California. By the early 1980s, the species had been restricted to mountain and foothill rangeland and forest habitats in a U- shaped range from northern Los Angeles County in the south, northward through the Coast Range to San Luis Obispo County and northward through the western Sierra Nevada to Tulare County. The greatest threat to the survival of the condor over the decades has been the unnaturally high rate of mortality caused by human activities, directly or indirectly. Probably no single, dominant factor caused the population decline. Adverse impacts have included development, egg predation by ravens, poisons and contaminants, human disturbance, energy development, collecting and shooting. The relative significance of each factor has changed over time. Recently, lead poisoning stemming from the ingestion by condors of lead bullets in carcasses, has been a significant contributor to the decline. Shooting has long been considered to be an important source of condor mortality, more so in the past than in recent decades. Incidental death from use of strychnine poisoning of predators in the early 20th and in the 19th century may have been another important factor. DDT contamination may have reduced condor reproductive success in the recent past. Unnaturally high incidence of loss of eggs to ravens may be the result of human activities that have benefited that species. The population declined steadily in recent decades from 120-180 in the 1940s to 25-35 in the late 70s. In 1980, an intensive last-ditch interagency recovery program was implemented. However, the decline continued so rapidly that the last remaining birds had to be trapped by 1987 for captive breeding. Captured wild birds and incubator-hatched young from eggs collected from nests of the last wild breeding pairs became the nucleus of a captive breeding population, which in 1987 comprised only 27 condors. The captive breeding program is progressing well. In 1988, the population increased by one, the result of the first egg ever laid and hatched in captivity by this species. With four more nestlings hatched in 1989 and eight more in 1990, the population has now reached 40. The population trend is stable, that is, the captive

population is secure but no wild population exists yet. Criteria for initiating the release program were established by the recovery team, and those criteria are expected to be met in 1991; captive- raised California Condors should be released in southern California in winter 1991/92 in an attempt to form the first of at least two self-sustaining wild populations. A successful experimental release program using female Andean condors has been under way in the Sespe Condor Sanctuary area to refine release procedures that will be needed when California condors are released. A Geographic Information System relating to condor habitat is nearing completion. All aspects of breeding and release programs are guided by recovery team recommendations and by the 1984 recovery plan. Many agencies and organizations contribute to the program. Significant State funding support of the captive breeding program is provided annually through the Environmental License Plate Program.

Bald eagle (Haliaeetus leucocephalus)

CA - Endangered FED - Endangered

The bald eagle is a large, dark brown bird of prey which, as an adult, has a white head and tail. It occurs widely in North America. The species winters throughout most of California at lakes, reservoirs, river systems and some rangelands and coastal wetlands. The breeding range is mainly in mountainous habitats near reservoirs, lakes and rivers in the northern one-third of the State; some pairs also breed in mainland southern California and on Santa Catalina Island. The breeding population trend is increasing, both in numbers and range. The number of breeding pairs known to be occupying territories in 1981 totaled 50; by 1990, it had increased to 93. The breeding range expanded from portions of 8 counties in 1981 to 14 in the late 80s. The winter population appears to be stable, varying from year to year and exceeding 1,000 birds some winters, as in 1987-88. The Pacific Bald Eagle Recovery Plan (1986) establishes geographical goals for population recovery; progress in meeting criteria is good, and the U.S. Fish and Wildlife Service is considering the possibility of reclassifying the Pacific states population to threatened status on the federal list.

Adverse impacts include development, agriculture, pesticides and contaminants, human disturbance, logging, off-road vehicles and shooting. The multi- agency California Bald Eagle Working Team provides guidance to agencies and groups in management and research matters, and the team is preparing a management plan for bald eagles in California to assist in implementing the recovery plan. Many breeding territories are being maintained and protected under local management plans. Key winter habitats are receiving increasing attention in terms of population monitoring, site protection and public viewing and education. Several agencies, including Pacific Gas and Electric Company and U.S. Forest Service, are sponsoring intensive ecological studies. Other research efforts are under way on

contaminants, human disturbance, and other issues that affect this species. Several bald eagle studies, including population restoration efforts on the Channel Islands, have been supported with Tax Check-off funding assistance. At Catalina, some of the 33 birds released there since 1980 are now breeding, but no eggs have hatched, possibly because of DDE contamination, a problem that is continuing to be assessed. A second reintroduction effort using translocated eaglets has been under way since 1987 in coastal Monterey County, and a third release area (Marin County) is being assessed. Also, a captive breeding population is being developed at the San Francisco Zoo. Breeding status of nesting territories and winter population size and distribution are monitored annually by cooperating agencies and individuals.

Swainson's hawk (Buteo swainsoni)

CA - Threatened FED - Candidate 3C

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

Swainson's hawks breeding in California spend the winter in South America as far south as Argentina. The diet of the Swainson's hawk is varied with the California vole (Microtus californicus) being the staple in the Central Valley. A variety of birds and insects are also taken. Swainson's hawks often nest peripherally to riparian systems of the valley as well as utilizing lone trees or groves of trees in agricultural fields. Valley oak (Quercus lobata), Fremont cottonwood (Populus fremontii), walnut (Juglans hindsii) and large willow (Salix spp.) with an average height of about 58 feet (41-82 feet) are the most commonly used nest trees in the Central Valley. Swainson's hawks in the Great Basin area of the State (northeastern counties) occupy the juniper-sagebrush community typical to the area. Junipers (Juniperus occidentalis), with an average height of 15 feet are most commonly used as nest trees in the Great Basin. The diet of Great Basin populations of Swainson's hawks consists of montane meadow voles (M. montanus) and Belding's ground squirrels (Spermophilus beldingi).

Swainson's hawks require large, open grasslands with abundant prey in association with suitable nest trees. Suitable foraging areas include native grasslands or lightly-grazed pastures, alfalfa and other hay crops and certain grain and row croplands. Unsuitable foraging

habitat includes row crops in which prey are scarce or unavailable due to the density of the vegetative cover. Those include vineyards, orchards, rice, corn and cotton crops. Suitable nest sights may be found in mature riparian forest, lone trees or groves of oaks and other species in agricultural fields and mature roadside trees. Over 85 percent of Swainson's hawk territories in the Central Valley are in riparian systems adjacent to suitable foraging habitats.

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

During historic times (ca. 1900) Swainson's hawks may have maintained a population in excess of 17,000 pairs. Today the statewide population is estimated to be only about 550 pairs. If current trends of agricultural and urban expansion continue, the remnant population may decline to the point of endangerment. Currently the population is declining statewide (see Table 1). Breeding populations of Swainson's hawks are monitored each year to determine trend and condition of habitat. Banding and color marking studies are ongoing in the Great Basin region, and recently radio- telemetry was used to monitor Swainson's hawk movements in the Central Valley. Management needs of the Swainson's hawk include ensuring availability of suitable nesting and foraging habitat through preservation of riparian systems and lone and groves of mature trees in agricultural fields, and maintenance of compatible (with the Swainson's hawk) agricultural practices in grasslands, pastures and croplands. Compatible agriculture is essential to the maintenance of current Swainson's hawk populations. The loss of agricultural lands to various developments in a serious threat to Swainson's Hawks throughout California (see Table III). Additional threats are posed by habitat loss due to bank protection projects, expansion of incompatible agriculture, shooting, pesticide poisoning of prey animals, competition from other raptors and human disturbance at nest sites (see Table III).

Developing a cooperative effort between DFG and private landowners is crucial to the effectiveness of habitat management programs since 95 percent of known territories in the Central Valley are on private lands. Swainson's hawks in the Great Basin exist on both private and public (BLM and USFS) lands. The widespread use of pesticides and rodenticides within the range of the Swainson's hawk is cause for concern. Besides the direct and sublethal effects on adult and young

birds caused by pesticides, there is a definite impact on potential prey animals upon which Swainson's hawks depend. No management plan has been prepared for the Swainson's hawk. Tax check-off funds support staff assigned to develop research and management programs involving the Swainson's hawk.

American peregrine falcon (Falco peregrinus anatum)

CA - Endangered FED - Endangered

The peregrine is a medium-sized falcon. Adults are slate gray above and light below, and the dark cap of the head extends down on each side over the cheeks. The range includes most of California during migrations and in winter, except in deserts. The California breeding range, which has been expanding, now includes the Channel Islands, coast of southern and central California, inland north coastal mountains, Klamath and Cascade ranges and the Sierra Nevada. Nesting sites are typically on ledges of large cliff faces, but some pairs are nesting on city buildings and bridges. Nesting and wintering habitats are varied, including wetlands, woodlands, other forested habitats, cities, agricultural areas and coastal habitats. Pairs formerly nested commonly in most of the State, but only about ten breeding pairs were known by the mid- 70's. The decline was attributed to DDT, causing failure of eggs to hatch. Restrictions on use of DDT and intensive recovery efforts have helped to restore breeding to some areas of the State. The breeding population trend is stable/increasing, with population increases in most regions of the State but with little or no improvement in others. Part of the increase is owing to the program of annual releases to the wild of captive-hatched birds. The known number of breeding pairs in 1990 was 106, compared with 39 in 1980. Under the Pacific Coast Recovery Plan for the peregrine falcon (1982), management has been directed to augmenting natural productivity by releasing large numbers of young, captive-hatched birds through various means. The Santa Cruz Predatory Bird Research Group (The Peregrine Fund) produces peregrine chicks from the incubator-hatching of eggs laid by captive peregrines or of thin-shelled eggs collected from poorly reproducing pairs in the wild. Young are released to the wild into active nests of peregrines or of prairie falcons or are hand reared in "hack" box nests for release where few peregrines now nest. Since 1977, 587 peregrines have been released to augment natural productivity of the growing number of wild breeding pairs in California. This part of the recovery program is gradually being diminished. Other recovery actions include annual surveillance and protection of nest sites; sampling of eggs for contaminant analyses; environmental review and restrictions on developments and disturbances near nest sites; creation or enhancement of nesting ledges; and acquisition of peregrine nesting habitat. The Environmental License Plate Program and Endangered Species Tax Check-off funds greatly supported much of this program through 1989. Ecological Reserves protect habitats of several breeding pairs. Two western U.S. Peregrine Falcon Recovery Teams were replaced by one team

in 1989 as part of Federal changes in administration of the nationwide recovery effort, and a new interstate working team is being established to aid coordination. The multi-agency California Peregrine Falcon Working Team provides recovery program guidance to cooperators. An interagency memorandum of understanding was signed in 1988 to ensure the adequacy of annual surveys for a five-year period to provide information needed for eventually reevaluating its endangered status.

California black rail (Laterallus jamaicensis coturniculus)

CA - Threatened FED - Candidate 1

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

The major threat to the existence of the rail in California is the loss and degradation of its habitat. The population trend for this species in California is considered to be stable/declining (see Table I), due to loss of coastal salt marshes, inland freshwater marshes and Colorado River marsh habitat. Adverse-impact categories (see Table III) include water projects, development, agriculture, and flood control. The Arizona Game and Fish Department has expressed concern about the rail along the lower Colorado River, which was subjected to extremely high water flows in 1983.

The rail is designated as a category 1 (also known as candidate 1) species in the January 6, 1989, Federal Register notice of review of vertebrate species. This means that the FWS currently has sufficient information to support a proposed listing as Endangered or Threatened, but that no proposed rule has been issued.

The first DFG five-year status report for the rail was written in 1987. In the report, the DFG recommended to the FGC that the Threatened classification be retained. Using Endangered Species Tax Check-off funds, the DFG contracted for a field study of the rail in

1988 to determine the distribution and relative abundance in the greater San Francisco Bay area. In 1989, also using tax check-off funds, the DFG contracted for a field study to determine distribution and relative abundance along the lower Colorado River and in the Imperial Valley. The 1988 and 1989 studies together should give a relatively complete picture of the status of the rail in California. There is no active management of habitat for the rail.

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

California clapper rail (Rallus longirostris obsoletus)

CA - Endangered FED - Endangered

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

Dramatic loss and degradation of its tidal marsh habitat originally led to the endangerment of the rail. The rail is threatened today by pollution from sewage effluent, industrial discharges and urban run-

off, which are contaminating its food resources. Sewage effluent in the south bay has converted its salt marsh habitat into brackish marsh with limited value for this species. Introduced cordgrass (Spartina sp.) which could negatively affect the rail's habitat has appeared at a number of salt marshes around the bay. About 1984 the alien red fox appeared in Alameda County. This exotic predator is responsible for recent drastic declines in the rail population in the San Francisco Bay National Wildlife Refuge, formerly the stronghold for this species. Adverse-impact categories (see Table III) include development; introduced predators and competitors; agriculture; pesticides, poisons, and contaminants; exotic plants; and flood control.

Management activities include protection of habitat, occasional surveys of local populations, monitoring the impacts of red fox predation and sewage effluent, and partial implementation of a federal recovery plan. In September 1990 the FWS issued a major news release from its Portland, Oregon regional office. Asking "Is San Francisco Bay about to be 'derailed'?", the news release correlated the recent rapid decline of the rail in the south bay with the rapid increase in the population of alien red foxes. The FWS revealed that federal biologists had found the remains of rails near the entrances of two active fox dens in April 1990. This species may become extinct within the next 10 years if a fox control is not implemented shortly.

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

Light-footed clapper rail (Rallus longirostris levipes)

CA - Endangered FED - Endangered

This is a brown, coot-sized marsh bird with long legs and bill; a short, upturned tail; and barred flanks. Disjunct breeding populations occur in coastal marshlands from Ventura County to San Diego County and also in northern Baja California. These populations inhabit cordgrass-pickleweed saltmarsh year-round. The species declined in population in recent decades as this habitat was drained or filled or came under increased predation pressure. In the past decade the status of the California population has been stable/declining, with fluctuating numbers of breeding pairs counted annually. Annual totals of breeding pairs from 1980 to 1983 ranged from 173 to 249, but the population drastically declined from 277 pairs in 1984 to about 140 pairs the following two years. From 1987 to 1990, 163 to 189 pairs of rails were counted. Nearly 200 pairs were recently counted in Baja California. Breeding pairs have been found at 22 marshes in California since 1980. The number of marshes

with breeding populations is declining: breeding pairs were found in 15 to 19 of the marshes in any single year from 1981 to 1984, 11-14 from 1985- 88, and only 8-9 in 1989- 90. A gradually increasing population resides at the Upper Newport Bay Ecological Reserve, which has supported about two-thirds of the statewide breeding population since 1985. Statewide, adverse impacts have included filling, dredging and development of wetlands, and loss of regular tidal connection with the ocean; sedimentation and the disruption of natural drainage through coastal wetlands because of upstream development or flood control; introduced predators and unnaturally heavy predation by some native predators; and human disturbance. In many wetlands, human-caused changes to marshland topography and vegetation has decreased the amount of suitable nesting habitat and also has made the rails more vulnerable to predation, especially at high tides. Carpinteria Marsh, the last remaining clapper rail habitat in Santa Barbara County, supported about 10% of the California population in 1984, but this entire subpopulation was eliminated over the next four years, apparently because of intensive predation by a large population of domestic cats and other predators associated with increased development of bordering uplands. Recent trapping of exotic red foxes at Anaheim Bay is allowing the Seal Beach National Wildlife Refuge rail population to rebound after having been nearly extirpated by predation. The Tijuana Marsh population is slowly rebuilding after near extirpation because of temporary cessation of tidal action in the mid 80s. The other California populations contain fewer than ten pairs. The Light- footed Clapper Rail Recovery Plan (1985) guides management and protection activities such as the annual breeding surveys; studies of reproductive biology; enhancement of nesting habitat by creation of nesting substrates, such as floating platforms; control of human disturbance and of predation; and habitat management and protection. A clapper rail working team has been formed to guide recovery efforts. Studies are under way to determine whether contaminants are affecting rail reproductive success. Increasing attention is being directed to predator control; identification of causes of local area extirpations or declines; determination of genetic relatedness of remaining populations; and implementation, where feasible, of reintroduction efforts, including development of captive hatching and captive breeding technology.

Yuma clapper rail (Rallus longirostris yumanensis)

CA - Threatened FED - Endangered

This rail is the most slender and pale of the three clapper rail subspecies in California. The clapper rails generally are gray-brown above and buffy- cinnamon below. The cheeks are brownish-gray, and the flanks are barred with black and white. The bill is long and slightly downcurved. The Yuma clapper rail eats mostly crayfish but also small fishes, isopods, insects, clams and seeds. Although some individuals may move southward into Mexico during the winter, the rail generally is a resident of shallow, freshwater marshes containing

dense stands of cattails (Typha latifolia) and bulrushes (Scirpus acutus) along the lower Colorado River from California and Arizona into Mexico. It is also found at the Salton Sea in Imperial County, California.

The rail is threatened by loss of habitat due to human-caused river flooding, so-called reclamation projects and mosquito abatement activities. The population trend for this species is considered to be stable/declining (see Table I) due to loss of marshes along the lower Colorado River and to land- management practices in Imperial County. Great concern has been expressed about the effects of high water in the river in 1983 on rail reproduction and habitat. The status in Mexico is not known. The status of the rail in Imperial County agricultural drains and the deltas of the New and Alamo rivers is uncertain. Adverse-impact categories (see Table III) include water projects, development, agriculture, exotic plants, and flood control.

Management actions include organization by the FWS of agency personnel into a recovery team; preparation of a recovery plan; periodic surveys of Colorado River marshes; habitat protection at state and federal wildlife refuges; and a three-year study of rail life history funded by the Bureau of Reclamation.

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

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

Greater sandhill crane (Grus canadensis tabida)

CA - Threatened

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

Historically, greater sandhill cranes nested in eastern Siskiyou County, northeastern Shasta County and southward to Honey Lake, Lassen County. Intensive surveys conducted under DFG contracts and as independent research in 1971, 1981 and 1988 have delineated the range and estimated current population size in California. Presently, greater sandhill cranes nest in Lassen, Modoc, Plumas, Shasta, Sierra and Siskiyou counties. During 1988 greatest numbers occurred in Modoc County (165 pairs), Lassen County (75 pairs), Siskiyou County (27 pairs) and Plumas County (7 pairs). Shasta and Sierra counties each had a single pair.

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

Favorable roost sites and an abundance of cereal grain crops characterize the greater sandhill cranes' Central Valley wintering ground. Rice is used extensively by cranes near the Butte Sink area of Butte County, and corn is the principal food source at most other Central Valley winter concentration areas, particularly in the Sacramento-San Joaquin Delta near Lodi, San Joaquin County. Irrigated pastures or shallow seasonal marshes are chosen for loafing sites throughout the wintering ground. A communal roost site consisting of an open expanse of shallow water is a key feature of wintering habitat. Most concentration areas on wintering grounds are within a few miles of secure roost sites that often can accommodate several thousand cranes (both greater sandhill cranes and the more common subspecies, the lesser sandhill crane, share the wintering ground in central California). Since both greater sandhill cranes and lesser sandhill cranes intermix on the wintering ground in California, it is difficult to accurately estimate populations. The estimate for

greaters is between 3,400 and 6,000 individuals. There are about 25,000 lesser sandhill cranes wintering in California each year. Annual population monitoring is conducted on both the breeding and wintering ground in California, with a focus on the threatened greater subspecies. Studies conducted on wintering grounds in California and breeding grounds in Oregon, particularly at Malheur National Wildlife Refuge, indicate the population is not producing enough young to maintain stability. Cranes are very long-lived in the wild (20+ years), and it may be years before the low recruitment rates result in population declines. However, the problems of habitat destruction, disturbances, predation and mower-caused mortality persist on the breeding ground in California, Oregon and other areas (see Table III). The population trend of this species is stable/declining (see Table I).

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

California least tern (Sterna antillarum browni)

CA - Endangered FED - Endangered

This is a small, mostly white and pale gray tern, about 9 inches long with a 20-inch wingspread. The head of the adult has a black cap and white forehead, wings are gray with black wingtips and the yellow bill is black- tipped. The winter range of this migratory bird is unknown, being somewhere in Latin American coastal habitats. The nesting range is along the coast from southern Baja California to San Francisco Bay; terns arrive in California usually in April and depart usually in August. They breed in colonies on bare or sparsely vegetated, flat substrates near the coast, nesting in shallow depressions they make in the ground. The historical nesting habitats of this species have been largely eliminated by development and recreation use. Typical nesting

sites are now located on isolated or specially protected sand beaches or on natural or man-made open areas in remnant coastal wetlands near estuaries, bays or harbors where small fish are abundant. Formerly nesting in colonies of up to thousands of birds, the total number of breeders found in California in the mid-1970s was only about 600 pairs. During the past decade, population status has been stable. Through protection and site management, they increased from about 800 pairs in 1978 to 1,200-1,300 in 1983. They declined to around 1,000 pairs from 1984-87, possibly because of a reduced forage supply caused by El Niño ocean conditions. The population has increased again to about 1,200-1,300 pairs in 1988-1990, distributed in 28-29 colonies each year in the San Francisco Bay area and from San Luis Obispo County to the Mexican border.

Adverse impacts include development, introduced predators and unnaturally heavy predation by native species, human disturbance, off-road vehicles, and climate. El Niño ocean conditions may diminish coastal fish populations. Spring rains and extreme high tides occasionally flood nest sites. Many colonies are located on land fills, dikes, broad paved areas or other artificial substrates in remant, often degraded wildlife habitats, so they are prone to weed overgrowth, human disturbance and unnaturally heavy predation by native and non-native animals. Many colonies are continually threatened by development pressures on nesting and feeding areas and by human disturbance. A major continuing threat to the nesting colonies is heavy predation on adults, eggs or chicks by birds of prey, domestic cats, mammalian carnivores and many other species. American kestrels and exotic red foxes have been significant predators at many sites. Local coordination, intensive nest-site management and colony protection efforts, including predator control, are critically needed each year to protect colonies. Annual breeding population surveys and site management activities are major elements of the 1980 California Least Tern Recovery Plan. A Least Tern Working Team has been formed to guide research and management direction.

Western yellow-billed cuckoo (Coccyzus americanus occidentalis)

CA - Endangered FED - Category 3B

This slender bird is brown with white underparts. In flight its wings show rufous or cinnamon color, and its tail shows black with white spots. The nest typically is on the horizontal branch of a willow tree, in a location hidden from view from the ground or from surrounding trees. Food items brought to the nest include katydids, green caterpillars, tree frogs and grasshoppers. The cuckoo historically was known as a breeder in all regions of California except the central and northern Sierra Nevada, the Great Basin and the Colorado Desert. These regions included the north coast, central coast, south coast, Klamath-Modoc, Sacramento Valley, San Joaquin Valley, southern Sierra Nevada (south fork of the of the Kern River), Mojave Desert and lower Colorado River. In 1977 a survey conducted

for the DFG found cuckoos in the following six areas: Sacramento Valley, Kern River, Owens Valley, Amargosa River, Santa Ana River and Lower Colorado River. Using Endangered Species Tax Check-off funds, the DFG contracted for field studies in 1986 and 1987 to determine the statewide distribution and population size for the cuckoo. Breeding pairs were found only along the Sacramento River in Butte, Glenn and Colusa counties; along the Feather River in Sutter County; on the south fork of the Kern River; and along the Santa Ana, Amargosa and lower Colorado rivers. The cuckoo has nested in walnut and almond orchards in California, but its natural nesting habitat is in deciduous riparian forest and woodland of a cottonwood- tree willow composition.

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

The cuckoo was designated as a category 3B species in the January 6, 1989, Federal Register notice of review of vertebrate species. This means that the FWS considers the cuckoo to not have the taxonomic status necessary to meet the federal Endangered Species Act's legal definition of species. Although the western cuckoo is recognized by ornithologists as a subspecies separate from the eastern yellow-billed cuckoo, the FWS unfortunately is relying on a recent scientific paper which determined, based entirely on museum specimens, that there were no subspecies of the yellow-billed cuckoo. Based on this study, which ignored information on ecological and vocalization differences between the western and eastern forms, the FWS has concluded that the western cuckoo does not deserve protection of the Act. The DFG believes, based on our knowledge of its status in California, Arizona, and the Pacific Northwest, that the western subspecies deserves a federal classification of Endangered.

The first DFG five-year status report for the cuckoo was written in 1987. In the report, DFG recommended to the FGC that the Threatened classification be changed to Endangered. The FGC subsequently made the change. As follow- up studies to the Statewide survey in 1986 and 1987, the DFG has used Endangered Species Tax Check-off funds to determine the annual status of the cuckoo on the south fork Kern River and the Sacramento River in 1988 and 1989. In a cooperative project with TNC, DFG has been providing Endangered Species Tax Check-off funds for several years (including the 1989 project) to restore riparian woodland for the cuckoo at TNC's Kern River Preserve. Several State wildlife areas and other State-owned properties protect habitat of the cuckoo, and several recently-acquired properties

possess great potential for revegetation of riparian forests. One example of the latter is the Schohr Ranch in Butte County, which will be established as the Upper Butte Sink Wildlife Area.

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

Elf owl (Micranthene whitneyi)

CA - Endangered

The elf owl is the smallest owl in North America, measuring 5-5 1/2 inches long. Plumage is spotted with buff and white on a gray or brown base. The breast is white with rust or brown streaks. The top of the head has some rust color, the white "eyebrows" are obvious and it has a short tail and yellow eyes. This species is migratory and only spends the breeding season in California. It arrives in March and probably leaves by October. Records of elf owls in California are from March 18 to early August with almost 70 percent occurring during April and May, the height of the breeding season when males are very territorial.

The diet of the elf owl consists almost entirely of large insects, centipedes and scorpions. Small birds and amphibians are taken occasionally. Hunting from a low perch, they use their superb hearing to locate prey and capture most victims in their talons while on-the-wing. In California the elf owl is limited to the cottonwood (Populus fremontii) - willow (Salix sp.) and mesquite riparian zone along the lower Colorado River. Here, the owl nests in deserted woodpecker holes which, when occurring in larger trees with thick walls next to the cavity, offer insulation from the high daytime temperatures. The nest hole is selected by the male who also assists in the incubation of two to five eggs. Incubation takes 14 days, and young are ready to leave the nest by late June or early July.

Elf owls have probably never been common in the State, and siting reports of more than one individual or a pair are uncommon. Current population estimates are extremely low -- only about 25 pairs. A 1987 survey encompassing the majority of the potential habitat in the lower Colorado River Valley documented between 17 and 24 owls at ten sites. Population declines have resulted from the conversion of riparian woodland to agriculture and from river channelization and flooding. Reintroduction efforts on the river have shown little success because of the lack of available habitat to support this species.

Management needs include: protecting remaining riparian habitat; eradication of exotic trees and restoration of native riparian species; annual monitoring of nesting sites; and working with the Bureau of Reclamation and other land managers toward large-scale restoration of native habitat. Current coordinated planning efforts aimed at re-establishing cottonwood-willow forests along portions of the lower Colorado River will hopefully provide future habitat for this endangered bird.

Great gray owl (Strix nebulosa)

CA - Endangered

The great gray owl is the longest and has the largest wingspan (five feet) of any species of owl in North America, although it doesn't weigh quite as much as great horned or snowy owls. In addition to a long tail and wings, great gray owls have a large head with a large, circular facial disc. Plumage is thick, which provides insulation for winter living at high elevations and in northern latitudes. The gray and gray-brown feathers are streaked with light and darker grays. There is some barring on the feathers of the belly.

This owl exhibits no regular seasonal migration. However, food scarcity or availability causes post-breeding season upslope and downslope movement in the winter. Owl pairs probably return to the same nesting area each year if nesting is attempted. This is determined by the quantity of prey, usually microtine rodents and pocket gophers, that are available early in the year. Nests are usually placed in the broken tops of large conifer trees where the soft heart of the tree is hollowed out with harder wood forming a rim. Nests are often 35 feet or more from the ground. Up to five eggs may be laid, although two or three are usual. Incubation by the female lasts about 30 days, and nestlings remain in the nest about three weeks. The flightless young remain in the vicinity of the nest for another three to five weeks. Fledglings stay in the nesting territory for several more months until they can fend for themselves.

There is no historic information on the abundance of the great gray owl in California. One can suppose that it was more numerous in the past because of the broader distribution of historic sighting and specimen records. This would indicate a larger historic population

than currently exists. It is known that they were found in over 15 counties throughout the Sierra Nevada and north coast. Only ten different pairs of breeding great gray owls have been documented in California in recent years, all in the vicinity of Yosemite National Park and adjacent national forests. The current statewide population estimate is approximately 60 individuals.

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

The primary cause for the decline of the great gray owl is habitat loss. The mixed conifer and red fir forest zones that the species depends on have also been the most important timber production zones in the Sierra Nevada. Over 100 years of logging activity has substantially reduced the quantity of mature forests available to owls. In addition, montane meadow habitats have a long history of overgrazing which has resulted in lower prey densities in these critical feeding environments. Currently the National Park Service (NPS) is assessing the potential of human disturbance on great gray owls in Yosemite National Park. This assessment involves studying the species' annual movement patterns, its daily activity cycle, the impact of increased human activity on the owl's prey base and its reproductive success, and if human noises are detrimental to the owl's ability to hunt. Results of this study will hopefully be available in 1991. While the study is developing information on NPS lands, the information also could serve as a guide for management procedures on National Forest lands. As a result of the recent studies and recommendations, artificial nest sites have been constructed on the Groveland Ranger District, Stanislaus National Forest. A single artificial nest site, different each year, was used by great gray owls in this area in 1985 and 1987. This area burned heavily in 1987 and it is not known whether owls have nested here since, although they have been heard. This management strategy may be used as the first step in providing augmented habitat for nesting on lands which have a history of logging. In addition to the information being gathered in the NPS study and the eventual implementation of management guidelines derived from that study, the next most important action is to continue to survey potential habitat and to follow up on unconfirmed sightings.

These efforts will guide future management and, in the interim, can provide some protection to currently occupied breeding habitat.

Gila woodpecker (Melanerpes uropygialis)

CA - Endangered

This large woodpecker has a grayish-brown head, neck and underparts, and has a back which is narrowly barred with black and white. In flight the bird has a conspicuous white patch in the wing at the base of the primaries, and conspicuous black and white barring on the central tail feathers. The male has a red crown patch which is visible only at a short distance. Food items include insects, mistletoe berries, cactus pulp, bird eggs, corn in fields and peaches and pears from fruit trees. This woodpecker is a primary cavity nester. It is a permanent resident of mature cottonwood (Populus fremontii) - willow (Salix gooddingii) riparian forest and mesquite (Prosopis glandulosa) riparian woodland. The bird was formerly found along the entire California portion of the lower Colorado River and adjacent Arizona in the extensive riparian forests and also was in the cottonwood groves of the Imperial Valley south of the Salton Sea. Now the Gila woodpecker is found only at scattered locations along the California side of the river between Needles and Yuma.

The species is threatened by habitat loss and degradation and by competition with the exotic European starling (Sturnus vulgaris) for nest cavities. The current population trend is considered to be unknown (see Table I), but the population has declined over time due to continuing loss of cottonwood- willow and mesquite habitats and the extirpation of saguaros from the lower Colorado River valley, coupled with continued competition with starlings for nesting cavities. Along the Colorado River the latest population estimates were about 200 individuals in 1984 with relatively few successfully breeding pairs (only 27 individuals were observed). Adverse- impact categories (see Table III) include water projects, development, introduced predators and competitors, agriculture, livestock grazing, exotic plants, flood control, and off-road vehicles.

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

The management needs for the woodpecker are as follows: protection of existing riparian woodland along the lower Colorado River through acquisition, cooperative agreement or conservation easement and through control of river flows; protection of former forested areas as sites for reforestation; extensive reforestation on public and other

lands; removal of exotic salt cedars (Tamarix sp.) from riparian areas; annual surveys to determine distribution, numbers, quality and extent of habitat at each site and threats to the site; and preparation of a State management plan which would include the elements of protection of existing and potential riparian areas, reforestation, removal of exotic vegetation and field surveys.

Gilded northern flicker (Colaptes auratus chrysoides)

CA - Endangered

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

The flicker is threatened by habitat destruction and degradation. The current population trend is considered to be unknown (see Table I), but the population has declined due to continuing loss of riparian forest habitat and the extirpation of saguaros from the lower Colorado River valley. Along the Colorado River the latest population estimates were less than 40 individuals in 1984, but in 1986 no birds were observed. In the Joshua tree woodland of Cima Dome, the last (1978) population estimate was only one to two pairs. Adverse-impact categories include water projects, development, agriculture, livestock grazing, exotic plants, flood control and off-road vehicles.

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

The management needs for this flicker are as follows: protection of existing riparian woodland along the lower Colorado River through acquisition, cooperative agreement or conservation easement and through control of river flows; protection of former forested areas as sites for reforestation; extensive reforestation on public and other lands; removal of exotic salt cedars (Tamarix sp.) from riparian areas; annual surveys to determine distribution, numbers, quality and

extent of habitat at each site and threats to the site; and preparation of a State management plan which would include the elements of protection of existing and potential riparian areas, reforestation, removal of exotic vegetation and field surveys.

Willow Flycatcher (*Empidonax traillii*)

CA - Endangered FED - Candidate

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

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

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

A survey of remaining willow riparian and montane meadow habitat should be conducted to determine the extent within the historic range of the willow flycatcher. Periodic breeding population surveys should continue to be conducted in all remaining willow riparian and montane meadow habitats throughout the range of the willow flycatcher to determine the number of nesting territories and locations of isolated population fragments. A population viability analysis of the willow flycatcher should be conducted. The Department, in cooperation with

other agencies and scientists, should evaluate the feasibility of intensive management including the transfer of eggs and/or young between isolated populations to expand the breeding range and size of populations and to facilitate gene flow. Cowbird nest parasitism must be controlled when possible.

Bank swallow (Riparia riparia)

CA - Threatened

The bank swallow is the smallest North American swallow, with a body length of about 4-3/4 inches. Bank swallows are distinguished from other swallows by their distinct brown breast band contrasting with white underparts. The upper parts are brown. The species creates nests by burrowing into vertical banks consisting of fine-textured soils. Bank swallows that breed in California during April to August spend the winter months in South America. Bank swallows are now locally common only in restricted portions of California where sandy, vertical bluffs or riverbanks are available for the birds to dig their burrows and nest in colonies. Most of California's remaining population of bank swallows nests along the upper Sacramento River where the stream still meanders in a mostly natural state. In this alluvial plain, the river system provides suitable soil types and erosion needed for prime nesting habitat. It is estimated that the range of bank swallows in California has been reduced by 50 percent since 1900.

During a survey conducted in 1987, a total of 111 colonies were located statewide. Seventy-five percent of the State's population is concentrated on the banks of Central Valley streams, including about 50 to 60 colonies on the Sacramento River. Bank swallows have been extirpated from southern California where they used to occur, principally on the coast. Remaining scattered populations exist in portions of northern, north coastal, central coastal and Inyo-Mono regions of the State. Bank swallows were eliminated from southern California because virtually every river and natural waterway was converted to flood control channels. Former coastal colonies have been abandoned due to increased human disturbance.

Sacramento River populations still persist in colonies that may support several hundred pairs of swallows. However, the activities of the U.S. Army Corps of Engineers and the State Reclamation Board are in conflict with bank swallow habitat in the last breeding stronghold in California. There have been documented losses of colony sites on the Sacramento River since 1975 due to riprap installation to provide bank stabilization and flood control. The riprapping of natural stream bank associated with bank protection projects is the single most serious threat to the long-term survival of the bank swallow in California (see Table III). It is projected that as much as 50 percent of the remaining population of bank swallows could be lost if all bank protection projects currently proposed are completed.

Existing active colony sites and areas of potential habitat are expected to be lost over the next few years. Riprap installed under the Sacramento River Bank Protection Project has affected almost 133 miles of Sacramento River bank since 1960. Additional riprap proposed under this project will result in loss of eroding bank habitat that ranges from 50-75 percent for a given reach of the river. There have been several recent documented losses of active bank swallow colonies due to riprapping. In 1980 a 2,000 burrow colony was riprapped just below the Red Bluff diversion dam. In 1985 three large colonies near Chico and Butte City were destroyed during the height of the breeding season resulting in total loss of the reproductive effort. Several thousand eggs and young were involved. In 1986-87 an additional five colonies, including some of the largest in the State, were lost to riprap. Most recently, in 1988, an extremely large and vital colony was replaced by more than a mile of riprap near Golden State Island on the upper Sacramento River. In addition to these losses on the Sacramento River, colonies in northern California and the Inyo-Mono region are threatened by actions of governmental agencies, corporations and private landowners. Eroding river bank, the critical breeding habitat for bank swallows, is currently unprotected throughout the species' range.

Some efforts have been undertaken to develop mitigation techniques for bank swallow habitat loss. These include improvement of natural habitat and construction of artificial banks near riprap installations. Although some success has occurred at these sites, no long-term solution may be possible with these techniques due to a variety of inherent problems including lack of private landowner cooperation and long-term maintenance costs. Only a system of habitat preserves that would be secure from riprap installations in the future will guarantee the long-term survival of the bank swallow on the Sacramento River.

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

Endangered Species Tax Check-off funds have been used to support bank swallow research on the Sacramento River and in the remainder of California in 1986- 87. These funds also support one position involved in bank swallow research and recovery planning. Cooperation between DFG, USFWS and State Board of Reclamation has resulted in surveys, experimental mitigation techniques and long-term planning efforts to preserve some bank swallow habitat in the face of an active riprapping program proposed for many miles of Sacramento River banks. An important nesting colony on the Fall River in Shasta County was recently acquired and protected by the Wildlife Conservation Board. A draft recovery strategy plan has been prepared and is currently undergoing review. A recovery planning team has also been constituted and has periodic meetings to discuss bank swallow research and management issues.

Arizona Bell's vireo (Vireo bellii arizonae)

CA - Endangered FED - Category 3C

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

The vireo is threatened by habitat destruction and degradation and by nest parasitism by the brown-headed cowbird. The current population trend is considered to be unknown (see Table I), but the population has declined due to continuing loss of willow and mesquite riparian habitat along the lower Colorado River, coupled with continued nest parasitism by brown-headed cowbirds. Along the lower Colorado River the latest population estimates were about 35 singing males in 1981, but in 1986 only four singing males were observed. Adverse-impact categories (see Table III) include water projects, development, introduced predators and competitors, agriculture, livestock grazing, exotic plants, flood control and off-road vehicles.

The vireo is designated as a category 3C species in the January 6, 1989, Federal Register notice of review of vertebrate species. This means that the FWS considers the vireo to be more abundant and/or widespread than previously thought. The FWS evaluated information from portions of the vireo's range in Nevada, Utah, and Arizona outside of the lower Colorado River Valley to make the 3C designation. Although declining habitat conditions in this valley led to local endangerment, the FWS believes that, on balance, conditions throughout the entire range do not warrant action under the federal Endangered Species Act.

No current surveys or habitat management efforts are planned due to lack of funds. The vireo may eventually benefit from riparian forest revegetation efforts along the lower Colorado River, particularly those involving establishment of willow and mesquite thickets along the river banks. It will take several years for any revegetation efforts to mature sufficiently to provide improved habitat.

The management needs for the vireo are as follows: protection of existing riparian woodland along the lower Colorado River through acquisition, cooperative agreement or conservation easement and through control of river flows; protection of former forested areas as sites for reforestation; extensive reforestation on public and other lands; removal of exotic salt cedars (Tamarix sp.) from riparian areas; annual surveys to determine distribution, numbers, quality and

extent of habitat at each site and threats to the site; control of brown-headed cowbirds by removal from vireo habitat; and preparation of a State management plan which would include the elements of protection of existing and potential riparian areas, reforestation, removal of exotic vegetation, cowbird control and field surveys.

Least Bell's vireo (Vireo bellii pusillus)

CA - Endangered FED - Endangered

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

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

Management activities include establishment by the FWS of a working group comprised of State, federal, local and private biologists to develop standard census methods, encourage research and make timely recommendations on ways to avoid impacts to vireo habitat in development projects; establishment by the San Diego Association of Governments (SANDAG) of a multi-agency task force to develop a

comprehensive species management plan (CSMP) for the vireo; development of a draft recovery plan; and annual cowbird control. As part of the CSMP process, four separate HCPs were being prepared for riparian areas on the Santa Ana, San Luis Rey, San Diego and Sweetwater rivers. The DFG participated in the process by serving on four advisory committees and on the task force itself. Unfortunately, a group of landowners along the San Luis Rey River, who were concerned that conservation planning for the vireo would interfere with the ability to develop their properties, has scuttled the San Luis Rey effort by convincing SANDAG to stop the preparation of this particular HCP. Local government did not move to prevent this action. The first five-year status report for the vireo was written in 1990. In the report the DFG recommended that the Endangered classification be retained.

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

Inyo brown towhee (Pipilo fuscus eremophilus)

CA - Endangered FED - Threatened

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

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

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

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

Belding's savannah sparrow (Passerculus sandwichensis beldingi)

CA - Endangered FED - Candidate 2

This 5-1/2-inch long sparrow is similar to other subspecies of savannah sparrows but is darker and is heavily streaked on the back, breast and sides. It resides year-round in coastal salt marshes from Goleta Slough, Santa Barbara County, south to northern Baja California. Nesting occurs primarily in pickleweed (Salicornia virginica) habitat at the higher levels of the salt marshes, above the reach of the highest spring tide. In 1986, breeding pairs were located in 27 marshes in California. Although small populations in some marshes vanished in recent years, overall population trend was stable/increasing during the early 1980s. The 1977 population in California was estimated at 1,610 pairs, compared with an estimate of 2,274 pairs in 1986. Part of the increase was owing to improved ecological conditions in some marshes. The next annual statewide survey is scheduled for 1991.
Adverse impacts have included filling, dredging and development of wetlands, and loss of regular tidal connection with the ocean; disruption of natural drainage through coastal wetlands because of upstream development or flood control; and human disturbance, including trampling of marsh vegetation. Also, there are concerns about the impact of exotic predators, especially domestic cats and red foxes. The management needs of this sparrow include the protection or enhancement of tidal marshes in public ownership, including military bases, federal refuges and State-owned wetlands; protection of other salt marshes through acquisition for public ownership or through cooperative management programs; restoration of marshes degraded by human activities; maintenance or restoration of regular tidal action to promote renovation of upper marsh vegetation; and statewide breeding population surveys approximately every five years to determine trends in distribution, population size and habitat condition. Government resource agencies have been conducting special

population surveys at some sites, such as Santa Margarita River mouth, Mugu Lagoon and the Upper Newport Bay and Bolsa Chica ecological reserves. In a current study by U.C. Santa Barbara, genetic relatedness of isolated populations of this subspecies is being investigated.

REPTILES

Desert Tortoise (Gopherus agassizii)

CA - Threatened FED - Threatened

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

Populations of the desert tortoise are declining. Its habitat in California has been reduced 50 to 60 percent since the 1920's and is now highly fragmented and has been degraded by a combination of human-related activities including livestock grazing, energy and mineral development, OHV use, vandalism (illegal shooting), road and trail construction, and collecting. More recently, the desert tortoise has suffered severe population losses due to disease and predation by ravens. The disease, called Upper Respiratory Disease Syndrome (URDS) has infected 50 percent of the tortoises in the vicinity of the Desert Tortoise Natural Area in the western Mojave Desert. In one study plot, 20 percent of the marked tortoises with disease signs died during the past year. The DFG, USFWS, and BLM are coordinating efforts to find a cure and treatment for the URDS. Veterinarians from the DFG, U.C. Davis, the University of Florida, and private practice are involved in the effort. Predation by ravens has caused serious reductions in the recruitment of young tortoises into the adult population. In the Mojave Desert, raven populations have increased 15 fold between 1968 and 1988, at a rate of nearly 15 percent per year.

DFG, working with the Desert Tortoise Preserve Committee and TNC, has recently acquired several blocks of tortoise habitat within the Desert Tortoise Natural Area (DTNA) and have established the West Mojave Ecological Reserve and Fremont Valley Ecological Reserve outside the DTNA. A portion of these lands was acquired with Endangered Species Tax Check-off funds. Tax check-off funds have also been used to investigate the disease and raven problems. Also, the DPR has

provided OHV Green Sticker funds to the DFG to help with the raven problem and a public education program.

Barefoot banded gecko (Coleonyx switaki)

CA - Threatened FED - Candidate

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

The rarity of this species makes it vulnerable to illegal collection by reptile hobbyists and commercial collectors. Anza-Borrego Desert State Park affords protection for some gecko habitat, and the DFG is involved with a Habitat Management Plan for BLM land on which the gecko occurs. The status of this gecko is unknown, as no monitoring technique has been developed yet which would not cause significant habitat destruction. DFG biologists hope to fund a study to develop a suitable monitoring technique during the 1991-1992 fiscal year.

Coachella Valley fringe-toed lizard (Uma inornata)

CA - Endangered FED - Endangered

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

Approximately 75 percent of this species habitat was lost to human activities such as agriculture and construction of golf courses, subdivisions, condominiums and shopping centers. A recovery plan was approved in 1983. Three reserves have been established in the Coachella Valley to set aside 313 ha of remaining lizard habitat (5% of the lizard's historical habitat) and blowsand sources. Studies, sponsored in part by Endangered Species Tax Check-off funds, obtained biological information critical to the management and preservation of the lizard. The impact of continuing drought conditions on survivorship, reproduction, and recruitment, however, is unknown. Recent research found wind-induced changes in the sandy habitat at two of the reserves that may be detrimental to the long-term survival of

this species. The population trend of this lizard is thus stable to declining. The researcher plans to continue monitoring habitat condition and population biology on his own time.

Blunt-nosed leopard lizard (Gambelia silus)

CA - Endangered FED - Endangered

The blunt-nosed leopard lizard is a large lizard with a long, round tail. Color above is grey or brown, with whitish crossbars on the back and tail. Dark blotches on the back and tail and a short, blunt snout give this species its common name. Breeding females have orange or reddish spots on sides. Lengths from snout to vent in adults is 3-5 inches. The species was originally found throughout the San Joaquin Valley and adjacent foothills from about San Joaquin County southward and into eastern San Luis Obispo County. It inhabits sparsely vegetated plains, alkali flats, low foothills, grasslands, canyon floors, large washes and arroyos.

Although there has been some progress towards recovery, primarily in the form of habitat protection, the trend of blunt-nosed leopard lizard populations is unknown. Urbanization and agricultural development have eliminated nearly all leopard lizard habitat in the San Joaquin Valley. Of the wildlife habitat remaining in the San Joaquin Valley in 1976, 228,000 acres were identified as leopard lizard habitat. By April 1980, this habitat had been reduced to 158,000 acres. The blunt-nosed leopard lizard now occurs in scattered locations in the valley and in the eastern portions of the coast ranges, including the Antelope and Carrizo Plains and Cuyama Valley.

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

Southern rubber boa (Charina bottae umbratica)

CA - Threatened FED - Candidate

The southern rubber boa is stout-bodied with a short, blunt tail that resembles the head. The skin is smooth and shiny. The scales on top of the head are large and sometimes asymmetrical. Color is olive or pale yellowish-brown dorsally and light yellow below. There is no color pattern, but there may be a few dusky flecks on the lower sides. Adults grow to about 2 feet. This snake is known only from several localities in the San Bernardino Mountains, San Bernardino County; near Idyllwild, Riverside County; and Mt. Pinos, Kern County. It occurs in the pine forests near streams and meadows.

This secretive snake is considered stable/declining because of habitat loss. The principle causes of habitat damage include resort development, OHV activities, logging and wood gathering. The USFS has investigated the distribution of the southern rubber boa in the Angeles, Los Padres and San Bernardino national forests. A Southern Rubber Boa Advisory Committee has been formed to coordinate studies and management of this snake. Recommendations have been made to lessen impacts on the snake from logging.

Alameda whipsnake (Masticophis lateralis euryxanthus)

CA - Threatened FED - Candidate

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

Populations are thought to be stable/declining as habitat is urbanized. A working group of agency and university specialists has recently been established and will be preparing a management plan. Protection efforts are underway on public lands, including Diablo State Park, various units of the East Bay Regional Park District and land owned by the East Bay Municipal Utilities District. A life history study funded by Endangered Species Tax Check-off money is underway at California State University, Hayward. The information gathered during this study should help in development of the management plan. The Alameda whipsnake working group has begun efforts to identify the remaining known and potential whipsnake habitat and refine the whipsnakes distributional limits.

San Francisco garter snake (Thamnophis sirtalis tetrataenia)

CA - Endangered FED - Endangered

The San Francisco garter snake has a mid-dorsal stripe of greenish-yellow edged with a black and a red stripe on each side which may be broken or divided. The belly is greenish-blue, and the top of the head is red. Adults grow to a length of 2-3 feet. This snake, until recently, was known only to be from San Mateo County. It has now been found in extreme northern Santa Cruz County, but the extent of its occurrence there is unknown. Small populations occur near freshwater marshes, ponds and slow-moving streams along the coast from Sharp Park to Ano Nuevo and east into the Santa Cruz Mountains where suitable habitat occurs. Recent studies have determined that upland areas near the pond/marsh habitats are important to the snake during the fall and winter. The largest population known occurs near the San Francisco International Airport.

The San Francisco garter snake is considered stable/declining. Urbanization has destroyed the majority of the prime habitat for this animal. Studies have been conducted on the distribution and ecology of the snake, and this information will be used to develop management plans for specific areas such as Pescadero Marsh and Ano Nuevo State Reserves. The DFG is working with USFWS and the San Francisco International Airport to provide protection for the snake on the airport's West of Bayshore property, although a study funded by PG&E indicated that this population has recently declined. USFWS has published a recovery plan for the snake.

Giant garter snake (Thamnophis couchi gigas)

CA - Threatened FED - Candidate

This is one of the largest garter snakes, reaching 3-4 feet total length. The basic color is dull brown with a checkered pattern of well-separated black spots on the dorsal side. There is a dull yellow mid-dorsal stripe, but lateral stripes are often not developed. The head is elongated with a pointed muzzle. The original reported range of this snake was the San Joaquin Valley from the vicinity of Sacramento and Antioch southward to Buena Vista Lake, Kern County. It appears that this snake has been extirpated from Buena Vista Lake and the Tulare Lake Basin. The present known distribution extends from near Chico, Butte County, to the vicinity of Burrel, Fresno County. It is one of the most aquatic garter snakes and is usually found in areas of freshwater marsh and low-gradient streams, although it has adapted to human-made habitats such as drainage canals and irrigation ditches, especially those associated with rice farming.

The giant garter snake is considered stable/declining. As a result of human activities, the giant garter snake and its supporting habitat are depleted throughout its range. In addition, much of the remaining

habitat is degraded or threatened in those areas that still support this species. Urbanization, including housing, business, industrial and recreational developments, often leads to the destruction of wetlands and channelization of streams. Other impacts of urbanization include pollution, destruction of food sources, predation by native and introduced species and removal by collectors.

DFG has utilized Endangered Species Tax Check-off funds to investigate the current status of this snake and its habitat requirements. This information is being used to develop a management plan for the snake in the American Basin (Sacramento and Sutter counties), including mitigation for anticipated habitat loss associated with proposed development in North Natomas. DFG is also addressing the needs of this snake in revised management plans for several DFG wildlife areas. During the past year, DFG has been working with the City of Sacramento to develop an acceptable mitigation plan for the giant garter snake to compensate for habitat losses from the North Natomas Drainage and Development Plan. This project will adversely affect 26 miles of ditches and canals utilized by the giant garter snake. DFG has also worked closely with CalTrans in reducing adverse impacts to the giant garter snake from the widening of State Route 99/70 in Sacramento and Sutter counties. About 25 miles of habitat are affected by this project. CalTrans is providing funds to DFG to determine the success of relocating canal and ditch habitat utilized by the giant garter snake within the project area. Both of these projects are within the American Basin which presently represents the largest remaining habitat area for this snake.

AMPHIBIANS

Santa Cruz long-toed salamander (Ambystoma macrodactylum croceum)

CA - Endangered FED - Endangered

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

The trend of the Santa Cruz long-toed salamander is unknown. Two localities are partially protected by a DFG Ecological Reserve and a USFWS Wildlife Refuge. Habitat at another locality, although protected by a conservation easement granted to TNC in 1982, was seriously degraded by previous saltwater intrusion. The remaining localities are all on privately-owned lands, some of which have recently been threatened by illegal wetland conversion, proposed housing developments and the appearance of a parasitic flatworm whose long-term effect on salamander survival is not yet known. An advisory committee was re-established in 1988 to address these problems. The status of salamander populations at all but one locality is unknown; population assessments at two localities are planned for the winter of 1991.

Siskiyou mountain salamander (Plethodon stormi)

CA - Threatened FED - Candidate

This is a slim-bodied salamander with short legs. It has five toes on the hind feet and four on the front feet. Color is dull brown to chocolate brown on the dorsal surface and sides, often profusely speckled with white or yellowish flecks. The ventral surface is purplish gray. Adults grow to 4-6 inches. This salamander occurs in scattered locations near the Hutton Guard Station, the Cook and Green Guard stations, along Joe and Dutch creeks in the upper Applegate River drainage and along Seiad and Horse creeks in the Klamath River drainage, Siskiyou County. It is associated with loose rock rubble and talus on north-facing slopes or with heavily wooded areas.

The Siskiyou Mountain salamander is considered stable. The most serious threat to this salamander appears to be the gradual destruction of overstory vegetation within its range by clear-cutting in areas of rock outcrops and talus slopes. This practice alters the habitat by eliminating the moist microhabitat necessary for species survival. Currently, management is limited to review of projects that may affect the animal or its habitat and to an "Interim Management Direction" developed for activities within the Klamath National

Forest. This direction provides some protection of most populations by the use of normal streamcourse protection measures designed to maintain water quality and fisheries habitat.

Desert slender salamander (Batrachoseps aridus)

CA - Endangered FED - Endangered

This is a moderately small slender salamander with a short tail. Color is blackish above, overlaid with an indistinct lighter band. Ventrally, the trunk is a darker blackish-maroon, and the underside of the tail is flesh-colored. Adults grow to about 4 inches. This salamander is known only from Hidden Palm Canyon, a tributary of Deep Canyon, about 10 miles south of Palm Desert, Riverside County. It is found in crevices between limestone sheets and under limestone slabs and other rocks along the base of cliffs where continuous water seepage occurs. During the late winter and early spring these salamanders may occasionally be found beneath rocks and other objects on the floor of the canyon.

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

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

Kern Canyon slender salamander (Batrachoseps simatus)

CA - Threatened FED - Candidate

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

material, as well as large rock slides and talus on rather steep north-facing slopes.

The trend of this salamander in unknown. Highway construction, small hydro development and firewood collecting are potential threats to this salamander.

Tehachapi slender salamander (Batrachoseps stebbinsi)

CA - Threatened FED - Candidate

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

The trend of this salamander is unknown. No intensive surveys have been done recently. Flood control in Caliente Creek Canyon could adversely impact habitat of this salamander.

Limestone salamander (Hydromantes brunus)

CA - Threatened FED - Candidate

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

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

Shasta salamander (Hydromantes shastae)

CA - Threatened FED - Candidate

This salamander has webbed toes and a flattened body. The dorsal side is gray-green, beige, tan or reddish, and usually with yellow on the tail. The ventral surface is dark with white flecks or blotches. The young are gray-green, olive, tan or reddish on the body and yellowish on the tail. Adults grow to 3-4 inches. The Shasta salamander inhabits limestone formations in several areas near Shasta Lake, Shasta County. They are found in moist limestone fissures and caves and under rocks on the surface during wet weather in mixed pine-hardwood stands.

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

Black toad (Bufo exsul)

CA - Threatened FED - Candidate

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

The trend of the black toad is unknown. Population sizes vary but appear to be adequate for maintenance of this species. DFG has purchased 719 acres to protect habitat of the black toad at Deep Springs. Deep Springs College, which owns property at Buckhorn and Antelope Springs, has been apprised of the legal status of this toad. The college has fenced an area to exclude livestock and is manipulating irrigation water to minimize impacts on breeding toads and developing eggs and larvae.

FISHES

Winter-run chinook salmon (Oncorhynchus tshawytscha)

CA - Endangered FED - Candidate

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

The winter-run chinook salmon population in California has declined greatly in recent years. Compared with the 60,000 to 120,000 spawners typical of the 1960's, the annual run size dropped to a 5-year average in the mid-1980's or 2,000 fish. By 1989, the spawning escapement had dropped to 547 fish. In 1990, this number further declined to 441 fish.

A State-Federal task force has been assembled to develop and implement a recovery plan for the winter-run salmon. Ongoing management actions which will likely form the basis of the recovery plan include (1) control and treatment of water pollution from Iron Mountain Mine, (2) structural and operational changes at Shasta Dam to provide suitable water temperatures for spawning and egg incubation below the dam, (3) correct fish passage and juvenile stranding problems at Anderson Cottonwood Dam, (4) correct fish passage problems at RBDD, (5) identify and take corrective action on the numerous unscreened agricultural diversions along the Sacramento River, and (6) fishery harvest restrictions to protect adult spawners. Other measures and studies are underway which will contribute to the recovery of this unique salmon.

Bull Trout (Salvelinus confluentus)

CA - Endangered FED - Candidate

The bull trout is a large (8-40 inches) non-anadromous species of char. It has a long, broad head which is flat above and sharply tapered through the snout with the eye positioned near the dorsal margin. The coloration is olive green with small yellow or light spots on the back and inconspicuous small red spots on the sides. Bull trout are bottom-dwelling fish that prefer deep pools of cold rivers and their larger tributaries. Spawning requires a large volume of cold water. Bull trout formerly occurred in the McCloud River drainage below Lower Falls. It was extirpated from this area. Management plans have been completed. This species was reintroduced above McCloud Reservoir in 1990 and these efforts are continuing.

Mohave tui chub (Gila bicolor mohavensis)

CA - Endangered FED - Endangered

The Mohave tui chub is a dark olive color above, with bluish or creamy-white on the belly. Bluish or gold reflections on its sides give this minnow a metallic appearance. Formerly found throughout the Mojave River drainage the Mohave tui chub is no longer found here due to hybridization with the illegally introduced arroyo chub, habitat alteration, water diversions and pollution. Occurrence of this fish in now restricted to four highly-modified habitats in San Bernardino County. Two of the populations are on BLM land, a third is at DFG's Camp Cady Wildlife Area and the fourth is at China Lake Naval Weapons Center. Maintenance of these artificial habitats, especially vegetation control, is an ongoing problem. DFG found some potential introduction sites for the chub during 1988 but has curtailed further efforts on BLM land, as the BLM has been unwilling to contact holders of grazing leases or mining claims to negotiate fish introductions with them. In 1990, the DFG prepared an invitation to bid on repair of a leaky pond at Camp Cady which, during 1989, was the cause of significant chub mortality. A proposal was also submitted to the USFWS requesting funds in FY 1991-92 to create a more natural, low-maintenance habitat at Camp Cady for the chubs. This subspecies is considered to be stable to declining.

Owens tui chub (Gila bicolor snyderi)

CA - Endangered FED - Endangered

The Owens tui chub is very similar in appearance to the closely-related Mohave tui chub; olivaceous on the dorsal surface and bluish or creamy-white below. Scales, gill rakers and fins must be examined carefully to tell these two subspecies apart. The Owens tui chub was formerly found throughout the Owens River basin in Mono and Inyo counties. Habitat was greatly reduced by development, storage

and export of Owens basin water for agricultural, domestic and industrial use. Illegal introductions of non-native species (especially largemouth bass) into chub refugia have hindered recovery efforts for this fish. Small populations are currently found in remnants of natural habitat at three locations: the Owens River Gorge, springs at the DFG's Hot Creek Hatchery and a pond near Owens Dry Lake owned by Anheuser Busch. Chubs introduced into a waterfowl pond in the Inyo National Forest in 1988 are thriving, and DFG will be using funds received from the USFWS to work cooperatively with Forest personnel to create additional chub habitat there. An Endangered Species Tax Check-off funded study to determine the genetic and taxonomic relationships among Owens tui chubs and other tui chubs which may hybridize with them will be completed in the spring of 1991. This subspecies is considered to be stable to increasing.

Bonytail (Gila elegans)

CA - Endangered FED - Endangered

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

Colorado squawfish (Ptychocheilus lucius)

CA - EndangeredFED - Endangered

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

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

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

Lost River sucker (Deltistes luxatus)

CA - Endangered FED - Endangered

This is a large sucker that may grow to 97 cm. It is characterized by a long, slender head with a subterminal mouth and long, rounded snout. The coloring is dark on the back and sides, fading to white or yellow on the belly. This species may occur in Clear Lake Reservoir and its tributary, the Lost River in Modoc County and in Iron Gate Reservoir and Copco Lake on the Klamath River, Siskiyou County. Lakes and deep pools within streams are preferred habitat. Like other suckers, this species migrates up rivers in the spring to spawn. Populations are thought to be declining because of lack of spawning habitat, predation and hybridization with other species. The fish was listed as Federally endangered in 1988. The Klamath Basin Sucker Working Group meets regularly and is currently developing a recovery plan. Distribution and status studies are being conducted by the Research Unit of the USFWS with Endangered Species Tax Check-off money. Preliminary results show that a good population occurs in the Lost River area. Genetic analysis of these fish is underway at U.C. Davis and should be completed during the spring of 1991.

Modoc sucker (Catostomus microps)

CA - Endangered FED - Endangered

This is a small (rarely exceeding 200 mm), fine-scaled sucker. Body coloration varies from dark above and white below with no markings, to black above with highly-mottled sides and white below. The species is only found in a small portion of the upper Pit River drainage in Modoc and Lassen counties. Populations are thought to be stable to declining. Major threats include continued drought conditions, introduction of exotic predators, grazing and hybridization. Genetics studies using Tax Check-off money continue at U.C. Davis to determine the extent of any hybridization. The USFS constructed a barrier to impede movement of Sacramento suckers and exotic fishes into Modoc sucker habitat and continues to improve Modoc sucker habitat within the Modoc National Forest. During the summer of 1990, USFS and DFG personnel rescued Modoc suckers from drying pools and transferred them to stable pools within the same creek. Electrofishing to remove exotic species occurs on a regular basis. Attempts to purchase critical properties through the WCB have to date been unsuccessful, but attempts to purchase key parcels continue.

Shortnose sucker (Chasmistes brevirostris)

CA - Endangered FED - Endangered

This is a heavy-bodied, nearly cylindrical lake sucker that grows to 51 cm. It has a large head with a blunt snout. The mouth is terminal, and the lips are thin with few papillae. Coloration is dark above and white to cream-colored below. During most of the year this species inhabits the open water of large, shallow lakes and river channels. Spawning occurs in tributary streams during April and May. Remnant populations of this species may occur in Copco Lake in Siskiyou County and Clear Lake Reservoir and the Lost River in Modoc County. Distribution and status studies are being conducted by the Research Unit of the USFWS. The decline of this fish is thought to be due to habitat alteration associated with agricultural diversions and resultant hybridization with other sucker species. There is not currently enough information to describe a trend in this species' population status. Preliminary results indicate that the population in Clear Lake Reservoir and the Lost River System may be a new species or subspecies. Genetic analysis underway at U. C. Davis, to be completed in the spring of 1991, should resolve this issue. The species was listed as Federally endangered in 1988 and a recovery plan is currently being developed by the Klamath Basin Sucker Work Group. A pilot program for rearing shortnose suckers is underway at Iron Gate Hatchery.

Razorback sucker (Xyrauchen texanus)

CA - Endangered FED - Candidate 2

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

Desert pupfish (Cyprinodon macularius)

CA - Endangered FED - Endangered

The desert pupfish is a small (less than 8 cm), chunky pupfish with tan to olive coloration and a series of lateral vertical bars. Males become bright blue with lemon yellow tails during the breeding season. In California, this species occurred historically in several springs, seeps and slow-moving streams in the Salton Sink basin, as well as in backwaters and sloughs along the lower Colorado River. Dams, channelization and water diversions, combined with the introduction of exotic fish species, reduced the natural occurrence of this pupfish to two localities in Imperial County. Pupfish in one of these areas, San Felipe Creek, are periodically threatened by invasions of non-native tilapia (an African fish used for aquaculture). Construction of a barrier to block continued migration of tilapia into pupfish habitat has been postponed until 1991 due to engineering problems. With the introduction of pupfish into a pond at Dos Palmas (Riverside County) in 1990, 10 refugia have been established for this species. This species is considered to be stable to increasing. A recovery plan is currently being prepared by the USFWS.

Cottonball Marsh pupfish (Cyprinodon milleri)

CA - Threatened

The cottonball March pupfish is a small (less than 3 cm), slender pupfish. Individuals of both sexes have seven or eight vertical bars on the sides, and breeding males become deep blue on the sides and iridescent purple on the back. This species occurs only in Cottonball

Marsh in Death Valley National Monument and presently occupies its entire known range. The population is thought to be stable due to the isolated, protected nature of the habitat. The NPS conducts periodic flights over the marsh to monitor existing conditions and occasionally inspects the marsh on foot to determine the status of the pupfish population.

Owens pupfish (Cyprinodon radiosus)

CA - Endangered FED - Endangered

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

Unarmored threespine stickleback (Gasterosteus aculeatus williamsoni)

CA - EndangeredFED - Endangered

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

The fish appear to be relatively abundant where found, but are continuously threatened by further urbanization and exotic predators. The UTS is currently being managed by a Recovery Team which meets regularly. The Recovery Plan for the species was revised in 1985. The agencies cooperating in the recovery effort have undertaken several actions to conserve the UTS. These activities include: (1) surveys to discover additional populations; (2) transplants to establish UTS in other waters; (3) surveys to discover exotic organisms; (4) eradication programs to remove or control exotic species; (5) contingency plans to establish response procedures in case of oil or toxic chemical spills; (6) rescue efforts to maintain the gene pool of populations threatened by stream desiccation; (7) genetic studies to ascertain taxonomic relationships;

(8) installation of water conveyance facilities to provide emergency supplemental flows; and (9) breeding and mate selection studies.

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

Ongoing management activities include a thorough search for possible reintroduction sites for sticklebacks from Soledad CAnyon and Shay Creek.

Rough sculpin (Cottus asperrimus)

CA - Threatened FED - Candidate

The rough sculpin is the smallest member of the family Cottidae in California. It is identified by its relatively narrow body shape and extremely rough skin. Rough sculpins are threatened by nature of their restricted range. They occur only in Shasta County in the Pit River immediately above and below the falls at Burney, as well as in Hat Creek and the Fall River and its tributaries. Population status is unknown at this time. No management or recovery actions are being considered.

INVERTEBRATES

Trinity bristle snail (Monadenia setosa)

CA - Threatened FED - Candidate 2

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

California freshwater shrimp (Syncaris pacifica)

CA - Endangered FED - Endangered

This is a small shrimp which seldom exceeds 50 mm total length. Males and juveniles are translucent to nearly transparent. Females may be translucent, but often are dark reddish-brown to nearly black. It is distributed in small stretches of low gradient streams throughout Marin, Sonoma and Napa counties. Population trends are not known. The species continues to be endangered by water diversion, watershed erosion, stream sedimentation, riparian removal, agricultural development, grazing and urbanization. The shrimp was listed as Federally endangered in 1988. A study to determine current distribution and population trends is being conducted with funding from the Endangered Species Tax Check-off Program. A proposal was submitted to the USFWS in 1990 to obtain funds for a taxonomic analysis to determine where genetically pure populations of this species exist.

Shasta crayfish (Pacifastacus fortis)

CA - Endangered FED - Endangered

The Shasta crayfish is a small- to medium-size crayfish. The usual color is dark brownish-green to dark brown dorsally and bright orange ventrally. Populations are small and restricted to Shasta Creek in the Pit River Drainage, including tributaries of the Hat Creek and Fall River subdrainages. It is uncommon and could number fewer than 3,000 individuals. It is endangered by competition for food and space with exotic crayfish species, habitat loss due to water diversion and impoundment and exotic predators. The species was listed as Federally endangered in 1988. No management plan exists at this time. A status survey has recently been completed. The exotic crayfish, Pacifastacus leniusculus, has breached one of the velocity barriers that separated

a large population of the exotic crayfish from one of the last populations of the Shasta crayfish. Further contract work is planned.

ENDANGERED PLANTS

1990 ANNUAL SUMMARY

ASSESSMENT/LISTING/DELISTING

The Department prepared species management strategies for the following plant species which were State-listed in February 1990: marsh sandwort (Arenaria paludicola), La Graciosa thistle (Cirsium loncholepis), Surf thistle (Cirsium rhothophilum), beach spectacle pod (Dithyrea maritima), Gambel's watercress (Rorippa gambellii), and Tiburon jewelflower (Streptanthus niger).

Five year reviews were written for the following species: San Mateo thorn mint (Acanthomintha obovata ssp. duttonii), large-flowered fiddleneck (Amsinckia grandiflora), Truckee barberry (Mahonia sonnei), and Amargosa nitrophila (Nitrophila mohavensis).

The Department revised the Petition Format used to propose State listing or delisting of threatened or endangered species. The revisions were aimed at improving the quality of information contained in petitions received by the Department and expediting review. The revised Petition Format was made available for public comment prior to being adopted by the Commission.

The Department reviewed a listing petition, received by the Commission, for the listing of sugar pine (Pinus lambertiana) as a threatened species. The petition stated that white pine blister rust (Cronartium ribicola), a fungus that infects sugar pine, is a serious threat to the species' survival. EPP staff conducted a detailed analysis of the petition and determined that, although the petition pointed out the seriousness of the problems posed by white pine blister rust for sugar pine in California, it did not contain sufficient information to indicate that listing may be warranted. Prior to the Commission hearing on the matter, the petitioner withdrew the petition from further consideration.

Sonoma sunshine (Blennosperma bakeri) was designated a candidate species by the Commission following a Departmental recommendation. The Department submitted a petition for the listing of Scotts Valley spineflower (Chorizanthe robusta var. hartwegii) as an endangered species, but the Commission declined to adopt this species as a candidate.

PROTECTION/MANAGEMENT/RECOVERY

The Department administered ongoing contracts and prepared new contracts with public agencies and other organizations to conduct protection and recovery activities for State-listed plant species. These projects were funded through public donations made to the California Endangered Species Tax Check-off Fund and from monies provided by the US Fish and Wildlife Service (USFWS) under provisions of Section 6 of the Federal Endangered Species Act.

These projects include surveys for and monitoring of rare plant species, protection and recovery efforts, preparation of management plans, research and public education. A survey of suitable habitat is being conducted for Mason's lilaeopsis (Lilaeopsis masonii, Solano/San Joaquin counties) and for various State-listed plants that occur on National Forest land. An analysis of the success of mitigation efforts involving State-listed plants is in progress. Research on the ecology/biology of San Mateo thornmint (Acanthomintha obovata ssp. duttonii, San Mateo County) and palmate-bracted bird's-beak (Cordylanthus palmatus, Alameda County) has begun. Ecological studies and monitoring of rare plant species are in progress at Cuyamaca Lake (San Diego County) and Table Bluff (Humboldt County). Protection planning is in progress for vernal pools in the Santa Rosa Plains (Sonoma County). Management plan recommendations are being implemented for wet meadow communities at North Baldwin Lake (San Bernardino County) and for various State-listed species that occur on National Forest land.

Protection and recovery efforts have been initiated or are ongoing for several species. These include: (1) Experimental introduction of large-flowered fiddleneck (Amsinckia grandiflora) at Black Diamond Mines Regional Park (Contra Costa County) and initiation of three additional experimental introductions; (2) implementation of management recommendations for striped adobe lily (Fritillaria striata) and Tulare pseudobahia (Pseudobahia peirsonii); (3) vernal pool enhancement in San Diego County; (4) construction of fences to protect rare plant populations and posting of interpretive and protective signs on Santa Catalina Island, at the North Spit of Humboldt Bay and Mad River Slough (Humboldt County), Santa Rosa Plateau (Riverside County), Loch Lomond Ecological Reserve (Lake County), the pebble plains/wet meadow communities at North Baldwin Lake (San Bernardino County), McGinty Mountain (San Diego County), Bonny Doon (Santa Cruz County), Nipomo Dunes (San Luis Obispo County) and Guadalupe Dunes (Santa Barbara County), Vina Plains Preserve (Tehama County), and Jepson Prairie (Solano County); and (5) exotic plant species removal at Vina Plains Preserve (Tehama County). Projects involving public education, including interpretive signs and brochures, have been initiated in the counties of Humboldt, Los Angeles, Riverside, San Bernardino, and Solano.

Memoranda of Understanding (MOU) governing research projects involving State-listed plant species were finalized between the Department and the following organizations for the species named: (1) The Nature Conservancy for Humboldt milk vetch (Astragalus agnicidus); (2) Rancho Santa Ana Botanic Garden for various vernal pool species; (3) BioSystems and J. Lohr Properties, Inc. for Santa Cruz tarplant (Holocarpha macradenia); (4) UC Davis for fountain thistle (Cirsium fontinale var. fontinale); (5) CSU-Fresno for Kaweah brodiaea (Brodiaea insignis); (6) USDA for Milo Baker's lupine (Lupinus milo-bakeri); (7) Sonoma State University for Burke's goldfields (Lasthenia burkei); (8) ERC and Energy Services Co. for slender-horned spineflower (Centrostegia leptoceras); (9) The Berry Botanic Garden for Pitkin Marsh lily (Lilium pitkinense); (10) East Bay Regional Parks District for Presidio clarkia (Clarkia franciscana); (11) San Diego State University Foundation for Cuyamaca larkspur (Delphinium hesperium ssp. cuyamacae); (12) UC Davis for beach layia (Layia

carnosa); (13) The Berry Botanic Garden for long-term storage of plant material of State-listed and State candidate species.

Mitigation Agreements (MA) governing mitigation efforts for projects adversely affecting State-listed plant species are being negotiated between the Department and the following organizations for the species named: (1) Gemtel Corporation for Santa Cruz tarplant (Holocarpha macradenia); (2) Abalone Unlimited for La Graciosa thistle (Cirsium loncholepis); (3) All American Pipeline Company for Gaviota tarplant (Hemizonia increscens ssp. villosa); (4) Olympic Quarry for Santa Cruz wallflower (Erysimum teretifolium); (5) The Pebble Beach Company for Tidestrom's lupine (Lupinus tidestromii var. tidestromii), Menzies' wallflower (Erysimum menziesii) and sand gilia (Gilia tenuiflora ssp. arenaria); and (6) Fresno Flood Control District for Tulare pseudobahia (Pseudobahia peirsonii). An MA was finalized between the Department and Sycamore Cogeneration Company for a project involving Bakersfield cactus (Opuntia basilaris var. treleasei).

The Department reviewed management plans for about 25 DFG Ecological Reserves and Wildlife Management Areas. The review focused on preservation and management of rare plant habitat occurring on DFG lands.

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

* Continued coordination with the City of Chico and landowners to develop a comprehensive habitat conservation plan for Butte County meadowfoam (Limnanthes floccosa ssp. californica).

* Consultation with project sponsors to discuss project design and potential mitigation for Scotts Valley spineflower (Chorizanthe robusta var. hartwegii).

* Coordination with California Department of Forestry and Fire Protection (CDF) to assess potential impacts to State-listed plants from proposed control burn projects on private lands in chaparral habitats in Amador and El Dorado counties. Recommendations were made to CDF to minimize impacts from equipment used for pre-burn vegetation treatment.

* Coordination with Los Angeles Department of Water and Power to implement management and protection objectives for Nevada oryctes (Oryctes nevadensis) in Inyo County.

* Coordination with the Springtown Wetlands working group, a committee chaired by the City of Livermore that includes DFG, USFWS, Livermore Parks and Recreation District, private landowners and representatives of the local community. The group meets regularly to develop and implement a plan to preserve the Springtown Wetlands, which contains the only known viable population of the palmate-bracted bird's-beak (Cordylanthus palmatus).

* Participation on the Bureau of Land Management's (BLM) Nationwide Rare Plant Management Team. The team is chaired by BLM's California State Director and is in the final stages of developing a report that assesses the current BLM special status plants and special habitats management program.

* Continued participation on the Vandenberg Air Force Base Technical Advisory Committee, which was formed in 1988 to guide mitigation of impacts caused by construction of missile test facilities.

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

* Coordination with representatives of BLM, USFWS, San Bernardino Valley Water Conservation District and sand and gravel operators to discuss appropriate mitigation for cumulative impacts to State and Federally listed plants in the Upper Santa Ana River Wash. The discussions have included identifying appropriate areas for permanent preserves for endangered plants which complement public lands in the area.

* Coordination with CalTrans, USFS, USFWS, BLM, and PG&E to initiate an interagency MOU that would address the protection and management needs of all the sensitive plant species within the Merced River Canyon area. Among these species is the Merced clarkia (Clarkia lingulata), a State-designated endangered species that is known from only two occurrences. A draft MOU was prepared by the USFS and circulated for review.

* Participation in Sonoma County Vernal Pools Task Force Meetings to discuss an interagency approach to developing a vernal pool habitat conservation program. The county is interested in adopting policies regarding vernal pool conservation utilizing recommendations in the Department-sponsored "Santa Rosa Plains Endangered Plant Protection Program Report" funded by the Endangered Species Tax Check-off Fund.

* Participation in a reconnaissance of two oil spills near the mouth of the Santa Maria River in San Luis Obispo County, on areas that support rare plants, including the State endangered La Graciosa thistle (Cirsium loncholepis). Cleanup plans will be submitted to DFG for review.

* Coordination with the Center for Plant Conservation (CPC) to identify those California plant taxa with the highest priority for protection efforts, and to determine which actions are the most urgent. Also in attendance were representatives from USFS, USFWS, BLM, Edwards Air Force Base, National Park Service, Rancho Santa Ana Botanic Garden, UC Botanic Garden, Berry Botanic Garden, and Regional Parks Botanic Garden, The Nature Conservancy, and California Native Plant Society.

* Participation in the Joint Management Committee for the Fish Slough Area of Critical Environmental Concern (ACEC), composed of representatives from BLM, LADWP, DFG, USFWS, UC Natural Reserve System, Eastern Sierra Audubon, and Desert Fishes Council. The committee meets annually to discuss Fish Slough management issues. At this year's meeting, a draft biological inventory was presented by UC Santa Barbara, and grazing was identified as a potentially significant adverse influence on the rare plants. The general concensus was that the management plan for the ACEC should be revised to eliminate grazing within the most sensitive areas. A rare plant subcommittee met the following day to discuss establishing a monitoring program for the rare plants of Fish Slough to begin in 1991.

The Department developed a Species Management Data Base (SMDB) format that would be suitable for sensitive plant and animal species. The primary purpose of the SMDB will be to summarize information on existing protection and management activities and prioritize protection and management needs for State-listed and other sensitive species. The format has been finalized, and a computerized version is scheduled for completion in 1991.

Guidelines for preparing Mitigation Agreements and Mitigation Plans involving State-listed plants were finalized and sent to Department staff. A Mitigation Plan describes the biological portion (implementation methods, performance criteria, monitoring regime, etc.) of a mitigation project and is referenced in the Mitigation Agreement, a legal contract between the Department and the project proponent. The guidelines, which standardize the content and format of these documents, are provided by the Department to project proponents to assist them in preparing both the Mitigation Agreement and Mitigation Plan for Department review and approval.

EDUCATION

The Department participated in the implementation of the Endangered Species Education Project, initiated by the Legislature under SB885, by providing the Department of Education with an introduction to their Endangangered Species Education Resource Guide, along with samples of educational materials that would be useful to schools participating in this project. The project will consist of a statewide competition in which each public elementary and junior high school is encouraged to adopt an endangered species from its locale, to design projects to educate the community about threats to the endangered species and to develop a plan for local community action to preserve the species' habitat.

"California's Vanishing Flora, A Curriculum Guide to Endangered Plants of California" was finalized. The guide, which was prepared in cooperation with the Department of Education, will be distributed to California schools with SB885 materials.

The Department continued outreach activities to increase public awareness of DFG endangered plant species conservation efforts and to improve public support and participation. Presentations were given to the following groups: the California Native Plant Society at the

Society's 25th Anniversary Celebration, botanists from the People's Republic of China, the San Diego City Council, the Baldwin Lake Ecological Reserve dedication, the California Nature Conservancy's Annual Stewardship Conference, the BLM/USFS Botanists and Ecologists Annual Workshop, the Effie Yeaw Nature Center, and the Theodore Payne Foundation.

An article on vernal pools was published in the March-April 1990 issue of Outdoor California. Articles on recovery efforts for large-flowered fiddleneck (Amsinckia grandiflora) and Santa Catalina Island mountain-mahogany (Cercocarpus traskiae) were published in WildlifeLines, a newsletter promoting the California Endangered Species Tax Check-off Fund.

Displays on endangered plants were exhibited at REI's photo essay display and at DFG's Wildlands Program's "Romancing the Rail" benefit in Sacramento.

EPP's Program Ecologist organized and led a symposium on Standards and Monitoring in Tallgrass Prairie Restoration at the Society for Ecological Restoration's second annual conference in Chicago.

Updates for the DFG Biologists Endangered Plant Training Notebooks were compiled and distributed to Unit Managers in DFG's five regions. The notebooks contain general resource information on plant conservation techniques and regulation and species information for the plants in the biologists' units.

ENDANGERED PLANTS

1990 SUMMARY

MITIGATION/MANAGEMENT/RECOVERY ACTIONS

TYPE OF ACTION	NUMBER OF SPECIES RECEIVING ACTION
Habitat Acquisition	4
Management Plans	15
On-the-ground Protection/ Maintenance	13
Monitoring	29
Experimental Reintroductions	1
Mitigation-related Transplants	6

PLANTS

Acanthomintha ilicifolia (San Diego thornmint)

CA - Endangered FED - Candidate 1

San Diego thornmint is a small, aromatic annual in the mint family (Lamiaceae). The thornmint genus occurs almost exclusively in California and every taxon within the genus is rare. The lower halves of its leaves are wedge-shaped and the flower clusters are covered by prominently spined bracts. This species is found on clay soils near vernal pools, in grasslands, and in coastal sage scrub of San Diego County. The populations occur mostly on private land with a few in the Cleveland National Forest.

Of the 50 historically known populations of San Diego thornmint, only about ten viable sites remain. This plant is extirpated from its historical sites in Ventura County. Development on the mesa bluffs within the last 100 years has reduced suitable habitat in the San Diego area by 90 percent. Several sites were lost in 1988 and 1989, and one of the best remaining sites was severely damaged by illegal road building in Penasquitos Canyon in 1989. Habitat acquisition and active management are essential for the preservation of this species. A small site was purchased by The Nature Conservancy at McGinty Mountain in 1989. Several attempts at experimental transplantation have been made with this species with generally disappointing results. The overall trend and the recent trend for this species is one of rapid decline.

Acanthomintha obovata ssp. duttonii (San Mateo thornmint)

CA - Endangered FED - Endangered

San Mateo thornmint is a small aromatic herb in the mint family (Lamiaceae) with flower clusters covered by spiny bracts. This genus is nearly entirely restricted to California and all of its taxa are rare. San Mateo thornmint is known from a very specific habitat type on soils derived from serpentinite rock in serpentine grassland.

Historically this thornmint was known from only five occurrences in the Crystal Springs region of San Mateo County. Currently, only two of the original populations remain, the rest having been extirpated by urbanization. One small population, in a serpentine grassland within Edgewood County Park, is directly downhill from a housing development. No protection has been undertaken by the county for this population, which is threatened by altered drainage patterns, changes in water chemistry, and off-road vehicles. A second population was discovered in the vicinity during 1987. This extremely small thornmint population is located on San Mateo County property in an area that may be damaged by golf course construction. The size of the populations vary from year to year due to local rainfall and competition from introduced weeds. San Mateo County and DFG have discussed developing a MOU to begin a study of the plant, but no work has been done. To

protect this taxon from extinction, both populations must be preserved. The overall trend for this taxon is one of decline.

Agrostis blasdalei var. marinensis (Marin bent grass)

CA - Rare FED - Candidate 2

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

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

Allium fimbriatum var. munzii (Munz's onion)

CA - Threatened FED - Candidate 1

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

The rapidly accelerating urbanization of western Riverside County poses a severe threat to Munz's onion. Approximately 80 to 90 percent of its historical habitat has been destroyed by impacts associated with human activities. The nine remaining populations are fragmented and isolated, and are threatened by active clay mining, urbanization, dryland agriculture, road construction, sheep grazing, off-highway vehicle activity, discing for fire control, competition from weedy exotic grasses, and a proposed reservoir expansion. Most of the Munz's onion populations occur on private land, and there are no management activities promoting the protection or recovery of Munz's onion or its habitat. The overall trend of this species has been one of decline.

Allium yosemitense (Yosemite onion)

CA - Rare

Yosemite onion, a member of the amaryllis family (Amaryllidaceae), is a perennial herb from a bulb. It produces two linear basal leaves, and the rose or white flowers occur in an umbel at the end of a leafless stem.

Yosemite onion is known from less than 20 occurrences in the central Sierra Nevada, between 1700 - 6900 feet in elevation, in Mariposa and Tuolumne counties. It occurs on open, steep, rocky slopes composed of metamorphic or granitic rocks. The existing populations occur on Federal lands, within Yosemite National Park and in the Sierra and Stanislaus National Forests. Although the possibility exists that plants could be eaten or trampled by hikers and climbers, especially around Bridalveil Falls in Yosemite National Park, the sites are inaccessible to most people. Those populations which occur in the vicinity of recent forest fires should be monitored to determine overall effects of fire on the habitat. At the present time there are no management plans for this species. The present trend of this extremely rare species appears to be one of stability or increase.

Amsinckia grandiflora (large-flowered fiddleneck)

CA - Endangered FED - Endangered

Large-flowered fiddleneck is an erect annual herb in the borage family (Boraginaceae) with coarse, stiff hairs and bright orange-red flowers borne in a fiddleneck-shaped inflorescence. Although several historical occurrences have been recorded, only one site with two small populations remains for this species, located on Lawrence Livermore Laboratory (LLL) property in Alameda and San Joaquin counties. The size of these populations varies from year to year; in 1989 one consisted of about 300 plants and the other of about 30. The 1990 census tallied 104 plants and 18 plants at the two sites. The larger of the two is fenced and protected from grazing.

These populations are monitored annually by the DFG and the USFWS. The LLL site manager is cooperative about working with the Department to protect the plant although its future safety cannot be guaranteed as it occurs on a weapons test site. The Recovery Plan calls for the enhancement of the LLL site so that it will support a minimum of 2500 individuals and the establishment of four additional populations, each consisting of at least 2500 individuals. DFG has used USFWS Section 6 grant-in-aid funding and California Endangered Species Tax Check-off funds to support recovery efforts. Previously completed work has included (1) development of efficient seed propagation techniques, (2) growth, harvest and storage of a garden-grown seed bank, (3) characterization of the natural habitat features, and (4) selection of an optimal reintroduction site. In 1989, a first attempt at re-establishing the plant within its historic range was made at Black Diamond Mines Regional Park in Contra Costa County. This experimental reintroduction was monitored and evaluated. The results will be used to guide further recovery efforts. The experiment used 3200 seeds,

from which about 1100 plants were produced. These plants produced about 30,000 seeds, which were allowed to remain on-site. Three additional experimental introductions will be attempted during the 1990-91 growing season. It will take at least five years before the long-term success of these experiments can be evaluated.

The total population size for natural populations of large-flowered fiddleneck declined precipitously until about 10 years ago. Since that time, numbers have ranged from 10s to 100s of individuals, with a high of about 400 plants, indicating a recent trend of relative stability though on the verge of extinction. The long-term success of experimental introductions cannot be evaluated at present.

Arabis macdonaldiana (McDonald's rock cress)

CA - Endangered FED - Endangered

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

McDonald's rock cress on Red Mountain in Mendocino County is known from only two occurrences. This species is slightly less restricted in Del Norte County, with nearly twenty occurrences. The main threat to this species is the potential for mining the significant nickel and chromium deposits under or adjacent to the populations. Mining companies have unpatented mining claims in this species' range in both counties. In addition to direct impacts, the indirect effects of strip mining and the nickel extraction operation (erosion and acid rain) would endanger all of the populations located on the North Fork of the Smith River in Del Norte County. The USFWS recognizes only the populations on Red Mountain as McDonald's rock cress; the Del Norte occurrences are considered hybrids or another taxon. More taxonomic work on the northern populations is needed. McDonald's rock cress occurs on private and BLM lands in Mendocino County and on USFS land in Del Norte County. Due to the unique assemblage of rare plants, BLM has designated Red Mountain as an Area of Critical Environmental Concern. The general trend for McDonald's rock cress is one of stability, but because mining claims exist over much of its restricted habitat, this species continues to warrant listing as endangered.

Arctostaphylos bakeri (Baker's manzanita)

CA - Rare FED - Candidate 2

Baker's manzanita is an evergreen shrub in the heath family (Ericaceae). It has branchlets and leaves with sticky glandular hairs, and pedicels without hairs. This species is restricted to serpentine soils in localized chaparral communities of Sonoma County.

Nine of the ten known occurrences are on private land, with two of the populations declining at present. All but one population are clustered in the area near Occidental, Sonoma County. The chief threat to Baker's manzanita is residential development which is increasing in the area. A recent DFG acquisition now protects a population at Harrison Grade. A management plan was completed for this preserve in 1987 using California Endangered Species Tax Check-off funds. The Nature Conservancy has negotiated a voluntary protection agreement with a private landowner for one site on Harrison Grade Road. The overall trend for Baker's manzanita is one of steady decline although recent protection efforts may slow population losses.

Arctostaphylos densiflora (Vine Hill manzanita)

CA - Endangered FED - Candidate 1

Vine Hill manzanita is a prostrate spreading evergreen shrub in the heath family (Ericaceae). It roots along its blackish branches, has branchlets with short fine hairs, and a many-flowered, branched inflorescence. It is restricted to the "Sonoma Barren", an area of acid marine sand deposits in western Sonoma County.

Over the last twenty years, this species was brought close to extinction when all but one population in the Vine Hill area were destroyed by agriculture and residential development and roadside weed abatement programs. Several plants were removed from the Vine Hill Road site as part of the county's road maintenance program in 1979, and the population was destroyed in 1985 by land-clearing activities. The last known population, consisting of several mature individuals and a number of younger plants grown from cuttings, occurs on the California Native Plant Society's Vine Hill Preserve. Suitable historical habitat should be acquired for establishing a larger population. The overall trend for this species has been one of decline to the brink of extinction. It is unclear if recent efforts to recover this taxon will succeed.

Arctostaphylos edmundsii var. parvifolia (Hanging Gardens manzanita)

CA - Rare FED - Candidate 2

Hanging Gardens manzanita is a prostrate evergreen shrub without a basal burl, with glossy green leaves, and glossy, bright red berries. This member of the heath family (Ericaceae) can be seen growing on

small eroded ridges and sandstone banks which are subject to strong on-shore winds causing the plant to assume a prostrate habit. Further taxonomic work is needed to determine if Hanging Gardens manzanita is a good variety or just a local variant of A. edmundsii, which is also rare.

Hanging Gardens manzanita is known from only one site in the world, along the Big Sur coast in Monterey County on private land. The trend for this taxon is stable as it has always been known from only one occurrence in the world.

Arctostaphylos hookeri ssp. hearstiorum (Hearst's manzanita)

CA - Endangered FED - Candidate 2

Hearst's manzanita is a restricted endemic evergreen shrub in the heath family (Ericaceae). This subspecies lacks a basal burl, and is found on grassy hills and mesas in open areas of coastal prairie and chaparral communities. It grows on sandy loam substrates which comprise old, stabilized sand dunes near the coast.

Only five occurrences are known, all of which are located in San Luis Obispo County on the Hearst Ranch. Only about 400 individuals are known in the world. The entire range of this plant occurs on land that is subject to grazing and clearing. Some sites have been burned and disced in an attempt to convert brushland to pasture. This species does not stump sprout after fire and needs time for seedling establishment. There are no management plans for Hearst's manzanita and little is known of its biology. Protection planning will require full cooperation with the management of the Hearst property. Hearst's manzanita is in the nursery trade as an ornamental shrub. The trend for this subspecies is stable to declining due to land use practices on the sites.

Arctostaphylos hookeri ssp. ravenii (Presidio manzanita)

CA - Endangered FED - Endangered

Presidio manzanita is an evergreen shrub in the heath family (Ericaceae). Historically, it was known from serpentinitic slopes in what is now San Francisco.

This taxon has been reduced to a single plant in the wild, on the U.S. Army San Francisco Presidio. The commanding officer of the Presidio is aware of the plant's location, although road widening activities destroyed some habitat in 1985. Some competing vegetation was removed in 1986. Propagation and reintroduction efforts will be restricted to the Presidio as it is the only historical habitat for this plant that has not been destroyed. DFG, USFWS, and the Department of the Army have entered into an MOU to protect the rare plants occurring on Presidio lands. DFG funded a recovery study using USFWS Section 6 grant-in-aid funding: "A Study of the Ecological Aspects Related to the Reintroduction of Arctostaphylos hookeri ssp. ravenii." The overall trend for this species has been one of steady decline to near

extinction. In relatively recent propagation and reintroduction efforts, clones of the remaining plant are being used to help arrest the decline.

Arctostaphylos imbricata (San Bruno Mountain manzanita)

CA - Endangered FED - Candidate 1

San Bruno Mountain manzanita is a low evergreen shrub in the heath family (Ericaceae). This species lacks a basal burl, has branchlets with short spreading hairs, bright green leaves, and glandular hairs on the fruit.

There are four small populations on sandstone outcrops of the north coast scrub community on San Bruno Mountain, San Mateo County. A portion of the area is within San Bruno Mountain County Park, managed under a habitat conservation plan that protects several rare and endangered animals and plants. Some of the habitat of San Bruno Mountain manzanita may be impacted by residential development on private lands surrounding the county lands. The overall trend for this species seems to one of stability to slow decline.

Arctostaphylos pacifica (Pacific manzanita)

CA - Endangered

Pacific manzanita is a low prostrate evergreen shrub in the heath family (Ericaceae). This plant has a basal burl, branchlets with fine hairs, pale green leaves, and fruits with short stiff hairs. It grows as part of the north coast scrub community in two distinct populations on San Bruno Mountain, San Mateo County, where it has been known historically in a very limited habitat.

One population is on private land where it is unprotected and threatened by nearby residential development. The second population is within San Bruno Mountain County Park. In addition to urbanization, other threats exist from long-term fire suppression that has allowed other shrubs to encroach on the habitat of Pacific manzanita. Those rare species which are found within the county park are governed by an established habitat conservation plan. The overall trend for this species appears to be one of stability to slow decline.

Arctostaphylos pallida (Alameda manzanita)

CA - Endangered FED - Candidate 1

Alameda manzanita, a member of the heath family (Ericaceae) grows to be a tall, erect evergreen shrub. It lacks a basal burl, has branchlets with short bristly hairs, and thin smooth leaves that clasp the stems. This species occurs on bare, somewhat sterile soils in the manzanita chaparral community on Sobrante and Huckleberry ridges of Alameda and Contra Costa counties.

There are seven isolated stands of this species in reasonably good condition and approximately six additional ones in poor condition. These stands are largely owned by the East Bay Regional Park District with a few sites on private land. Residential development in the habitat, competition and shading from exotic plants, lack of fire for regeneration, and fungal disease outbreaks are serious threats to the future survival of Alameda manzanita. A management plan, funded by the California Endangered Species Tax Check-off, was completed in 1987 by the East Bay Regional Park District. The District is now seeking implementation funding. The overall trend for this species is one of decline although protection efforts initiated by the Regional Parks may help to stabilize the trend.

Arenaria paludicola (marsh sandwort)

CA - Endangered FED - Candidate 1

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

Despite recent searches, no populations of marsh sandwort have been verified in Washington in recent years. Eight of the nine known California occurrences have been eliminated due to competition with non-native plants, urbanization, and off-road vehicle activity. Today, the worldwide distribution of this species is limited to one site in San Luis Obispo County, on privately owned land in Black Lake Canyon on the Nipomo Mesa. In its entirety, this species consists of less than 10 plants occupying less than five square meters of land. The encroachment of non-native eucalyptus trees into marsh sandwort habitat and the proposed drilling of water wells upstream of the population are serious threats to the continued existence of this species. In addition, the remaining population is extremely susceptible to chance events such as a fire, flood, disease outbreak, or landslide, which could eliminate the population, thereby causing extinction of the species. In 1990 a management strategy for marsh sandwort was developed by DFG. The trend for this species is one of severe decline due to the destruction and degradation of its wetland habitat.

Astragalus agnicidus (Humboldt milk vetch)

CA - Endangered FED - Candidate 1

Humboldt milk vetch, a member of the pea family (Fabaceae), is a perennial herb up to a meter tall, with hollow stems, divided leaves, and many small white flowers on a branched inflorescence. The entire global distribution of this species is restricted to one occurrence of several small colonies on a private ranch south of Miranda in Humboldt

County. The milk vetch was the target of an apparently successful weed eradication effort during the 1920s when this putatively toxic plant was implicated in the death of lambs on the ranch. Subsequently, the plant was not seen after 1954 and was presumed extinct for many years. Several attempts to relocate the plant during the 1970s were unsuccessful.

In 1987, a few milk vetch plants were located on the original ranch by botanists from Department of Fish and Game, California Native Plant Society (CNPS) and the local community. Apparently, dormant seeds had persisted in the soil and were stimulated when a dead tree was felled and removed by the ranch owner a few years earlier. The resulting soil disturbance and opening of the tree canopy triggered seed germination and regeneration of the population. The landowner has since agreed to voluntarily protect the plants and has registered the site in The Nature Conservancy's (TNC) California Register of Natural Areas. Three portions of the population have since been fenced by TNC and CNPS volunteers and have been monitored annually for three years. 1990 monitoring results showed a decrease in population size and an increase in plant size, indicating that the population has thinned and may be stabilizing. More years of monitoring are needed to substantiate this hypothesis. Research conducted separately on this population indicates that shade has a deleterious effect on growth. Under a 1990 Memorandum of Understanding (MOU) with DFG, The Nature Conservancy conducted research on the germination and growth requirements of the milk vetch. Upon completion of these laboratory studies, the study plants were grown to maturity, harvested and sent to the National Cancer Institute for screening to determine if the toxic properties of the plant have potential pharmacological value. Results from preliminary testing are expected in early 1991. In recent years the Humboldt milk vetch has experienced an increasing trend.

Astragalus clarianus **(Clara Hunt's milk vetch)**

CA - Threatened FED - Candidate 1

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

Only three populations of Clara Hunt's milk vetch are known to exist. Combined, these populations consist of several hundred individuals within less than two acres of habitat. Habitat modification and destruction threaten the remaining occurrences. One historic population, near St. Helena in Napa County, was eliminated by urbanization and viticulture. The largest occurrence, at Lake Hennessey, was severely damaged in late 1990 by the inadvertent dumping of dredge material onto the milk vetch habitat during a project by the City of Napa to enlarge the lake. Although site restoration has begun, the prospects for recovery and long-term survival of this population are unknown. The development of Lake Henessey and subsequent traffic from recreational users of the lake

park has threatened this population in the past. Because Clara Hunt's milk vetch is an annual plant with extremely small populations, any of the populations could be eliminated through random variation in numbers from year to year. Further reductions in the size, health, or numbers of populations increases the risk of extinction by random or chance events such as drought or fire. A management plan directing protection and recovery actions for this species is needed. The trend for this species has been one of decline as a result of habitat destruction and modification.

Astragalus johannis-howellii (Long Valley milk vetch)

CA - Rare

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

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

Astragalus lentiginosus var. sesquimetralis (Sodaville milk vetch)

CA - Endangered FED - Candidate 1

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 and elongate seed pods. This species is restricted to moist alkaline clay flats around desert seeps and springs. There is only one known occurrence in California, at Big Sand Spring in Inyo County; it also occurs at two sites in Nevada.

The California occurrence is owned and managed by the BLM. Trampling by burros that frequent the water holes at this site has been a major threat to Sodaville milk vetch. Other threats include trampling by humans and off-road vehicles. Also, any alteration to the hydrological regime at the springs where Sodaville milk vetch occurs could threaten the plants. A fence to exclude the burros was installed in 1985 around Big Sand Spring and included approximately 90 percent of the Sodaville milk vetch occurrence. The burros still occasionally gained access to the fenced area by climbing a mound of dirt adjacent to the fence and jumping inside the exclosure; once inside the burros could not easily get back out. Fence repairs, including moving the fence away from the mound of dirt, were made in

summer 1990 to make the exclosure more secure. Monitoring results over the past several years have suggested that the only known occurrence of Sodaville milk vetch is stable to increasing, but access to the population should still be restricted.

Astragalus magdalenae var. peirsonii (Peirson's milk vetch)

CA - Endangered FED - Candidate 2

Peirson's milk vetch is a stout herbaceous perennial from a woody base, with leaves which are divided into numerous oval leaflets. This member of the the pea family (Fabaceae) is covered with fine silky hairs and has purple flowers and inflated pods. In California, this plant is known to occur on sand dunes in the Algodones Dunes system (Imperial County). Historically, it was known from Borrego Valley (San Diego County) but has not been seen there in years. It is also known from Baja California and Arizona. Recreational ORV activity has destroyed a large portion of the vegetation in areas of the dunes open to public use.

The BLM has closed a portion of the Algodones Dunes to ORV use to protect a number of rare plant species. A recent dunes management plan estimates a doubling in ORV use in the next twenty years. This activity will heavily impact all endemic dune plants including populations of Peirson's milk vetch outside of the closed area. It is likely this species has already been extirpated from San Diego County, therefore protection of remaining populations is crucial. Elimination of recreational vehicle impacts and monitoring of the existing populations would give Peirson's milk vetch the best chance for continued survival. The overall trend for this plant has been one of decline due to habitat destruction.

Astragalus monoensis (Mono milk vetch)

CA - Rare FED - Candidate 2

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

Although there are nearly twenty known occurrences, many of these sites are threatened by overgrazing and trampling by livestock. Researchers have stated that destruction of ground-dwelling bee pollinators by grazing animals could result in reduced levels of reproduction for this species. Further information is needed on the long-term effects of grazing. Relocating water troughs, which concentrate livestock activity, out of habitat occupied by this species could result in improvement of general habitat conditions. ORV use has resulted in habitat degradation of some sites. Widening

of State Highway 395 by CalTrans in 1989 destroyed portions of several sites. No mitigation was proposed or implemented for this project. The overall trend for Mono milk vetch is stable to declining.

Astragalus tener var. titi (coastal dunes milk vetch)

CA - Endangered FED - Candidate 1

The 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. The habitat of this plant is moist depressions in coastal terrace grasslands and in coastal strand vegetation on sand dunes.

Historically, the coastal dunes milk vetch was known from six sites in Monterey, Los Angeles, and San Diego counties. Only one population has been located in recent years, on the Monterey Peninsula. All other sites have apparently been destroyed by urbanization, recreational activity and exotic plant encroachment. The single remaining site is subject to recreational beach activity with foot, horse, and auto traffic impacting the population. Competition from aggressive, introduced beach plants such as iceplant also threatens the coastal dunes milk vetch. Surviving plants and their habitat at Monterey remain unprotected in 1990. The overall trend for the coastal dunes milk vetch is one of steady decline to the brink of extinction.

Astragalus traskiae (Trask's milk vetch)

CA - Rare FED - Candidate 2

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 impart a gray-green color. This species is restricted to seven populations in five areas on Santa Barbara Island and is widespread on San Nicolas Island. It occurs on shallow, often rocky soils in a community that has been described variously as a form of island grassland, southern coastal bluff scrub, cactus scrub and others.

On Santa Barbara Island, which is a part of Channel Islands National Park, the habitat of Trask's milk vetch is managed by the National Park Service (NPS). Introduced rabbits were a threat to all of the rare plants on Santa Barbara Island, but the NPS has completed an eradication program and vegetation recovery is underway. However, monitoring from 1985-89 detected an overall loss of nearly two-thirds of the total Trask's milk vetch population, which now numbers approximately 1200 individuals. This abrupt decline was caused by a severe winter storm in 1988 that completely destroyed two populations and greatly reduced a third. Recovery from the effects of this storm has been minimal. The NPS is planning to continue monitoring of Trask's milk vetch populations on Santa Barbara Island. The U.S. Navy

controls San Nicolas Island, where continued military activity could pose a threat, but the Navy is aware of the plant's presence and has taken steps to avoid adversely affecting its habitat. The overall trend for this species is declining.

Atriplex tularensis (Bakersfield saltbush)

CA - Endangered FED - Candidate 2

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

Five of the six historic occurrences of Bakersfield saltbush have been extirpated. The remaining occurrence is in an alkali sink surrounded by farmland. It is managed by TNC as part of their Kern Lake Preserve; the population is fenced and monitored annually. This species had not been seen since the 1930's until its rediscovery in 1983 on the southern edge of the Kern Dry Lake. The population size of this annual species fluctuates from year to year, due in part to local rainfall patterns. The shallow water table that supplies the soil moisture to support Bakersfield saltbush and other members of the scrub community has been reduced as a result of agricultural practices in the area. Also, studies indicate that this species hybridizes with bracted saltbush (Atriplex serenana), a closely related widespread species that is able to tolerate drier conditions. Monitoring data from 1989 and 1990, during which water conditions were below normal, indicated that few if any plants with true Bakersfield saltbush characteristics were present. Monitoring data over the past several years suggest that the trend of the only remaining population is in decline and the species is in serious danger of extinction.

Baccharis vanessae (Encinitas baccharis)

CA - Endangered FED - Candidate 1

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

This species has undergone rapid loss of habitat due to residential development and agricultural conversion. In 1987, its status was changed from rare to endangered. Less than ten good to fair quality occurrences remain and several are on sites suitable for development or are proposed for development. An additional four poor quality populations exist as well. Two populations consist of a single plant which cannot reproduce (separate male and female plants are needed). There are no management or protection plans for Encinitas baccharis.

One occurrence is in a county park and four others are located in areas that are or could become open space preserves, but they are in poorly regulated sites associated with residential development. The overall trend for this species is one of decline; this trend will continue to endanger the plant without immediate intervention and protection efforts.

Bensoniella oregana (bensoniella)

CA - Rare FED - Candidate 2

Bensoniella is a perennial herb with basal heart-shaped leaves, unbranched flowering stems, and small saucer-shaped flowers bearing thread-like petals. This member of the saxifrage family (Saxifragaceae) is found only in Humboldt County, California and Curry County, Oregon. Bensoniella grows in moist, grassy meadows and small openings in evergreen forests. Of the four known California occurrences, three are found on private land and one occurs on Six Rivers National Forest. This species was thought to be extinct until 1977, when it was relocated in Humboldt County. Since that time several additional occurrences have been found during surveys.

None of the bensoniella occurrences are protected. Some sites have been damaged by cattle trampling and are threatened by timber harvest activities. In 1988, private logging activities on adjacent lands negatively affected the only publicly owned occurrence of bensoniella on National Forest lands. Sedimentation and windthrow of unlogged trees has further degraded the bensoniella habitat. Six Rivers National Forest is working with the California Native Plant Society to design a habitat protection project to repair the gully where this population grows. This project is scheduled to commence in summer 1991. Further information on the ecology and reproductive biology of this species are needed to help formulate management plans. Timber harvest activities should be restricted near bensoniella habitat. The overall trend for bensoniella has been one of decline in recent years.

Blennosperma bakeri (Sonoma sunshine)

CA - Candidate Fed - Proposed Endangered

Sonoma sunshine is a small annual herb in the sunflower family (Asteraceae) with small, yellow, daisy-like flowers that bloom from March through April. The yellow disk flowers bear white pollen and stigmas; the sterile ray flowers bear red stigmas, a character that separates Sonoma sunshine from other members of this genus.

Sonoma sunshine is endemic to vernal pools and intermittent swales in Cotati Valley and the adjacent Sonoma Valley in Sonoma County. Approximately 30% of the 37 historic occurrences have been extirpated or seriously damaged, and most of the remaining sites are threatened by rapid urbanization, wastewater irrigation, expansion of vineyards and agricultural lands, and grazing. Concern over the continuing loss of vernal pool habitat and associated rare plants in Sonoma County has prompted the formation of a Sonoma County Vernal Pools Task Force, an

interagency effort to develop a regional program for conserving vernal pool habitat. The DFG is working with the City of Santa Rosa and the County of Sonoma in this capacity, and has funded a study addressing protection of endangered plants in the Santa Rosa Plains as an initial step in this program. At the DFG's Todd Road Preserve, Sonoma sunshine occurs with two State-listed endangered plant species, Burke's goldfields (Lasthenia burkei) and Sebastopol meadowfoam (Limnanthes vinculans). The overall trend for this species is one of decline.

Blennosperma nanum var. robustum (Point Reyes blennosperma)

CA - Rare FED - Candidate 2

Point Reyes blennosperma, a member of the sunflower family (Asteraceae), is a annual herb with thick, hollow sprawling stems. There are less than a dozen known occurrences of this taxon. The majority of the distribution occurs on sandy soils in the coastal prairie habitat on the Point Reyes Peninsula in Marin County. One population occurs in Mendocino County in north coast bluff scrub overlying sand dunes.

The Marin County populations of Point Reyes blennosperma are on Point Reyes National Seashore property, some of which is leased to ranchers. These population occur in areas grazed by cattle and tule elk, but the animals do not appear to feed on it. Trampling is a potential threat. The NPS has a regular monitoring program for Point Reyes blennosperma and other rare species at the seashore; the NPS is also studying the effects of prescribed burns in selected areas. The Mendocino population is entirely on private land and has no protection. Trampling and development are potential threats. The overall trend for this taxon is one of stability.

Bloomeria humilis (dwarf golden star)

CA - Rare FED - Candidate 2

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

Only three occurrences of dwarf golden star are known to exist. One occurrence consists of a single small population, and the other two are made up of several scattered subpopulations. Combined, these populations consist of approximately 2,000 plants occurring within an area of approximately ten square miles. All of the populations exist on the Hearst Ranch property on land that is used primarily for cattle grazing. Although there are no direct threats to this species, range

management and fire suppression activities on the Hearst property could impact the occurrences. A land use change by the property owners could be detrimental to the existence of dwarf golden star and the other rare species that occur there. Although historical records for this species are lacking, the extremely limited distribution of dwarf golden star makes its existence precarious. The trend for this species appears to be one of stability.

Brodiaea coronaria ssp. rosea (Indian Valley brodiaea)

CA - Endangered FED - Candidate 2

Indian Valley brodiaea produces long, linear grass-like leaves from a perennial corm. This member of the amaryllis family (Amaryllidaceae) has rosy pink flowers on a leafless flowering stem. This plant is restricted to red serpentine clay and gravel in open areas along creeks. This taxon often occurs in association with other rare plants.

Historically, the plant 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. An increase in the operating lake level of only five feet would inundate and destroy many of the remaining plants. The Glenn County population is used as a local dump. The BLM has established the Indian Valley Area of Critical Environmental Concern and Research Natural Area Management Plan in order to protect and enhance 40 acres of existing habitat of the Indian Valley brodiaea. A new population of this plant was located in 1989 in the vicinity of Cook Springs, Colusa County. The overall trend for this plant is one of slow decline, though habitat loss has slowed in recent years.

Brodiaea filifolia (thread-leaved brodiaea)

CA - Endangered FED - Candidate 1

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

Thread-leaved brodiaea is known historically from approximately 20 occurrences. Only about 15 of these are considered extant and some are damaged and declining. Most of the occurrences are on the Santa Rosa Plateau in Riverside County and the San Marcos and Vista areas of San Diego County. It was thought to be extirpated from Los Angeles County as the population in the Glendora area had not been seen since

1921, but it was rediscovered in 1988; this population had several hundred plants in 1989. A small population of about two dozen individuals was discovered in 1989 in southeastern Orange County in habitat similar to the Santa Rosa Plateau in adjacent Riverside County. Much of thread-leaved brodiaea's habitat is threatened by housing development and off-road vehicle use. Transplanting was attempted to save one population near Vista that was impacted by a housing development, but the plants did not survive. In 1988 DFG entered into a Mitigation Agreement with a developer in San Diego to mitigate loss of a large population of thread-leaved brodiaea as a result of a housing development; this agreement requires that the developer monitor the transplanted population for at least five years and establish a preserve with permanent protection for this population. Two of the occurrences in Riverside County are on TNC's Santa Rosa Plateau Preserve and the recently discovered population in Orange County is on county park property. The other occurrences are on private property and are afforded no protecton. California Endangered Species Tax Check-off funds are being used to finance rare plant habitat protection efforts at TNC's Santa Rosa Plateau Preserve. This project includes protection and restoration of native habitats on the preserve, installation of interpretive signs, and a study of the species biology to determine appropriate management practices. Despite recent discoveries, the overall trend for thread-leaved brodiaea is one of decline.

Brodiaea insignis (Kaweah brodiaea)

CA - Endangered FED - Candidate 2

Kaweah brodiaea is a showy, herbaceous perennial in the amaryllis family (Amaryllidaceae). It produces several linear leaves which are crescent-shaped in cross-section and a leafless stalk terminated by a cluster of rose-purple to pink tubular flowers. This species is endemic to the drainage of the Kaweah and Tule Rivers. It forms pink carpets of color in May within the blue oak savannah and valley grassland plant communities it occupies.
Kaweah brodiaea has been extirpated from sites in the Tule River Canyon, although a few plants that were transplanted there in 1984 are monitored by Sequoia National Forest. Recent surveys have located new sites in the Kaweah River drainage; currently the Natural Diversity Data Base records about eleven occurrences in stable or better condition. An additional six occurrences are either extirpated or heavily damaged. Kaweah brodiaea is often found in roadside localities where herbicide spraying by county maintenance personnel is a threat. Some populations near the town of Three Rivers are threatened by residential development. Other threats include heavy livestock grazing and road widening. DFG acquired an occurrence in 1984-85 and designated the site an Ecological Reserve. This population has been monitored since 1987 to establish baseline population data. In 1990 this population appeared stable despite severe drought. Recently, both a species and an ecological reserve management plan were prepared for DFG using California Endangered Species Tax Check-off funds. One of the largest populations, at Terminus Dam, has been registered as a voluntarily protected site by The Nature Conservancy. Under a Memorandum of Understanding with CSU

Fresno, genetic research on this species will be conducted. The overall trend for Kaweah brodiaea has been one of decline, although in recent years this has stabilized due to a combination of new populations located and sites protected.

Brodiaea pallida (Chinese Camp brodiaea)

CA - Endangered FED - Candidate 1

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

All of the known habitat of Chinese Camp brodiaea is under private ownership and is unprotected. A portion of the habitat is zoned for residential use. An acquisition proposal was written by DFG in 1985 but the private landowners have not been willing to sell to the State. In 1989, further subdivision of the parcel was proposed by the owners. In order to secure the future survival of this species, the habitat must be protected. A preserve for the species should be established as a condition of the county subdivision permit. It is important to exclude extensive cattle grazing and to provide protection of the existing hydrological conditions. The trend for this species continues to be one of decline and critical endangerment.

Calamagrostis foliosa (leafy reed grass)

CA - Rare

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

Most of the extant occurrences are protected by their inaccessibility to livestock and humans although a few may be subject to development. Three new occurrences were found in 1987, and additional potential habitat needs to be searched. Leafy reed grass appears more widespread than previously known and is not currently threatened. The overall trend for this species in recent years has been stable.

Calochortus dunnii (Dunn's mariposa lily)

CA - Rare FED - Candidate 2

Dunn's mariposa lily is an herbaceous perennial from a bulb in the lily family (Liliaceae). It has slender basal leaves, short stem leaves, and showy, bell-shaped white to pink flowers with a red spot at the base of the petals. This plant is known only from the mountains of San Diego County and adjacent Baja California. It grows on dry stony ridges and in fire breaks in chaparral and yellow pine forests. It appears to be restricted to gabbroic soils.

About 20 occurrences of Dunn's mariposa lily are known, some of which consist of small populations of only a few plants. A major threat to this showy plant is from flower picking and digging of the bulbs by collectors. Ownership is spread among Cleveland National Forest, BLM, Cuyamaca Rancho State Park and private owners. Controlled burning and/or brush clearing may be useful in habitat improvement, but more information is needed on the ecology of Dunn's mariposa lily before a management plan can be written. The trend for this species is difficult to determine; it is probably best described as stable to declining.

Calochortus persistens (Siskiyou mariposa lily)

CA - Rare FED - Candidate 2

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

Only a few occurrences of Siskiyou mariposa lily are known and these appear to be declining due to competition from introduced weedy plants and heavy browsing by deer. Near the summit of Gunsight Peak, the habitat has been disturbed by structures and access roads for radio towers and telephone repeater stations. The known occurrences are currently being monitored by the Forest Service (Klamath National Forest). In 1990 Klamath N.F., in cooperation with the California Native Plant Society, removed non-native weeds from 10 acres of Siskiyou mariposa lily habitat. Control and test plots were established to measure the effectiveness of the weed removal. A management plan is needed to address ways to avoid impacts in case of fire management and further development of the habitat. Few occurrences exist, but with continued monitoring and protection from disturbances, this plant may be able to exist at stable, safe levels. A listing category of "threatened" may be more appropriate for Siskiyou mariposa lily since it is threatened throughout its range. The overall trend for this plant has been one of decline.

Calochortus tiburonensis (Tiburon mariposa lily)

CA - Threatened FED - Candidate 2

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

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

Calystegia stebbinsii (Stebbins' morning glory)

CA - Endangered FED - Candidate 2

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

In El Dorado County, rapid residential development in the vicinity of Cameron Park and Shingle Springs has extirpated several morning glory occurrences since 1974 and the losses are increasing. Of the six occurrences seen in 1987, all but two are close to Highway 50 in areas undergoing rapid development. Much of the chaparral habitat of this species has been subdivided into five-acre lots. A habitat conservation plan is needed for Stebbins' morning glory and the other State-listed plants that occur on Pine Hill gabbro soils. DFG staff is working with El Dorado County Planning Department to identify high priority areas for protection and develop means to secure them through the land use planning process. DFG has identified a proposed Ecological Reserve near Salmon Falls along the South Fork of the American River. In 1990 the Wildlife Conservation Board approved

purchase of a 40 acre parcel with Proposition 70 funds to begin the Ecological Reserve. An agreement is being developed between DFG, BLM, and Bureau of Reclamation to work cooperatively to acquire and manage land to protect rare plant habitat along the South Fork of the American River. In Nevada County, a 1990 expansion of a landfill eliminated morning glory habitat. Protection of the remaining habitat is needed to ensure conservation of the species in Nevada County. The recent trend for Stebbins' morning glory has been one of continued decline.

Carex albida (white sedge)

CA - Endangered FED - Candidate 1

White sedge, a member of the sedge family (Cyperaceae) is a short tufted grass-like perennial herb from a creeping rhizome with erect stems, flattened leaves and flowers in dense terminal spikes. This species is restricted to moist sites adjacent to freshwater marshes and creeks in Sonoma County. Only five occurrences have ever been reported and only one of these, Lower Pitkin Marsh, has been confirmed in the last 10 years. This represents the only known extant occurrence.

Pitkin Marsh is subject to development pressures and any changes in the present hydrological regime, including draining, could threaten not only the white sedge but other rare species growing there. Habitat conversion has eliminated several historic occurrences of white sedge from other freshwater marshes of Sonoma County. All of the marsh habitat is privately owned and there is currently no protection afforded to this species. The trend for this species is one of continued decline.

Carex tompkinsii (Tompkins' sedge)

CA - Rare

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

There are no management plans for Tompkins' sedge, but all occurrences are on Federal forest or park land (Sequoia and Sierra National Forests; Kings Canyon and Yosemite National Parks) and therefore receive some protection. Those occurrences located near roads may be subject to threats from highway maintenance activities and herbicide spraying. Field surveys are needed to determine the effects of the 1987 forest fires on several occurrences. Recent population data are not available to assess the trend for this species.

Carpenteria californica (tree anemone)

CA - Threatened FED - Candidate 1

Tree anemone, a member of the mock orange family (Philadelphaceae), is an erect to spreading evergreen shrub. Its flowers, which bloom from May through July, are large and showy, with white petals and yellow centers. Tree anemone is an extremely localized endemic species that is found only in eastern Fresno County, about 30 miles northeast of Fresno. It grows on well-drained granitic soils, and is most abundant on north-facing ravines and drainages in chaparral and cismontane woodland communities. The total range of this species covers an area of approximately 225 square miles, within which there are fewer than ten native populations. This species appears to require very specific conditions for successful sexual reproduction. No seed germination or seedling establishment in nature had ever been observed until 1990, following the Powerhouse fire of the summer of 1989. Fire may be an important ecological requirement of this species; burned tree anemone plants have been observed to resprout vigorously.

Threats to the continued existence of tree anemone consist of highway construction, foothill development, off-road vehicle use, illegal dumping, hydroelectric operations, and incompatible fire management techniques. Approximately 60 percent of the population distribution of tree anemone occurs on private land; the remainder is on U.S. Forest Service land. The landowners of one occurrence have entered into a voluntary protection agreement with The Nature Conservancy to protect tree anemone on their property. The Forest Service has established a Carpenteria Botanical Area encompassing a portion of the largest tree anemone occurrence, and its Backbone Creek Research Natural Area (RNA) supports another population. Monitoring of seedling survival was conducted on a regular interval. Although mortality was high, as might be expected with the continued drought, a number of seedlings that were established along moist seeps appear vigorous. A portion of the RNA was fenced in 1990 to prevent access by cattle, which had been trampling and grazing on the seedlings and stump sprouts. A draft species management plan was prepared by the Forest Service in 1990. This species appears to be stable to declining from the combined threats of habitat loss and low seedling establishment.

Castilleja gleasonii (Mt. Gleason paintbrush)

CA - Rare FED - Candidate 2

Mount Gleason paintbrush is a grayish, hairy perennial herb in the figwort family (Scrophulariaceae). It occurs on open flats or slopes in granitic soil of ponderosa pine forest and montane chaparral plant communities of the San Gabriel Mountains, Los Angeles County. There are several known occurrences near Mount Gleason in the Angeles National Forest.

This species has always been rare but is now threatened by human activities including illegal off-road vehicle use of the habitat, local foot traffic, grazing and trampling by horses and cattle, and

brush clearing for forest management. In 1987, Angeles National Forest conducted field surveys and completed a management plan for Mt. Gleason paintbrush. Annual monitoring is being conducted by Rancho Santa Ana Botanic Gardens. The recent trend has been one of decline.

Castilleja grisea (San Clemente Island paintbrush)

CA - Endangered FED - Endangered

San Clemente Island paintbrush is a branched perennial herb in the figwort family (Scrophulariaceae). The plants are covered with matted hairs and they produce elongated inflorescences of yellow flowers. This paintbrush grows in the maritime desert scrub plant community on the rocky slopes of canyons of San Clemente Island. Populations are scattered around the island, and about half contain fewer than 10 individuals.

In the 1930's this plant was relatively common on the southeastern coast of the island, but feral goats have nearly denuded much of that area, destroying the native vegetation and threatening several endemic plant species. The U.S. Navy owns San Clemente Island and has used portions of it for military activities. To guide protection efforts for the paintbrush the USFWS has written management and recovery plans. The Navy has a feral animal removal program underway.

Castilleja neglecta (Tiburon Indian paintbrush)

CA - Threatened FED - Candidate 1

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

Tiburon Indian paintbrush occurs at American Canyon in Napa County and at three sites on the Tiburon Peninsula in Marin County. Combined, the four occurrences contain approximately 1500 individuals within 32 to 40 acres of habitat. Only a portion of one occurrence is protected; this is on The Nature Conservancy's Ring Mountain Preserve in Marin County. Tiburon Indian paintbrush is threatened by urbanization on the Tiburon Peninsula and by mining at American Canyon. In the immediate future, proposed mining and urbanization could eliminate 65 to 72 percent of the species' habitat. Each of the four extant populations contains only several hundred individuals within 8 to 15 acres. These populations are at risk of extirpation from a random or chance event such as severe disease outbreak, fire, or another natural or human-caused calamity. Further reductions in the size, health, or number of occurrences would increase this risk. The trend of this species is one of continued decline.

Castilleja uliginosa (Pitkin Marsh Indian paintbrush)

CA - Endangered FED - Candidate 1

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 an inflorescence of yellow flowers in a spike. Historically, it was restricted to the wet marsh habitat of upper Pitkin Marsh, Sonoma County. Reports in the 1950's suggest there was a large population scattered throughout the area. Loss of marsh habitat has greatly impacted this species. Since the late 1970's only a single plant has remained.

This species requires two plants for pollination, consequently the single known plant cannot reproduce. Tissue culture and other vegetative propagation techniques are being developed to increase its numbers. Hybridization and backcrossing with related species is also being attempted. Pitkin Marsh is in private ownership and the several rare species there are unprotected; grazing threatens several of them. In recent years the landowner has not allowed DFG personnel on his property to cut back competing vegetation from the single fenced individual. This last plant may already be gone. In order to properly manage the habitat, protection of the hydrological regime will be necessary. The trend for Pitkin Marsh Indian paintbrush is one of continued decline.

Caulanthus californicus (California jewelflower)

CA - Endangered FED - Endangered

California jewelflower, a member of the mustard family (Brassicaceae), is an herbaceous annual, branched at the base, with upper leaves clasping the stems, and white and purple flowers arranged on one side of the stem. This species historically occurred in slightly alkaline sandy loam in native grasslands of the southern San Joaquin Valley and adjacent valleys. Its range once included Fresno, Kern, Kings, Santa Barbara, San Luis Obispo and Tulare counties, but now it is known only from native occurrences in Santa Barbara and San Luis Obispo counties. A transplanted population is being maintained at TNC's Semitropic Ridge Preserve in Kern County; this site is on more alkaline soil than California jewelflower normally tolerates and is therefore ecologically marginal.

Of nearly 50 historic occurrences, less than 10 native occurrences remain, most of which are in San Luis Obispo County. BLM and TNC own and manage a few of the California jewelflower occurrences. The remainder are under private ownership; one of these is protected by a voluntary agreement with TNC. Loss of habitat, as a result of conversion to agriculture or alteration by grazing, has nearly eliminated this species from its native range. Until 1988 only one natural population was known from Santa Barbara Canyon in Santa Barbara County. In the spring of 1988 new populations were found on the Carrizo Plain within its historic range. California Endangered Species Tax Check-off funds were used to finance an inventory of rare plant species (including California jewelflower) and habitat in the

Carrizo Plain and to develop management recommendations for adequate protection of these species and their habitats. Surveys were conducted in 1989 and 1990; a vegetation map and final report are in preparation. Los Padres National Forest has entered into an MOU with DFG to establish a new population within the forest boundaries on suitable but unoccupied habitat. No seedlings survived at the introduction sites in 1989; about 150 plants were found in 1990. Because natural population sizes of annuals such as California jewelflower fluctuate from year to year, continued monitoring is needed before determining the success of this introduction effort. Despite recent discoveries of additional populations, this species is declining, primarily as a result of habitat alteration or destruction.

Caulanthus stenocarpus (slender-pod jewelflower)

CA - Rare FED - Candidate 2

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

Less than a dozen occurrences of slender-pod jewelflower are known in California, and some are composed of less than 100 individuals. The ownership is divided between BLM, Cleveland National Forest and private owners. Maintenance of fuel breaks with herbicides, and grazing pose potential threats to this species. None of the occurrences are currently protected and little is known about the reproductive biology or habitat requirements of this plant. The slender-pod jewelflower appears after chaparral burns which may suggest that controlled burning could improve habitat conditions. The trend for this plant has been one of decline due primarily to grazing and spraying.

Ceanothus hearstiorum (Hearst's ceanothus)

CA - Rare FED - Candidate 2

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

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

necessary to preserve this species. The trend for Hearst's ceanothus has been stable to declining.

Ceanothus maritimus (maritime ceanothus)

CA - Rare FED - Candidate 2

Maritime ceanothus is a prostrate, mat-forming evergreen shrub in the buckthorn family (Rhamnaceae). It occurs in coastal prairie and chaparral on coastal bluffs near Arroyo de la Cruz, San Luis Obispo County. Associated species include the State-listed rare Hearst's ceanothus (Ceanothus hearstiorum) and the endangered Hearst's manzanita (Arctostaphylos hookeri ssp. hearstiorum) as well as several unlisted, but equally rare species.

There are fewer than seven known occurrences of the maritime ceanothus, all growing on the Hearst Ranch. Rangeland conversion by the Hearst Ranch may impact maritime ceanothus and other rare plants in the Arroyo de la Cruz area. Frequent fire and brush clearing activities are potential threats. The role of fire in the ecology of maritime ceanothus is not known. The cooperation of the management of the Hearst Ranch is needed in order to preserve this species. The trend for this species has been stable to declining.

Ceanothus masonii (Mason's ceanothus)

CA - Rare FED - Candidate 2

Mason's ceanothus, a member of the buckthorn family (Rhamnaceae), is an erect, spreading, evergreen shrub in manzanita chaparral or mixed serpentine chaparral. The entire global distribution of Mason's ceanothus is restricted to one confirmed occurrence from Bolinas Ridge in Marin County.

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

Ceanothus roderickii (Pine Hill ceanothus)

CA - Rare FED - Candidate 1

Pine Hill ceanothus is a prostrate evergreen shrub in the buckthorn family (Rhamnaceae). This ceanothus occurs on red clay soils of the Pine Hill gabbro formation within openings in chaparral and oak woodlands in the Sierra foothills of El Dorado County. It is commonly associated with four other State-listed plants: Calystegia stebbinsii, Fremontodendron decumbens, Galium californicum ssp. sierrae, and Senecio layneae . Fewer than ten occurrences are known with some

habitat protected on the Pine Hill Ecological Reserve as part of an ensemble of rare species.

Unfortunately, the majority of Pine Hill ceanothus occurrences are on private land near Highway 50 in areas undergoing rapid residential development. A habitat conservation plan is needed for Pine Hill ceanothus and the other rare plants that occur on Pine Hill gabbro soils. DFG staff is working with the El Dorado County Planning Department to identify high priority areas for protection and to develop means to secure them through the land use planning process. DFG has identified a potential preserve area near Salmon Falls along the South Fork of the American River. In 1990 the Wildlife Conservation Board approved acquisition of 40 acres with Proposition 70 funds to begin the Ecological Reserve. An agreement is being developed between DFG, BLM, and Bureau of Reclamation to work cooperatively to acquire and manage land to protect rare plant habitat along the South Fork of the American River. The overall trend for Pine Hill ceanothus has been one of decline.

Centrostegia leptoceras (= Dodecahema leptoceras)
(slender-horned spineflower)

CA - Endangered FED - Endangered

The slender-horned spineflower is a delicate prostrate annual, with red spreading stems, oblong basal leaves, and tiny reddish flowers inside a ring of six spined teeth. This member of the buckwheat family (Polygonaceae) is restricted to sandy, flood-deposited river terraces and washes in Los Angeles, Riverside, and San Bernardino counties. The alluvial sage scrub that supports the spineflower is an endangered community. More than two-thirds of the historic spineflower occurrences are extirpated or have not been seen for many years. In 1989, a new population center was discovered on the Cleveland National Forest, while thorough field surveys on the Angeles National Forest failed to locate any plants.

In 1987, both California and the Federal Government designated this species as endangered. The extant populations are small and seriously threatened by urbanization, flood control activities, competition from non-native plants, agricultural conversion, off-road vehicles and illegal trash dumping. Most occurrences are on private land and are unprotected. In 1989, a portion of the Temescal Canyon occurrence in Riverside County was vandalized by illegal grading activities. The Tujunga Wash occurrence in Los Angeles County is threatened by a proposed golf course. The large population center on the upper Santa Ana River Wash near Redlands is seriously threatened by gravel mining, off-road vehicles and the Seven Oaks Flood Control Dam. The Army Corps of Engineers is purchasing more than 800 acres of alluvial sage scrub habitat as compensation for losses due to the dam but this may not be the appropriate type of alluvial scrub habitat to support the spineflower. The best prospects for spineflower conservation in the Santa Ana River Wash is establishment of an interagency Preserve from Norton Air Force Base to the Seven Oaks Dam. Bureau of Land Management has taken initial steps to fence a portion of this area to protect the spineflower. San Bernardino National Forest has partially

fenced the Bautista Canyon occurrence to protect it from impacts by vehicles. In 1990, the Cleveland N.F. completed an interim management guide for this species. In addition, the Boy Scouts of America fenced some spineflower habitat under the direction of the National Forest. Coordinated habitat conservation planning is critically needed for this species. High priority should be given to preserving the remaining habitat of slender-horned spineflower, especially at Big Tujunga Wash, Santa Ana River Wash near Redlands, San Jacinto River near Hemet, and on National Forest lands. Research on species biology and ecology are needed to develop management plans. The trend for slender-horned spineflower has been one of continued decline, though recently discovered populations present new opportunities for protective action.

Cercocarpus traskiae (Santa Catalina Island mountain mahogany)

CA - Endangered FED - Candidate 1

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

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

Chlorogalum purpureum var. reductum (Camatta Canyon amole)

CA - Rare FED - Candidate 1

Camatta Canyon amole is a perennial herb from a bulb in the lily family (Liliaceae). It has long linear leaves in a basal cluster and an elongate open branched flowering stem. The flowers are deep blue-purple. The entire global distribution of this plant is restricted to a single, vulnerable occurrence in upper Camatta Canyon, San Luis Obispo County, on the Los Padres National Forest. The habitat of Camatta Canyon amole is open areas with very low vegetation

cover in hard-packed gravelly red serpentine soil within a blue oak woodland community.

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

Chorizanthe howellii (Howell's spineflower)

CA - Threatened FED - Candidate 1

Howell's spineflower is a small annual that branches from the base, is covered with hairs, has mostly basal oblong leaves, and clusters of small flowers enclosed by spines. This member of the buckwheat family (Polygonaceae) is known only from the vicinity of MacKerricher State Park in the Ten Mile Dunes north of Fort Bragg, Mendocino County. It is generally restricted to northern dune scrub habitat and occurs with the State-listed endangered Menzies' wallflower (Erysimum menziesii) and the rare Northcoast phacelia (Phacelia insularis var. continentis).

Three of the four occurrences are threatened or damaged by trampling from people and horses, road maintenance activities, and competition from non-native plants such as iceplant. These threats could easily extirpate some occurrences. State Park personnel are aware of the plant on State property and are planning protective measures including fencing some areas and controlling competing non-native plants. The trend for Howell's spineflower has generally been declining.

Chorizanthe orcuttiana (Orcutt's spineflower)

CA - Endangered FED - Candidate 1

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

This species was considered extirpated throughout its range for over ten years until it was seen in 1979 at Torrey Pines State Reserve. This population was last seen in 1987 and no new occurrences have been found. Much of the original habitat for Orcutt's spineflower has been

converted to residential use with the rapid urban growth of coastal San Diego County. A careful survey of all historic sites is needed to determine if suitable habitat remains. No management plans currently exist for this species. The trend for this species has been one of severe decline due to destruction of habitat.

Chorizanthe valida (Sonoma spineflower)

CA - Endangered FED - Candidate 1

Sonoma spineflower is a robust, annual herb in the buckwheat family (Polygonaceae). It has broad, lance-shaped basal leaves, and bears headlike clusters of spine-tipped bracts and pinkish flowers that bloom from June through August. The worldwide distribution of Sonoma spineflower is limited to one site in Marin County, just south of Abbott's Lagoon, on a working cattle ranch within Point Reyes National Seashore. In its entirety, this species occupies less than 2.5 acres of land within an enclosed pasture of about 360 acres.

Until its rediscovery in 1980, this extremely rare species was thought to be extinct. Damage to the spineflower has occurred from trampling by hikers visiting Abbott's Lagoon. Trampling by cattle, which are allowed on the site by permit from the National Park Service, causes some damage to the plants, but effects of grazing on the population are not known. The California Native Plant Society monitors this population annually. Studies have been initiated to determine the effects of grazing on the plants. Field observations suggest that this species relies on insect pollinators for reproductive success. Although the seed dispersal mechanism is not known, the seeds are light enough to be dispersed short distances by wind, and have spines that could easily become attached to the fur of small animals. Sonoma spineflower occurs exclusively in the coastal prairie plant community, which exists at the species' only known occurrence within a larger surrounding area of northern coastal scrub. Because Sonoma spineflower consists of only one extant population, it is extremely susceptible to random or chance events that could eliminate the population, thereby causing extinction of the species. The trend for this species is one of decline as a result of habitat loss.

Cirsium ciliolatum (Ashland thistle)

CA - Endangered

Ashland thistle, a perennial member of the sunflower family (Asteraceae), produces a tall stem from a horizontal rhizome, has short lateral branches and yellowish-white flower heads. The California populations are known from the vicinity of Montague (Siskiyou County), with several additional sites in southern Oregon. This thistle often grows in dry plains and open grassland habitats, where the soils are thin with rocky outcrops present.

Of the approximately half dozen occurrences of Ashland thistle reported from California, only one has been visited (and seen) in recent years. All known occurrences are on private land in

agricultural areas devoted to grazing and grain production. Historical occurrences need to be relocated and suitable habitat should be searched for new populations. Management plans are needed to provide permanent protection for surviving California populations. There is some question as to the validity of this taxon. The new Jepson Manual (expected to be completed in 1992) will present the most recent taxonomy for this plant. The overall trend for Ashland thistle is stable, but at unsafe levels.

Cirsium fontinale var. fontinale (fountain thistle)

CA - Endangered FED - Candidate 1

Fountain thistle is an herbaceous perennial with several stout, erect, reddish stems and white to pinkish flowering heads. This member of the sunflower family (Asteraceae) is a plant of extremely restricted range occurring in serpentine seeps of the Crystal Springs region, San Mateo County. It can occur with other rare plants such as the fragrant fritillary (Fritillaria liliacea) and the San Francisco wallflower (Erysimum franciscanum).

Construction of Interstate 280 contributed to the decline of fountain thistle by destroying habitat and altering the drainage patterns feeding the seeps in the serpentine grassland plant community. A fire in 1988 burned some of the populations, but initial reports indicate that they sustained little if any permanent damage. All existing occurrences are on public land controlled by CalTrans, San Mateo County, and the San Francisco Water District. There are no management plans or protection programs for any of the populations of fountain thistle. Coordinated activities are needed by the land holding agencies to prevent further destruction of the habitat. Under a Memorandum of Understanding with UC Davis, research on germination requirements and taxonomy will be conducted. The overall trend for fountain thistle has been one of decline, with a sharp decline when Highway 280 was built and then a slower rate following that initial disturbance. The recent trend has been stable.

Cirsium loncholepis (La Graciosa thistle)

CA - Threatened FED - Candidate 1

La Graciosa thistle is a bushy biennial or short-lived perennial herb with large smooth to slightly hairy leaves and clustered heads of white flowers at the top of the plant. This member of the sunflower family (Asteraceae) is known from coastal San Luis Obispo and Santa Barbara counties from Pismo Beach south to the vicinity of Los Alamos. Its habitat is freshwater and brackish marshes, especially among dunes, and riverbottom lands with high levels of subsurface moisture. Seven sites are now known (1990) for this species, with the largest, consisting of several thousand plants, at the mouth of the Santa Maria River. Other populations are small, generally with less than 50 individuals.
Several have declined significantly in size in recent years.

About one-third of the historic occurrences of La Graciosa thistle have been extirpated as a result of cattle grazing, agricultural land conversions, and highway construction. Continuing threats include impacts by off-road vehicle use in the dunes, proposed coastal development projects and groundwater pumping. The latter could lower the water table within coastal dune areas, resulting in loss of wetland habitat required by La Graciosa thistle. All populations of this species occur on privately owned land. At present there are no management or protection plans for any sites. In 1989 The Nature Conservancy acquired title to a dune area south of Oso Flaco Lake, formerly owned by Mobil Oil, that supports a small population of this species. A commercial abalone operation now being built at the mouth of the Santa Maria River will destroy some plants of the largest population during pipeline construction. A thorough survey in 1990 of all known, suspected, and previously reported sites, found that the species has been extirpated at two sites where it was found within recent years. In 1990 a management strategy for La Graciosa thistle was developed by DFG. The overall trend for this species is one of decline.

Cirsium rhothophilum (Surf thistle)

CA - Threatened FED - Candidate 1

Surf thistle is a bushy, white-woolly, short-lived perennial in the sunflower family (Asteraceae). It is characterized by large rosettes of spiny, white-woolly, deeply lobed and undulating leaves, and whitish flowers which occur in dense heads. 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. Surf thistle usually grows for several years before flowering, fruiting, and dying. The maximum flowering period is between May and July. Surf thistle is endemic to the dunes of the central California coast, from the Nipomo Dunes of southern San Luis Obispo County to Point Conception in Santa Barbara County. It grows in coastal foredunes, often on the slopes of transverse ridges in areas of active sand accumulation. At the southern extreme of its range, it is found in sand at the bases of cliffs.

Less than 20 occurrences of Surf thistle exist at present. It is estimated that approximately one-third of the total Surf thistle population has been eliminated due to destruction of its fragile foredune habitat. Although off-road vehicles are presently excluded from Surf thistle occurrences, they have contributed to the decline of this species in the past. Pedestrian traffic still poses a threat to this species. With continuing disturbances from human activities, the invasion of Surf thistle's habitat by non-native invasive plants such as European beach grass and ice plant will continue, increasing the likelihood of this species being excluded from its existing habitat. The largest populations of this species occur on Vandenberg Air Force Base in Santa Barbara County. Vandenberg has entered into an agreement with The Nature Conservancy to protect rare plant species, including Surf thistle, that occur on the Base. In 1990 a management strategy for Surf thistle was developed by DFG. The overall trend of this species has been one of decline.

Clarkia franciscana (Presidio clarkia)

CA - Endangered FED - Candidate 1

Presidio clarkia is a slender, branched annual herb with narrow leaves and lavender-pink flowers. This member of the evening-primrose family (Onagraceae) is native to three locations at the San Francisco Presidio. Additional populations have been found in the Oakland Hills in Alameda County. One of these is located behind the headquarters of the East Bay Regional Parks District. This population was thought to have been introduced, however, recent information, including the discovery in 1988 of another population on private land in the Oakland Hills, suggests that it is a natural occurrence. The natural habitat of Presidio clarkia consists of open slopes with serpentine soils in coastal prairie grassland.

Only two of the Presidio populations are still extant and both have been damaged by maintenance activities. A road improvement project in 1985 destroyed some plants and a portion of the habitat, and early season mowing of the grassland for fire prevention has interfered with seed set. Ornamental and weedy plants encroaching on the habitat are an additional threat. A 1987 MOU between the Army, USFWS, NPS, and DFG is a first step toward management and recovery of the sites at the Presidio. The City of Oakland has provided protection to the private site by requiring a biological monitor to be present during construction occuring in 1989 in the vicinity of the clarkia population. East Bay Regional Park District has entered into an MOU with DFG to examine the genetic variation of the Presidio and Oakland populations. The overall trend for Presidio clarkia is stable, but at numbers so low that extinction remains a continuing threat.

Clarkia imbricata (Vine Hill clarkia)

CA - Endangered FED - Candidate 1

Vine Hill clarkia, a member of the evening primrose family (Onagraceae), is a late-blooming, slender, annual herb with pinkish flowers. This species grows in disturbed habitats with sandy, Blucher loam soils. It is known from only two natural occurrences in the Vine Hill area of Sonoma County. One of these is extirpated, leaving only one native population. A third occurrence is a transplanted population on the California Native Plant Society's Vine Hill Preserve.

The native population of Vine Hill clarkia is privately owned; TNC has secured voluntary protection agreements for this site with both owners. Late-season mowing of weeds may have accidently impacted some of the population. Efforts have been made to time future mowing more appropriately. Because there were only two native occurrences of Vine Hill clarkia and one has been extirpated in recent years, the trend for this species is one of decline.

Clarkia lingulata (Merced clarkia)

CA - Endangered FED - Candidate 1

Merced clarkia is a late-blooming, slender, annual herb in the evening primrose family (Onagraceae) with bright pink flowers. The worldwide distribution of Merced clarkia consists of only two populations (about two miles apart) along Highway 140 in the Merced River Canyon, Mariposa County.

Merced clarkia exists on land administered by the Sierra National Forest, but the roadside habitat is maintained by CalTrans. The combination of herbicide spraying and poor growing seasons have reduced the populations to low levels. In order to protect this species from further herbicide spraying, "No Spray" road markers have been installed. In response to a proposal by CalTrans to make improvements to Route 140, DFG has recommended that temporary fencing be installed, that zones be designated for equipment storage and parking, and that a biologist be on site during construction to protect Merced clarkia. One population was reduced by herbicide spraying in 1984. In 1989 the USFS developed a species management guide for Merced clarkia. The plan recommends protecting essential habitat for the species, establishing an interagency MOU, and conducting annual monitoring of populations. A draft interagency MOU was developed in 1990 to protect several sensitive species in the Merced River Canyon, including Merced clarkia. A fire swept through one of the two populations in August 1990, and the Sierra N.F. plans to monitor this population to determine its response to fire. The overall trend for Merced clarkia has been one of decline.

Clarkia speciosa ssp. immaculata (Pismo clarkia)

CA - Rare FED - Candidate 1

Pismo clarkia is an erect annual herb in the evening primrose family (Onagraceae). Each flower has four lavender, fan-shaped petals that appear from May to June. This species has been found growing on dry, sandy, often disturbed soils, along the margins of chaparral in open grassy sites. This plant is only known from the Pismo Beach area in San Luis Obispo County where there are less than five extant occurrences.

Several historic occurrences of Pismo clarkia have been destroyed by residential development in the Pismo Beach area. This clarkia remains threatened by urbanization, sand mining, and roadside maintenance activities near several populations. All of the habitat is privately owned. TNC has secured voluntary landowner protection for two occurrences and has contacted owners of several other occurrences. The status of this plant is in need of review and protective strategies need to be developed. The overall trend for Pismo clarkia has been one of decline.

Clarkia springvillensis (Springville clarkia)

CA - Endangered FED - Candidate 1

Springville clarkia is an annual herb with simple or branched stems, narrow leaves and lavender-pink flowers containing dark purplish basal spots. It is in the evening-primrose family (Onagraceae). This wildflower is restricted to grasslands near the Tule River in the Sierra Nevada foothills of Tulare County. The major portion of its range lies within a six-mile radius. One other outlying population is found near Three Rivers, also in Tulare County. Most occurrences are on private land with a few located in Sequoia National Forest.

This clarkia is threatened by residential development, overgrazing, roadside herbicide spraying and early-season mowing of annual grasses for fire protection. It is a late-blooming species that may not develop mature seed before the grasslands are mowed. DFG owns and protects a four and one-half acre site, the Springville Clarkia Ecological Reserve, encompassing one of the best populations. This population has been monitored since 1987 to establish baseline population data. In 1990 Springville clarkia experienced a dramatic decline in population size at this site, possibly due to high temperatures during the flowering period coupled with severe drought. This site provides education opportunities for grade-school science students who attend a nearby camp. The overall trend for this species is declining.

Cordylanthus maritimus ssp. maritimus (salt marsh bird's-beak)

CA- Endangered FED - Endangered

Salt marsh bird's-beak is a diffusely-branched annual herb with grayish-green, hairy leaves. This member of the figwort family (Scrophulariaceae) has flowers which are arranged in spikes with two-lipped petals: the upper beak-like with a yellowish tip, and the lower a purplish pouch. It grows in higher reaches of coastal salt marshes, where it receives inundation only at the higher tides.

This bird's-beak was widespread in coastal marshes from Morro Bay, San Luis Obispo County to San Diego County and northern Baja California. Presently it is restricted to scattered sites in fewer than ten remnant salt marshes with half of the original occurrences now extirpated. Currently, in California, it is found at Tijuana Marsh and Sweetwater Marsh (San Diego County), Upper Newport Bay and possibly Anaheim Bay (Orange County), Ormond Beach and Mugu Lagoon (Ventura County), Carpinteria Marsh (Santa Barbara County), and Morro Bay (San Luis Obispo County). Salt marsh bird's beak's decline is due to modification of much of its original salt marsh habitat by land filling, dredging for marinas, creation of levees and roads, dumping of dredge spoils, and ORV use. The known occurrences are under control of Federal, State, local government, and private owners. The USFWS Salt Marsh Bird's-Beak Recovery Plan calls for protection of present sites, restoration of historic sites, and continued field monitoring and biological studies. Through an interagency agreement with CalTrans, researchers at San Diego State University conducted a

3-year study which identified factors that contribute to the population dynamics of the bird's beak colonies and presented methods for expanding existing colonies and reintroducing the plant into historic habitat. The overall trend for this plant has been one of decline due to habitat destruction.

Cordylanthus mollis ssp. mollis (soft bird's-beak)

CA - Rare FED - Candidate 1

Soft bird's-beak is a sparingly-branched, herbaceous annual plant having stems covered with soft hairs. It grows in the coastal salt marshes and brackish marshes from northern San Francisco Bay to Suisun Bay in Napa, Solano, and Contra Costa counties.

There are approximately a dozen historic occurrences of soft bird's-beak, but a 1986 survey confirmed that only three are extant. One occurrence is located at Benecia State Recreation Area, where a park management plan is being developed. Another site is on DFG land along the Napa River at Fagan Slough, where it may have been damaged by polluted runoff from a municipal water treatment plant. Another occurrence may be adversely affected by residential development. Little current information is available on the ecology of this species. Studies are needed to determine ecological requirements and factors involved in annual population size fluctuations. The overall trend for this species has been one of decline.

Cordylanthus nidularius (Mount Diablo bird's-beak)

CA - Rare FED - Candidate 1

Mount Diablo bird's-beak, a member of the figwort family (Scrophulariaceae), is a prostrate to ascending, branched mat-forming annual. The interlacing of branches of numerous plants form an unbroken mat over much of the serpentine chaparral habitat in which it grows. The entire global distribution of this unusual bird's-beak is restricted to just one occurrence on the northeast slope of Mount Diablo in Contra Costa County.

The entire habitat of this species occurs on Mount Diablo State Park property. The area was burned in 1977, which may have benefitted this species. A 1988 survey indicated that this occurrence, which is bisected by a fire road, is composed of several hundred plants over a two acre area. Although the site is remote and there are no specific known threats, a man-made fire at the wrong time of year or further road improvements could impact this population. There is currently no active management for this species. Establishing a second population would ensure survival in the event of extirpation of the original occurrence. The trend for Mount Diablo bird's beak is believed to be one of stability.

Cordylanthus palmatus (Ferris' or palmate-bracted bird's-beak)

CA - Endangered FED - Endangered

Ferris' bird's-beak is a pale green-gray annual herb in the figwort family (Scrophulariaceae). The plants have spreading branches from the base, and the leaves and bracts are covered by deposits of salt extruded from special glands. This species is confined to the saline-alkaline soils of the Pescadero and Solano soil series. It is a component of alkali sink scrub vegetation, in relatively undisturbed, seasonally flooded lowland sites of the Central Valley. Historically, it occurred in scattered locations in Fresno and Madera counties in the San Joaquin Valley, north to the Sacramento Valley in Colusa and Yolo counties, and west to the Livermore Valley in Alameda County.

This distribution pattern coincides with regions of California that have been intensively developed for agriculture or have been urbanized. Today only four occurrences remain: one which was recently discovered in Colusa County, a second site near Woodland in Yolo County, a third on the DGF Alkali Sink Ecological Reserve in Fresno County, and the fourth found outside the Central Valley near Livermore in Alameda County. These sites are owned by private individuals, the cities of Woodland and Livermore, DFG, and the USFWS. Woodland has agreed to protect its site and negotiations are underway with the City of Livermore and private landowners to achieve long-term protection for the Livermore site, which is the largest of the four remaining sites. A preliminary management plan prepared for the Livermore site (using USFWS Section 6 grant-in-aid and California Endangered Species Tax Check-off funds) recommends protection of all remaining suitable habitat and restoration of natural hydrology at the site. In 1990 progress was made on using wetland mitigation banking as a means of acquiring and protecting the Livermore site. Also in 1990, researchers from Stanford's Institute for Conservation Biology began an in-depth study of the habitat and reproduction requirements of Ferris' bird's-beak. The overall trend for this species is one of decline.

Cordylanthus rigidus ssp. littoralis (seaside bird's-beak)

CA - Endangered FED - Candidate 1

Seaside bird's-beak is a bushy annual herb in the figwort family (Scrophulariaceae). The branches and leaves are covered with fine hairs and the pale yellow flowers are clustered at the ends of the branches. The habitat of seaside bird's-beak is sandy soils of stabilized dunes covered by closed-cone pine forest or maritime chaparral communities. The plants thrive in areas of recent surface soil disturbance. The historic distribution of this bird's-beak was, until recently, thought to be restricted to northern Monterey County from Carmel to Elkhorn Slough. However, in the early 1980's several collections from Burton Mesa in Santa Barbara County were identified as this subspecies. About 10 sites are known at present on privately owned lands and on Vandenberg Air Force Base. At some of these sites, subspecies littoralis hybridizes with subspecies rigidus, the latter also native to this area.

All but one of the original seven Monterey occurrences have been extirpated or have not been relocated for many years. The remaining site is privately owned and is slated for development. Populations in Santa Barbara County on Burton Mesa are threatened by residential and energy developments, off-road vehicle use and military operations at Vandenberg Air Force Base. However, a 200-acre preserve of Burton Mesa chaparral, established as mitigation for impacts of energy development, protects at least one population. In addition, the County of Santa Barbara in 1989 commissioned a study to evaluate the condition and preservability of remaining Burton Mesa chaparral habitat, with the intention of developing a long-term habitat protection strategy. Since seaside bird's-beak occurs in this community it is likely that additional populations will eventually receive protection as a result of the County's actions. The overall trend for this subspecies has been one of decline.

Cordylanthus tenuis ssp. capillaris (Pennell's bird's-beak)

CA - Rare FED - Candidate 1

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 inflorescences. It is restricted to open sites and clearings in a serpentine chaparral plant community. This bird's-beak is associated with the State-listed rare Baker's manzanita (Arctostaphylos bakeri). Both plants are found a few miles southeast of Occidental at Harrison Grade in Sonoma County.

There are less than five occurrences of Pennell's bird's-beak. All but one are in private ownership. Threats to this species include illegal dumping, off-road vehicle impacts and future residential development. A portion of one occurrence is now protected at the DFG Harrison Grade Ecological Reserve. A management plan was prepared for the Reserve, using California Endangered Species Tax Check-off funds, which addressed the preservation of rare plants. Plants outside of the ecological reserve remain in private hands. The Nature Conservancy recently negotiated a voluntary protection agreement for one private site. Though the overall trend for this taxon has been one of decline, during the past few years the trend has stabilized due to efforts by the State and by nonprofit groups to protect its habitat.

Croton wigginsii (Wiggins' croton)

CA - Rare

Wiggins' croton is a silvery-haired, much-branched perennial shrub in the spurge family (Euphorbiaceae). Male and female flowers are produced on separate plants. This species occurs on the Algodones Dunes in southeast Imperial County, with additional sites in Baja California and Sonora, Mexico. In California, it grows on the more stable sand areas along the west side of the Algodones Dunes system.

Although there are just over a dozen occurrences for Wiggins' croton within the dunes, most of them are large and cover extensive areas.

Portions of the dune habitat have been degraded due to ORV use, and visitor use days will double by the year 2000. A northern portion of the Algodones Dunes has been closed to ORV use by BLM, primarily to protect the endemic dune plants. BLM has prepared an Algodones Dunes habitat management plan which will include monitoring of rare plant populations. Although the overall trend for Wiggins' croton has been stable, the dune habitat is expected to become increasingly degraded with increased visitor use. Long term management planning will be needed to avoid a downward trend.

Cryptantha roosiorum (bristlecone cryptantha)

CA - Rare FED - Candidate 2

Bristlecone cryptantha is a member of the borage family (Boraginaceae) which produces dense cushions of grayish leaves and compact heads of small white flowers. This diminutive perennial plant is most commonly found on the gentle slopes or flats of dolomite or limestone formations, in open sunny sites of the bristlecone pine community. It occurs locally in the Inyo Mountains, Inyo County.

About five occurrences of bristlecone cryptantha are known within a small area of Inyo National Forest. Off-road vehicles and grazing threaten some sites. A trail bisects others, so trampling is also a potential threat. Monitoring was conducted in 1989 by DFG and California Native Plant Society botanists on two occurrences. There is little information available on the population biology or habitat requirements of bristlecone cryptantha. Further studies are needed to determine population trends.

Cupressus abramsiana (Santa Cruz cypress)

CA - Endangered FED - Endangered

Santa Cruz cypress, a member of the cypress family (Cupressaceae), is an erect, densely-branched, compact, coniferous tree, with slender branchlets and cones containing many seeds per scale. It grows on old marine sandstones or granitic soils in chaparral and closed cone pine forest communities. This cypress is restricted to a localized area within the Santa Cruz Mountains near Bonny Doon and Eagle Rock in Santa Cruz County and Butano Ridge in San Mateo County. Its distribution suggests that its is a relict species, representing a type of vegetation widespread during glacial times, but now confined to scattered sites.

There are only five small populations of Santa Cruz cypress. Portions of each grove have been destroyed or are threatened by residential development, vandalism, agricultural conversion, logging and/or alteration of the natural frequency of fires that maintain the cypress groves. In 1989 the Wildlife Conservation Board acquired more than 500 acres for DFG's Bonnie Doon Ecological Reserve. All other stands, except for a portion of one occurrence at Portola State Park, are on private land. One of these occurrences is receiving protection by the Sempervirens Fund. Acquisition of other significant occurrences will

be necessary to protect this species. DFG has entered into an MOU with UC Berkeley to assess the amounts and patterns of genetic diversity and to establish a comprehensive seed bank for this species. Further studies are needed to better understand the ecological requirements of Santa Cruz cypress, so that effective management plans can be developed. The overall trend for this species is one of decline.

Dedeckera eurekensis (July gold)

CA - Rare

Dedeckera eurekensis, a species described in 1976, is a rounded, densely branched low shrub in the buckwheat family (Polygonaceae). The plants are covered with small olive-green leaves and, when in bloom, masses of tiny golden flowers. It is a shrub of rocky ridges, cliffs, talus slopes, and washes in mixed desert shrub and shadscale scrub plant communities. About ten small disjunct populations are known at present. The plants seem to be restricted to dolomite and limestone formations in the Last Chance, White, Inyo, and Panamint mountains of Inyo and Mono counties on federal land managed by the U.S. Forest Service and the BLM.

Potential threats include mining, off-road vehicles, and small hydro-electric projects. There is no management plan for July gold and all sites remain unprotected. The ecology of the species remains largely unknown, however, on-going studies of its reproductive biology indicate that although most embryos are fertilized, few healthy seeds are produced, possibly as a result of genetic abnormalities. The reproductive capacity of this shrub is further reduced as a result of low seed viability, low seed germination rates and post-germination seedling death. Some researchers believe that these factors may explain the relict nature of July gold and may eventually cause its extinction. However, at present, the overall trend for this species is stable.

Delphinium bakeri (Baker's larkspur)

CA - Rare FED - Candidate 1

Baker's larkspur, a member of the buttercup family (Ranunculaceae), is an erect, leafy-stemmed perennial with showy blue and white flowers. Currently, only one population of Baker's larkspur is known to exist; this population occurs on a grassy bank along the edge of an old roadcut in northwestern Marin County.

Baker's larkspur, which was once known from several populations in Marin and Sonoma counties, has become endangered by conversion of its habitat to cultivated farmland, extensive grazing, and roadside maintenance activities. The single remaining occurrence is extremely small, privately owned, and unprotected. It is extremely vulnerable to chance catastrophic events. CNPS and Marin County Public Works are working together to time roadside clearing so that it does not damage this remaining population. Although Baker's delphinium has always

been rare, habitat losses have nearly caused its extinction. It is appropriate to change the State designation from rare to endangered. Research is needed to determine the habitat requirements, reproductive biology, and management needs of Baker's larkspur. The recent trend for this species is one of decline.

Delphinium hesperium ssp. cuyamacae (Cuyamaca larkspur)

CA - Rare FED - Candidate 2

Cuyamaca larkspur is a herbaceous perennial in the buttercup family (Ranunculaceae) with erect leafy stems which produce dense blooms of blue-violet flowers. This larkspur grows in low, moist areas usually within grassy meadows bordering Cuyamaca Lake and nearby areas in San Diego County.

Although more than twenty occurrences of Cuyamaca larkspur are known, several have not been seen for many years and are believed to be extirpated. Most extant occurrences are located within the drainages that flow into Cuyamaca Lake, with several found at Cuyamaca Ranch State Park and on land managed by the Cuyamaca Lake Recreation and Park District. Other occurrences are situated on private land and remain unprotected. Threats to this larkspur come from lakeside residential development and increased use and development of recreational facilities. Periodic changes in reservoir levels impact the local hydrology and change the amount of suitable habitat available to Cuyamaca larkspur. The California Department of Parks and Recreation has devised a management plan for the rare plants at Cuyamaca Rancho State Park, and a portion of the area supporting Cuyamaca larkspur has been designated a Natural Preserve. DFG has been working with local landowners to encourage protection of rare plants on their property. The San Diego State University Foundation has entered into an MOU with DFG to examine the population dynamics and habitat requirements of Cuyamaca larkspur. Although this plant is extremely rare and has declined as a result of habitat loss, these efforts may help to protect it from further decline. The recent trend for this species is stable to declining.

Delphinium kinkiense (San Clemente Island larkspur)

CA - Endangered FED - Endangered

San Clemente Island larkspur is a perennial herb in the buttercup family (Ranunculaceae). The plants have divided basal leaves and elongate stalks of pale violet flowers. This species is known from about 10 sites in grasslands on the eastern slopes of San Clemente Island in Los Angeles County.

All of the populations of San Clemente Island larkspur were damaged by feral animals. Intense grazing by introduced goats, the accompanying soil loss and the competition from introduced weedy annual plants resulted in serious threats to this larkspur and its associated species. The U.S. Navy, which has jurisdiction over the island, has an on-going program to remove feral goats and pigs in an effort to

restore the native vegetation. In the summer of 1989 a new phase of this eradication effort was initiated. Two larkspur populations which have been fenced have grown to several hundred plants each. The last complete survey of the Island's rare plants was done from 1985 to 1987. The Navy's biologist for the area has recommended a follow-up survey to gauge the effects of feral animal removal. Over the last three years there has been a general improvement in the condition of the Island's native vegetation, in spite of drought conditions. San Clemente Island larkspur populations have increased in size as a result of improved conditions and the overall trend for this species can now be considered as stable to increasing.

Delphinium luteum (yellow larkspur)

CA - Rare FED - Candidate 1

Yellow larkspur is a distinctive yellow-flowered herbaceous perennial plant of steep, rocky outcrops in the coastal sage scrub plant community, often in areas subject to active rock sliding. The restricted distribution of this buttercup family member (Ranunculaceae) is centered near the town of Bodega Bay, Sonoma County, where fewer than a dozen historic occurrences are recorded.

Yellow larkspur has been declining in recent years due to a number of threats including cattle grazing and residential development. It is likely that there are only two extant occurrences remaining of yellow larkspur. Both occurrences are on private lands without protection or management plans, although one is near a quarry and is fenced for safety reasons. A few other questionable sites exist containing only hybrid plants. Due to the severe decline of this species, a change in status from rare to endangered may be appropriate.

Dichanthelium lanuginosum var. thermale (Geysers panicum)

CA - Endangered FED - Candidate 2

Geysers panicum, a member of the grass family (Poaceae), is an unusual tufted, velvet-haired perennial grass that has been found only in area of The Geysers in Sonoma County. It is restricted to the hydrothermally altered soil near surface active geothermal sites and is adapted to the high acidity and high soil temperatures at these sites. The name Panicum thermale is a synonym.

Geysers panicum is currently known from fewer than 10 occurrences. Extensive development for geothermal power altered the original sites of this species before its historic abundance was known. Geothermal developments by the Pacific Gas and Electric Co. and Union Oil Co. have caused extensive alteration of the localized habitat, increasing the impacts to this grass. Physical disturbance of the habitat from earth-moving operations, landslides, and maintenance operations are continuing threats. DFG and the California Energy Commission have been working with the private companies to avoid disturbance within the Little Geysers Natural Area which supports a large population of this plant. The initial phase of a monitoring study was recently

completed by PG&E under an MOU with DFG; recommendations for long-term monitoring were made. The overall trend for Geysers panicum is one of decline as a result of continued impacts to its habitat.

Dithyrea maritima (beach spectacle pod)

CA - Threatened FED - Candidate 2

Beach spectacle pod is a low growing, whitish-flowered perennial herb in the mustard family (Brassicaceae). It is found in swales between small transverse foredunes within sight of the surf. It is usually found at the bases of these fragile dunes where the sand is relatively unstable.

Beach spectacle pod once ranged on mainland California from Hermosa Beach in Los Angeles County north through Santa Barbara County to the Morro Bay sandspit in San Luis Obispo County. It was reported from San Miguel Island in 1930, and healthy populations were recently seen on San Nicholas Island. By the early 1930's, the Los Angeles County populations had been extirpated. Populations throughout the rest of the original range exist, but have been heavily impacted and greatly reduced. Despite recent searches, only about half of the historic occurrences have been seen in the last decade. Much of the decline of this species can be attributed to habitat loss associated with damage by off-road vehicles, foot traffic, and activities associated with oil drilling. Vandenberg Air Force Base has entered into an agreement with The Nature Conservancy to protect rare plant species, including beach spectacle pod, that occur on the base. In 1990 a management strategy for this species was developed by DFG. The overall trend of this species has been one of decline due to habitat loss and destruction.

Downingia concolor var. brevior (Cuyamaca Lake downingia)

CA - Endangered FED - Candidate 1

Cuyamaca Lake downingia, a member of the bellflower family (Campanulaceae), is a small, annual herb with blue and white flowers tinged with purple spots. It grows in the vernally moist soils in the vicinity of Cuyamaca Lake in San Diego County.

Since Cuyamaca Lake downingia is dependent on seasonal rainfall and standing water levels, the numbers and locations of the plants vary from year to year. Suitable habitat has been inundated by high reservoir levels during some years, reducing the size of several populations. Development plans for lakeside building and recreational facilities may eliminate additional habitat. A few occurrences are protected within Cuyamaca Rancho State Park. Other sites are on land managed by the Cuyamaca Lake Recreation and Parks District or are under private ownership. DFG is preparing an MOU with the California Department of Parks and Recreation to conduct research on this species, and a portion of its habitat within Cuyamaca Rancho State Park has been designated a Natural Preserve. Dr. Ellen Bauder of San Diego State University is studying the distribution and abundance of

this species. Although the population sizes fluctuate from year to year, the overall trend for this species has been one of decline.

Dudleya brevifolia (short-leaved dudleya)

CA - Endangered FED - Candidate 1

Short-leaved dudleya grows as a small, succulent perennial plant from a corm, with a rosette of leaves. This member of the stonecrop family (Crassulaceae) produces short stalks of white flowers with red or purple markings. This dudleya has never been widespread and remains restricted to open sites in the chaparral communities of western San Diego County.

The short-leaved dudleya is primarily located on private land where habitat destruction by residential development and off-road vehicle recreation threaten several populations. Four sites, or about 50% of the total range, have been destroyed in the last four years. Small populations are known from Crest Canyon Preserve and Torrey Pine State Preserve, but recreational use of the habitat has damaged both sites. The largest populations occurring on Carmel Mountain are in areas being proposed for development. There are no protection or management plans for this species. The trend for this species has been one of rapid decline which may lead to its extinction without immediate protection efforts.

Dudleya cymosa ssp. marcescens (Santa Monica Mountains dudleya)

CA - Rare FED - Candidate 2

Santa Monica Mountains dudleya is a succulent perennial with a basal rosette of leaves in the stonecrop family (Crassulaceae). Its flowers are bright yellow, often marked with red. It grows in rocky volcanic cliffs of the Santa Monica Mountains in Little Sycamore Canyon, Ventura County and above Seminole Hot Springs, Los Angeles County.

This dudleya has less than ten occurrences and has always been restricted by its habitat requirements. Very little ecological or reproductive information is known about this plant. Ownership is divided between the National Park Service, the Department of Parks and Recreation, and private owners. The sheer cliff habitat seems likely to remain undisturbed and therefore there is little immediate threat. The overall trend for Santa Monica Mountains dudleya has been stable.

Dudleya nesiotica (Santa Cruz Island dudleya)

CA - Rare FED - Candidate 2

Santa Cruz Island dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with a basal rosette of leaves, and a stalked inflorescence of white flowers with erect petals. It grows in about three populations on sea bluffs and coastal terraces on the west end of Santa Cruz Island, Santa Barbara County.

The effects of grazing over many years by introduced sheep severely damaged many of the native plant communities on Santa Cruz Island and may have affected Santa Cruz Island dudleya. The native vegetation has begun to recover since the removal of nearly all of the sheep by The Nature Conservancy, which, since 1988, has managed most of the island. However, in 1989 a researcher noted pig damage to Santa Cruz Island dudleya sites for the first time after nearly 20 years of continuous observations. Feral pig numbers on the Island have skyrocketed since the sheep removal effort was completed. There appears to be an additional potential threat to dudleya sites from increased vehicle use at the west end of the Island. Increased future monitoring has been recommended to track the impacts of these potential threats. A change in status from rare to threatened may be appropriate for Santa Cruz Island dudleya. The overall status for this species is stable to declining.

Dudleya stolonifera (Laguna Beach dudleya)

CA - Threatened FED - Candidate 1

Laguna Beach dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with basal leaves and a short inflorescence of yellow-green flowers. The entire global distribution is restricted to very steep, north-facing cliffs in canyons near Laguna Beach, Orange County.

All five occurrences are privately owned and several are under threat of residential and commercial development of the habitat, which prompted the Fish and Game Commission to list the plant as threatened in 1987. Since Laguna Beach dudleya grows on steep terrain that is generally unsuitable for development, conservation easements may be an effective means to protect its habitat. The Nature Conservancy, through its Register of Natural Areas has reached agreements with several private landowners to voluntarily protect this species. Active management is needed to protect the dudleya from encroachment by non-native plants used to landscape the steep cliffs. The overall trend for Laguna Beach dudleya has been of continuing decline.

Dudleya traskiae (Santa Barbara Island dudleya)

CA - Endangered FED - Endangered

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. This dudleya is endemic to Santa Barbara Island, the smallest of California's Channel Islands. This species is primarily restricted to steep, rocky slopes and outcrops within canyons. It is found in the coastal bluff scrub plant community. Santa Barbara Island dudleya is now known from eleven populations.

Grazing by introduced herbivores, especially rabbits, and other land use practices reduced the numbers of Santa Barbara Island dudleya to such an extent that by the early 1970's it was presumed extinct. The

National Park Service, which now manages the Island, initiated a rabbit control program that eliminated the animals by 1981. Recent monitoring indicates that rabbit removal has been followed by increases in numbers of this species and improvement in the general condition of the Island's vegetation. A study completed in 1989 (partially funded by USFWS Section 6 grant-in-aid and California Endangered Species Tax Check-off funds) determined that the total population remained more or less stable for the years 1985 to 1987. However, the total number of plants is low and reproduction is limited by seed availability, seed dispersal, herbivory and seedling death from drought. Transplant experiments indicate that Santa Barbara Island dudleya could survive in sites outside of its present distribution. The overall trend for this species appears to be stable, but numbers are low enough that extirpation of some populations is a continuing threat.

Eriastrum densifolium ssp. sanctorum
(Santa Ana River woolly-star)

CA - Endangered FED - Endangered

Santa Ana River woolly-star is a much-branched, erect perennial herb of the phlox family (Polemoniaceae) occurring in sandy soils on river floodplains or terraced alluvial deposits of the Santa Ana River drainage. Historically it was known to extend along 60 river miles in Orange and San Bernardino counties, but now occupies only two major locations along about 18 miles of river in San Bernardino County.

Many activities threaten the woolly-star, including flood control work, construction of groundwater recharge facilities, sand and gravel mining, grazing, farming, off-road vehicle recreation, and development. The status of this plant continues to decline, prompting the U.S. Fish and Wildlife Service and the Fish and Game Commission to classify it as endangered in 1987. Ownership is mostly private with some habitat under public ownership (Bureau of Land Management). Surveys in 1989 on the San Bernardino National Forest failed to located the plant on Forest lands. A habitat conservation program for Santa Ana River woolly-star is urgently needed to ensure coordination between the many agencies having juridiction over land use decisions. DFG has negotiated an MOU with CalTrans to protect a population along a highway right-of-way near San Bernardino. Efforts to propagate and transplant woolly-star individuals in conjunction with sand and gravel mining and highway construction mitigations have achieved limited success, but these activities divert attention from protection of alluvial sage scrub habitat, which should be the focus of woolly-star management. The Army Corps of Engineers is purchasing more than 800 acres of alluvial scrub habitat along the upper Santa Ana River Wash as compensation for the Seven Oaks flood control dam. These acquisitions should be coordinated with BLM and local agency activities to protect a continuous strip of habitat along the wash. The overall trend for Santa Ana River woolly-star has been one of continuing decline.

Eriastrum tracyi (Tracy's eriastrum)

CA - Rare FED - Candidate 2

Tracy's eriastrum is a slender brittle annual in the phlox family (Polemoniaceae). It grows to 1-2 dm high and produces light blue to white flowers in the spring. Tracy's eriastrum occurs in open dry gravelly flats within the closed-cone pine forest, chaparral, and serpentine scrub plant communities. The number of viable occurrences is less than twenty. Its range includes Trinity, Tehama, Glenn, Lake, Colusa, and Santa Clara counties.

A taxonomic revision in progress indicates that this species should be included in the species Eriastrum brandegeae, an equally rare plant. Extant occurrences are being degraded by off-road vehicle activity, cattle grazing, and recreational use. Up-to-date information is lacking for several occurrences, and field surveys are needed. Site ownership is both private and public (BLM and USFS). There are no active management programs or protection plans for Tracy's eriastrum by Federal agencies. Livestock grazing and ORV activity should be eliminated from known occurrences. More studies are needed to evaluate the population trends for Tracy's eriastrum.

Eriodictyon altissimum (Indian Knob mountain balm)

CA - Endangered FED - Candidate 1

Indian Knob mountain balm of the waterleaf family (Hydrophyllaceae) grows into a tall evergreen shrub, with dark green, sticky leaves, and clusters of tubular pale lavender flowers. This shrub is restricted to a limited area of the coastal region of San Luis Obispo County. It grows on shallow, sandy soils derived from siliceous sandstone in chamise chaparral, mixed chaparral and coastal sage scrub. Some researchers question the taxonomic validity of this species. It is morphologically similar to E. captitatum (see below).

Most of this species's habitat is potentially threatened by off-road vehicle activity, housing construction, mining of tar sands and oil well drilling. Four of the six known occurrences are on private land and are unprotected. Two sites are within Montana de Oro State Park. The Park is preparing a resource management plan that will address the habitat protection needs for populations within Park boundaries. The most recent field surveys for Indian Knob mountain balm are from 1985; more recent information is needed to assess the overall trend for this species.

Eriodictyon capitatum (Lompoc yerba santa)

CA - Rare FED - Candidate 1

Lompoc yerba santa is a sticky evergreen shrub with smooth, sticky leaves, and branched inflorescences of tubular lavender flowers. It is in the waterleaf family (Hydrophyllaceae). This species is found in small populations in about 10 sites in the Santa Ynez Mountains,

the Solomon Hills and on Burton Mesa in Santa Barbara County. It occurs in chaparral, coastal sage scrub, and closed-cone Bishop pine forest plant communities. It is similar in morphology to Indian Knob mountain balm (E. altissimum). At least three sites occur on Vandenberg Air Force Base; the rest are on private lands. None are actively protected.

Lompoc yerba santa may be declining as a result of fire suppression activities. A study of one population at Vandenburg Air Force Base after a prescribed burn showed that existing plants either sprouted back or died, but no seedlings were noted. Few seeds are produced by the plants and one theory to explain this holds that some of the existing populations consist of self-incompatable clones. Further studies of the reproductive biology are needed before the protection needs of this species can be assessed. There have been no recent comprehensive surveys for this species. Based on available information, the overall status is probably stable. A status review is planned to determine if Lompoc yerba santa should be designated as a threatened species.

Eriogonum alpinum (Trinity buckweat)

CA - Endangered FED - Candidate 2

Trinity buckwheat is a short perennial herb in the buckwheat family (Polygonaceae). The plants are covered with a dense white felt and bear clusters of yellow flowers on short leafless stems. This buckwheat grows on subalpine ridges and slopes in the vicinity of Mt. Eddy and Cory Peak in Siskiyou County. It is apparently restricted to serpentine and ultrabasic peridotite soils and scree slopes.

All occurrences are managed by Klamath or Shasta-Trinity National Forests. The population status of Trinity buckwheat was investigated in 1987 by the U.S. Forest Service (using California Endangered Species Tax-Checkoff funds). This study identified some limited threats by mining activity. The condition of the known sites was stable, and several new localized populations were found. The overall trend of this species is stable.

Eriogonum apricum var. apricum (Ione buckwheat)

CA - Endangered FED - Candidate 1

Ione buckwheat is a compact, erect herbaceous perennial in the buckwheat family (Polygonaceae), with felt-covered lower leaves and white flowers with reddish midribs on short stems. It is confined to the gravelly kaolinite clay soils of the Ione formation in the Sierra Nevada foothills of Amador County.

There are less than ten extant occurrences of this plant; these are found in openings of the unique chaparral which covers several adjacent hills in the region. Ione buckwheat may have been more widespread at one time, but clay mining has destroyed extensive areas of Ione chaparral where this species may have occurred. Increasing

urbanization in the area of Ione is a potential threat to this species. DFG owns and manages one small population on Apricum Hill Ecological Reserve. Caltrans is attempting to protect two populations that exist in highway rights-of-way. Research has been conducted (using California Endangered Species Tax-Checkoff funds) to provide information on the reproductive biology of Ione buckwheat and the role of fire in the Ione chaparral community, and to develop a management plan for the Ecological Reserve. Although the overall trend for this endangered plant is likely one of decline due to habitat loss, the existing populations appear stable at present.

Eriogonum apricum var. prostratum (Irish Hill buckwheat)

CA - Endangered FED - Candidate 1

Irish Hill buckwheat is a prostrate perennial herb in the buckwheat family (Polygonaceae). The plants have white flowers with reddish midribs borne on short stems. This buckwheat grows on the Ione formation in a soil composed of gravelly kaolinitic clay of high acidity. Populations commonly occur in open barren areas within the Ione chaparral plant community on Irish Hill and on Carbondale Mesa in Amador County.

Active clay mining operations continue to reduce the available habitat for this plant. Off-road vehicle use of the area has damaged populations and threatens to destroy suitable habitat. All of the area is privately owned and remains open to mining. There are no ongoing protection strategies for Irish Hill buckwheat. A research project at the Apricum Hill Ecological Reserve (using California Endangered Species Tax-Checkoff funds) examined the ecology of the Ione Chaparral. Irish Hill buckwheat, although not present on the Reserve, should benefit from the habitat management recommendations of the study. The overall trend for this species has been one of decline due to habitat destruction.

Eriogonum butterworthianum (Butterworth's buckwheat)

CA - Rare FED - Candidate 2

Butterworth's buckwheat is a low spreading woody perennial herb in the buckwheat Family (Polygonaceae), with leaves that have reddish-brown felt on both surfaces, and that sheath the stems. Its habitat is dry sandstone outcrops and crevices within chaparral or mixed evergreen forests in the Santa Lucia Mountains near the headwaters of the Arroyo Seco River in Monterey County. The four known occurrences of this species are on USFS land and were last visited in 1984.

Cattle have continued to graze throughout the habitat, without apparent damage to the buckwheat populations. Little additional information is available on the ecology or population biology of this species. Updated surveys and a management plan are needed. The overall trend for Butterworth's buckwheat has been one of decline due primarily to loss of habitat.

Eriogonum crocatum (Conejo buckwheat)

CA - Rare FED - Candidate 2

Conejo buckwheat, a member of the buckwheat family (Polygonaceae), is a short loosely-branched, woolly perennial usually found on dry slopes of volcanic rock within coastal sage scrub and chaparral plant communities. Less than a dozen occurrences of this species are known; these are restricted to Conejo Grade and Long Grade of the Santa Monica Mountains in Ventura County.

Residential development threatens Conejo buckwheat in a portion of its range. Most of the occurrences are privately owned. Some habitat was recently acquired by the City of Thousand Oaks to incorporate into Wildwood Park as a Conejo Buckwheat Preserve. There are no management plans for this species. This popular plant is available for horticultural use through the nursery trade. The overall trend for this species is believed to be stable.

Eriogonum ericifolium var. thornei (Thorne's buckwheat)

CA - Endangered FED - Candidate 2

Thorne's buckwheat, a low spreading subshrub in the buckwheat family (Polygonaceae), has leaves which are felty below and soft-shaggy above, and bears flowers in a compact inflorescence. It is found in the pinyon-juniper woodland community of two canyons in the New York Mountains of the eastern Mojave Desert in San Bernardino County. It grows on sandy loam soil derived from weathered quartz monzonite that is high in copper. The density and diversity of other typical desert plants decrease on this soil type.

Several mining claims exist in the habitat for Thorne's buckwheat, and the potential for renewed activity threatens this plant. There are several grazing allotments in the region, but the effects of livestock on this species are unknown. All of the occurrences are located in a BLM Area of Critical Environmental Concern. The BLM has withdrawn the area from future mining claims and plans to monitor the effects of grazing on the habitat. Nineteen lode claims made prior to 1985 are still in effect, and if development begins, it could impact Thorne's buckwheat. The overall trend for this species has been one of decline due mainly to habitat loss from mining activities, but monitoring and subsequent protection efforts should help to stabilize this species in the future.

Eriogonum giganteum var. compactum
(Santa Barbara Island buckwheat)

CA - Rare FED - Candidate 2

Santa Barbara Island buckwheat is a rounded, shrubby, white-woolly perennial in the buckwheat family (Polygonaceae). It grows on rocky sea bluffs and within the coastal grasslands on Santa Barbara Island and its satellite, Sutil Island, which are part of Channel Islands

National Park. One population is located on Sutil Island and about a dozen are known from Santa Barbara Island.

In the past, grazing by goats and rabbits, soil erosion caused by these animals, and plant collecting seriously threatened this buckwheat. Shortly after acquiring Santa Barbara Island, the National Park Service eliminated the introduced exotic herbivores and, as a result, the native vegetation is recovering. The NPS has supported a monitoring program, funded in part by a Federal grant-in-aid from the U.S. Fish and Wildlife Service, that was conducted from 1985-89. During this period 9 of 11 sites were monitored. Numbers of individuals increased at some sites and decreased at others, with the total population at 9 sites estimated at about 1100 individuals in 1985 and 3300 individuals in 1989. However, about half of the 1989 population is composed of immature plants that may never reach reproductive maturity. In addition, there is evidence that new populations are becoming established in sites that did not support this buckwheat during a 1979 census. The overall trend for Santa Barbara Island buckwheat is increasing.

Eriogonum grande var. timorum (San Nicolas Island buckwheat)

CA - Endangered FED - Candidate 2

San Nicolas Island buckwheat is a short, white-woolly perennial from a woody base, with wavy or curled leaves and clusters of white flowers. It is in the buckwheat family (Polygonaceae). This subspecies is endemic to the east- and south-facing cliffs of the southern part of San Nicolas Island, one of the Channel Islands. The plants grow in soil-filled cracks and dry alluvial soils in the coastal scrub community.

Grazing by goats and sheep has diminished many native species and allowed the spread of exotic weeds on San Nicolas Island. The U.S. Navy, which has owned the Island since 1933, has used it as a bombing and gunnery range. Numerous naval operations and construction projects have also modified much of the Island's vegetation. The Navy is aware of rare endemic plants on San Nicolas Island and now reviews military activities and construction which may affect sensitive species. Permanent transects have been set up to monitor the status of this buckwheat. The overall trend for this species is stable.

Eriogonum kelloggii (Kellogg's buckwheat)

CA - Endangered FED - Candidate 1

Kellogg's buckwheat, a member of the buckwheat family (Polygonaceae), is a low spreading, loosely-matted perennial, with short erect inflorescences bearing white flowers with reddish midribs. This species is known only from the Red Mountain and Little Red Mountain areas of Mendocino County. It occurs on serpentine soil found in open rocky areas within montane coniferous forest. Among its associates is McDonald's rock cress (Arabis macdonaldiana), which is State and

Federally listed as endangered. Kellogg's buckwheat is known from fewer than ten occurrences.

Much of Red Mountain is administered by the BLM, but because of chromium and nickel deposits, extensive mining claims exist. Although the region has been recognized by BLM as an Area of Critical Environmental Concern, it remains open to mining and the rare plants are unprotected. Further studies are being conducted to determine the location and size of the existing colonies of Kellogg's buckwheat and its associates on Red Mountain serpentines. Occurrences of this species are owned privately, and publicly by the BLM, and by DFG on the recently acquired Little Red Mountain Ecological Reserve. Only a small portion of this species' habitat is protected on the Reserve. The general trend for Kellogg's buckwheat is stable, but because mining claims exist in its restricted habitat, this species continues to warrant listing as endangered.

Eriogonum twisselmannii (Twisselmann's buckwheat)

CA - Rare FED - Candidate 2

Twisselmann's buckwheat, in the buckwheat family (Polygonaceae), is a loosely-matted woody perennial with erect flowering stems and clusters of yellow-brown to reddish-brown flowers. It grows on open, granitic outcrops in the red fir forest community of the southern Sierra Nevada. It is endemic to Slate Mountain and the Needles in Sequoia National Forest. There are fewer than a dozen occurrences, and the entire extent of all populations does not exceed 100 acres.

Due to its remote location, there are few threats to Twisselmann's buckwheat. If logging or ski area development were to take place at Slate Mountain, it could be become endangered because of its localized distribution and intolerance to disturbance. The U.S. Forest Service has this plant on its sensitive plant list and will continue to monitor its status.
The overall trend for Twisselmann's buckwheat appears stable.

Eriophyllum congdonii (Congdon's woolly sunflower)

CA - Rare

Congdon's woolly sunflower is an erect, freely branched annual with yellow flowering heads. It is in the sunflower family (Asteraceae). It occurs on dry ridges of metamorphic rock, scree and talus within chaparral and oak woodlands of the Merced River Canyon in Mariposa County. There are approximately a dozen occurrences, all found within Sierra National Forest or near the western boundary of Yosemite National Park.

There are few threats to most populations of Congdon's woolly sunflower. Those occurrences found near roads are subject to road maintenance activities and herbicide spraying. The ecology and population biology of this species are poorly known and the effects of disturbance and logging have not been determined. There are no

active management or protection programs for this sunflower. The overall trend appears to be stable.

Eryngium aristulatum var. parishii (San Diego button celery)

CA - Endangered FED - Candidate 1

San Diego button-celery, a member of the carrot family (Apiaceae), is an herbaceous biennial that can be distinguished by its low spreading appearance, heads of greenish flowers, and spine-tipped margins of bracts at the base of the inflorescence. This taxon is restricted in the U.S. to vernal pools in San Diego and Riverside counties; it is also known from Baja, Mexico. Associated species that are also State-listed include: San Diego mesa mint (Pogogyne abramsii), California orcutt grass (Orcuttia californica), and Otay mesa mint (Pogogyne nudiuscula).

Historically, San Diego button-celery occurred in many vernal pool systems throughout San Diego County and on the Santa Rosa Plateau in Riverside County. While nearly 80 occurrences have been reported for this taxon, at least 30 are extirpated or in severe decline; another 10 are historic records and have not been seen in recent years. A recent report to the Department indicated that in less than ten years, from 1979 to 1986, 23% of the existing vernal pools in San Diego County were destroyed. Projections suggest that this trend will continue or worsen. Residential development, off-road vehicle damage, dumping, alteration of drainage patterns and grazing continue to degrade or destroy vernal pool habitats for San Diego button-celery and its associates. The vernal pool preservation program by the City of San Diego has failed to secure vernal pool habitat. The only sites that have protection are those on TNC's Santa Rosa Plateau Preserve in Riverside County. These sites are monitored annually; also, California Endangered Species Tax Check-off funds are being used for protection and restoration of vernal pool habitat at this Preserve. Other landowners include the U.S. Department of Defense, San Diego County, City of San Diego (Chollas Park), CalTrans, and private landowners. In order to protect this endangered species, priority must be given to immediate formal protection of significant vernal pool systems. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, San Diego button celery seed will be stored at the Garden's long-term storage facilities. The overall trend for this species is one of decline as a result of habitat alteration and destruction.

Eryngium constancei (Loch Lomond button celery)

CA - Endangered FED - Endangered

The Loch Lomond button-celery is a slender, herbaceous annual in the carrot family (Apiaceae). The plants are covered with fine hairs, and produce open inflorescences of tiny white to light purple flowers. This species is endemic to the bed of a small vernal lake near the community of Loch Lomond in Lake County. The lake, surrounded by a

ponderosa pine and black oak forest, is the only known site for Loch Lomond button-celery, making it one of California's rarest plants.

The Loch Lomond vernal lake was privately owned and was damaged in 1984 when the owner illegally dredged part of the lakebed. He was required to return the excavated material to the site, but the damage was still visible in 1989. The Wildlife Conservation Board purchased the lake and a small area of surrounding habitat in 1988. However, adverse impacts to the site continued as a result of damage from off-road vehicles. The U.S. Fish and Wildlife Service provided funds in 1987 to purchase fencing material and in 1989 a split-rail fence allowing access to people on foot was built. The site is now protected by the DFG as Loch Lomond Ecological Reserve. A design is being developed for an interpretive display to be constructed and installed at the lake in 1991. The overall trend for this species is stable.

Eryngium racemosum (Delta button celery)

CA - Endangered FED - Candidate 2

Delta button-celery, a member of the carrot family (Apiaceae), is a slender, prostrate, herbaceous perennial, with greenish, rounded heads of flowers. It occurs in lowland areas of riparian and floodplain habitat. Its historic distribution includes Calaveras, Merced, Stanislaus, and San Joaquin counties.

Of the approximately 20 known occurrences, about a third have been extirpated by flood control activities and conversion of lowlands to agriculture, including all of the occurrences in San Joaquin County and most in Stanislaus County. The occurrence in Calaveras County has not been seen recently. A new population in Stanislaus County was reported in 1989. Most of the extant occurrences are found in Merced County along the San Joaquin River. These populations may be threatened by future flood control activities which could change the local hydrology and alter the habitat. Delta button-celery occurrences are under private ownership, on USFWS property, and on DFG's Los Banos Wildlife Area. There are no specific protection measures being implemented for this species. USFWS's San Luis National Wildlife Refuge has an MOU with DFG to examine the effects of different grazing regimes on this species. The overall trend for this species is one of decline.

Erysimum capitatum var. angustatum (Contra Costa wallflower)

CA - Endangered FED - Endangered

Contra Costa wallflower, a member of the mustard family (Brassicaceae), is a coarse-stemmed, erect, herbaceous biennial herb with yellowish-orange flowers. Its distinctive habitat consists of stabilized interior sand dunes that are sparsely covered with herbs, grasses, and shrubs. Only two populations remain, both at the Antioch Dunes, a 70-acre area of dunes along the San Joaquin River near Antioch in Contra Costa County.

Loss of habitat through sand mining, industrial development, rototilling for fire control, and off-road vehicle activities have left this wallfower on the verge of extinction. Today the Contra Costa wallflower is protected at the USFWS Antioch Dunes National Wildlife Refuge. A Recovery Plan for this species and two others endemic to the Antioch Dunes, prepared by USFWS, calls for enhancement of existing populations and establishment of new populations within its historic range. Research on the Antioch Dunes populations has determined that, although Contra Costa wallflower is capable of producing large numbers of seed, 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 the overlying sand has been stripped away, although an experimental attempt to establish plants on this substrate was unsuccessful. A long-term monitoring program has been established at the Refuge. The overall trend for Contra Costa wallflower is one of decline.

Erysimum menziesii (Menzies' wallflower)

CA - Endangered FED - Candidate 1

Menzies' wallflower is a facultative biennial or monocarpic perennial herb found on the flanks and crests of partially stabilized sand dunes or sand flats. It is a member of the mustard family (Brassicaceae). The entire global distribution is restricted to three coastal dune systems in Humboldt, Mendocino, and Monterey counties. Urbanization and industrialization of California's coast has extirpated many dune communities and few undisturbed areas remain. This species has been nearly extirpated from the Monterey Peninsula.

Several wallflower occurrences are located within State Parks (Asilomar in Monterey County and Mackerricher in Mendocino County), but they are threatened by trampling by visitors, off-road vehicles, and displacement by invasive non-native plants. Sites on private lands face similar threats in addition to potential elimination from coastal development. Ownership is divided between BLM, California Department of Parks and Recreation, The Nature Conservancy, and other private parties. A part of the occurrence on the North Spit of Humboldt Bay is protected by TNC's Lanphere-Christensen Dunes Preserve and by BLM. Both organizations have fenced portions of their land to control vehicle trespass. TNC has used volunteer labor to conduct annual removal of encroaching non-native plants. BLM's Samoa Recreation Area includes an off-highway vehicle staging area which may increase impacts to adjacent habitat areas. Efforts are continuing to protect the remaining habitat on the North Spit. Humboldt County has formed a Beach and Dune Advisory Committee to help develop a resource management program for the Humboldt Bay dune system that will protect dune habitats and allow limited vehicle use. Monitoring is continuing at the State Parks, and habitat restoration has occurred at Marina and Asilomar State Beaches in Monterey County. Humboldt State University has been conducting research to develop a genetic conservation plan for the species in cooperation with the Humboldt Bay pulp mills and

the EPA. Overall, the trend for Menzies' wallflower is one of continuing decline.

Erysimum teretifolium (Santa Cruz wallflower)

CA - Endangered FED - Candidate 1

Santa Cruz wallflower, a member of the mustard family (Brassicaceae), is an erect, usually simple-stemmed, herbaceous annual or biennial, with orange to yellow flowers. Its range is restricted to inland ponderosa pine sandhills near Felton, Ben Lomond and Bonny Doon in Santa Cruz County. The habitat, which contains a combination of deep, coarse, and poorly developed soils in a relatively humid coastal climate, is rare in California.

Of approximately 20 known occurrences, at least three are extirpated and several others are damaged and declining due to gravel and sand mining operations and nearby residential development. Illegal bulldozing by a quarry operator, before a permit was issued, destroyed part of one occurrence. A small but significant wallflower site was acquired in the Quail Hollow sandhills by Santa Cruz County and DFG. DFG also recently acquired a parcel in Bonnie Doon that protects a population of Santa Cruz wallflower. Direct acquisition and conservation easements would provide further protection. The overall trend for this species is one of decline.

Fremontodendron decumbens (Pine Hill flannelbush)

CA - Rare FED - Candidate 2

Pine Hill flannelbush, a member of the cacao family (Sterculiaceae), is a low-growing, many-branched, spreading shrub growing on reddish-brown clay soil derived from gabbro. It is found only in chaparral and oak woodlands of Pine Hill and nearby foothills of the Sierra Nevada in El Dorado County. Associated with this species are the State-listed rare Pine Hill ceanothus (Ceanothus roderickii) and El Dorado bedstraw (Galium californicum ssp. sierrae). There are approximately six known occurrences of this flannelbush, the largest of which are protected on the DFG's Pine Hill Ecological Reserve. Other occurrences are on private lands nearby and are relatively undisturbed.

Future development in rapidly-growing western El Dorado County could threaten the populations on private land. Experimental burns on Pine Hill suggest that fire may be of benefit to this shrub by promoting resprouting and stimulating seed germination. Additional occurrences in other counties have been suggested, but further studies indicate they belong to another species. The overall trend for Pine Hill flannel bush is stable, but the species remains threatened.

Fremontodendron mexicanum (Mexican flannelbush)

CA - Rare FED - Candidate 2

Mexican flannelbush, a member of the cacao family (Sterculiaceae), is a stiff, robust, tree-like shrub with bright orange flowers that occurs in the chaparral and cypress woodland plant communities of southern California. Its range once extended from northern Baja California to Los Angeles County. Today it is restricted to a few sites in San Diego County near the International Border. This flannelbush is a showy plant that is used as a drought-tolerant ornamental shrub in gardens.

The habitat of Mexican flannelbush is subject to frequent human-caused fires, which may occur too frequently to permit regrowth of the chaparral. The flannelbush must also compete for water and nutrients with annual ryegrass, which is seeded by the California Division of Forestry after a fire. The occurrences of Mexican flannelbush are owned by the BLM and private individuals and remain unprotected. The Nature Conservancy is looking into acquisition of a significant occurrence of this species. At the present time there are no management plans for Mexican flannelbush. The trend for this species is one of decline.

Fritillaria roderickii (Roderick's fritillary)

CA - Endangered FED - Candidate 2

Roderick's fritillary, a member of the lily family (Liliaceae), is a slender perennial from a bulb, having mostly narrow basal leaves, and nodding greenish-brown to purplish-brown flowers. This showy wildflower is found in heavy clay soils in an oak woodland community near Boonville and in coastal prairie near sea bluffs south of Point Arena, Mendocino County.

There are only three known native occurrences of Roderick's fritillary, one of which is extirpated. The two existing native occurrences are in disturbed sites; one is in the Boonville Cemetery and the other is a coastal occurrence that is privately owned with a portion in a CalTrans right-of-way. TNC has secured a voluntary protection agreement with one of the landowners. The CalTrans population was partially destroyed during work to improve Highway 1, although some plants were transplanted or fenced in 1985 to avoid damage during construction. There are no management plans for this species, but DFG has an MOU with the California Native Plant Society to salvage and relocate plants which would otherwise be lost to bluff erosion. During the past four years, several sites have been selected for transplanting salvaged plants. These include a county park, privately owned sites and the Ft. Bragg campus of the College of the Redwoods. The overall trend for Roderick's fritillary is one of decline.

Fritillaria striata (striped adobe lily)

CA - Threatened FED - Candidate 2

The striped adobe lily, a member of the lily family (Liliaceae), is a slender, bulbous perennial with fragant, white to pink bell-shaped flowers with burgundy stripes. It grows in open annual grasslands bordering blue oak woodlands, on heavy clay soils. This lily is found in eastern Tulare and Kern counties, in the Sierra Nevada foothills. About 12 populations are known, including two east of Porterville in Tulare County, and about 10 in Kern County in the Greenhorn and Tehachapi mountains.

Urbanization and agriculture have probably extirpated striped adobe lily from some of its historic range. Currently, all of the known populations are on private rangeland and none are protected. An analysis is needed of the impacts of long-term cattle grazing on the habitat. Observations indicate that low levels of livestock grazing with avoidance of the flowering season may benefit this species. A management plan for striped adobe lily was completed in 1989. This plan recommends that suitable habitat on National Forest lands be surveyed for this species and that protection be sought for several of the largest sites. The overall trend for this species appears to be stable.

Galium angustifolium ssp. borregoense (Borrego bedstraw)

CA - Rare FED - Candidate 2

Borrego bedstraw is a slender, herbaceous perennial plant in the madder family (Rubiaceae), found on north-facing steep walls and slopes in canyons and on hillsides.

All six known occurrences of Borrego bedstraw are found in Anza Borrego Desert State Park in San Diego County. Current information is lacking on this bedstraw; the most recent surveys were conducted in 1978. Research is needed to better understand the reproductive biology and ecology of Borrego bedstraw. Because it grows in steep terrain, there is little threat from off-road vehicle disturbance. Other potential threats have not been identified. Monitoring of known populations would help provide information necessary to develop management strategies.
Although historical records are lacking, it is possible that this species has always been rare. The recent trend for this species in unknown.

Galium buxifolium (box bedstraw)

CA - Rare FED - Candidate 2

Box bedstraw, a member of the madder family (Rubiaceae), is a stout, shrubby plant that branches widely, producing many leafy shoots. It grows on dry rocky bluffs in coastal sage scrub or closed-cone pine forest plant communities on three of the Channel Islands. Most of the

nearly dozen known occurrences are located on Santa Cruz Island, with others on Santa Rosa and San Miguel islands.

Box bedstraw populations may have been adversely affected in the past on Santa Cruz Island by high levels of sheep grazing. The Nature Conservancy, as part of its management over a large portion of the island, has removed all of the sheep. Box bedstraw populations and other native vegetation are expected to benefit from the reduction in grazing pressure. Observations on Santa Cruz Island in 1989 indicate that the potential of pig damage is the only threat known at present. The population on San Miguel Island has not been seen since 1979. There is no current information on the Santa Rosa Island populations. Both islands are now part of Channel Islands National Park and are protected. However, Santa Rosa Island was privately owned until recently and has been severely degraded by years of overgrazing by livestock and other exotic species. The overall trend for this species cannot be accurately assessed with the information available at present.

Galium californicum ssp. sierrae (El Dorado bedstraw)

CA - Rare FED - Candidate 2

El Dorado bedstraw is a low, sprawling, slender stemmed herbaceous perennial which grows on gabbro-derived soils. It is a member of the madder family (Rubiaceae). It is restricted to chaparral and oak woodlands in the vicinity of Pine Hill, El Dorado County. This species occurs with four other State-listed plants, the rare Pine Hill flannelbush (Fremontodendron decumbens), Pine Hill ceanothus (Ceanothus roderickii), and Layne's butterweed (Senecio layneae) and the endangered Stebbins' morning glory (Calystegia stebbinsii). A habitat conservation program is needed for El Dorado bedstraw and the other Pine Hill gabbro endemic plants.

There are seven known occurrences, only one of which is protected on the DFG's Pine Hill Ecological Reserve. Other occurrences on private lands are threatened by rapid residential development, road construction and maintenance, and herbicide spraying. There is little information on the biology or ecology of El Dorado bedstraw. Additional monitoring is needed to determine the status of most occurrences. The recent trend for this species appears to be one of decline.

Galium catalinense ssp. acrispum (San Clemente Island bedstraw)

CA - Endangered FED - Candidate 2

San Clemente Island bedstraw is a small shrub in the madder family (Rubiaceae), with four small leaves in a whorl, and clusters of tiny white or greenish-yellow flowers. It grows on steep, rocky cliffs and slopes overlooking the sea or in adjoining canyons on San Clemente Island, one of California's Channel Islands.

These sites offer the only refuge from the destructive activities of introduced goats and pigs. Erosion of canyon slopes, caused in part by loss of vegetation, is eliminating some of the cliff refuges. The U.S. Navy uses the island as a bombing and gunnery range. Although military activities continue to impact portions of the habitat, the Navy is attempting to remove all of the feral herbivores from San Clemente Island in order to allow recovery of the native vegetation. Slope stabilization and other bedstraw habitat protective measures are needed. The overall trend for San Clemente Island bedstraw is one of decline.

Gilia tenuiflora ssp. arenaria (sand gilia)

CA - Threatened FED - Candidate 1

Sand gilia is a short, erect, glandular annual confined to bare, wind-sheltered areas of coastal sand dunes of Monterey Bay. It is a member of the phlox family (Polemoniaceae). It is typically found in the central dune scrub community from the mouth of the Salinas River south to the Monterey Peninsula. Associated species include two State-listed endangered plants, Menzies' wallflower (Erysimum menziesii) and Tidestrom's lupine (Lupinus tidestromii).

There are fewer than ten known occurrences, and those on the Monterey Peninsula are threatened by residential development and recreational impacts. Trampling is a threat at all sites. Aggressive non-native plants are invading the habitat and displacing native vegetation on the dunes. Most populations of sand gilia occur on private land and are unprotected. Populations also occur within Marina State Beach and Salinas River State Beach in proposed natural preserves. The overall trend for sand gilia has been one of continuing decline.

Gratiola heterosepala (Boggs Lake hedge-hyssop)

CA - Endangered FED - Candidate 2

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 is found in shallow waters or moist clay soils of vernal pools and lake margins from Lassen County south to Fresno County in scattered sites.

The vernal pool habitat of this species has been lost through agricultural conversion, overgrazing, and urbanization. The present distribution contains large gaps where the species once may have occurred, but various human activities destroyed intervening habitat. Today, several populations are found in Lassen, Lake, Madera, Placer, and Sacramento counties. Boggs Lake is protected by The Nature Conservancy, but the population of hedge-hyssop has not been seen there in recent years. Other occurrences on both public and private lands are unprotected. Two new populations were found in Lassen County in 1989. The overall trend for this species has been one of decline due to habitat loss.

Helianthus niveus ssp. tephrodes (Algodones Dunes sunflower)

CA - Endangered FED - Candidate 2

Algodones Dunes sunflower is a silvery-white, semi-shrubby perennial in the sunflower family (Asteraceae) with a woody base, large hairy leaves, and circular heads of bright yellow flowers with reddish-purple centers. It occurs on unstabilized sand dunes in the Algodones Dunes system of Imperial County.

All of the habitat for Algodones Dunes sunflower in California is managed by the BLM, which has closed a portion of the dunes to off-road vehicle use to protect several rare species. The dunes are a popular recreation area, resulting in destruction of most of the vegetation in areas open to ORV use. Visitor use days are expected to double by the year 2000, thereby increasing habitat disturbance. The BLM has prepared a draft Algodones Dunes Wildlife Management Plan which addresses monitoring of impacts on rare plant populations, but does not specify plans for mitigation to protect plants. The overall trend for this plant has been one of stability, but as recreational impacts increase, this species may experience a significant decline.

Hemizonia arida (Red Rock tarplant)

CA - Rare FED - Candidate 1

Red Rock tarplant, a member of the sunflower family (Asteraceae), is a much-branched, glandular and mildly odorous annual, usually found in the creosote bush scrub plant community in moist to dry places where water collects in ephemeral streams and washes. This species is endemic to Red Rock Canyon and adjacent south-draining canyons of the Mojave Desert in Kern County.
There are fewer than ten occurrences scattered in the canyons around Red Rock Canyon State Park and on adjacent BLM lands.

Off-road vehicle use of the habitat, especially on Federal lands, poses the greatest threat. Introduced tamarisk, an invasive weedy tree, is encroaching into the habitat and could displace the Red Rock tarplant. Red Rock Canyon State Park personnel are monitoring the tarplant populations and have searched potential habitat where they have found additional plants. During the past two years, populations in the State Park have experienced an estimated 95% reduction in size, probably due to lack of rainfall. DFG has an MOU with UC Davis to study the evolutionary relationships of this taxon with other members of the genus. The general trend for this species is believed to be stable, although there has been a significant decline during the last two years due to drought.

Hemizonia conjugens (Otay tarplant)

CA - Endangered FED - Candidate 2

Otay tarplant is an aromatic, glandular, and much-branched herbaceous annual with mostly solitary, yellow flower heads. This member of the

sunflower family (Asteraceae) grows on clay soils in coastal southern San Diego County and northern Baja California. It is found within coastal sage scrub and grassland communities in open, often mildly disturbed areas.

Loss of habitat due to land development seriously threatens this species and may prevent reintroduction and recovery efforts. Only a few remaining occurrences are known, most of which have not been seen in many years. A survey of historical locations and searches for additional populations are needed to determine the status of Otay tarplant. Only one site was found in a 1987 survey. Another site was seen in 1988, but unfortunately the habitat was partially destroyed by housing construction. In 1989, this site was designated as open space. Since all sites are privately owned and unprotected, a significant part of the remaining habitat will need protection to preserve this species. The overall trend for the Otay tarplant is one of decline due to heavy development pressures.

Hemizonia increscens ssp. villosa (Gaviota tarplant)

CA - Endangered FED - Candidate 1

Gaviota tarplant is a summer-flowering aromatic annual herb in the sunflower family (Asteraceae). The plants are widely branched, with small, gray-green, sticky leaves and small heads of yellow flowers. This tarplant is restricted to one extended population along a two-mile stretch of coastal terrace near Gaviota in Santa Barbara County. It grows only on sandy loam soils of the Milpitas-Positas-Concepcion series that have a subsurface clay layer first encountered from about 18 to about 36 inches below the soil surface. These areas are dominated by annual grassland, which may contain scattered shrubs of the coastal sage scrub community. Since this subspecies was described in 1982 it has been searched for in likely sites nearby along the coast and inland, but no other populations have been found.

Several colonies of Gaviota tarplant have been destroyed by construction activities associated with oil and gas development. As mitigation, one new colony was established and has persisted for three years, although it declined in size in 1990. Another re-establishment effort is being planned as mitigation for impacts of a pipeline project. A mitigation plan has been finalized and a suitable mitigation site has been selected, but the Mitigation Agreement with DFG that formalizes the mitigation activities has not been signed and, therefore, on-the-ground activities have not begun. The potential for increased energy-related development within the range of Gaviota tarplant remains the predominant threat. Knowledge of Gaviota tarplant is too recent to determine an overall trend for this subspecies.

Hemizonia minthornii (Santa Susana tarplant)

CA - Rare FED - Candidate 2

Santa Susana tarplant is a perennial subshrub with slender ascending stems, sticky herbage, and yellow flower heads. This sunflower relative (Asteraceae) grows in crevices of sandstone bluffs and outcrops in chaparral in the Santa Susana and Santa Monica mountains of Los Angeles and Ventura counties. There are over twenty recorded occurrences of this tarplant, but one-fourth of these have not been seen in many years and their status is unknown.

Several of the remaining occurrences are threatened by residential development, road construction and road maintenance activities. Land ownership is both private and public (Los Angeles Department of Water and Power). None of the Santa Susana tarplant habitat is protected and conservation easements or permanent dedications need to be negotiated to ensure long-term preservation. In order to develop long-term management priorities, research is needed to determine the reproductive biology, germination and growth, and habitat requirements of this species. The trend for this species has been one of decline.

Hemizonia mohavensis (Mojave tarplant)

CA - Endangered FED - Candidate 1

Mojave tarplant is a sparsely branched, aromatic, sticky annual herb with yellow flower heads arranged in compact clusters. This member of the sunflower family (Asteraceae) has not been seen for certain in over 50 years. Historical collections of this plant come from a single occurrence on a sand bar along the Mojave River on the north slope of the San Bernardino Mountains in San Bernardino County. A second, apparently erroneous, occurrence was reported from Riverside County in chaparral, which is not known habitat for this tarplant.

In 1988, Red Rock Canyon State Park personnel reported a possible Mojave tarplant occurrence within the park (Kern County). To confirm the identification, specimens from this population were sent for chromosome analyses, but the results are still pending.
All of the original habitat for Mojave tarplant has been altered by flood control activities and ORV recreation. Additional searches in suitable habitat, along the tributaries of the Mojave River, are required to determine the status of this extremely rare, possibly extinct species. The overall trend for this plant has been one of severe decline. If it is determined that populations exist, it is critical that they be protected to avoid the extinction of this species.

Hesperolinon didymocarpum (Lake County dwarf-flax)

CA - Endangered FED - Candidate 1

Lake County dwarf-flax is an erect, narrow-stemmed, annual herb, with widely spreading branches, and open inflorescences of white to pink flowers. This member of the flax family (Linaceae) is known only from serpentine soils of alluvial origin in the Big Canyon drainage north of Middletown, Lake County. The surrounding plant community is either grassland or chaparral.
Presently there are six known occurrences of this species, made up of clusters of small related colonies on islands of serpentine within a six square mile area.

The habitat is privately owned and subject to light to moderate cattle grazing with unknown effects on the plant. A change in land use could seriously endanger Lake County dwarf-flax because of its restricted distribution. Information is needed on the population and reproductive biology of this species in order to provide a basis for long-term management strategies. A 1988 study on Lake County serpentine endemics, financed by the California Endangered Species Tax Check-off Fund, included the dwarf-flax. The overall trend for the Lake County dwarf-flax appears to be stable.

Holocarpha macradenia (Santa Cruz tarplant)

CA - Endangered FED - Candidate 1

Santa Cruz tarplant is a spreading, aromatic and glandular annual herb, with yellow flowers in dense heads. It is in the sunflower family (Asteraceae). This tarplant was once found in most of the counties of the San Francisco Bay Area, south to Monterey County. Today it has been extirpated from Marin and Alameda counties and the last wild population in Contra Costa County will be destroyed in 1990 to make way for a shopping center. About 10 wild populations still exist in Santa Cruz and Monterey counties. One of these occurs on State Park property, but the others are all on private land without protection. Santa Cruz tarplant grows on clay soils of coastal or near-coastal grasslands. Some investigators think that this species is a poor competitor and does best under light livestock grazing.

In 1982 salvaged seed was introduced to five sites at Wildcat Canyon Regional Park in Contra Costa County. In subsequent years additional introductions were carried out in a total of 22 sites. Monitoring was begun in 1983 and continued until 1989, when 18 sites were found to support Santa Cruz tarplant populations. Five of these sites had 1000 or more individuals in 1989. Santa Cruz tarplant continues to face threats from residential development and agricultural land conversion. A habitat conservation plan is needed for this species, along with efforts to secure representative sites while the southern portion of its historic distribution retains populations that are large enough and in good enough condition to persist over the long-term. Under a Memorandum of Understanding, demographic and ecological research will be conducted on an existing natural population, and an experimental population will be introduced to a permanently protected area of

suitable habitat. The overall trend for Santa Cruz tarplant is one of steady decline.

Ivesia callida (Tahquitz ivesia)

CA - Rare

The Tahquitz ivesia is a dwarf tufted perennial, with glandular-hairy divided leaves, and small white flowers on a short inflorescence. This member of the rose family (Rosaceae) is found on steep slopes of decomposing granitic outcrops in the San Jacinto Mountains of Riverside County. Previously presumed extinct, this plant was rediscovered in 1980 at two sites in the San Jacinto Wilderness Area of San Bernardino National Forest.

Human disturbances and threats are unlikely due to the relative inaccessibility of the rocky habitat. Potential threats include disturbance during fire suppression actions, trail building, and rock climbing activities. There are no management or protection plans for this species, although the Forest Service is aware of the populations. In 1988, the DFG monitored both occurrences and found them to be stable. The trend for Tahquitz ivesia has been stable in recent years.

Lasthenia burkei (Burke's goldfields)

CA - Endangered FED - Proposed Endangered

Burke's goldfields is an erect herbaceous annual herb, with narrow opposite leaves and small heads of yellow flowers. This sunflower relative (Asteraceae) grows in vernal pools and moist depressions in a limited habitat surrounding Santa Rosa in Sonoma County and to a lesser extent at sites in Lake County. It often occurs with the State-listed endangered Sebastopol meadowfoam (Limnanthes vinculans) or Sonoma sunshine (Blennosperma bakeri), a State candidate endangered plant that is not yet State-listed.

Urbanization, conversion of land to row crops, and widening along Highway 101 have impacted this species in Sonoma County. Extensive gully erosion at Manning Flat in Lake County is destroying the habitat. The Department of Fish and Game's Todd Road Ecological Reserve once protected Burke's goldfields, but it has not been seen there in several years. There are several populations of this species at the Sonoma County Airport. An MOU between DFG and Sonoma County addresses management and revegetation of vernal pools on airport property. In recent years, many development projects have been approved in the Santa Rosa area with significant impacts to Burke's goldfields and other vernal pool species. Approved mitigations have relied on transplantation of rare plants into experimentally created habitat rather than preservation of existing vernal pool habitat. In 1989, a vernal pool preservation program was developed for Sonoma County funded by the California Endangered Species Tax Check-off Fund. The final report has been received by Sonoma County and is being revised by county planning staff prior to County adoption of the

conservation program. Sonoma State University has entered into an MOU with DFG to examine the amount and pattern of genetic diversity within and between Burke's goldfields populations throughout its range. Under an MOU with DFG, Rancho Santa Ana Botanic Garden will store Burke's goldfields seed at its long-term storage facilities. The trend for this species has been one of drastic decline in recent years.

Layia carnosa (beach layia)

CA - Endangered FED - Candidate 1

Beach layia is a small, succulent annual herb with low spreading branches and heads of short, white to pink ray flowers and yellow disk flowers. The leaves and branches have sticky glands that allow sand to adhere to the plant. This sunflower relative (Asteraceae) occurs on semi-stabilized sand in sparse coastal dune scrub vegetation. Historically, this plant was known to occur on five dune systems from Humboldt County to Santa Barbara County. Human impacts have nearly eliminated the species from the southern half of its range. Currently, the entire global distribution of beach layia is restricted to approximately a dozen occurrences in Humboldt, Marin, and Monterey counties. The species occurs with other State-listed plants at various localities, including Menzies' wallflower (Erysimum menziesii) and Tidestrom's lupine (Lupinus tidestromii var. tidestromii). In 1989 a population was discovered at DFG's Eel River Wildlife Area in Humboldt County and in 1990 another was discovered on the South Spit of Humboldt Bay.

Beach layia habitat is threatened by coastal development, off-road vehicles, recreational activities, and invasive non-native plants. Currently, there is no coordinated program for conservation of beach layia. Some populations occur on State and Federal lands (BLM, NPS) but are not actively managed to protect the species. Many opportunities exist for habitat protection and recovery activities. Research on population genetics of this species is being conducted through an MOU with the UC Davis. The trend for this species has been one of decline.

Lessingia germanorum (San Francisco lessingia)

CA - Endangered FED - Category 1

San Francisco lessingia, a member of the sunflower family (Asteraceae), is a slender annual herb with clusters of lemon-yellow flowers. This species occurs in remnant areas of coastal dune scrub habitat on the San Francisco peninsula. It appears to require open sandy soils that are relatively free of competing plants. This species probably evolved on semi-active dunes, for it appears to require some degree of sand movement and disturbance. Historic collections of San Francisco lessingia are all from the San Francisco area, with the range reported to include San Mateo County. Today, four natural populations and one experimentally introduced population are known to exist within the Presidio of San Francisco, which is

under the jurisdiction of the U.S. Army. These populations are within one half mile of each other on remnant areas of coastal dune scrub habitat. The Presidio occurs within the boundaries of the Golden Gate National Recreation Area, which is administered by the National Park Service. An additional occurrence was discovered in 1989 on San Bruno Mountain in San Mateo County.

San Francisco lessingia faces a variety of threats. Damage to lessingia and its habitat has occurred from trampling by hikers, bikers, and joggers. Disturbance from trampling can directly destroy lessingia plants and encourage the invasion of competing exotic plants such as ice plant (Carpobrotus sp.). Ice plant appears to be displacing San Francisco lessingia at all known sites. Sand excavation has eliminated most of one population; proposed development threatens another. This species will continue its declining trend without special protection and management activities.

Lewisia congdonii (Congdon's lewisia)

CA - Rare

Congdon's lewisia, a perennial member of the purslane family (Portulaceae), has a basal rosette of semi-succulent leaves and rose-colored flowers. It grows on dry talus slopes and in rock crevices in the chaparral and oak woodland plant communities of the Merced River Canyon, Mariposa County, and along the Kings River Canyon, Fresno County.

Less than ten occurrences of Congdon's lewisia are known and several of these are along roads where herbicide spraying, road improvements and maintenance, and trash dumping are threats. All of the occurrences are on USFS lands. Habitat requirements and reproductive biology of this species are areas for future research. Additional field surveys may result in the discovery of new populations in suitable habitat between the presently known scattered occurrences. Plant surveys are also needed in the areas burned in the recent extensive forest fires of the Sierra Nevada. The overall trend for this species has been one of decline due to adverse impacts from roadside threats.

Lilaeopsis masonii (Mason's lilaeopsis)

CA - Rare FED - Candidate 2

Mason's lilaeopsis is a minute, turf-forming perennial plant in the carrot family (Apiaceae). It spreads by rhizomes and produces long, narrow, jointed leaves. It is semi-aquatic and is usually found on saturated clay soils which are regularly inundated by waves and tidal action. Its known distribution extends from the margins of the Napa River in Napa County, east to the channels and sloughs of the Sacramento-San Joaquin Delta in Contra Costa, Solano, Sacramento, Yolo, and San Joaquin counties.

Currently, less than fifty occurrences of Mason's lilaeopsis are known, but many are expected to be lost because of proposed modifications to the habitat. The cumulative effects of several proposed projects combine to threaten this species. These activities include flood control projects (rip-rap), widening of Delta channels for water transport, dredging and dumping of spoils, recreational development, and changes in water quality resulting from decreased flows in the Delta. Although much of the habitat is privately owned, several State and Federal agencies have jurisdiction over the Delta waterways. One site is protected in Solano County on a DFG Ecological Reserve. California Endangered Species Tax Check-off funds are being used to support a study that will define more accurately the existing distribution of this species and recommend a long-term preservation strategy with the goal of preventing it from becoming a threatened species. Information from this study will be used in a review of the listing status of Mason's lilaeopsis. The future trend for Mason's lilaeopsis is one of imminent decline due to the numerous modifications planned for its habitat. The trend for the recent past was stable.

Lilium occidentale (western lily)

CA - Endangered FED - Candidate 1

Western lily is a tall rhizomatous perennial herb with a slender stem and long narrow whorled leaves. The flowers of this member of the lily family (Liliaceae) are crimson, except at the base of the petals where they are colored with yellow-orange or green with maroon spots. In California this showy lily is known from near the southern perimeter of Humboldt Bay, Humboldt County, and from a newly discovered site approximately 90 miles to the north in Del Norte County. Another form of this plant occurs along Oregon's coast; this form is somewhat different and hybridizes with L. columbianum. There are fewer than ten recorded occurrences for western lily.

Western lily is threatened by habitat loss, over-collecting of bulbs, and cattle grazing in the habitat. Yearly monitoring is needed to assess effects of illegal bulb collecting and grazing. Some measures have already been taken to protect this species. The recently acquired DFG Table Bluff Ecological Reserve contains a population which is annually monitored, and in 1989, California Endangered Species Tax Check-Off funds were used for this monitoring. A preserve management plan and a demographic study of western lily are in progress, and TNC has secured voluntary protection agreements with the landowners of three occurrences of western lily. The Del Norte County population, a portion of which occurs within the bounds of DFG's Crescent City Marsh Wildlife Area, is the largest population known to exist. The overall trend for this species has been one of decline, but recent monitoring and protection efforts have resulted in a more stable trend lately.

Lilium pitkinense (Pitkin Marsh lily)

CA - Endangered FED - Candidate 1

Pitkin Marsh lily is a showy herbaceous perennial from a rhizome, with tall slender stems, narrow whorled leaves, and nodding yellow-orange flowers with red tips and deep maroon dots. In is a member of the lily family (Liliaceae). There are only three recorded occurrences of Pitkin Marsh lily, only two of which have been seen recently. They are confined to a small portion of Sonoma County in the Vine Hill vicinity, near marshy areas.

Land clearing and draining operations, cattle grazing and horticultural bulb collecting have impacted all populations. Introduced blackberry plants also compete with the lily at Pitkin Marsh. In 1988 this plant was seen for the first time in several years at two separate marshes in the Sebastopol area. In 1989, TNC entered into voluntary protection agreements with landowners for the two confirmed occurrences. Measures have been taken to clear these areas of the invasive blackberry plants and to build cattle exclosures. Under an MOU with DFG, The Berry Botanic Garden will provide for long-term storage of plant material of this species. Though the overall trend for this plant has been one of decline, recent focused attention has helped to create greater stability.

Limnanthes bakeri (Baker's meadowfoam)

CA - Rare FED - Candidate 2

Baker's meadowfoam is an herbaceous annual with dissected leaves and white or cream-colored funnel-shaped flowers. It is a member of the false mermaid family (Limnanthaceae). Its habitat is saturated or inundated clay soils in low-lying swales, roadside ditches, and along margins of marshy areas. Its distribution is restricted to Mendocino County near Laytonville and Little Lake Valley near Willits. Less than a dozen occurrences are known and all are found on private lands.

Most of the habitat for Baker's meadowfoam is used for grazing and some discing has occurred, but the meadowfoam populations appear to tolerate some disturbance and light grazing. The greatest potential threats to this plant may come from the alteration of local drainage patterns and the removal of standing water to prepare the land for agriculture. A proposed reallignment of Highway 101 through the center of Baker's meadowfoam's distribution could inflict serious damage. Residential development on the outskirts of Willits would also destroy the habitat where most populations are found. TNC has entered into voluntary landowner agreements to protect some of the occurrences of this species, but more information is needed on the status of Baker's meadowfoam. The overall trend for this species has been one of decline, due primarily to habitat destruction and development.

Limnanthes douglasii var. sulphurea (Point Reyes meadowfoam)

CA - Endangered FED - Candidate 2

Point Reyes meadowfoam, a member of the false mermaid family (Limnanthaceae), is an herbaceous annual, with 3-5-lobed leaves and bell-shaped yellow flowers. There are fewer than 10 known occurrences of this species; most of these are on the Point Reyes Peninsula in Marin County. One occurrence is near Pescadero in San Mateo County. This species occurs primarily in vernally moist depressions in open, rolling coastal prairies and meadows. At Point Reyes it is also found in roadside ditches.

The Marin County populations are on Point Reyes National Seashore property, some of which is leased to ranchers. The NPS has a regular monitoring program for Point Reyes meadowfoam and other rare species at the seashore. Threats include trampling by cattle, competition from exotic weeds, altered drainage patterns, and highway maintenance. The Point Reyes populations appear to be relatively stable; the only San Mateo County site has been damaged by a Christmas tree operation. The overall trend for Point Reyes meadowfoam is stable to declining.

Limnanthes floccosa ssp. californica (Butte County meadowfoam)

CA - Endangered FED - Candidate 1

Butte County meadowfoam is a small, white-flowered annual herb in the false mermaid family (Limnanthaceae). The plants are covered with soft hairs and have sparsely distributed leaves divided into 5-11 leaflets. This subspecies is potentially economically valuable because it possesses the ability to transfer important traits to other species of meadowfoam that are being bred for commercial use as suppliers of a substitute for sperm whale oil. Butte County meadowfoam is restricted to vernal swales and vernal pools in the Chico area. Recent surveys have discovered about eight new sites for this subspecies, which was known from only four areas in 1987.

All but one of the sites for Butte County meadowfoam are on private land. Most of these lie within the sphere of influence of the City of Chico in areas that the City has designated as regions of future development. Recognizing the potential for adverse impacts, the City and the Department of Fish and Game began working together in the spring of 1988 to devise a mechanism for protecting the plants in their natural habitat. After surveys located new populations, a draft habitat conservation plan was prepared for Butte County meadowfoam sites within the Chico area, using funds from the California Endangered Species Tax Check-off program. In 1989 the Chico City Council adopted an amended version of the plan after an extensive period of review and public input. The plan is designed to protect at least two of the largest, best quality sites and at least two additional sites that may be restored. Developers of land occupied by Butte County meadowfoam will either donate preserve sites or contribute to restoration activities as a condition of their development permits. This conservation plan does not protect

populations beyond the immediate Chico area, of which there are at least three. These are threatened by overgrazing, agricultural land conversion and residential development. The overall trend for Butte County meadowfoam is one of decline.

Limnanthes gracilis var. parishii (Parish's meadowfoam)

CA - Endangered FED - Candidate 2

Parish's meadowfoam is small herbaceous annual plant in the false mermaid family (Limnanthaceae), with wide-spreading branches, divided leaves, and white bowl-shaped flowers fading to pink. This meadowfoam is known from mountain meadows of San Diego County with one additional occurrence on The Nature Conservancy's Santa Rosa Plateau Preserve in Riverside County. It is a plant of moist habitats, often growing in vernal pools, wet meadows and near springs and seeps.

Today, less than thirty occurrences of Parish's meadowfoam are known to exist; these are centered around Cuyamaca Lake and the Laguna Mountains of San Diego County. Extensive habitat was probably lost during the inundation of meadows behind the dam which formed Cuyamaca Lake. The remaining habitat near the lake is threatened by lakeside development, grazing, wetland habitat manipulation, and intense recreational use. The U.S. Forest Service and DPR are aware of the occurrences of Parish's meadowfoam on their lands. The Cleveland National Forest has implemented a habitat improvement project for the meadowfoam, and is recommending seasonal deferral of grazing in the meadowfoam habitat. In 1990 the Cleveland N.F. discovered a few new occurrences on their land. Cuyamaca Rancho State Park is writing a plan to protect and manage the rare plants in the Park through an MOU with DFG, and a portion of the habitat has been designated a Natural Preserve. Dr. Ellen Bauder of San Diego State University is conducting ecological monitoring of Parish's meadowfoam to increase knowledge of its distribution and abundance. The overall trend of this species has been one of decline.

Limnanthes vinculans (Sebastopol meadowfoam)

CA - Endangered FED - Proposed Endangered

Sebastopol meadowfoam is an annual herb, with divided leaves, and bowl-shaped light-colored flowers. This member of the false mermaid family (Limnanthaceae) is found in seasonal wetlands comprising wet meadows, pasture and vernal pools primarily in the drainage of Laguna de Santa Rosa in Sonoma County. Most occurrences are on private land within five miles of the City of Santa Rosa. It often occurs with the State-listed endangered Burke's goldfields (Lasthenia burkei) or Sonoma sunshine (Blennosperma bakeri), a candidate for State listing as endangered.

Several occurrences are on parcels zoned residential and commercial. Indirect effects of urban growth, such as alteration of local and regional drainage patterns, threaten this species. Heavy grazing and off-road vehicle recreation also affect populations. Without

protection most extant occurrences could soon be lost. CalTrans owns populations along Highway 12 that could be saved. The Department of Fish and Game protects one site at the Laguna de Santa Rosa Ecological Reserve. In recent years, many development projects with significant impacts to vernal pool species have been approved in the Santa Rosa area. Approved mitigations have relied on transplantation of rare plants into experimentally-created habitat rather than preservation of existing vernal pool habitat. In 1989, a vernal pool preservation program was developed for Sonoma County financed by the California Endangered Species Tax Check-off Fund. The final report has been received by Sonoma County and is being revised by county planning staff prior to the County's adoption of the conservation program. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, Sebastopol meadowfoam seed will be stored at the Garden's long-term storage facilities. The trend for this species has been one of decline in recent years.

Lithophragma maximum (San Clemente Island woodland star)

CA - Endangered FED - Candidate 1

San Clemente Island woodland star is a perennial herb in the saxifrage family (Saxifragaceae) with three-parted leaves, stout flowering stems, and glandular white to pinkish flowers. This species is extremely rare and at one time was thought to be extinct. Today less than 50 plants are thought to remain in the wild in two remote locations, although there have been no recent surveys for this species. It is restricted to moister habitats on north-facing slopes in nearly inaccessible canyons on the east side of San Clemente Island.

Much of its essential habitat has been damaged by feral goats, feral pigs, former ranching activities and military operations. The U.S. Navy, which has jurisdiction over the island, has been removing goats and pigs as part of its Feral Animal Removal Program and improvements in the condition of the native vegetation have been noted. A propagation program may be needed to achieve recovery for this species. The overall trend for San Clemente Island woodland star is one of decline.

Lotus argophyllus ssp. adsurgens
(San Clemente Island bird's-foot trefoil)

CA - Endangered FED - Candidate 2

San Clemente Island bird's-foot trefoil is an erect, shrubby perennial, with crowded silvery leaves, small yellow-orange flowers and short pods. It is a member of the pea family (Fabaceae). Its current distribution is limited to a few sites on the southern tip of San Clemente Island, Los Angeles County. Each site has less than 50 individuals. This bird's-beak grows on wave cut marine terraces in the cholla phase of maritime desert scrub vegetation.

Ranching operations on the Island resulted in overgrazing and elimination of much of the native vegetation before the distributions of several rare plants were determined. Sheep were removed in 1934 but, more recently, the feral goat population increased substantially and nearly denuded large portions of the Island. The U.S. Navy, which currently controls San Clemente Island, has used it as a bombing and gunnery range, but military operations have not directly affected this subspecies. The Navy has implemented a goat eradication program in an effort to recover the vegetation. In 1989 a new phase of this program began. There has been a noticeable improvement in habitat quality since the beginning of this program. The Navy has contracted with a nursery to propagate San Clemente Island bird's-beak and other rare plant species of the Island and plans to use nursery stock to enhance the existing populations. The long-term trend for this subspecies is one of decline.

Lotus argophyllus ssp. niveus
(Santa Cruz Island bird's-foot trefoil)

CA - Endangered FED - Candidate 2

Santa Cruz Island bird's-foot trefoil is a low, much-branched perennial covered with silvery silky hairs. The plants have divided leaves and produce yellow and brown or purple flowers. It is a member of the pea family (Fabaceae). This subspecies is found only on Santa Cruz Island, the largest of the Channel Islands. It grows on rocky slopes, stony floodplains and dry canyon stream beds in coastal sage or chaparral plant communities.

As a result of long-term overgrazing by cattle and especially sheep, much of the native vegetation was destroyed and weedy exotic plants became established on the Island. The Nature Conservancy now owns and manages most of Santa Cruz Island and has succeeded in eliminating all of the sheep. This action has resulted in a substantial recovery for Santa Cruz Island bird's-foot trefoil, especially on high ground within floodplain areas. Although the feral pig population has increased following sheep removal, no adverse impacts to this subspecies have been noted. The long-term trend for this subspecies has been one of decline, but some recovery has been noted in the last two years.

Lotus dendroideus var. traskiae (San Clemente Island lotus)

CA - Endangered FED - Endangered

San Clemente Island lotus is a small subshrub with erect, often silky branches, leaflets usually in threes, and yellow or red-tinged flowers. This member of the pea family (Fabaceae) grows on open grassy north-facing slopes at the mouth of a canyon and on hillsides at several sites on San Clemente Island. The extent of its historic distribution is unknown; currently there are about a dozen existing sites.

San Clemente Island is under the jurisdiction of the U.S. Navy, which has initiated a Feral Animal Control Program to remove the pigs and goats that have destroyed much of the Island's native vegetation. The Navy has contracted with a nursery to propagate and reintroduce San Clemente Island lotus and other rare plant species as provided for in the recovery plan prepared by the U.S. Fish and Wildlife Service. Surveys conducted from 1985 to 1987 found several previously unknown sites. Several populations have increased in size since the removal of some of the feral animals. The recent trend for San Clemente Island lotus is stable to increasing.

Lupinus deflexus (Mariposa lupine)

CA - Threatened FED - Category 2

Mariposa lupine, a member of the pea family (Fabaceae), is an annual plant with long spikes of white or pinkish flowers. This species is found in foothill woodlands on decomposed granite domes on the western slope of the Sierra Nevada in southwestern Mariposa County, south of the town of Mariposa.

All four occurrences of this very rare plant occur on privately- owned land. The landowners of three sites have entered into voluntary protection agreements with The Nature Conservancy. The total area covered by Mariposa lupine is less than 50 acres within a five square mile area. The rapidly accelerating subdivision and development of the area is a serious potential threat to this species. Grazing and trampling by sheep and cattle also threaten this species. At one time, two sites were heavily grazed and another site was disturbed when a parking pad was excavated. Although historical records are lacking, it is likely that this species was always rare, and has become threatened by urbanization and grazing. The recent trend for this species is one of decline.

Lupinus milo-bakeri (Milo Baker's lupine)

CA - Threatened FED - Candidate 2

Milo Baker's lupine, a member of the pea family (Fabaceae), is a tall herbaceous annual of wet roadside ditches and streams in Round Valley near the town of Covelo in Mendocino County and in the Bear Valley region in Colusa County. There are approximately a dozen known extant occurrences of this species, most of them in Mendocino County; four occurrences in Mendocino County have been extirpated.

Milo Baker's lupine occurs on private land and on highway rights-of-way. It is threatened by roadside maintenance activities and herbicide spraying. CalTrans has sprayed some of the populations, but is aware of the problem and has obtained an MOU with DFG to offset losses due to roadside maintenance activities. One of the privately-owned occurrences is voluntarily protected through an agreement with TNC. The U.S. Department of Agriculture has entered into an MOU with DFG to determine whether this lupine is adversely affected by exposure to larvae of a naturalized insect used for

biocontrol of gorse. The overall trend for Milo Baker's lupine is stable to declining.

Lupinus nipomensis (Nipomo Mesa lupine)

CA - Endangered FED - Candidate 1

Nipomo Mesa lupine is a low-growing blue-flowered annual herb of the pea family (Fabaceae). It is restricted to dry sandy flats of stabilized coastal dunes that lie west of Nipomo Mesa in San Luis Obispo County. It occurs in areas of light soil disturbance within the central coastal dune scrub community. Surveys in 1988 found five populations including one previously unknown site. At least three historic populations have been extirpated, including the type locality.

The existing populations of Nipomo Mesa lupine are threatened by off-road vehicle activity and coastal development within the existing potential habitat. This species also is threatened by habitat degradation resulting from expansion of introduced weedy plants, such as veldt grass and ice plant, within the backdune scrub community. All existing occurrences are on private land and remain unprotected. The recent trend for Nipomo Mesa lupine is one of decline.

Lupinus padre-crowleyi (Father Crowley's lupine)

CA - Rare FED - Candidate 2

Father Crowley's lupine is a bushy perennial herb, covered with gray spreading hairs, with leaves divided into 7-8 leaflets, and creamy white flowers. This member of the pea family (Fabaceae) occurs in the understory of red fir forest and on sagebrush flats on the eastern slope of the Sierra Nevada in Inyo County. There are four reported populations consisting of about 10 subpopulations. Local subpopulations are generally comprised of scattered individuals on steep avalanche chutes, in sunny sites in drainages, and in valley bottoms. All known sites are within Inyo National Forest.

Historic and current threats include mining, logging, heavy grazing, and recreational off-road vehicle use of the habitat. A complete status review of the species in 1981 reported that no extirpated populations were known. In 1987 the Inyo National Forest botanist surveyed four populations and found generally low levels of disturbance and successful reproduction. Overgrazing was identified as a potential threat although grazing levels are under the control of the Forest Service. The USFS does not have a management plan for Father Crowley's lupine. Long-term monitoring on a regular basis is planned. The recent trend for this species is stable.

Lupinus tidestromii var. tidestromii (Tidestrom's lupine)

CA - Endangered FED - Candidate 1

Tidestrom's lupine is a low creeping perennial that occurs on partially stabilized coastal dunes of the Monterey Peninsula in Monterey County. This member of the pea family (Fabaceae) is sometimes associated with two other State-listed endangered plants, Menzies' wallflower (Erysimum menziesii) and sand gilia (Gilia tenuiflora ssp. arenaria).

Tidestrom's lupine is threatened throughout its limited range by recreational use of dunes, housing developments, and golf course construction and maintenance activities. Its remaining habitat is being invaded by sea fig (Carpobrotus sp.), an invasive non-native plant of coastal dunes. This lupine occurs at Asilomar State Park, which has restored native dune habitats. It is also found on a 20-acre open space preserve planned by the privately-owned Pebble Beach Foundation. Other sites are on private property, several of which are in backyards of recent subdivisions and remain unprotected. Tidestrom's lupine has had a declining trend in recent years.

Machaeranthera lagunensis (Laguna Mountains aster)

CA - Rare FED - Candidate 2

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 flower heads. This species is found in a localized area of the southern Laguna Mountains in San Diego County growing on dry, sandy loam soils, often in disturbed sites of the oak-pine woodland plant community.

The several known California occurrences are found on public (USFS) and private lands. In 1988, USFS personnel surveyed sites within the Cleveland National Forest and the Descanso Ranger District. The surveys resulted in the discovery of several new populations. The USFS will implement management strategies to reduce or eliminate threats to these populations. Threats include heavy grazing, which prevents seed set, recreational activities, and maintenance activities which damage roadside populations. Suggested protection measures include fencing to exclude cattle, and light soil disturbance to stimulate colonization by seedlings. Although the trend for this species has been one of decline, recent attention by the USFS has resulted in the prospect of more stable conditions in the future.

Mahonia (= Berberis) nevinii (Nevin's barberry)

CA - Endangered FED - Candidate 1

Nevin's barberry is a blue-green evergreen shrub in the barberry family (Berberidaceae). It has prickly compound leaves, yellow flowers, and round yellow-red berries. This species occurs in coastal sage scrub and chaparral communities in the margins of dry washes in

foothills of the Transverse and Peninsular ranges. The plants are found growing on either steep north-facing slopes or on low grade sandy washes. Although once more widespread, the extant range of Nevin's barberry is thought to include about a half-dozen disjunct populations in portions of Los Angeles, San Bernardino, Riverside, and perhaps San Diego counties, but many of these areas have become urbanized in recent years.

In 1986, TNC entered into a voluntary protection agreement with the private landowner of one occurrence of Nevin's barberry located in San Timoteo Canyon in San Bernardino County. In 1989, a Species Management Guide for the Angeles National Forest (ANF) was prepared jointly by the the Rancho Santa Ana Botanic Garden and the USFS. Two populations in San Francisquito Canyon, Los Angeles County, occur on land managed by the ANF. Threats to these populations, including invasion by Spanish broom, road maintenance activities and gold extraction, were identified in the study and will be addressed throughout a five-year action plan. The plan is expected to be developed within the first year and modified as needed. Residential development and flood control projects threaten sites elsewhere. Studies focusing on factors limiting seed production in the wild and pollination requirements would be useful since little is known in these areas. The overall trend for Nevin's barberry has been one of sharp decline due to habitat destruction, but the future trend should stabilize as the monitoring plan for the ANF is implemented.

Mahonia (= Berberis) pinnata ssp. insularis (island barberry)

CA - Endangered FED - Candidate 2

Island barberry is an evergreen shrub in the barberry family (Berberidaceae). The plants have glossy divided leaves, yellow flowers, and blue berries. This endemic barberry is known from three of the Channel Islands: West Anacapa, Santa Cruz and Santa Rosa. It grows in closed-cone pine forest, coastal chaparral and coastal sage scrub communities. Five small populations are known, one on Santa Rosa, three on Santa Cruz and one, consisting of a single shrub, on West Anacapa Island.

Intensive sheep and cattle grazing has degraded the vegetation of Santa Cruz and Santa Rosa islands and has probably reduced or eliminated occurrences of island barberry. TNC has removed the sheep from its lands on Santa Cruz Island and recovery of the barberry populations is expected. The National Park Service manages West Anacapa; there are no threats to the barberry plant on that island. NPS recently acquired Santa Rosa Island but lacked funding in 1989 to begin surveys or planning for rare plant management. The current status of island barberry on Santa Rosa Island is unknown. Cattle grazing will continue on the Island for the near future. The long-term trend for this subspecies is one of decline; current information from Santa Rosa Island is needed to assess future prospects for recovery.

Mahonia (= Berberis) sonnei (Truckee barberry)

CA - Endangered FED - Endangered

Truckee barberry is an upright evergreen shrub in the barberry family (Berberidaceae) with divided spiny leaves, small clusters of yellow flowers, and blue-black berries. Only one natural occurrence of Truckee barberry exists; this is on alluvial granitic soils along the upper banks of the Truckee River in the town of Truckee, Nevada County. The only other occurrence of this species is a population that was experimentally introduced in 1988 to a site about five miles northeast of Truckee. It is too early to ascertain long-term viability of this introduced population.

The single known natural population of Truckee barberry could easily be extirpated if not carefully protected. Currently there is competition from riparian vegetation, polluted runoff from urban sources, vandalism, and encroachment of development. Since there is only one established population of this species, it is vulnerable to chance catastrophic events which could lead to its extinction. The introduced site, with less than 15 individuals, has not been established long enough to evaluate success. A regular monitoring program and long-term protection of both sites is necessary for the long-term survival of this species. In 1988 the USFWS supervised the outplanting of nursery-grown Truckee barberry plants in areas of historic distribution. A 1987 report on the taxonomy of several closely related species of barberry, funded by a Federal Section 6 grant-in-aid, concluded that Truckee barberry is a variant of the more widespread Mahonia repens. Once this information is published delisting may be recommended. The recent trend for this species is one of stability.

Malacothamnus clementinus (San Clemente Island bush mallow)

CA - Endangered FED - Endangered

San Clemente Island bush mallow is a rounded evergreen shrub with numerous ascending branches, large leaves that are lobed and hairy, and inflorescences of crowded pink flowers. This member of the mallow family (Malvaceae) is found on sedimentary rock walls and ridges of San Clemente Island. Six small populations were found during the most recent surveys completed in 1985 and 1986. San Clemente Island is managed by the U.S. Navy.

Feral goat and pig populations have caused serious degradation of the native vegetation of the Island. The surviving populations of San Clemente Island bush mallow are restricted to cliffs and steep slopes that protect them from grazing by feral goats and pigs. Most of the goats have recently been removed through an eradication program and vegetation recovery has been observed. San Clemente Island is used for military activities. Bush mallow habitat in one canyon is in an area used as a bombing impact zone, resulting in increased erosion and potentially posing a direct threat to the plants. The U.S. Fish and Wildlife Service has prepared a recovery plan that makes management recommendations for all of the Federally listed plant species of the

Island. The recent trend for this bush mallow is stable, but the total population is so small that it remains critically endangered.

Malacothamnus fasciculatus var. nesioticus
(Santa Cruz Island bush mallow)

CA - Endangered FED - Candidate 2

Santa Cruz Island bush mallow is a tall evergreen shrub with slender wand-like branches covered with woolly hairs, large, lobed leaves, and open inflorescences of pinkish flowers. It is a member of the mallow family (Malvaceae). This plant is known from a single occurrence at the west end of Santa Cruz Island. It grows on a dry, south-facing canyon slope in coastal chaparral and sage scrub vegetation. The single population contains less than 50 plants and may consist of one large clone.

Past overgrazing by sheep and cattle denuded much of the Island and caused the near-extinction of this bush mallow. The Nature Conservancy now owns most of Santa Cruz Island and has succeeded in removing all of the sheep, thus eliminating a major threat. The population was fenced in 1989 to protect it from the rooting and foraging of feral pigs, which continue to pose a significant threat. None of the plants have flowered for several years. Efforts should be made to re-establish the plant in suitable habitat sites. There are established plantings of Santa Cruz Island bush mallow at the U.C. Research Station on the Island and at the Santa Barbara Botanic Garden. The overall trend for this species is one of serious decline.

Maurandya petrophila (rock lady)

CA - Rare FED - Candidate 2

Rock lady is a soft-hairy, herbaceous perennial in the figwort family (Scrophulariaceae). It has short, hanging stems from a woody base, rounded, bristly leaves, and creamy yellow flowers. Rock lady is found in the transition zone of the mixed desert scrub and creosote bush scrub plant communities of Fall and Titus canyons, in the Grapevine Mountains in Inyo County. It grows as scattered individuals in limestone rock crevices of steep canyon walls. The habitat is owned by the National Park Service and is located in Death Valley National Monument.

This beautiful and unusual plant recently has been confirmed from one site in California, in Titus Canyon. Suitable habitat exists at other nearby sites in unsearched canyons. Little is known of the ecology or population biology of rock lady. Before a management plan can be developed, a full status survey and identification of any potential threats is needed . No threats to this plant are currently known. Although it is an extremely rare plant, the trend for rock lady appears to be stable.

Monardella linoides ssp. viminea (willowy monardella)

CA - Endangered FED - Candidate 2

Willowy monardella, a member of the mint family (Lamiaceae), is a perennial with erect stems from a woody base, silvery minute hairs, narrow leaves, and tiny rose-lavender flowers in dense heads. It grows in rocky or sandy areas within canyons, mostly in washes or floodplains. Its U.S. distribution is restricted to San Diego County, mostly north of San Diego near Poway. This taxon also occurs in Baja California, Mexico.

Because of its location, willowy monardella is vulnerable to urbanization and highway construction. At least seven occurrences which were extant in 1981 have been extirpated by development or transplanted by CalTrans as part of mitigation for highway construction. About half of the approximately two dozen known occurrences of willowy mondardella in California are either damaged and declining or have been extirpated. Most occurrences are on Federal (Department of Defense) and private land; a few are on City and County of San Diego property. No specific management or protection measures have been implemented for this species. Recent studies suggest that the trend for willowy monardella is one of decline throughout its range.

Navarretia pauciflora (few-flowered navarretia)

CA - Threatened FED - Candidate 2

Few-flowered navarretia is a small annual herb in the phlox family (Polemoniaceae). This plant grows unbranched or with a few short, spreading branches. The tiny flowers occur in clusters and are white or pale blue. Few-flowered navarretia occurs in drying vernal pools on volcanic substrate in the north coast ranges of California in Lake and Napa counties. It has always been restricted to this very specialized habitat. It often occurs with other rare plants such as the State-listed endangered Lasthenia burkei (Burke's goldfields). Historically, this plant was collected from about nine sites in Lake and Napa counties. Today, the few-flowered navarretia is known from only three sites, all of which occur on private land.

Threats include urban development, off-road vehicle activity, hydrologic changes to the habitat, erosion, grazing and land conversion to agriculture. Immediate action will be necessary to forestall extinction of this species. The overall trend for few-flowered navarretia has been one of steady decline; total habitat loss has been estimated to be as much as 67%.

Navarretia plieantha (many-flowered navarretia)

CA - Endangered FED - Candidate 1

Many-flowered navarretia is a prostrate, mat-forming, spiny annual herb, with widely-spaced narrow leaves and heads of small, pale blue

flowers. This member of the phlox family (Polemoniaceae) is known from moist habitats in volcanic ash vernal pool systems in Lake and Sonoma counties. The Sonoma County sites have not been seen in recent years and are probably extirpated.

Historically, about eight sites for many-flowered navarretia were known. Most of the four remaining Lake County occurrences are in good condition. However, off-road vehicle use and cattle grazing in the pool habitat are continuing threats to this plant. The occurrence at Boggs Lake is owned and protected by the Nature Conservancy; California Endangered Species Tax Check-off funds were used to establish a trail and to build a boardwalk, parking area, and interpretive sign at TNC's Boggs Lake Preserve. Another site, at Loch Lomond, has been purchased by the Wildlife Conservation Board for the protection of several endangered species. DFG has recently provided fencing to prevent entry of off-road vehicles in this fragile pool habitat. The two other Lake County occurrences are privately owned and unprotected. The overall trend for many-flowered navarretia has been one of decline; at least 50% of the habitat has been destroyed. However, recent protection efforts have stabilized the status of this species.

Nemacladus twisselmannii (Twisselmann's nemacladus)

CA - Rare FED - Candidate 2

Twisselmann's nemacladus is an inch-high, gray-hairy annual herb with basal leaves in rosettes, and small short stemmed flowers. It is a member of the bellflower family (Campanulaceae). It grows in small colonies on loose gravels and granitic soils amid sparse Jeffery pine forests at the rim of the Kern Plateau in Kern and Tulare counties.

There are only two known occurrences of Twisselmann's nemacladus; both are in Sequoia National Forest. At present, this species does not appear to be threatened. There is little commercial timber and remote locations preclude heavy recreational use of the habitat. The U.S. Forest Service is monitoring the populations. This rare species was probably always extremely restricted in distribution. The overall trend for Twisselmann's nemacladus is stable.

Neostapfia colusana (Colusa grass)

CA - Endangered FED - Candidate 1

Colusa grass is a coarse, pale green annual member of the grass family (Poaceae), with several stems, leaves loosely folded around the stems, and thick terminal spikes of flowers. This grass occurs only on the adobe muds of large or deep vernal pools in Merced, Stanislaus and Solano counties. The type locality for this species was in Colusa County, but Colusa grass has been extirpated from this county. Associated species in some locations include hairy Orcutt grass (Orcuttia pilosa) and San Joaquin Valley Orcutt grass (O. inaequalis), both of which are also State-listed as endangered.

With the loss of 90% of California's vernal pools, many occurrences of this and other associated species have been destroyed. In December 1989, the USFWS released the final report of a status survey on the Central Valley Orcuttieae, including Colusa grass. This report indicates that, of nearly 50 known occurrences of this species, 20 percent have been extirpated; another 20 percent are damaged and declining. Heavy grazing and competition from introduced weedy species threaten to displace Colusa grass. Many occurrences are on unprotected private land and are subject to agricultural conversion. The Solano County occurrence of Colusa grass is protected by The Nature Conservancy. TNC has also secured conservation easements on the Flying M Ranch of Merced County to protect a large expanse of valley grassland vernal pool habitat. The overall trend for Colusa grass is one of decline.

Nitrophila mohavensis (Amargosa nitrophila)

CA - Endangered FED - Endangered

Amargosa nitrophila is a small erect perennial in the goosefoot family (Chenopodiaceae). This compact plant has smooth pinkish stems, rounded opposite leaves that clasp the stems, and minute rose-colored flowers at the base of the leaves. It is found in open alkali flats and low sand deposits in the Amargosa River drainage of Inyo County, California and Nye County, Nevada. This area includes the Carson Slough drainage near Tecopa, and Ash Meadows, a unique desert oasis.

There are only three known occurrences of Amargosa nitrophila worldwide, two of which are in California. This species requires natural and unaltered hydrology for its survival, and any modifications to either site could be detrimental. Mining, grazing, ORV's, roadside maintenance, and residential development also pose direct threats. A significant portion of one of the sites, which is privately owned, was recently destroyed by earth fill. The other California site, which is managed by the Bureau of Land Management, has potential grazing threats. In April 1990 this occurrence was damaged by vehicles from an unauthorized mining survey; fortunately the damage was minimal. As a result of these mining actions, a botanical survey of suitable habitat in the vicinity was required to obtain current information on the condition and trend of the population. Formal protection of the private occurrence is needed. The BLM should maintain the natural hydrology of its site, minimize or eliminate any grazing effects, and establish a long-term monitoring program for this species. The overall trend for Amargosa nitrophila has been one of decline due to habitat destruction.

Nolina interrata (Dehesa nolina)

CA - Endangered FED - Candidate 1

Dehesa nolina is a large underground-stemmed perennial, forming rosettes of long flat leaves, tall much-branched flower stalks, and light-colored male and female flowers on separate plants. This yucca-like plant in the agave family (Agavaceae) is found in chaparral

plant communities in a limited area of south-central San Diego County and adjacent Baja California.

This species is limited to about a half-dozen occurrences which are threatened by residential development of the habitat and collection of plants for sale in the nursery trade. TNC recently established a preserve on part of McGinty Mountain which protects part of the largest known occurrence. This important site contains over half of the existing plants in California. Studies are needed to determine if fire management will increase the reproduction of this species. Transplanting may be necessary to provide plants of the opposite sex into populations containing only individuals of the same sex. The overall trend for this plant has been one of decline, but recent efforts to protect the largest and most vigorous population should help stabilize the trend.

Oenothera avita ssp. eurekensis (Eureka Dunes evening primrose)

CA - Rare FED - Endangered

Eureka Dunes evening primrose is a perennial herb with large showy white flowers. This member of the evening primrose family (Onagraceae) grows in the flat to gently sloping sand areas bordering larger desert sand dunes of Eureka Valley in Inyo County. Eureka Dunes evening primrose is associated with the State-listed rare Eureka Valley dune grass (Swallenia alexandrae), although the grass often grows much higher on the dunes. There are only three known occurrences of Eureka Dunes evening primrose; all are confined to the southern portion of Eureka Valley.

The Bureau of Land Management (BLM) manages all three Eureka Dunes evening primrose occurrences. In 1976, the BLM closed the dunes to off-road vehicle (ORV) activity in order to protect the dunes and associated vegetation. Since the closure, the dune vegetation has recovered dramatically. However, illegal entry by ORVs is still a threat to the dune vegetation. Recent research, done under contract to DFG using Federal endangered species funds, revealed that although Eureka Dunes evening primrose is short-lived and suffers high mortality, it produces abundant, long-lived seeds. Restricting human disturbance to the dune sites will allow a continuation of the existing stable trend.

Oenothera deltoides var. howellii
(Antioch Dunes evening primrose)

CA - Endangered FED - Endangered

Antioch Dunes evening primrose is a showy, white-flowered, much-branched perennial herb, with grayish toothed or divided leaves. It is a member of the evening primrose family (Onagraceae). The habitat for this plant consists of loose sand and semi-stabilized dunes in a small area along the San Joaquin River near Antioch, Contra Costa County, now mainly protected as a part of San Francisco Bay National Wildlife Refuge. The State and Federally endangered Antioch

Dunes wallflower (Erysimum capitatum var. angustatum) grows in the same area as the evening primrose.

Although the dunes once covered a larger area, they have been reduced to about 70 acres as a result of industrial development, sand mining and agricultural conversion. The remaining habitat has been degraded by fire control activities, off-road vehicle use and invasion by exotic species. The USFWS has prepared a recovery plan for Antioch Dunes evening primrose and two other endangered species found at the Dunes. Research funded by a grant-in-aid from USFWS has determined that although plants of this species typically produce large numbers of seeds, seed set by the plants at Antioch Dunes is reduced, possibly due to pollination limitations. This research also determined that seedlings were unable to survive on the clay soils that are now present in areas where overlaying dune sand was removed. In 1988 a permanent plot was established at the Refuge to facilitate long-term monitoring. In 1970 this species was introduced from seed at two sites within Brannan Island State Recreation Area. A survey in 1988 determined that one site supported a population of about 60 individuals; the second was reduced to six plants and did not appear likely to survive over the long-term. There is no active management program for these populations, although they are monitored on a regular basis. The lack of funds has so far prevented implementation of an experimental introduction to sandy sites not currently occupied by this species. The recent trend for Antioch Dunes evening primrose is stable, but at a total population size and distribution that leaves it vulnerable to extinction.

Opuntia basilaris var. treleasei (Bakersfield cactus)

CA - Endangered FED - Endangered

Bakersfield cactus is a succulent, spiny member of the cactus family (Cactaceae). It is a spreading perennial plant with gray-green stems which form flat joints (pads). It has large, showy, magenta flowers that bloom from March through June. This species grows on coarse or cobbly well-drained granitic sand on bluffs, low hills, and flats in the valley and foothill grasslands of Kern County.

Bakersfield cactus once formed extensive colonies in the area around the present city of Bakersfield, extending up the Kern River Canyon to the northeast, up the Caliente Creek drainage to the southeast, and to the Tejon Hills, about twenty miles to the south. Much of the historical habitat for this species has been destroyed by impacts associated with human activities. The rapidly accelerating urbanization of this area poses a severe threat to the species today. Agricultural development, oilfield development, overgrazing by sheep and cattle, off-road vehicle activity, dumping, sand mining, and invasion of weedy grasses have contributed to the decline of this species and destruction of its habitat throughout its range. As these activities continue, they threaten the existence of Bakersfield cactus. The overall trend of this species has been one of dramatic decline.

Orcuttia californica (California Orcutt grass)

CA - Endangered FED - Candidate 1

California Orcutt grass, a member of the grass family (Poaceae), is a bright green, sticky, aromatic, densely-tufted annual plant, with flowers borne in dense spikes. It was once commonly found in the volcanic terrace and valley vernal pool systems of southern California in Los Angeles, Riverside and San Diego counties.

Of approximately 25 historic occurrences, at least half have been extirpated or are damaged and declining as a result of conversion to agriculture, urbanization and roadbuilding activities. Extensive urbanization has extirpated California Orcutt grass from Los Angeles County and reduced the number of sites in the other two counties. Most San Diego County occurrences are found on Otay Mesa and are threatened by development associated with the International Border crossing. Some of the Riverside County occurrences are protected and monitored on The Nature Conservancy's Santa Rosa Plateau Preserve. The other occurrences are on private property and are unprotected. High quality pools need to be identified so that priority can be given to long-term protection of the most viable populations of rare plants. California Endangered Species Tax Check-off funds are being used to finance rare plant habitat protection efforts at TNC's Santa Rosa Plateau Preserve; this project includes protection and restoration of native habitat on the preserve land and installation of interpretive signs. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, California Orcutt grass seed will be stored at the Garden's long-term storage facilities. The overall trend for this species is one of decline as a result of habitat alteration and destruction.

Orcuttia inaequalis (San Joaquin Valley Orcutt grass)

CA - Endangered FED - Candidate 1

San Joaquin Valley Orcutt grass is a grayish-green, sticky, aromatic annual in the grass family (Poaceae), with a terminal inflorescence of overlapping flowers. This grass was once common in vernal pools in Stanislaus, Merced, Fresno, Madera, and Tulare counties. Associated species in some locations include Colusa grass (Neostapfia colusana), Boggs Lake hedge-hyssop (Gratiola heterosepala), and succulent owl's clover (Orthocarpus campestris var. succulentus), all of which are State-listed as endangered.

In December, 1989, the USFWS released the final report on a status survey of the Central Valley Orcuttieae, including San Joaquin Valley Orcutt grass. This report indicated that over 60 percent of the approximately 30 known occurrences of this species have been extirpated, primarily as a result of conversion of suitable habitat to agriculture. San Joaquin Valley Orcutt grass has been completely extirpated from Stanislaus and Tulare counties. Most of the extant occurrences are concentrated in two small areas in eastern Merced County. Several populations have been damaged and are declining due to heavy grazing, discing and competition from weedy exotic species.

Only six of the extant occurrences are considered stable. Occurrences of San Joaquin Valley Orcutt grass on the Flying M Ranch in Merced county are protected through conservation easements with The Nature Conservancy. BLM owns one of the occurrences in Fresno County. A draft proposal for designating this site as an Area of Critical Environmental Concern (ACEC) has been prepared. The other occurrences are under private ownership and are unprotected. The general trend for this species is one of decline.

Orcuttia pilosa (hairy Orcutt grass)

CA - Endangered FED - Candidate 1

Hairy Orcutt grass is a yellow-green, aromatic, tufted annual in the grass family (Poaceae), with sticky hairs throughout, and a branched inflorescence of numerous flowers. This grass occurs in vernal pools in Stanislaus, Merced, and Madera counties in the San Joaquin Valley, with several more populations farther north in Tehama and Butte counties. Associated species in some locations that are also State-listed include Colusa grass (Neostapfia colusana) and Greene's tuctoria (Tuctoria greenei).

Hairy Orcutt grass is severely threatened by conversion of its vernal pool habitat to agriculture. A USFWS report released in December, 1989, on the status of Central Valley Orcuttieae indicated that nearly 40 percent of the approximately 30 known occurrences have been extirpated as a result of conversion of habitat to irrigated agriculture. All of the occurrences in Merced County are believed to be extirpated. Existing habitat continues to be threatened by overgrazing, discing, and competition from weedy plants, and several of the extant occurrences are damaged and declining. It appears that hairy Orcutt grass can tolerate some grazing, but livestock impacts on occurrences should be monitored. Several occurrences receive protection on TNC's Vina Plains Preserve in Tehama County. The occurrences in the San Joaquin Valley are not protected. The overall trend for hairy Orcutt grass is one of decline due to loss of vernal pool habitat.

Orcuttia tenuis (slender Orcutt grass)

CA - Endangered FED - Candidate 1

Slender Orcutt grass is a blue-green, sticky, aromatic annual member of the grass family (Poaceae), with a branched, several-flowered inflorescence. This grass occurs in the bottom of vernal pools primarily associated with valley grassland and blue oak woodland communities. It has been reported from Lake, Sacramento, Shasta, Siskiyou, and Tehama counties. Associated species that are also State-listed include: many-flowered navarretia (Navarretia plieantha), Boggs Lake hedge-hyssop (Gratiola heterosepala), and Greene's tuctoria (Tuctoria greenei).

Much of the vernal pool habitat in which this species occurs has been damaged or lost as a result of agricultural conversion. The remaining

habitat is threatened by development at the Redding Municipal Airport, overgrazing and changes in pool hydrology. A 1989 report by the USFWS on the status of Central Valley Orcuttieae indicated that nearly a third of the approximately 45 known occurrences of slender Orcutt grass have been damaged, are in marginal condition, or are extirpated. TNC protects and monitors a few occurrences of slender Orcutt grass at the Vina Plains and Boggs Lake preserves. Other occurrences on BLM, USFS and private rangeland are subject to cattle grazing. Populations on USFS's Lassen National Forest are being monitored, and California Environmental License Plate funds have been approved to fence a vernal pool that supports slender Orcutt grass. A species management guide has been developed cooperatively by USFS and BLM. California Endangered Species Tax Check-off funds have been used to implement management and protection measures at TNC's Boggs Lake Preserve. This project included installing an interpretive trail and signs as well as constructing a fence to restrict ORV and equestrian access. The trail includes a floating dock that allows visitors access to the lake without adversely impacting the environmentally sensitive site. Although discoveries of additional populations in recent years have extended the known range of this species, the overall trend is declining as a result of habitat alteration and loss.

Orcuttia viscida (Sacramento Orcutt grass)

CA - Endangered FED - Candidate 1

Sacramento Orcutt grass is a blue-green, tufted, sticky aromatic annual plant in the grass family (Poaceae), with flowers crowded into bristly heads. It flowers in dry vernal pool beds within either blue oak woodland or valley grassland communities. This grass is restricted to several vernal pool complexes in Sacramento County and is the rarest and most restricted member of the genus Orcuttia. This species is associated with State-listed endangered Boggs Lake hedge-hyssop (Gratiola heterosepala) at one site. Fewer than 10 occurrences of Sacramento Orcutt grass have been reported; one of these was artificially established in 1979 by seeding a vernal pool.

A 1989 USFWS report on the status of the Central Valley Orcuttieae indicated that two of the known occurrences of this species have been extirpated by urban development and hydrologic modification. Only five of the extant occurrences are currently considered stable. The threats to this species include residential development, overgrazing, and conversion to agriculture. Most occurrences are on private land and remain unprotected. One site at Phoenix Field is owned and managed by DFG as an Ecological Reserve and a management plan has been written for this site. Sacramento Orcutt grass also occurs nearby on recreational park land owned by the City of Fair Oaks; other occurrences are owned by the County of Sacramento and Sacramento Municipal Utility District. The general trend for Sacramento Orcutt grass is one of decline.

Orthocarpus campestris var. succulentus
(succulent owl's-clover)

CA - Endangered FED - Candidate 2

Succulent owl's-clover is a succulent annual herb in the figwort family (Scrophulariaceae) with brittle narrow leaves, and heads of yellow flowers with maroon markings. This species grows in beds of receding vernal pools in valley grassland or woodland areas of the Sierra Nevada foothills in Fresno, Madera, Merced and Stanislaus counties.

Agricultural conversion, discing of pools, competition from introduced weeds, overgrazing, and urbanization of the San Joaquin Valley have eliminated vernal pool habitat and associated species, and continue to threaten succulent owl's clover occurrences. This species, which occurs primarily on private land, lacks permanent protection. The Nature Conservancy has secured vernal pool habitat for this and other State-listed vernal pool species through conservation easements with the Flying M Ranch in Merced County. The overall trend for this species has been one of decline.

Parvisedum leiocarpum (Lake County stonecrop)

CA - Endangered FED - Candidate 1

Lake County stonecrop is a diminutive succulent, annual plant in the stonecrop family (Crassulaceae). It has reddish stems from 1 to 2 inches tall, small fleshy leaves and pale yellow flowers that appear in April or May. This stonecrop grows in level areas that are seasonally wet and dry out in late spring. The substrate is generally of volcanic origin, such as in volcanic ash vernal pools. Lake County stonecrop has always been rare and is restricted to a few sites in Lake County.

Six historical collections for Lake County stonecrop are known. Recent surveys determined that there are only three left; these three sites cover a total area of only about three acres. The total number of plants, though variable, is estimated to be about 4400. This plant is only known from private lands. Its small size and presence on private land make it extremely vulnerable. Threats include urban development, grazing, hydrologic changes to the habitat, land conversion to agriculture and off-road vehicle activity. Immediate protection actions are necessary to prevent further loss of this species. The overall trend for this plant has been one of decline, with at least 50% of the habitat and plants lost.

Pedicularis dudleyi (Dudley's lousewort)

CA - Rare

Dudley's lousewort is a short perennial herb with mostly compound basal leaves, and stalks of pinkish flowers. This member of the figwort family (Scrophulariaceae) grows under shaded conditions in

coastal redwood and mixed evergreen forest communities in San Luis Obispo, Monterey, Santa Cruz, and San Mateo Counties.

There are fewer than ten known occurrences of Dudley's lousewort. The majority of them are within the Los Padres National Forest or on State Park land and are threatened by recreational activities. In 1988, an occurrence in the Pico Blanco Boy Scout Camp (Monterey County) was afforded some protection as a result of contact with camp officials. The plant populations there had been impacted heavily by various activities, but a monitoring program has since been implemented. No permanent management programs for this species exist. The overall trend for this plant has been one of decline, and unless permanent protection plans are implemented, the trend will undoubtedly continue. A change in listed status to threatened seems appropriate for this plant considering the many impacts to the populations, the low population numbers, and the absence of permanent protection.

Pentachaeta lyonii (Lyon's pentachaeta)

CA - Endangered FED - Candidate 1

Lyon's pentachaeta is an annual herbaceous plant in the sunflower family (Asteraceae). It has yellow ray and disk flowers arranged in heads that bloom from March to August. Habitat for Lyon's pentachaeta consists of grassy openings within chaparral. It can also be found at the edges of artificially created clearings adjacent to firebreaks and roads. Currently, Lyon's pentachaeta is known only from the coastal mountain region of northern Los Angeles County and southern Ventura County in the Santa Monica Mountains and in the Simi Valley. Populations on the Palos Verdes Peninsula and on Santa Catalina Island have not been seen for many years.

Only nine of the sixteen historical occurrences of Lyon's pentachaeta are known to exist. Since most populations are on privately owned land, and urbanization is occurring throughout much of southern California, the remaining Lyon's pentachaeta populations have been seriously affected by numerous development-related disturbances. Golf course construction, illegal dumping, road construction, transplantation attempts, and housing developments have contributed to the decline of this species and its habitat, and continue to jeopardize its existence. Populations in State and Federal park lands are threatened by trampling by park visitors. Natural impacts, including drought and gopher disturbance, have reduced populations. Rancho Santa Ana Botanical Garden is growing Lyon's pentachaeta for reintroduction into suitable sites as part of a mitigation plan associated with development at one occurrence.
The overall trend for this species has been one of decline.

Phlox hirsuta (Yreka phlox)

CA - Endangered FED - Candidate 1

Yreka phlox is a low, cushion-like perennial subshrub, with hairs throughout, leaves crowded on short stems, and short-stalked pink to purple flowers. This phlox family (Polemoniaceae) member occurs in juniper woodlands and open Jeffrey pine forests on granitic soils in the general vicinity of Yreka, Siskiyou County. There are three known occurrences owned by several private individuals, Klamath National Forest, and CalTrans.

The occurrences have been disturbed by road building activity associated with a subdivision, and logging and support activities. One occurrence in the town of Yreka is in the path of development. The Forest Service is protecting an occurrence on its land. The Nature Conservancy has secured voluntary protection agreements with private landowners in the China Hill and Forest Mountain areas through their Registry of Natural Areas. The recent trend for Yreka phlox has been one of decline.

Plagiobothrys diffusus (San Francisco popcornflower)

CA - Endangered FED - Candidate 2

San Francisco popcornflower is a low, herbaceous annual, with narrow leaves, and a branched inflorescence of white flowers. This member of the borage family (Boraginaceae) is known only from the Presidio of San Francisco and from one occurrence near the City of Santa Cruz. The type locality near Mountain Lake in San Francisco has been altered by landscaping with trees and shrubs and introduced annual weedy grasses.

San Francisco popcornflower has not been seen in many years on the Presidio and may be extirpated from San Francisco. Until a population is relocated, any remaining historic habitat on the Presidio should be protected. Specimens from Empire Grade in Santa Cruz County (previously not thought to be P. diffusus) have since been identified as such. There is some dissention among experts on the taxonomy of this species. Some have suggested combining it with a more common taxon, while others maintain it should remain as a distinct species. The new Jepson Manual (to be published in 1991) will present an updated taxonomy for this species. No management plans exist for this plant. The overall trend for San Francisco popcornflower has been one of decline due to loss of habitat and encroachment of introduced species.

Plagiobothrys strictus (Calistoga popcornflower)

CA - Threatened FED - Candidate 1

Calistoga popcornflower is an annual herb in the borage family (Boranginaceae). It is slender-stemmed, with narrow leaves and small white flowers. This species exists within vernal pools adjacent to

active geysers and hot springs. These seasonal wetlands are underlain by a gravelly loam interbedded with clay, and water tables are close to the surface. Concentrations of boron, arsenic, and sulphates are high.

Only two of the three historic occurrences of Calistoga popcornflower remain. These are near the town of Calistoga, in Napa County. Urbanization and viticulture have extirpated one historic occurrence and eliminated over 70 percent of the species' habitat. Both extant occurrences exist on privately owned land. One population has declined in the last decade due to disturbances such as grass mowing, traffic, and vehicle parking. Both populations are small and at risk of extirpation by a random or chance event such as a severe disease outbreak, a fire, or other natural or human-caused disaster. The overall trend of this species has been one of decline.

Pleuropogon hooverianus (North Coast semaphore grass)

CA - Rare FED - Candidate 2

North Coast semaphore grass, a member of the grass family (Poaceae), is a large, succulent perennial grass, with long and flat ribbon-like leaves and a terminal unbranched spike bearing widely spaced spikelets. It grows in moist sites of redwood forest and mixed evergreen forest communities. This species is a northwest California endemic known only from Marin, Sonoma, and Mendocino counties.

There are only about a dozen known occurrences of this species, many of which have not been seen recently. Impacts have occurred to roadside populations of North Coast semaphore grass from maintenance activities and herbicide spraying. A survey conducted in 1988 indicated that one of the Marin County occurrences may be extirpated due to habitat destruction for a housing development. Elimination of habitat and disruption of natural hydrologic conditions have resulted in population declines. Predation by insects may also threaten this species. One of the occurrences of this species is on DFG's Laguna de Santa Rosa Ecological Reserve, but no active management strategy has been initiated. The other occurrences are privately owned and subject to land conversion, which alters the hydrologic conditions necessary to support this grass. Thorough field surveys are needed at historic locations to up-date information on this grass. The overall trend for this species is one of decline.

Poa napensis (Napa bluegrass)

CA - Endangered FED - Candidate 1

Napa bluegrass is a tufted perennial bunchgrass that lacks rhizomes and has fertile stems crowded with purplish flowers. This rare grass is known from just two sites near Calistoga in Napa County. It grows in moist alkaline meadows that are fed by runoff from nearby hot springs.

Both Napa bluegrass populations are on private land, and have been impacted by development of health spas and other construction near the Calistoga Airport. Continuing threats include alteration of the hot springs hydrology, early season mowing before flowering or seed set, and potential residential and commercial development. There is no management plan for Napa bluegrass. The status of this plant is declining, and preservation efforts through acquisition of habitat by DFG or by conservation easements are essential to its survival.

Pogogyne abramsii (San Diego mesa mint)

CA - Endangered FED - Endangered

San Diego mesa mint, a member of the mint family (Lamiaceae), is a small, aromatic herbaceous annual, with opposite leaves, and two-lipped violet to reddish-purple flowers. It is restricted to vernal pools within grasslands, chamise chaparral and coastal sage scrub plant communities on the mesas of western San Diego County. In some locations, this species is associated with San Diego button-celery (Eryngium aristulatum var. parishii), also State-listed as endangered.

Although approximately 40 occurrences of San Diego mesa mint remain, nearly all are seriously threatened by agricultural development, urbanization, off-road vehicle activity, illegal dumping, and gravel mining operations. About half of the known sites are damaged and declining; about 10 others have already been extirpated. A 1986 habitat survey (using Federal Endangered species funds) reported significant losses during the last several years in the City of San Diego. The San Diego Vernal Pool Preservation Plan has failed to preserve significant habitat for this species and additional vernal pools within the City of San Diego continue to be lost. Significant pools are on Federal land at the Miramar Naval Air Station; ownership of other occurrences include State (CalTrans), municipal (City of San Diego), and private. DFG acquired some pools as mitigation for a CalTrans project and has given the USFWS responsibility for their management. To preserve San Diego mesa mint, the high quality vernal pool habitat remaining in San Diego County should be formally protected. A Federal Section 6 grant-in-aid is being used to continue efforts to restore and monitor damaged vernal pools that support San Diego mesa mint. The overall trend for this species is one of decline as a result of habitat alteration and destruction.

Pogogyne clareana (Santa Lucia mint)

CA - Endangered FED - Candidate 2

Santa Lucia mint is a strong-odored, herbaceous annual, with low-spreading branches, and narrow head-like clusters of reddish- purple flowers. This member of the mint family (Lamiaceae) is known only from the tributaries of the Nacimiento River on the Hunter Liggett Military Reservation in Monterey County. It grows in moist, sandy soil in streamside habitats.

The distributional range and ecological requirements of Santa Lucia mint are poorly known. Work needs to be done to identify potential habitat, develop management plans and address real and potential threats. Emphasis should be placed on working cooperatively with the Army to secure the known occurrences and prevent their accidential destruction by military activity. The overall trend for this species has been fairly stable, but at levels which are deemed too low to ensure its long-term survival.

Pogogyne nudiuscula (Otay Mesa mint)

CA - Endangered FED - Candidate 1

Otay mesa mint is a much-branched aromatic annual in the mint family (Lamiaceae). This small upright herb grows in vernal pools on Otay Mesa in southwestern San Diego County in association with two other State-listed endangered species: California orcutt grass (Orcuttia californica) and San Diego button-celery (Eryngium aristulatum var. parishii).

There are fewer than six stable or viable occurrences for Otay Mesa mint in California, with several more declining or possibly extirpated. Although once considered widespread near Balboa Park, Mission Valley and University Heights, urbanization has destroyed those occurrences. The Otay Mesa habitat is highly threatened with development, heavy cattle grazing, agricultural conversion, and increased activities around the second International Border crossing. Cattle are degrading many of the vernal pools, and one of the largest and most vigorous populations of Otay Mesa mint is at the periphery of a proposed jail site. Most of the habitat is privately owned and under the jurisdiction of the City of San Diego or San Diego County. There is no ongoing management plan, and the City of San Diego Vernal Pool Preservation Plan has not preserved habitat for this species. Under a Memorandum of Understanding with Rancho Santa Ana Botanic Garden, Otay Mesa mint seed will be stored at the Garden's long-term storage facilities. The overall trend for this species has been one of decline due to habitat destruction and urbanization.

Potentilla hickmanii (Hickman's cinquefoil)

CA - Endangered FED - Candidate 1

Hickman's cinquefoil is an herbaceous, slender-stemmed perennial member of the rose family (Rosaceae), with leaves divided into many leaflets, and numerous yellow flowers. Historically, there were four occurrences of Hickman's cinquefoil, one in coastal San Mateo County, and three sites on the Monterey Peninsula. It was known from seepage areas and other wet sites in coastal prairies or open forested areas along the central coast.

Today, only one site is thought to be extant in the Del Monte Forest of the Monterey Peninsula. This occurrence is owned by the Pebble Beach Foundation, which has fenced an area containing some of the plants. Much of the habitat was previously destroyed by fill to

construct a baseball field. Suitable habitat should be searched to locate additional populations. Cooperation with the Pebble Beach Foundation is essential in management efforts. Hickman's cinquefoil has had a declining trend in recent years.

Pseudobahia bahiaefolia (Hartweg's pseudobahia)

CA - Endangered FED - Candidate 2

Hartweg's pseudobahia, a member of the sunflower family (Asteraceae) is a small, sometimes branched, annual herb covered with white woolly hairs. The plants have small heads of bright yellow flowers. Historically, Hartweg's pseudobahia was scattered but locally abundant in valley and foothill grasslands of the Central Valley. Currently fewer than 20 sites are known, and several of these are classified as damaged, declining or possibly extirpated. The species is now restricted to the east side of the San Joaquin Valley, primarily in Stanislaus County, south to Madera and Fresno counties.

Most of the habitat of this species is privately owned and is subject to agricultural conversion, intensive grazing, and levee construction. There are no protected populations of this species, and most have not been surveyed or seen in several years. Based on admittedly dated information, the overall trend for this species is stable to declining. Current surveys are needed for an accurate assessment of its status.

Pseudobahia peirsonii (Tulare pseudobahia)

CA - Endangered FED - Candidate 1

Tulare pseudobahia is a small, erect, yellow-flowered, woolly annual herb in the sunflower family (Asteraceae). It grows on grassy valley floors and rolling foothills of the eastern San Joaquin Valley, in scattered areas from northern Kern County to Tulare and Fresno counties. Two sites are on land administered by the U.S. Army Corps of Engineers and the remaining sites are on private land.

Approximately one-third of the more than 20 historical sites have been extirpated by agricultural development. Existing populations are seriously threatened or damaged by agriculture, urbanization, overgrazing by cattle and sheep and competition from introduced weeds. A 1989 management plan for Tulare pseudobahia recommends that preserves be established to protect one or more populations, and that studies be initiated to determine the environmental requirements of the species, and evaluate the effects of livestock grazing and competition from exotics. Threats to a population near Fresno from construction of a flood control dam are being mitigated by protecting habitat on-site and by acquiring and protecting a population off-site. The overall trend for this species is one of decline.

Rorippa gambellii (Gambel's watercress)

CA - Threatened FED - Candidate - 1

Gambel's watercress is an herbaceous perennial in the mustard family (Brassicaceae). This species characteristically roots from the stem, which bears scattered compound leaves and dense clusters of white flowers. Gambel's watercress is found in freshwater or brackish marsh habitats at the margins of lakes or along slow-flowing streams. It grows in or just above the water level, and requires a permanent source of water.

Historically, Gambel's watercress occurred in interior wetland areas of San Diego, San Bernardino, and Los Angeles counties, as well as coastal wetland areas of San Luis Obispo and Santa Barbara counties. A population from Mexico is thought to be extirpated. Of approximately a dozen historical locations of Gambel's watercress in California, only three small populations in San Luis Obispo County remain. These populations support a total of about 700 plants. The primary threat to Gambel's watercress today is loss of suitable wetland habitat. Two of the populations, in the Oso Flaco Lake area, are on DPR's Pismo Dunes State Vehicular Recreation Area. The Oso Flaco Lake occurrence is threatened by the encroachment of unsecured sand from adjacent dunes. These dunes have in the recent past been used heavily by off-road vehicles (ORVs); such use has resulted in the removal of much of the stabilizing native vegetation which was securing the dune sand. This threat has been partially mitigated by restrictions placed on areas in which the ORVs may operate. Attempts to manually revegetate the adjacent dunes have not been successful. At Little Oso Flaco Lake, fluctuating water levels due to agricultural activities in adjacent farmlands is a serious threat. In 1990 the Off Highway Vehicle Commission approved cooperative management of the Oso Flaco Lake Natural Area by DPR's Off Highway Motor Vehicle Recreation Division (OHMVRD) and TNC. The Black Lake Canyon occurrence is privately owned and is seriously threatened by the proposed drilling of water wells up-canyon from Gambel's watercress habitat. In 1990 a management strategy for this species was developed by DFG. The overall trend of this species has been one of decline.

Rorippa subumbellata (Tahoe yellow cress)

CA - Endangered FED - Candidate 1

Tahoe yellow cress is a creeping herbaceous perennial, with divided leaves, and terminal to elongate inflorescences of yellow to white flowers. This member of the mustard family (Brassicaceae) grows on sandy deposits in riparian communities and along lakeshore margins of Lake Tahoe in El Dorado and Placer Counties, and historically at Tallac Lake and near Truckee in Nevada County, as well as in adjacent Nevada.

This species has declined in recent years from heavy recreational use of beaches, soil disturbance, private and commercial development and cattle grazing. Artificial changes in the water level of Lake Tahoe have inundated shoreline habitat. Some populations of Tahoe yellow

cress occur on National Forest and State Park lands in the Tahoe Basin. Monitoring and protection activities, including fencing, have been initiated by these agencies. The USFS Lake Tahoe Basin Management Unit has developed an interim management guide for the species and has completed a second full year of monitoring of the planted populations. In 1989, the State Lands Commission initiated steps to develop a coordinated bi-state habitat conservation program for Tahoe yellow cress to address the cumulative impacts of development on its habitat. This program, scheduled to begin in early 1991, will identify high priority areas for protection and establish mechanisms to conserve the species' habitat through the shoreline development permitting process. The State Lands Commission is coordinating the program with the Tahoe Regional Planning Agency, the Department of Fish and Game, and other State, Federal and local agencies. This program should help arrest or reverse the declining trend of Tahoe yellow cress.

Rosa minutifolia (small-leaved rose)

CA - Endangered

Small-leaved rose is a spiny shrub in the rose family (Rosaceae). It has slender gray shoots, small compound leaves, and showy rose-pink flowers. It grows in the coastal sage scrub plant community of southern California and Baja California. In the United States, this species is known from a single population, discovered in 1985, on Otay Mesa in southern San Diego County.

The existing California occurrence occupies an area of only 75 to 100 square yards, and is located in the vicinity of an area of unauthorized off-road vehicle use. Impacts to the habitat from OHV activity have resulted in the complete removal of vegetation on two sides of the colony. This single remaining California occurrence is within an intense urban development zone of the City of San Diego. A major subdivision has been proposed for the site. Development on the coastal plain in Mexico is converting small-leaved rose habitat to farmland and housing developments. The overall trend for small-leaved rose is one of decline.

Sanicula maritima (Adobe sanicle)

CA - Rare FED - Candidate 2

Adobe sanicle grows as a stout, aromatic, perennial herb, with large basal leaves and smaller upper leaves, and with flowers in several head-like clusters. This member of the carrot family (Apiaceae) can be found in wet to dry adobe clay soils of coastal prairie and coastal sage scrub plant communities. Its distribution is centered in the coastal hills of San Luis Obispo County with additional historical records from the San Francisco Bay Area.

Fewer than ten occurrences are still extant and all but one, located in Los Padres National Forest, are privately owned and unprotected. Adobe sanicle lacks a species management plan and would benefit from

studies to determine its ecological requirements. More information is needed in order to assign a trend to adobe sanicle.

Sanicula saxatilis (rock sanicle)

CA - Rare FED - Candidate 2

Rock sanicle is a low, stout, perennial herb in the carrot family (Apiaceae), with numerous dissected basal leaves and small pale yellow flowers borne in round stalked clusters. It can be found on rocky soil, rock outcrops, and talus slopes, usually within the chaparral plant community.

Fewer than ten occurrences of rock sanicle are known. In Contra Costa County, this species occurs on the main and north peaks within Mount Diablo State Park. In Santa Clara County, the species is known from the vicinity of Mount Hamilton, on privately owned land or on property of the University of California (Lick Observatory). Although the overall trend for this species has been one of decline, several populations along trails at Mount Diablo appear stable and receive few impacts from hikers.

Senecio ganderi (Gander's butterweed)

CA - Rare FED - Candidate 2

Gander's butterweed is a member of the sunflower family (Asteraceae). This basal-leaved perennial herb has compact yellow-orange flowerheads with leaves which are suffused with purple. It is usually found on recently burned sites or in the understory of mature mixed chaparral on soils derived from gabbro. It grows in the foothills and mountains of San Diego County including Tecate, Lawson and Cuyamaca peaks and McGinty and El Cajon mountains.

Fewer than a dozen occurrences of Gander's butterweed exist today, some in remote and undisturbed sites, and others which are threatened by ORVs and horticultural collecting. Although this species thrives after fire, it has little tolerance for human disturbance of its habitat. Gander's butterweed does not grow on fire breaks or other cleared sites. Ownership of sites is divided between several private landowners, Cleveland National Forest and Cuyamaca Rancho State Park. Management suggestions include protection of undisturbed chaparral and occasional fire for seedling establishment. The trend for this plant has been one of decline.

Senecio layneae (Layne's butterweed)

CA - Rare FED - Candidate 2

Layne's butterweed is a perennial herb, with mostly basal leaves and reduced stem leaves, and flowers in small yellow heads. It is a member of the sunflower family (Asteraceae). Its habitat is the gabbro derived soils of chaparral and oak woodlands in the vicinity of

Pine Hill in western El Dorado County and the Red Hills of Tuolumne County. Associated species in El Dorado County include three other State-listed plants; Pine Hill flannelbush (Fremontodendron decumbens), El Dorado bedstraw (Galium californicum ssp. sierrae) and Stebbins' morning glory (Calystegia stebbinsii).

Although more than thirty occurrences of Layne's butterweed are known, most are privately owned and subject to rapid residential and commercial development near Highway 50 in Cameron Park and Shingle Springs. A habitat conservation program is needed for the Pine Hill gabbro plants. DFG staff is working with El Dorado County planning staff to identify high priority areas that can be protected through the land use planning process. An extensive occurrence is protected at the Department of Fish and Game Pine Hill Ecological Reserve. A management plan for the reserve has been written, and a prescribed burn monitoring program began in 1983. In 1990 El Dorado National Forest and The Nature Conservancy conducted surveys and completed monitoring prescriptions for this species in the Traverse Creek Botanical Area. The recent trend for Layne's butterweed has been one of decline.

Sidalcea covillei (Owens Valley checkerbloom)

CA - Endangered FED - Candidate 2

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 inflorescence. This species is endemic to moist alkaline meadows and freshwater seeps in Owens Valley, east of the Sierra Nevada, in Inyo County.

Most of the occurrences of Owens Valley checkerbloom are found on land owned by the Los Angeles Department of Water and Power; the others are owned by BLM, the Bureau of Indian Affairs, and private landowners. One of the major threats to this species is loss of suitable moist habitat as a result of lowering water tables through groundwater pumping and draining of meadows in the Owens Valley. Drought tolerant species are able to invade the once moist meadows and outcompete the checkerbloom. Also, Owens Valley has traditionally been subject to heavy cattle grazing; livestock activities continue to threaten most of the checkerbloom occurrences. Management suggestions include fencing to exclude cattle, reducing hydrologic alteration and monitoring occurrence vigor. Because of continued loss of suitable habitat for Owens Valley checkerbloom, the overall trend for this species is stable to declining.

Sidalcea hickmanii ssp. anomala (Cuesta Pass checkerbloom)

CA - Rare FED - Candidate 2

Cuesta Pass checkerbloom is a perennial herb in the mallow family (Malvaceae) distinguished by its covering of grayish star-shaped hairs, rounded basal leaves and deeply lobed stem leaves, and pinkish-lavender flowers above broad bracts. It grows in open sites

on serpentine rock and soils at the edge of a Sargent cypress forest. Its distribution is narrowly restricted to a small area in San Luis Obispo County.

There are only three known occurrence records of Cuesta Pass checkerbloom, all of which are located on Cuesta Ridge in the Los Padres National Forest. Two of the occurrences are within the Cuesta Ridge Botanical Area; the third is in the immediate vicinity. The Botanical Area was established primarily because of the unique stand of Sargent cypress, but the area also supports eight rare plant species. No specific management strategies have been initiated for any of these rare species. There are no immediate threats to this plant, although it should be monitored regularly due to its extremely restricted habitat and distribution. Additional biological information is required before a management plan can be written for Cuesta Pass checkerbloom. The overall trend for Cuesta Pass checkerbloom is believed to be stable.

Sidalcea hickmanii ssp. parishii (Parish's checkerbloom)

CA - Rare FED - Candidate 2

Parish's checkerbloom is a woody root-crowned perennial with coarse, gray hairs throughout. This member of the mallow family (Malvaceae) has rounded leaves with scalloped edges and elongated inflorescences of pinkish-lavender flowers. It grows in burned or cleared areas on dry, rocky slopes of both scrub oak and yellow pine forest communities in the San Bernardino Mountains, San Bernardino County, and in several ranges of Santa Barbara County. Most sites are on land owned by the USFS.

Although nearly 20 occurrences of Parish's checkerbloom are known, only a few have been seen recently. Fire suppression may threaten this plant because it is an early successional plant requiring openings for establishment. Controlled burns and chaparral removal may be effective for habitat enhancement. Surveys should be conducted to determine the current status of historical occurrences. The overall trend for this Parish's checkerbloom has been one of decline, possibly due to fire suppression.

Sidalcea oregana ssp. valida (Kenwood Marsh checkerbloom)

CA - Endangered FED - Candidate 1

Kenwood Marsh checkerbloom, a member of the mallow family (Malvaceae), is a many-stemmed perennial herb with deeply lobed stem leaves and dense, spike-like inflorescences of pink to mauve flowers. Only two occurrences of this California endemic are known, one in Kenwood Marsh and the other in Knights Valley, both in Sonoma County.

Both sites are located on private land and have been adversely affected by nearby housing development, cattle grazing, and agricultural practices, resulting in alteration of local hydrology and elimination of habitat. In 1988, field surveys were conducted for

both known occurrences of Kenwood Marsh checkerbloom and DFG is attempting to purchase one site. There are no management agreements with the private landowners. Conservation easements or acquisition of habitat will be necessary to prevent further impacts and alteration of the marsh environment. The overall trend for this species has been one of decline due to development and habitat destruction.

Sidalcea pedata (bird-footed checkerbloom)

CA - Endangered FED - Endangered

Bird-footed checkerbloom is a many-stemmed, slender, pinkish-rose flowered perennial in the mallow family (Malvaceae). This species is restricted to moist pebble plain meadows and sparsely vegetated drier meadows of Big Bear Valley in San Bernardino County. A large number of endemic species occurs in the area, including the State and Federally endangered slender-petaled thelypodium (Thelypodium stenopetalum).

Bird-footed checkerbloom is believed to have been much more widespread in the region prior to the construction of the dam in the 1890s that flooded much of the meadow habitat to create Big Bear Lake. Although there are sixteen recorded sites for this plant, two-thirds of these occurrences have been extirpated or are damaged and declining. The chief threats are residential development near Big Bear and Baldwin lakes, horse grazing, and alteration of the local drainage patterns feeding the meadows. Most of the occurrences are privately owned; some of these are voluntarily protected through the TNC Registry of Natural Areas. The other occurrences are on property owned by the City of Big Bear, USFS and DFG. The Nature Conservancy and DFG cooperated to acquire habitat at Baldwin Lake for an Ecological Reserve to protect rare endemic pebble plains species, including bird-footed checkerbloom. The Wildlife Conservation Board, in 1990, approved the acquisition of an additional parcel adjacent to the existing reserve. This acquisition is significant in that the whole watershed for this pebble plains community will be protected. California Endangered Species Tax Check-off funds were used to prepare a management plan for this reserve; a Federal Section 6 grant-in-aid and Tax Check-off funds are being used to implement some of the management recommendations. The overall trend for this species is one of decline.

Sidalcea stipularis (Scadden Flat checkerbloom)

CA - Endangered FED - Candidate 1

Scadden Flat checkerbloom is a perennial herb in the mallow family (Malvaceae). It grows from elongated rhizomes, has basal leaves without lobes, and mauve flowers in densely branched inflorescences. This taxon was described as a distinct species in 1974. It grows in a wet montane marsh fed by local springs, which also supports many plants normally found at higher elevations.

Scadden Flat checkerbloom is known from only one occurrence, in the vicinity of Grass Valley in Nevada County. Any change in the local hydrological regime of the marsh that supports it would adversely affect the only existing population. Introduced weedy plants compete with native marsh plants, and an increase in the cattail population of the marsh may become a threat to the population. CalTrans owns approximately half of the known population, and modified the realignment plans for Highway 20 to avoid impacts to Scadden Flat checkerbloom. The private owners of the occurrence have voluntarily agreed to protect the habitat on their property through The Nature Conservancy's Register of Natural Areas. Although the overall trend for this species has been one of decline, this population, which is part of TNC's monitoring program, appears to be stable at this time.

Silene campanulata ssp. campanulata (Red Mountain catchfly)

CA - Endangered FED - Candidate 1

Red Mountain catchfly, a member of the pink family (Caryophyllaceae), is a short, much-branched perennial herb, with long narrow leaves, short glandular hairs, and cream to greenish or pink flowers. It occurs on rocky, dry serpentine soils within lower montane coniferous forest and montane chaparral communities on Red Mountain and Little Red Mountain in Mendocino County. Among its associates in Mendocino County is McDonald's rock cress (Arabis macdonaldiana), which is State and Federally-listed as endangered. A new population of Red Mountain catchfly was discovered on serpentine soils in the vicinity of Cook Springs, Colusa County, in 1989.

There are less than ten occurrences of Red Mountain catchfly. It occurs on private land in Colusa County, and on mining company land, on public land administered by BLM, and on DFG's Little Red Mountain Ecological Reserve in Mendocino County. Although there are no active mining claims in the Red Mountain area, all of the occurrences owned privately and by BLM are subject to mineral extraction by strip mining operations for nickel and chromium. Red Mountain has been designated an Area of Critical Environmental Concern by BLM, but this does not protect plants from existing mining claims. The general trend for Red Mountain catchfly is stable, but because mining claims exist over much of its restricted habitat, this taxon continues to warrant listing as endangered.

Streptanthus niger (Tiburon jewelflower)

CA - Endangered FED - Candidate 1

Tiburon jewelflower is a slender annual herb in the mustard family (Brassicaceae). The purplish-black flowers, which appear at the end of May, occur in a zig-zag fashion along the branches. The long, narrow seed pods open in late June, releasing dormant seed. Seedlings appear in March and April. The habitat for this species consists of shallow, rocky soils derived from serpentinite rock, on south to west-facing slopes within a native bunchgrass plant community.

Tiburon jewelflower is known from only two occurrences. Its entire range occupies less than one third of a square mile on the Tiburon Peninsula in Marin County. Combined, the two occurrences contain approximately 12 acres of habitat. It is likely that this species was once more widespread, and has declined as a result of urbanization. Populations at each existing site have fluctuated between lows of less than 50 individuals and highs of 1000 to 1500 individuals. Both occurrences have multiple landowners. A small portion of one occurrence is protected by the Tiburon Landmark Society, and part of the other occurrence is on designated open space owned by the Town of Tiburon. However, the majority of each occurrence is unprotected. In the immediate future, urbanization may eliminate 45% to 55% of the species' habitat. In addition, this species is at risk of extirpation by a random or chance event such as drought, disease outbreak, or fire. In 1990 a management strategy for Tiburon jewelflower was developed by DFG. The overall trend for this species has been one of decline.

Swallenia alexandrae (Eureka Valley dune grass)

CA - Rare FED - Endangered

Eureka Valley dune grass is a stiff, branched, perennial member of the grass family (Poaceae). This species grows from a long, branched, scaly rhizome, which spreads through the sandy substrate. Eureka Valley dune grass is confined to a few occurrences on active desert dunes in Eureka Valley in Inyo County.

The Bureau of Land Management, which owns and manages the habitat for this species, closed the Eureka Valley Dunes to off-road vehicle use in 1979 to protect the dune grass and its associated species. Since the closure, the dunes have recovered dramatically. However, illegal entry by ORVs is still a threat to the dune vegetation. Recent research, done under contract to DFG using Federal endangered species funds, revealed that although seed production in Eureka Valley dune grass is low and variable, seeds and plants are long-lived. Restricting human disturbance from the dune grass sites will allow the existing populations to remain stable.

Thelypodium stenopetalum (slender-petaled thelypodium)

CA - Endangered FED - Endangered

Slender-petaled thelypodium, a member of the mustard family (Brassicaceae), is a much-branched biennial herb with an open inflorescence of purple-white flowers. This native mustard is endemic to Big Bear Valley in San Bernardino County and grows in seasonal moist alkaline clay soils associated with seeps and springs in the pebble plains. A large number of endemic species occur in the area including the State and Federally endangered bird-footed checkerbloom (Sidalcea pedata).

There are about a dozen known occurrences of slender-petaled thelypodium; at least a third of these are declining or have been

extirpated. The major threats to this species include urban and recreational development, grazing, off-road vehicles, and alteration of local drainage patterns. Occurrences are owned privately, by the USFS, and by DFG. The Nature Conservancy and DFG cooperated to acquire habitat at Baldwin Lake for an Ecological Reserve to protect rare endemic pebble plains species, including slender-petalled thelypodium. The Wildlife Conservation Board, in 1990, approved the acquisition of an additional parcel adjacent to the existing reserve. This acquisition is significant in that the whole watershed for this pebble plains community will be protected. California Endangered Species Tax Check-off funds were used to prepare a Management Plan for this reserve; a Federal Section 6 grant-in-aid and Tax Check-off funds are being used to implement some of the management recommendations. The overall trend for this species is one of decline.

Thermopsis macrophylla var. agnina (Santa Ynez false-lupine)

CA - Rare FED - Candidate 2

Santa Ynez false-lupine is a stout herbaceous perennial with tomentose stems and leaves; it reaches a height of about 1.8 meters. This member of the pea family (Fabaceae) occurs in the San Ynez Mountains of Santa Barbara County. It can be seen growing in disturbed sites and openings in the chaparral and it germinates well after fire. The occurrences are entirely within Los Padres National Forest.

There are fewer than a dozen known occurrences for the Santa Ynez false-lupine; only five have been seen since 1960. This species may suffer from the effects of fire suppression policies. Knowledge about population trends and fire ecology is needed for proper management and protection. Although recognized as a sensitive species, Santa Ynez false-lupine lacks active management programs, however Los Padres National Forest is developing a management guide for the species. The trend for this taxon is difficult to assess, but seems to have been one of decline. A change in listed status may be appropriate for this species.

Trifolium polyodon (Pacific Grove clover)

CA - Rare FED - Candidate 1

Pacific Grove clover is a low annual herb in the pea family (Fabaceae). This small clover has dull purple flowers with lighter tips and occurs in moist grassy openings in the closed cone pine forest near Pacific Grove on the Monterey Peninsula, Monterey County. Only three occurrences of this species were ever known; one was destroyed by golf course construction.

All of the habitat for Pacific Grove clover is in private ownership without permanent protection or preservation measures. One occurrence near a road is subject to impacts from foot traffic and road maintenance activities. A second occurrence is near a recreation area and is partially disturbed. This species has always been rare, and

its present condition warrants an endangered status. Cooperative efforts with the landowner (the Pebble Beach Foundation) are needed to preserve this species.
The overall trend for this species has been one of decline.

Trifolium trichocalyx (Monterey clover)

CA - Endangered FED - Candidate 1

Monterey clover is a small, low-growing, branched, herbaceous annual with wedge-shaped leaflets and small, pale purple flowers. This member of the pea family (Fabaceae) has extremely limited distribution. It is confined to a small portion of the Monterey Peninsula in the pygmy cypress plant community. Nutrient-poor ancient podzol-like soils in this habitat are poorly drained and underlain with hardpan.

Pressures from urbanization have reduced Monterey clover's numbers and eliminated much of its potential habitat. There are only four occurrences remaining, one of which was discovered in 1988 in a recent burn area. This large population and one other small one are the only two which have been seen at all in recent years. Both are owned by the Pebble Beach Company and are threatened by development. One of the occurrences is found within the Morse Botanical Preserve, but its population is limited to a few plants. Measures are being pursued to include the other occurrence as part of the Preserve also. This plant appears to be a fire-follower, but more surveys and biological research are needed to determine the role of fire in its distribution and ecology. The overall trend for this plant has been one of decline due to urbanization.

Tuctoria greenei (Greene's Orcutt grass)

CA - Rare FED - Candidate 1

Greene's Orcutt grass is a pale green, hairy, tufted annual grass. This unusual member of the grass family (Poaceae) grows in the dried bottoms of vernal pools in open grasslands of the Central Valley. It is currently found in Butte, Merced, and Tehama counties, and is believed to be extirpated from Fresno, Madera, San Joaquin, Stanislaus, and Tulare counties. Associated species in some locations include the State-listed hairy Orcutt grass (Orcuttia pilosa) and slender Orcutt grass (O. tenuis).

Over half of the nearly forty known occurrences have been extirpated by conversion of habitat to irrigated agriculture or by intensive cattle grazing. Greene's Orcutt grass continues to be threatened by destruction of vernal pools for agriculture and residential development in the Central Valley. In 1989, the USFWS released a status survey on the Central Valley Orcuttieae, including Greene's Orcutt grass. This study indicated that only 5 of the extant occurrences are considered stable. All of the occurrences are privately owned, and none of the vernal pool habitat in the San Joaquin Valley is currently protected. In the Sacramento Valley, The

Nature Conservancy manages several occurrences at Vina Plains Preserve in Tehama County. The general trend for this species is one of decline as a result of habitat alteration and destruction.

Tuctoria mucronata (Crampton's tuctoria)

CA - Endangered FED - Endangered

Crampton's tuctoria, a member of the grass family (Poaceae), is a sticky, aromatic annual grass, with a dense spike of overlapping spikelets of flowers emerging from the upper leaves. It grows in the clay bottoms of drying vernal pools and lakes of the valley grasslands. This grass is only found in two locations several miles south of Dixon in Solano County.

Crampton's tuctoria is believed to have been more widely distributed in the past in the flooded depressions on the west side of the Sacramento Valley. Most of these were converted to agriculture before the species was discovered, and there is little additional suitable habitat remaining. Threats to the two known occurrences include alternation of local drainage patterns which feed the pools, off-road vehicle recreation, local farming operations, and trampling by livestock. Roads and transmission corridors have degraded the habitat. All of the vernal pool habitat is privately owned. The Nature Conservany owns and protects a portion of the habitat at the Jepson Prairie Preserve. The plant has not been seen during annual monitoring efforts at the Preserve since 1987, perhaps because of drought conditions. The USFWS has prepared a recovery plan for Crampton's tuctoria which provides management recommendations. The overall trend for this species is one of decline.

Verbesina dissita (big-leaved crown-beard)

CA - Threatened

Big-leaved crown-beard is a semi-woody perennial shrub in the sunflower family (Asteraceae). It grows up to 3 feet (1 meter) in height, and bears terminal clusters of bright yellow flowers. This species occurs primarily on steep, rocky, north-facing slopes within 1.5 miles of the ocean, in a maritime chaparral plant community. The densest populations are found on shaded slopes under a layer of shrubs. Native occurrences of big-leaved crown-beard are in two widely disjunct areas. In the United States, this species is restricted to a few canyons in Orange County, California in southern Laguna Beach. It also occurs in Baja California, about 90 miles south of San Diego.

The entire U.S. distribution of big-leaved crown-beard consists of two occurrences, two miles apart, in Orange County, California. Combined, these occurrences occupy approximately 20-25 acres. The primary threats to the continued survival of big-leaved crown-beard are destruction and modification of habitat as a result of development. Much of the area in which this species occurs in Baja California is subject to impacts resulting from resort and residential development

as well as from slash and burn practices. In California, small scale residential development continues to destroy and fractionalize suitable habitat for big-leaved crown-beard. Other threats are grading, fire breaks, and fuel modification zones. The overall trend for this species has been one of decline.

APPENDIX A

Numbers of Plants and Animals Listed
by the California Fish and Game Commission
as Rare, Threatened and Endangered (Title 14, CCR,
Sections 670.2 and 670.5).*

	Rare	Threatened	Endangered	TOTAL
Plants	69	18	122	209
Gastropods	--	1	--	1
Crustaceans	--	--	2	2
Fish	--	2	13	15
Amphibians	--	6	2	8
Reptiles	--	4	4	8
Birds	--	5	17	22
Mammals	--	10	6	16
TOTAL	**69**	**46**	**166**	**281**

*Refer to the lists of rare, threatened and endangered plants and animals, which are updated periodically as changes are made, for the most current information. These lists are available from the Natural Heritage Division, 1416 Ninth Street, Sacramento, California 95814.

APPENDIX B

Federally Listed Plants and Animals of California not Listed by the California Fish and Game Commission*

PLANTS

Camissonia benitensis (San Benito evening primrose): Threatened
Centaurium namophilum (spring-loving centaury): Threatened
Grindelia fraxino-pratensis (Ash Meadows gumplant): Threatened
Eremaiche kernensis (Kern mallow): Endangered
Eriastrum hooveri (Hoover's wooly-star): Threatened
Lembertia congdonii (San Joaquin wooly-threads): Endangered

INSECTS

Oregon silverspot butterfly: Threatened
Bay checkerspot butterfly: Threatened
Mission blue butterfly: Endangered
Lotis blue butterfly: Endangered
Palos Verdes blue butterfly: Endangered
El Segundo blue butterfly: Endangered
Smith's blue butterfly: Endangered
San Bruno elfin butterfly: Endangered
Lange's metalmark butterfly: Endangered
Kern primrose sphinx moth: Threatened
Delta green ground beetle: Threatened
Valley elderberry longhorn beetle: Threatened

FISHES

Little Kern golden trout: Threatened
Lahontan cutthroat trout: Threatened
Paiute cutthroat trout: Threatened

REPTILES

Island night lizard: Threatened

BIRDS

Aleutian Canada goose: Endangered
Northern spotted owl: Threatened
San Clemente loggerhead shrike: Endangered
San Clemente sage sparrow: Threatened

MAMMALS

Gray whale: Endangered
Sei whale: Endangered
Finback whale: Endangered
Blue whale: Endangered
Humpback whale: Endangered
Right whale: Endangered
Sperm whale: Endangered
Southern sea otter: Threatened
Northern (Steller) sea lion: Threatened

APPENDIX C

Abbreviations and Technical Terms

Annual	A plant which completes its life-cycle in a single season.
BLM	U.S. Bureau of Land Management
CalTrans	California Department of Transportation
Candidate 1 or 2	A Federal designation indicating a plant or animal species under consideration for listing by the U.S. Fish and Wildlife Service; also called category 1 or 2.
CCC	California Conservation Corps
CDF	California Department of Forestry and Fire Protection
Critical Habitat	Habitat essential to the survival of a species. Critical Habitat is officially designated by the USFWS for some species.
DFG	California Department of Fish and Game
DIURNAL	Daytime
DPR	California Department of Parks and Recreation
EPP	Endangered Plant Project
FCG	California Fish and Game Commission
FOSSORIAL	Adapted to digging
FWS	U.S. Fish and Wildlife Service
HCP	See definition for Section 10
MOU	Memorandum of Understanding
NPS	U.S. National Park Service
ORV (or OHV)	Off-road vehicle or off-highway vehicle
Perennial	A plant which grows for more than one season, overwinters in a dormant condition and resumes growth the following season.
Recovery Plan	A USFWS document which sets forth a plan to recover a Federally listed species.

Recovery Team	A group of experts convened by the USFWS to recover Federally listed species.
Regions 1, 2, 3, 4, 5	DFG geographic administrational boundaries.
Section 6	An element of the Federal Endangered Species Act providing for coordination with states and grant-in-aid funding for recovery programs.
Section 7	A provision of the Federal Endangered Species Act requiring Federal agencies to consult with the USFWS when their involvement might affect a Federally listed species.
Section 10(a)/Habitat Conservation Plan (commonly referred to as HCP)	A provision for incidental taking of Federally listed species during the undertaking of otherwise lawful activities. The HCP is a component of the application for incidental taking.
Species of Special Concern	DFG-generated lists of species and subspecies that are possibly declining or are vulnerable to extirpation and may be considered for listing or for special management and protection measures.
SWRCB	State Water Resources Control Board
Tax Check-off	A voluntary contribution on the State personal income tax form. Contributions are administered through the California Endangered Species Tax Check-off Progam.
TNC	The Nature Conservancy (a private land preservation organization)
USFWS	U.S. Fish and Wildlife Service
WCB	Wildlife Conservation Board

APPENDIX D

Plant and Animal Species for Which Five-year Reviews Have Been Completed*

MAMMALS

Mohave ground squirrel	(1987)
San Joaquin antelope squirrel	(1987)
Giant kangaroo rat	(1988)
Stephens' kangaroo rat	(1987)
Fresno kangaroo rat	(1990)
Amargosa vole	(1989)
Sierra Nevada red fox	(1987)
Island fox	(1987)
Wolverine	(1987)
California bighorn sheep	(1987)
Peninsular bighorn sheep	(1987)

BIRDS

Bald eagle	(1988)
Swainson's hawk	(1988)
Peregrine falcon	(1989)
California black rail	(1987)
Greater sandhill crane	(1988)
Western yellow-billed cuckoo	(1987)
Elf owl	(1987)
Great gray owl	(1987)
Inyo brown towhee	(1987)
Belding's savannah sparrow	(1987)

REPTILES

Barefoot banded gecko	(1987)
Coachella Valley fringe-toed lizard	(1990)
Blunt-nosed leopard lizard	(1990)
Southern rubber boa	(1987)
Alameda whipsnake	(1987)
San Francisco garter snake	(1990)
Giant garter snake	(1987)

AMPHIBIANS

Santa Cruz long-toed salamander	(1990)
Siskiyou mountain salamander	(1987)
Desert slender salamander	(1990)
Kern Canyon slender salamander	(1987)
Tehachapi slender salamander	(1987)
Limestone salamander	(1987)
Shasta salamander	(1987)
Black toad	(1987)

FISH

Bull trout	(1987; Rev. 1988)
Mohave tui chub	(1990)
Owens tui chub	(1990)
Bonytail	(1990)
Colorado squawfish	(1990)
Lost River sucker	(1987)
Modoc sucker	(1990)
Shortnose sucker	(1987)
Razorback sucker	(1987)
Desert pupfish	(1990)
Cottonball Marsh pupfish	(1987)
Owens pupfish	(1990)
Tecopa pupfish (extinct)	(1987)
Unarmored threespine stickleback	(1990)
Rough sculpin	(1987)

INVERTEBRATES

Trinity bristle snail	(1987)
California freshwater shrimp	(1987)
Shasta crayfish	(1987)

PLANTS

Acanthomintha ilicifolia (San Diego thornmint)	(1987)
Acanthomintha obovata ssp. duttoni	(1990)
Amsinckia grandiflora	(1990)
Arabis macdonaldiana (MacDonald's rock cress)	(1988)
Arctostaphylos densiflora (Vine Hill manzanita)	(1988)
Arctostaphylos hookeri ssp. hearstiorum (Hearst's manzanita)	(1987)
Arctostaphylos hooker ssp. ravenii (Presidio manzanita)	(1989)
Arctostaphylos imbricata (San Bruno Mountain manzanita)	(1987)
Arctostaphylos pacifica (Pacific manzanita)	(1987)
Arctostaphylos pallida (Alameda manzanita)	(1987)
Astragalus agnicidus (Humboldt milk-vetch)	(1987)
Astragalus lentiginosus var. sesquimetralis (Sodaville milk-vetch)	(1987)
Astragalus magdalenae var. peirsonii (Peirson's milk-vetch)	(1987)
Astragalus tener var. titi (coastal dunes milk-vetch)	(1987)
Brodiaea coronaria ssp. rosea (Indian Valley brodiaea)	(1987)
Brodiaea filifolia (threadleaf brodiaea)	(1987)
Brodiaea insignis (Kaweah brodiaea)	(1987)
Brodiaea pallida (Chinese Camp brodiaea)	(1987)
Calochortus tiburonensis (Tiburon mariposa-lily)	(1987)
Calystegia stebbinsii (El Dorado morning glory)	(1987)
Carex albida (white sedge)	(1987)
Castilleja grisea (San Clemente Island Indian paintbrush)	(1988)
Castilleja uliginosa (Pitkin Marsh Indian paintbrush)	(1987)
Cercocarpus traskiae (Santa Catalina Island mahogany)	(1987)
Chorizanthe orcuttiana (Orcutt's spineflower)	(1987)
Cirsium ciliolatum (Ashland thistle)	(1987)
Cirsium fontinale var. fontinale (fountain thistle)	(1987)
Clarkia franciscana (Presidio clarkia)	(1987)

Clarkia imbricata (Merced farewell to spring) (1987)
Clarkia springvillensis (Springville clarkia) (1987)
Cordylanthus maritimus ssp. maritimus (salt marsh bird's-beak) (1988)
Cordylanthus rigidus ssp. littoralis (Seaside bird's-beak) (1987)
Delphinium kinkiense (San Clemente Island larkspur) (1988)
Dichanthelium lanuginosum var. thermale (geysers panicum) (1987)
Downingia concolor var. brevior (Cuyamaca Lake downingia) (1987)
Dudleya brevifolia (short-leaved live-forever) (1987)
Eriodictyon altissimum (Indian Knob Mountain balm) (1987)
Eriogonum alpinum (Trinity buckwheat) (1987)
Eriogonum apricum var. apricum (Ione buckwheat) (1987)
Eriogonum ericifolium var. thornei (Thorne's buckwheat) (1987)
Eriogonum grande ssp. timorum (San Nicolas Island buckwheat) (1987)
Eriogonum kelloggii (Kellogg's buckwheat) (1987)
Eryngium aristulatum var. parishii (San Diego coyote-thistle) (1987)
Eryngium racemosum (Delta coyote-thistle) (1987)
Erysimum capitatum var. angustatum (Contra Costa wallflower) (1988)
Erysimum menziesii (Menzies' wallflower) (1989)
Erysimum teretifolium (Santa Cruz wallflower) (1987)
Fritillaria roderickii (Roderick's fritillary) (1987)
Galium catalinense ssp. acrispum (San Clemente Is. bedstraw) (1987)
Gratiola heterosepala (Boggs Lake hedge-hyssop) (1987)
Helianthus niveus ssp. tephrodes (Algodones sunflower) (1987)
Hemizonia conjugens (Otay tarplant) (1987)
Hemizonia mohavensis (Mojave tarplant) (1987)
Hesperolinon didymocarpum (Lake County dwarf-flax) (1997)
Holocarpha macradenia (Santa Cruz tarplant) (1987)
Lasthenia burkei (Burke's goldfields) (1987)
Lilium occidentale (western lily) (1987)
Lilium pitkinense (Pitkin Marsh lily) (1987)
Limnanthes douglasii var. sulphurea (Point Reyes meadowfoam) (1987)
Limnanthes floccosa ssp. californica (Butte County meadowfoam) (1987)
Limnanthes gracilis var. parishii (Parish's slender meadowfoam) (1987)
Limnanthes vinculans (Sebastopol meadowfoam) (1987)
Lithophragma maximum (San Clemente Island woodland star) (1987)
Lotus argophyllus ssp. adsurgens (San Clemente Is. silver hosackia) (1987)
Lotus dendroideus var. traskiae (San Clemente Island broom) (1988)
Lotus argophyllus ssp. niveus (Santa Cruz Island silver hosackia) (1987)
Mahonia sonnei (1990)
Mahonia pinnata ssp. insularis (island barberry) (1987)
Malacothamnus fasciculatus var. nesioticus (Santa Cruz Is. bush-mallow) (1987)
Monardella linoides ssp. viminea (willowy monardella) (1987)
Navarretia plieantha (many-flowered navarretia) (1987)
Neostapfia colusana (Colusa grass) (1987)
Nitrophila mohanensis (1990)
Nolina interrata (Dehesa beargrass) (1987)
Oenothera deltoides ssp. howellii (Antioch Dunes evening primrose) (1988)
Orcuttia californica (California Orcutt grass) (1987)
Orcuttia inaequalis (San Joaquin Valley Orcutt grass) (1987)

Orcuttia pilosa (hairy Orcutt grass) (1987)
Orcuttia tenuis (slender Orcutt grass) (1987)
Orcuttia viscida (sticky Orcutt grass) (1987)
Orthocarpus campestris var. succulentus (succulent owl's-clover) (1987)
Plagiobothrys diffusus (San Francisco popcorn-flower) (1987)
Poa napensis (Napa blue grass) (1987)
Pogogyne abramsii (San Diego mesa mint) (1988)
Pogogyne clareana (Santa Lucia mint) (1987)
Potentilla hickmanii (Hickman's cinquefoil) (1987)
Pseudobahia bahiifolia (Hartweg's pseudobahia) (1987)
Rorippa subumbellata (Tahoe yellow cress) (1987)
Sidalcea covillei (Owens Valley checkerbloom) (1987)
Sidalcea pedata (bird-footed checkerbloom) (1989)
Sidalcea stipularis (Scadden Flat checkerbloom) (1987)
Silene capanulata ssp. capanulata (Red Mountain catchfly) (1987)
Thelypodium stenopetalum (slender-petaled thelypodium) (1989)
Trifolilum trichocalyx (Monterey clover) (1987)
Tuctoria mucronata (Crampton's tuctoria) (1988)

*Complete sets can be obtained from the Natural Heritage Division, Department of Fish and Game, 1416 Ninth Street, Sacramento, California 95814.