



Species Accounts - Plants

San Diego thorn-mint

Acanthomintha ilicifolia

State: Endangered 1982
Federal: Threatened 1998

General Habitat:

San Diego thorn-mint genus occurs almost exclusively in California and every taxon within the genus is rare. This species is restricted to calcareous marine sediments, clay, or gabbro-derived soils and is associated with coastal sage scrub, chaparral, and native needlegrass grassland. It ranges from San Diego County and Baja California Norte, Mexico.

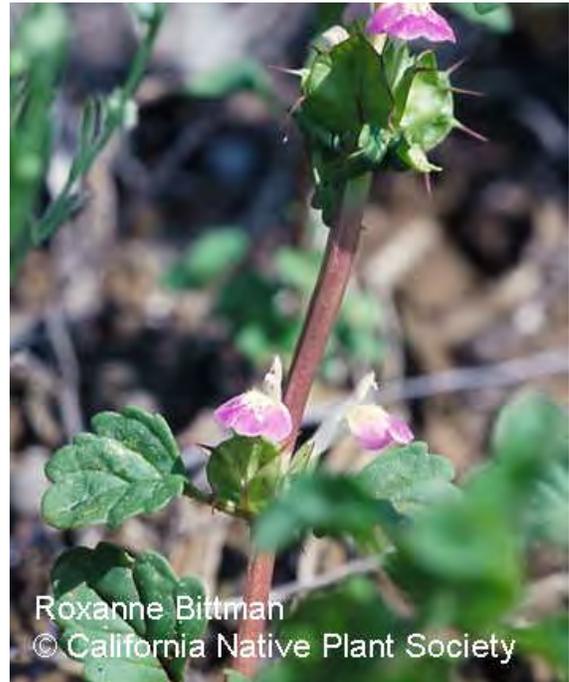
Description:

San Diego thorn-mint is a small, aromatic annual in the mint family (Lamiaceae) with delicate white and rose colored flowers. The lower halves of its leaves are wedge-shaped and its flower clusters are covered by prominently spined bracts.

Status:

Approximately 30 natural populations of San Diego thorn-mint remain in San Diego County and more than 15 populations are known to have been extirpated. The extirpations are largely the result of urban development along the coastal plain of western San Diego County from Carlsbad south to Otay Mesa. Urban development, unauthorized off-highway vehicle (OHV) activity, and continuing invasion of natural habitat by weedy, non-native annual plants are ongoing threats to this species. For example, researchers have found that tocalote, one of the yellow star thistles, significantly reduces the seed production in San Diego thorn-mint. Habitat protection and active management will be essential to the continued preservation of San Diego thorn-mint.

Though the majority of known populations occur on privately owned lands, scattered populations of San Diego thorn-mint are found on lands owned or managed by public agencies or conservation organizations such as the Cleveland National Forest, The Nature Conservancy's (TNC) McGinty Mountain, City of San Diego's Mission Trails Regional Park, the Manchester Avenue Conservation Area in Encinitas, and on DFG land in Sycamore Canyon. The two largest known occurrences are on National Forest lands on Viejas and Poser Mountains. San Diego thorn-mint is covered in the San Diego Multiple Species Conservation Plan NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating



jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. San Diego thorn-mint is considered to be a narrow endemic species under the MSCP and 85 percent of the major populations will be conserved. Monitoring was conducted under the San Diego County MSCP in 2002. A population of San Diego thorn-mint near the summit of McGinty Mountain was estimated at over 2,250 individuals and a population in Hollenbeck Canyon also supported individuals in the thousands.

The City of San Diego has implemented a monitoring for selected populations of San Diego thorn-mint within its portion of the San Diego Multiple Habitat Conservation Program preserve lands. In 2001, the populations at Mission Trails Regional Park, Peñasquitos Canyon, Black Mountain Ranch, and Sabre Springs were surveyed. Surveyors counted a total of 354 flowering adults and 0 non-flowering adults in the southwest portion of Mission Trails Regional Park. The area in which the thornmint is found at this location is approximately 12,982 square feet in size. Surveyors also counted a total of 508 flowering adults and 63 non-flowering adults within the population at Peñasquitos Canyon; 770 flowering adults and 7 non-flowering adults within the Black Mountain Ranch population; and 2,830 flowering adults and 2 non-flowering adults within the Sabre Springs population.

Results of surveys at Otay Mesa were reported in 2002. Five quadrats were surveyed at this locality where the small thorn-mint populations are in danger of extinction. The majority of suitable habitat at Otay Mesa is dominated by non-native grasses and forbs. Monitoring found that the average number of individual thorn-mint plants was only 18 plants per meter². Non-native cover ranged from about 50 percent to over 80 percent cover. The surveyors observed that grazing was an ongoing problem at this site, with cattle coming in from adjacent private property through highly deteriorated fences. This grazing disturbance appears to contribute to the invasion of non-native species into the clay soils that provide habitat for the thorn-mint.

The species is also included in the San Diego Multiple Habitat Conservation Program (MHCP). The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. Over 90 percent of the known locations and major populations will be conserved under the MHCP. Specific guidelines in the MHCP for San Diego thorn-mint include managing all conserved populations to control edge effects; implementing fire management plans to protect conserved populations from frequent or high-intensity fires and fire suppression activities; enhancing declining populations through adaptive management; implementing conservation seed storage; and conducting intensive surveys prior to potential impacts.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 15% of habitat suitable for San Diego thorn-mint burned during the fires. Eleven vernal pool complexes burned in the Cedar Fire and two complexes burned in the Otay Fire. Thirty pools or swales that supported San Diego thorn-mint were impacted. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on Marine Corps Air Station Mirimar, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on San Diego thornmint.

San Diego thorn-mint is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

San Mateo thorn mint *Acanthomintha obovata*
spp. duttonii

State: Endangered 1979
Federal: Endangered 1985

General Habitat:

San Mateo thorn mint is restricted to serpentine soils in grassland and chaparral. It occurs on deep, heavy clay lenses on flats and slopes. It is associated with tidy-tips, soap plant, owl's clover, clarkia, and species of needlegrass. Much of its native grassland habitat is now dominated by invasive non-native grasses such as wild oats and Italian ryegrass.

Description:

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

Status:

Historically, San Mateo thorn mint was known from six populations in the Crystal Springs region of San Mateo County. The only remaining large population, in Edgewood County Park, is a remnant of a more extensive population damaged by motor-vehicle use. Edgewood County Park also contains a small subpopulation. There is an introduced population at Pulgas Ridge. The remaining populations were extirpated by urbanization. The populations occur on land owned by the City and County of San Francisco and managed by SFWD. The small population at Edgewood Park lies directly downhill from a housing development; the resulting changes in drainage patterns and water chemistry threaten this population. Population sizes vary from year to year due to local rainfall and competition from nonnative plants. Projects are being implemented at Edgewood Park to remove competing non-native grasses and weeds to benefit the federally-listed bay checkerspot butterfly could also benefit San Mateo thorn mint. To protect this plant from extinction, natural and introduced populations must be preserved; further reintroduction into suitable habitat should be pursued. Management and recovery actions for the species have been addressed in the 1998 federal *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*.



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Stephen P. Rae, DFG File Photo

**Marin bent
grass**

Agrostis blasdalei
var. marinensis

State: Rare 1978
Federal: None

General Habitat:

This variety grows on a decomposed granite outcrop at a single location in Marin County. It is very closely related to Blasdale's bent grass (*Agrostis blasdalei* var. *blasdalei*), which is found in northern coastal dunes.

Description:

Marin bent grass, a member of the grass family (Poaceae), has erect stems and slender leaves. Its green flowers occur in narrow spikes.



Status:

Taxonomic classification no longer treats Marin bent grass as a separate species and it is now placed within Blasdale's bent grass. Marin bent grass was described from a single population of approximately a dozens individuals growing near a popular parking area for picnickers; no plants were found during a survey in 1998. The area from which Marin bent grass was collected is on private property near the junction of two roads although the specific location is not known.

Blasdale's bent grass is a USFWS Species of Concern. A Species of Concern is an informal term that refers to those species that USFWS believes might be declining or be in need of concentrated conservation actions to prevent decline.

Munz's onion

Allium munzii

State: Threatened 1990
Federal: Endangered 1998

General Habitat:

Allium munzii is restricted to moist clay soils in the rapidly disappearing grasslands of western Riverside County. This species is frequently found in association with southern needlegrass grassland, grassy openings in coastal sage scrub or, occasionally, in cismontane juniper woodlands. It is associated with mariposa lily, blue-dicks, goldfields, and purple needlegrass.

Description:

Munz's onion is a small, bulb-bearing perennial herb in the lily family (Liliaceae). Plants can reach 1.5 feet (35 cm) in height. Flowers are produced in head-like clusters. Each cluster contains 10 to 35 individual white flowers that turn red with age.

Status:

Munz's onion is found only in two areas of western Riverside County; more than 90% of its historic habitat has been lost. Loss of habitat is due primarily to clay mining, agricultural conversion, flood control activities, urbanization, and OHV activity. Ongoing threats include impacts of fire suppression activities, such as mowing and discing, competition from invasive plant species, and changes in hydrology. Prior to large-scale habitat conversion, Munz's onion probably occurred as scattered, interrelated populations within a larger area (metapopulation). The remaining 14 populations are fragmented and isolated and only half of them are on public land on USFS land or within natural reserves or county parks. Munz's onion is considered to be a narrow endemic species in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP) although only a portion of occupied habitat is included within the MSHCP planning area. Under the MSHCP, conservation of Munz's onion will be achieved by inclusion of at least 21,260 acres of suitable habitat (grassland, coastal sage scrub, chaparral and peninsular juniper woodland between 300 and 1,000 m in the Riverside Lowlands and Santa Ana Mountains Bioregions) and 15 known localities within large blocks of habitat in the MSHCP Conservation Area. This acreage will include at least 2,070 acres of clay soils to which the onion is restricted. Munz's onion shares its range and habitat with an onion of similar appearance, the red-skinned onion (*Allium haematochiton*). The two species occur within several feet of each other at some sites, but do not interbreed.

A 2002 court decision requires that the USFWS designate critical habitat for Munz's onion and several other plants that occur in the same area of western Riverside County. The critical habitat designation identifies the habitat that is essential to the survival and recovery of listed species and provides mechanisms for protecting that habitat from destruction or degradation. The Department has received funding from USFWS to implement a research project involving Munz's onion. The project will investigate several aspects of the plants



biology relevant to adaptive management considerations: identification of pollinators and pollinator ecology; seed production and biology; and persistence of individual bulbs over time. Data collected by a researcher at UC Riverside will be incorporated into the study. For example, this research has shown that a portion of bulbs do not send up leaves or flowers each year, and therefore cannot be counted. Although this response is likely correlated with broad climatic patterns in annual temperature and rainfall, it renders monitoring difficult. The same researcher has found that establishment of new plants in two populations is primarily by seed, rather than by bulbs.

Yosemite onion

*Allium
yosemitense*

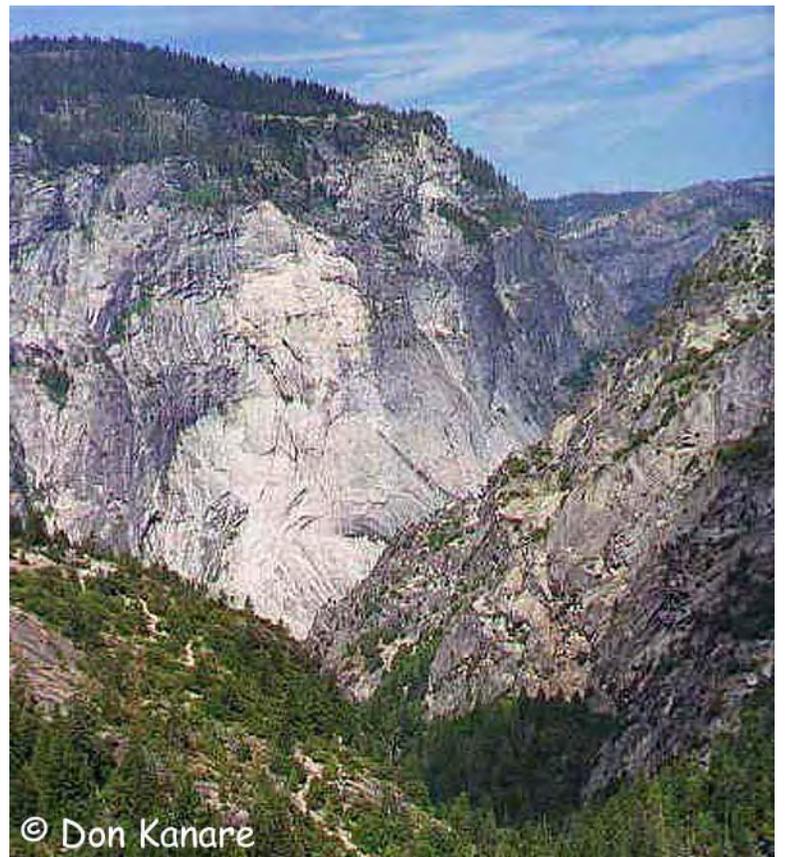
State: Rare 1982
Federal: None

General Habitat:

Yosemite onion is restricted to steep, open slopes in the Merced River watershed of the central Sierra Nevada (Mariposa and Tuolumne Counties). It is found on talus and scree slopes, metamorphic rock outcrops, and on the margins of large granitic slabs. It is reported from elevations of 1400 feet to 6600 feet. It is associated with two other state-listed species, Congdon's lewisia, Congdon's woolly sunflower, as well as selaginella and species of Penstemon.

Description:

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



Status:

Yosemite onion is known from three extant populations on federal lands within Yosemite National Park and in the Sierra and Stanislaus National Forests. It has also been reported from a number of other locations although the majority of these occurrences are in remote areas. Threats to this species are few although trail routing and maintenance and development of transmission line corridors could impact some colonies.

**Large-flowered
fiddleneck** *Amsinckia grandiflora*

State: Endangered 1982
Federal: Endangered 1985

General Habitat:

Grassland on dry inland hills of Alameda, Contra Costa, and San Joaquin counties. Much of the habitat of the species is now grazing land dominated by non-native grasses such as wild oats and species of cheat grass (*Bromus*). The historic habitat for large-flowered fiddleneck is native perennial grassland dominated by purple needlegrass.

Description:

Large-flowered fiddleneck is an erect, coarsely hairy annual herb in the borage family (Boraginaceae). The large, orange-red flowers are borne on stalks curved like the neck of a fiddle.



Status:

Large-flowered fiddleneck is the rarest of the ten California species of *Amsinckia*. It is currently known from three populations, two natural and one introduced. The populations all occur in the Altamont Hills of the Diablo Range. Two of the natural populations occur on Lawrence Livermore National Laboratory (LLNL) land at Site 300, a high-explosive testing facility operated by the University of California for the United States Department of Energy. The two natural populations at Site 300 are known as the Drop Tower population and the Draney Canyon population. The Draney Canyon population is now believed to have been extirpated. The third natural population is on private ranch land in Carnegie Canyon near the southern border of Site 300.

Attempts at establishing two experimental populations have also occurred near Site 300. An experimental population was established at the Department's Corral Hollow Ecological Reserve but is not considered successful since no reproducing plants have been observed at this site in recent years. Another experimental population was established at the Connolly Ranch near the southeast border of Site 300. This population did not persist, possibly due to extremely high rodent activity. Other experimental populations attempted at Black Diamond Mines Regional Preserve in eastern Contra Costa County and at Los Vaqueros have not been successful.

In April 2000, the Department of Energy entered into an agreement with the USFWS and designated 160 acres within LLNL Site 300 as the *Amsinckia grandiflora* Reserve to provide for the survival and recovery of the species. As the landowner, the Department of Energy will manage the environmental compliance, safety, health, fire protection, access, and cleanup activities at Site 300, while limiting the future programmatic use of the area. The U.S. Fish and Wildlife Service will manage the recovery efforts for *Amsinckia grandiflora* resources within

the area, and provide expertise and technical advice to DOE for the Reserve's ecological management.

The principal current threat to large-flowered fiddleneck is competition from non-native, annual grasses. Research has shown that these invasive grasses threaten endangered plants through competitive exclusion. The goal of long-term management at the LLNL site is to reduce the exotic annual grass cover and restore and maintain the native perennial bunch grass community to ensure the persistence of the large-flowered fiddleneck. The use of controlled burning is being investigated as a tool for creating and maintaining perennial grasslands. Finally, the impact of seed predation is being investigated to determine its impact on the population dynamics of *Amsinckia grandiflora*.

Population numbers at both the native and experimental Drop Tower locations remain low according to 2001 data from LLNL. Competition from encroaching shrubs and high seed predation pressure by birds and rodents may be contributing to the low number of plants.

McDonald's rock cress *Arabis macdonaldiana*

State:	Endangered	1979
Federal:	Endangered	1978

General Habitat:

McDonald's rock cress is restricted to serpentine soils in open, rocky areas of montane coniferous forests. It occurs on barren to shrub-covered dry ridges and rocky outcrops, often in rock crevices. It is associated with huckleberry oak, ceanothus, manzanita, and buckwheat. McDonald's rock cress is known in California from Red Mountain in Mendocino County and from Del Norte, Trinity, and Siskiyou Counties. It also occurs in Curry County, Oregon.

Description:

McDonald's rock cress is a member of the mustard family (Brassicaceae). It is a small rosette-forming perennial herb with rose-purple flowers and erect flattened seed pods. This species is closely related to rose rock cress (*Arabis blepharophylla*) which grows in coastal California.

Status:

McDonald's rock cress occurs on private and BLM lands in Mendocino County and on USFS land in Del Norte, Siskiyou, and Trinity Counties. BLM has designated Red Mountain as an ACEC and a Research Natural Area and has conducted studies on the population dynamics and reproductive biology of the species there. These populations continue to be monitored as part of a long-term study being conducted by CSU Sacramento with support from BLM. The Six Rivers National Forest has designated 21,370 acres of the North Fork Smith River watershed as a Botanical Area and has developed a monitoring plan. The goals of this plan are to develop a habitat management guide, investigate habitat characteristics, and continue to survey for potential habitat. Other sensitive taxa known to occur on the serpentine soils of Red Mountain include the State-listed endangered Kellogg's buckwheat and Red Mountain catchfly, as well as the unlisted, but rare, Red Mountain stonecrop.

McDonald's rock cress has apparently never been abundant or widespread since the substrate to which it is adapted is restricted to few locales. McDonald's rock cress is known from three occurrences on Red Mountain in Mendocino County. It is also known from 25 occurrences in from Siskiyou, Trinity, and Del Norte Counties, in Siskiyou, Klamath, Six Rivers, and Shasta-Trinity National Forests. The majority of these occurrences are in a specific geographic area in Del Norte County.

The main threat to this species is potential mining of the significant nickel and chromium deposits under or adjacent to populations. OHV activities may also threaten populations located on the North Fork of the Smith River in Del Norte County in this area. Outlying colonies growing in the Rough and Ready Creek watershed in Oregon could also be threatened by mining.



Baker's manzanita

*Arctostaphylos
bakeri*

State: Rare 1979
Federal: None

General Habitat:

This species is largely restricted to serpentine soils in the localized chaparral communities in the vicinity of Occidental, Sonoma County. It is associated with Sargent cypress, Jepson's ceanothus, and native bunchgrasses.

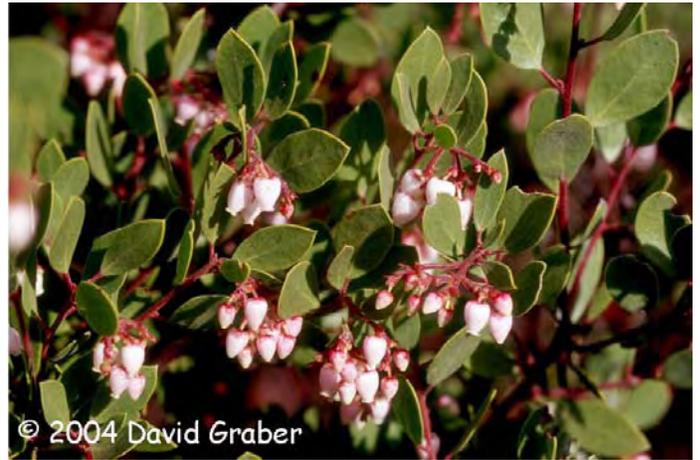
Description:

Baker's manzanita is an upright, evergreen shrub in the heath family (Ericaceae) with pinkish flowers, dark purple bark, pungent leaves, and bright red fruits. Its branchlets and leaves have sticky glandular hairs, and its flower stems are hairless. One population in the vicinity of the Bohemia Ranch possesses a unique trait: young branches root along the ground.

Status:

Most populations are clustered in the area near Occidental, Sonoma County where it is known from eight occurrences. One occurrence is within the Department's Harrison Grade Ecological Reserve managed by the Department and the California Native Plant Society; the remainder is on private land. Baker's manzanita is considered by the USFWS to be a Species of Concern. This designation is an informal term that refers to those species that we believe might be declining or be in need of concentrated conservation actions to prevent decline.

The chief threat to Baker's manzanita is residential development, agricultural conversion to vineyards, road development, OHV use, dumping, nonnative plant encroachment, and hybridization with common manzanitas. Succession toward oaks and California bay, which shade out Baker's manzanita, is also occurring as a result of fire suppression at most locations. Fire suppression also constitutes a threat to Baker's manzanita. This species does not possess an underground burl from which it can regenerate. Rather, it reproduces by seed, often following fires. In the absence of such disturbance, mature plants eventually die. Active management to remove encroaching vegetation and invasive plants, as well as the ecological use of fire, is needed to ensure long-term survivorship of this species. This species is in horticultural cultivation and sold as *Arctostaphylos bakeri* "Louis Edmunds."



Vine Hill manzanita *Arctostaphylos densiflora*

State: Endangered 1981
Federal: None

General Habitat:

Vine Hill manzanita is found only in an area of acid marine sand deposits in western Sonoma County. Associate species include coyote brush, Vine Hill ceanothus, and Vine Hill clarkia.

Description:

Vine Hill manzanita is a low evergreen shrub in the heath family (Ericaceae) with shiny green leaves, black branches, and small white to pinkish flowers in a many-flowered, branched flower stalk. It roots from nodes along its spreading branches and a single plant can reach several meters across.

Status:

Over the last 20 years, Vine Hill manzanita has come close to extinction. All but one population in the Vine Hill area have been destroyed by agricultural conversion, residential development, or roadside weed abatement. The last known population, consisting of several mature individuals and a number of younger plants grown from cuttings, occurs on the CNPS one-acre Vine Hill Preserve. Plants at the preserve suffer from a persistent fungal disease. Vine Hill manzanita is known to hybridize with common manzanita (*Arctostaphylos manzanita*) and with Stanford manzanita (*Arctostaphylos stanfordiana*), its closest relative. Plants are also in the horticultural trade and sold under the names of cultivars: "Howard McMinn," "Sentinel," and "Harmony."



Susan Cochrane Levitsky, DFG File Photo



Susan Cochrane Levitsky, DFG File Photo



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**Hanging Gardens
manzanita**

*Arctostaphylos
edmundsii* var.
parvifolia

State: Rare 1981
Federal: None

General Habitat:

This member of the heath family (Ericaceae) grows near the ocean on eroded ridges and sandstone banks subject to strong on-shore winds. It is known from one population on private land near Point Sur in Monterey County.

Description:

Hanging Gardens manzanita is a prostrate evergreen shrub without a basal burl, with glossy green leaves and bright red berries.

Status:

The plant grows down perpendicular banks in closely adherent drapes. A recent taxonomic treatment has consolidated Hanging Gardens manzanita with Little Sur manzanita (*A. edmundsii*), which is itself limited to only nine occurrences on the Little Sur coast. Little Sur manzanita is not a listed species.



Hearst's manzanita *Arctostaphylos hookeri*
 ssp. hearstiorum

State: Endangered 1979
Federal: None

General Habitat:

Hearst's manzanita is found in coastal sage scrub vegetation near Arroyo de la Cruz Creek north of San Simeon. It grows on sandy loam substrates derived from old, stabilized sand dunes. Summer fog drip contributes to the annual rainfall at the site. Hearst's manzanita is associated with several species of *Ceanothus*, including the listed species, Hearst's ceanothus (*Ceanothus hearstiorum*). Other associate species include chamise, coyote brush, poison oak, and bush monkeyflower.

Description:

Hearst's manzanita is a mat-forming, evergreen shrub in the heath family (Ericaceae) with shiny green leaves, tiny white flowers, and bright red fruits. This subspecies lacks a basal burl and reproduces solely from seed.

Status:

All five known occurrences of Hearst's manzanita are located on the Hearst Ranch, owned by the Hearst Corporation, in San Luis Obispo County. The DFG's most recent observation information for this species dates from the mid-1980s. The population status and habitat conditions for this species need further investigation. Hearst's manzanita is in cultivation and is offered in the horticultural trade.



Susan Cochrane Levitsky, DFG File Photo



Susan Cochrane Levitsky, DFG File Photo

Presidio manzanita *Arctostaphylos hookeri ssp. ravenii*

State: Endangered 1978

Federal: Endangered 1979

General Habitat:

This member of the heath family (Ericaceae) grows on exposed bedrock outcrops composed of serpentine and greenstone. It was formerly associated with Franciscan manzanita (*Arctostaphylos hookeri ssp. franciscana*) which is now extinct in the wild. Torrey's melic, miner's lettuce, and soap plant are most common associates of Presidio manzanita today.

Description:

Presidio manzanita is a prostrate, evergreen shrub covered with fine gray hairs, with round leaves and compact flower stalks of urn shaped white to pink flowers. This low-growing evergreen shrub has reddish bark and does not have a basal burl. The leaves are round to broadly elliptic, growing from branchlets covered with fine grayish-white hairs. The small white flowers and fruit are sparse. Blooming time is from February to March



S. C. Levitsky, DFG File Photo



NPS File Photo

Status:

Historically, Presidio manzanita was known from three other sites in San Francisco County that were destroyed by urbanization in the late 1930s. This taxon has been reduced to a single wild plant plus some clones, which are managed by the National Park Service (NPS). The single wild plant was found in the winter of 1997-98. This plant was infected with a fungal pathogen resulting in approximately 10% dieback of branches. The parent plant and 18 clones were monitored in 2000. The parent plant shows signs of growth and new leaf production.

Fungal infection is potentially a greater threat to the clones, due to their smaller sizes, than it is to the native parent plant. Up to 40% of the clonal plants have died as a result of the twig blight. Another concern is the potential susceptibility of Presidio manzanita to Sudden Oak Death (*Plytopthera*) which attacks common manzanita (*Arctostaphylos manzanita*).

In 2001, the USFWS prepared a Draft Recovery Plan for coastal plants of the northern San Francisco peninsula. The plan was written to recover the Presidio manzanita and San Francisco lessingia (*Lessingia germanorum*). Recovery of Presidio manzanita will depend, in part, upon the protection of the remaining natural plant at the Presidio and ongoing research into propagation of this species and its reintroduction into former parts of its range.

San Bruno Mountain manzanita

Arctostaphylos imbricata

State: Endangered 1979

Federal: None

General Habitat:

San Bruno Mountain manzanita is restricted to the slopes of San Bruno Mountain in northern San Mateo County. It occurs on shallow soils derived from Franciscan sandstone, greywacke, and shale in coastal scrub vegetation. Associate species include wild lilac (*Ceanothus thrysiflorus*) and coyote brush (*Baccharis pilularis*). San Bruno Mountain manzanita also grows with bearberry (*Arctostaphylos uva-ursi*), another mat-forming manzanita that it superficially resembles.

Description:

San Bruno Mountain manzanita is a low evergreen shrub in the heath family (Ericaceae) with white flowers. This species lacks a basal burl, has branchlets with short spreading hairs, bright green, closely overlapping leaves, and fruits with glandular hairs. It forms dense, mat-like colonies.

Status:

San Bruno Mountain manzanita is known only from the summit of San Bruno Mountain in San Mateo County. At present there are six small colonies of San Bruno Mountain manzanita. Five of these occur within San Mateo County Park, while one is located on privately owned property.

In 1997, USFWS withdrew its Proposed Rule to list San Bruno Mountain manzanita as threatened based on protection given to the plant under the 1982 San Bruno Mountain HCP. The HCP preserves most of San Bruno Mountain and provides for monitoring and management of San Bruno Mountain manzanita. None of the colonies are threatened by the level of development permitted under the HCP. In 2002, Federal Section 6 funds were provided to San Mateo County to update the San Bruno Mountain HCP. The revision will focus on the conservation of sensitive species and habitats and provide guidance on the control and eradication of exotic invasive plants that threaten these species and the habitats on which they depend. Ongoing restoration activities on San Bruno Mountain will benefit San Bruno Mountain manzanita and other sensitive species. These activities include control and removal of gorse and eucalyptus, as well as restoration of native grasslands and coastal scrub vegetation.



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Pacific manzanita *Arctostaphylos
pacifica*

State Endangered 1979
Federal

General Habitat:

Pacific manzanita is found in the northern coastal scrub of San Bruno Mountain, San Mateo County. It is associated with coyote brush and blue blossom.



Image of bearberry.

Description:

Pacific manzanita, in the heath family (Ericaceae), was described as a low, prostrate, evergreen shrub with a basal burl, pale green leaves, branchlets covered with fine hairs, and fruits with short stiff hairs.

Status:

Pacific manzanita is believed to be of hybrid origin, derived from bearberry (*A. uva-ursi*) and *A. glandulosa*. It is no longer recognized as a valid taxon. Current taxonomic treatment consolidates Pacific manzanita with bearberry. The DFG is considering proposing Pacific manzanita for delisting based on invalid taxonomy.

**Alameda
manzanita**

*Arctostaphylos
pallida*

State: Endangered 1979
Federal: Threatened 1998

General Habitat:

Alameda manzanita occurs in the Diablo Range of Contra Costa and Alameda Counties where grows on siliceous shales of uplifted marine terraces. It is primarily in manzanita-dominated shrub surrounded by oak woodland and coastal scrub. Associated species include brittleleaf manzanita and shrubby interior live oak. It is also found in the understory of landscaping trees such as Monterey pine and Monterey cypress.

Description:

Alameda manzanita, a member of the heath family (Ericaceae), is a tall, erect, evergreen shrub without a basal burl. It has branchlets with short, bristly hairs, thin, smooth, pale green leaves that clasp the stems, white flowers, and bright red fruits.



Status:

Alameda manzanita, also referred to as pallid manzanita, is found primarily at Sobrante Ridge Preserve and Huckleberry Preserve in Contra Costa and Alameda counties. Sobrante Ridge is completely within a 111-hectare (277-acre) Regional Preserve owned and managed by East Bay Regional Park District. Most of the population at Huckleberry Ridge is within lands owned and managed by East Bay Regional Park District (EBRPD) as part of the 94-hectare (236-acre) Huckleberry Botanic Regional Preserve. Scattered plants within the Huckleberry Ridge population also exist on privately owned lots along Villanova and Manzanita Drives in the City of Oakland. Several other small (natural and planted) populations occur in Alameda or Contra Costa Counties.

Alameda manzanita is addressed in the 2003 Draft Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay California. The primary threats to *Arctostaphylos pallida* are the effects of fire suppression, shading, and competition from native and nonnative plants. The species also is threatened by disease, herbicide spraying, hybridization, and the ongoing effects of habitat loss and fragmentation. Possibly the single most important factor limiting the recovery of the *Arctostaphylos pallida* is the continuing suppression of its natural disturbance regime.

It is believed that fire plays a major role in maintaining the health of manzanita stands and the genetic diversity of populations. *Arctostaphylos pallida* is a fire-adapted chaparral shrub that shows signs of decline with great size and age. Fire suppression in the Oakland/Berkeley Hills, in combination with increased browsing of tree and

shrub seedlings and acorns by deer and livestock, has led to structural and compositional change in habitats within the range of *A. pallida*. Open-canopied oak woodlands maintained historically by frequent fire have been converted, in the absence of fire, into closed-canopied woodland-forests dominated by California bay, other native trees, or exotic coniferous or *Eucalyptus* forests. The denser canopies of these forests and woodlands create a microclimate unsuitable for healthy *A. pallida* plants. Additionally, as populations of *A. pallida* dwindle, the negative effects of genetic drift and inbreeding depression may be magnified. Small populations often are subject to increased genetic drift and inbreeding as consequences of their small populations. A loss of genetic variability, and consequent reduction in genetic fitness, provides less opportunity for a species to successfully adapt to environmental change.

Proposed management by East Bay Municipal Utility District includes rectifying some of the shading and competition problems, and collecting seed for greenhouse propagation for the purpose of planting this species in a more manageable location. This area has an extremely high wildfire potential and East Bay Municipal Utility District is considering a plan to remove the woody plants and plant grasses to reduce the fire threat to nearby homes. EBRPD has purchased some small lots that are contiguous with existing park land and that support Alameda manzanita. Removal of non-native trees such as Monterey pine and eucalyptus also benefit the species. However, much of the species' habitat is close to existing homes, and ecological use of fire in this intermix of residential development and wildland is not feasible. Due to past and present fire suppression policies and inactive or ineffective fire management plans, the long-term viability of *Arctostaphylos pallida* is in doubt.

Marsh sandwort *Arenaria paludicola*

State: Endangered 1990
Federal: Endangered 1993

General Habitat:

Historically, this species occurred in swamps and freshwater marshes in widely disjunct localities in California and Washington. It occurred in four counties in San Francisco, Santa Cruz, San Luis Obispo, and San Bernardino Counties in California, as well as the coastal region of Washington. It is associated with cattail, sedge, bur-reed, and Gambel's watercress (*Rorippa gambelii*), a listed species.

Description:

Marsh sandwort is a perennial herb in the pink family (Caryophyllaceae). It has weak, trailing stems and small white flowers which bloom from May through August. The trailing stems often root at the nodes.



Status:

The distribution of this species is limited to two locations in San Luis Obispo County on the Nipomo Mesa. One population is in Black Lake Canyon, and one population was rediscovered in 1998 at Oso Flaco Lake. Two of three historically documented locations in Black Lake Canyon no longer appear to support plants; one was last seen during the 1980s, one in the mid-1990s, and the last site was documented in April 1998. Encroachment of non-native eucalyptus trees and drilling of water wells in the immediate watershed of Black Lake Canyon are serious threats to the continued existence of this species. Seven of the nine known California occurrences have been lost because the fresh water habitat in which they occurred was eliminated. Even when extant, all the sites supported only a few plants in a limited area. Despite thorough searches, no populations of marsh sandwort have been verified in Washington in recent years. A population of a related species of sandwort from Mendocino County was originally thought to be marsh sandwort.

The Land Conservancy of San Luis Obispo County acquired two acres in Black Lake Canyon which include the existing marsh sandwort site and one of the previously occupied marsh sandwort sites; they have prepared a management plan for the canyon which addresses marsh sandwort. In addition, The Nature Conservancy (TNC)

recently purchased a conservation easement in the Nipomo Dunes which includes a large dune lakes complex; this area, which has not been surveyed by botanists for half a century, will be surveyed to determine if other populations exist and if potential habitat is available for establishment of experimental populations of this species. Beginning in 1993, research into demography, general ecology, and recovery options was conducted by researchers from the University of California, Santa Barbara.

Cuttings have been used to propagate marsh sandwort. These cuttings have been transplanted into suitable sites in Black Lake Canyon and have established. Best establishment was seen when plants were placed in proximity to a nurse plant, such as a tussock of rush, on which the stems could climb. Some of the transplants that failed to establish, apparently due to rising water levels and increases in cover by other marsh species. Rodent predation on transplants has been observed in the field and plant protection measures would improve the likelihood of successful establishment. Greenhouse plants continue to thrive although some have been attacked by fungus. Although the cultivated plants flower, plants do not produce viable seed. Hand pollinator has not been attempted. A Recovery Plan for Marsh Sandwort (*Arenaria paludicola*) and Gambel's watercress (*Rorippa gambellii*) was completed in 1999.

Humboldt milk-vetch *Astragalus
agnicidus*

State: Endangered 1982
Federal: None

General Habitat:

Humboldt milk-vetch occurs in openings of mixed conifer and hardwood forests, often disturbed sites. Overstory species include Douglas-fir, coast redwood, tanbark oak, and Pacific madrone. Understory species include ceanothus, manzanita, orange bush monkey-flower, deerweed, iris, phacelia, bracken fern, yerba de selva, and various grasses. The species is restricted to localized areas of western Humboldt and Mendocino counties.

Extensive potential habitat exists on managed forest lands, however, occurrences are highly localized and appear primarily to be the consequence of the exposure of dormant seed banks. Natural and human-made disturbance events likely increase available habitat. Reforestation, competition from invasive non-native plants, and fire suppression likely decrease available habitat.

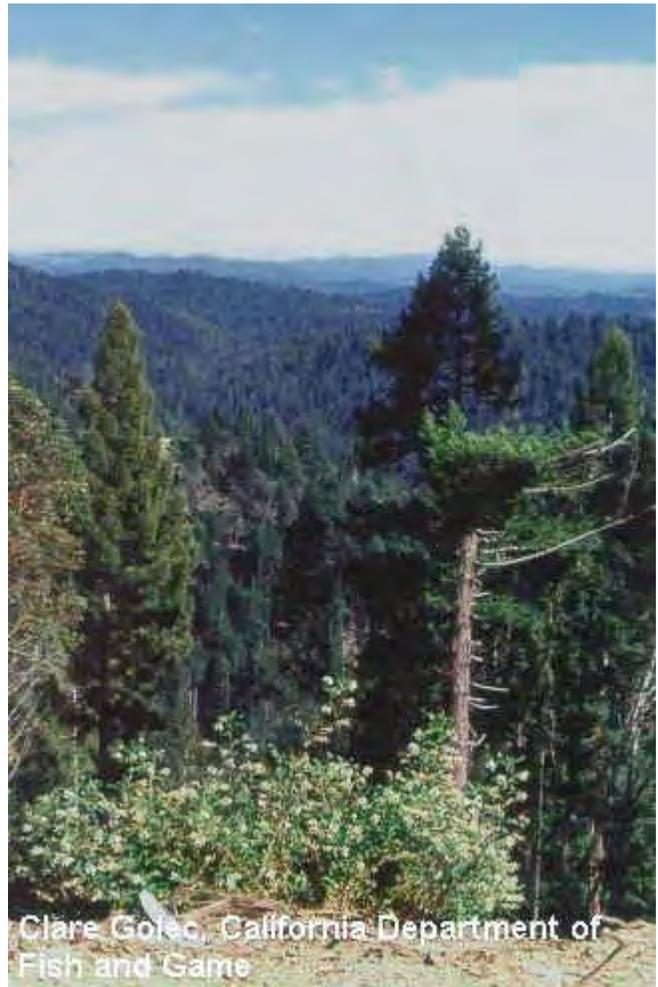
Description:

Humboldt milk-vetch, a member of the pea family (Fabaceae), is a low-shrubby perennial up to 3.5 feet tall, with hollow stems, sparsely hairy pinnately divided leaves without tendrils, many small white flowers on a branched flower stalk, and a flat hairy pod.

Status:

Humboldt milk-vetch was the target of a weed eradication effort during the 1920s when this reportedly toxic plant was implicated in the death of lambs. Subsequently, the plant was not seen after 1954 and was presumed extinct for many years. Several attempts to relocate the plant during the 1970s were unsuccessful. In 1987, the species was rediscovered on the ranch in Humboldt County where it was originally found. Dormant seeds that had persisted in the soil were stimulated by the opening of the tree canopy when a dead tree was felled and removed a few years earlier.

Soon after rediscovery of the population on the ranch, the landowner agreed to voluntarily protect the plant in



coordination with TNC and volunteers of CNPS. Portions of the population were fenced and monitored by TNC and CNPS volunteers. Results of monitoring have demonstrated that Humboldt milk-vetch is an early successional species with specific germination requirements. It requires frequent openings in the forest to allow germination and growth and is shade intolerant. Studies on this species have indicated that it is subject to inbreeding depression, but there is a persistent seed bank, presumed to be genetically diverse.

Within the last few years, the forest canopy openings at the ranch have contracted in size and, since no new openings have occurred, the population size of Humboldt milk-vetch has declined. TNC was the primary leader in coordinating protection and monitoring on Humboldt milk-vetch for ten years. However, since 1998 the local chapter of CNPS is taking over the coordination of monitoring and protection activities. A new management plan is in preparation. The current landowner is one of the active cooperators protecting Humboldt milk-vetch.

Two populations of Humboldt milk-vetch were discovered on a ridge in 1999 in the Jackson State Forest in Mendocino County during a survey for a Timber Harvest Plan. Subsequent to 1999 twenty-four additional populations have been discovered in western Humboldt and Mendocino counties on managed forest lands. Population numbers of Humboldt milk-vetch are highly variable from a few individuals to thousands of plants, and frequently include numerous seedlings. The species appears quite cyclic in occurrence with population numbers fluctuating substantially over time.

Humboldt milk-vetch is an endemic species to California with a very limited distribution, and belongs to a distinct small taxonomical group of four species that are all rare or highly localized and distinct from the European and Asian species. DFG management objectives for Humboldt milk-vetch on forest lands is to maintain adequate presence and numbers of Humboldt milk-vetch plants to ensure completion of life cycle, visitation by pollinators, establishment of seed banks, and to prevent genetic and habitat degradation. Research is proposed in 2003 by DFG and Humboldt State University to conduct an analysis of the genetic variation between populations.

**Clara Hunt's
milk-vetch**

Astragalus clarianus

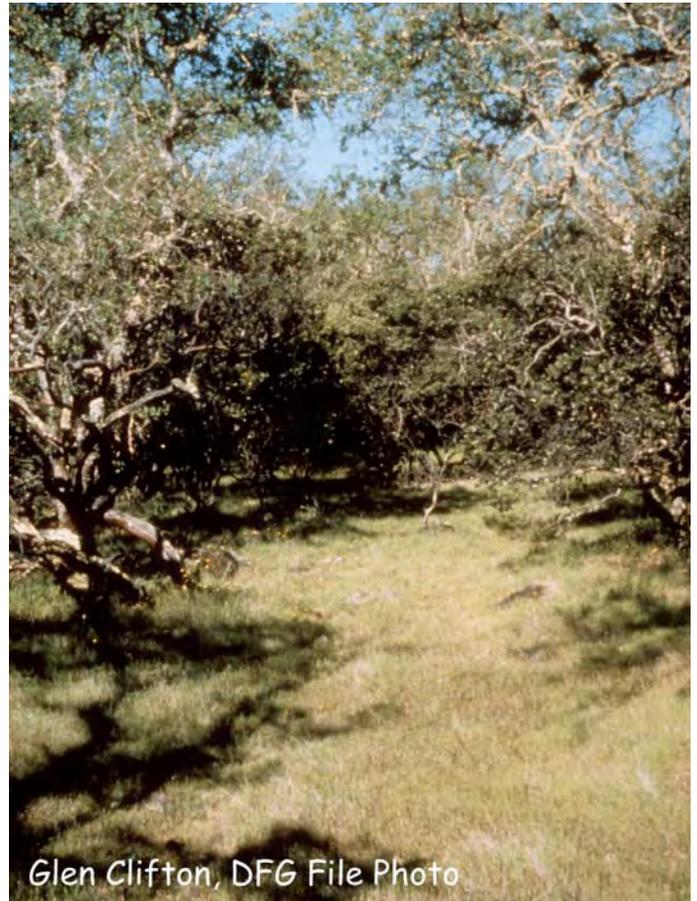
State: Endangered 1990
Federal: Endangered 1997

General Habitat:

Clara Hunt's milk-vetch occurs on thin rocky clay soils derived from volcanic material or serpentine. It is found in openings of grasslands, manzanita chaparral, and blue oak woodland in Napa and Sonoma Counties. It is associated with purple needlegrass, species of brodiaea, California poppy, and gilia.

Description:

Clara Hunt's milk-vetch is a small annual herb in the pea family (Fabaceae). The milk-vetch has up to nine leaflets per leaf and white, purple-tipped flowers which bloom in March and April.



Status:

Astragalus clarianus is known from five occurrences. Principal threats to this species are urbanization, maintenance activities, introduced invasive plants and animals (feral pigs), and recreational activities. Natural vegetation succession in the absence of disturbance regimes is another factor affecting Clara Hunt's milk-vetch.

Several colonies in one area occur in a pasture. Road widening and nearby development threaten this site. Foot traffic at Bale Grist Mill State Historic Park has impacted the second population, although high dense stands of yellow star thistle and plant community succession are also factors. The third population is adjacent to a fishing access road and is impacted by vehicle traffic and invasive plants. A large portion of this occurrence was accidentally buried in 1990 by dredge material which was subsequently removed. The site was fenced subsequent to clean-up and plants have been observed there as recently as 1998. The fourth site, south of St. Helena, is the largest known population. When observed in 2000, it supported 134 plants in native grassland. French broom is

invading this site and there is evidence of feral pigs in the meadow in which the milk-vetch occurs. The fifth site was discovered in 1997 in Napa County in an area proposed for vineyard expansion. The landowner agreed to a vineyard setback that will protect at least a portion of the plants, and in 1998, 290 plants were observed. Because this milk-vetch is an annual plant with extremely small populations, sites could be eliminated through random fluctuations in population size from year to year or other chance events such as drought or invasion by weeds.

**Long Valley
milk-vetch**

*Astragalus
johannis-howellii*

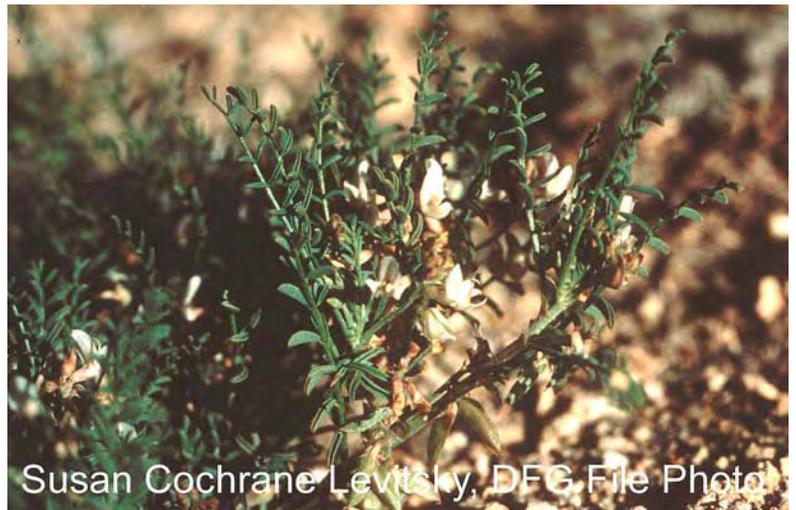
State: Rare 1982
Federal:

General Habitat:

Long Valley milk-vetch grows on sandy gravelly loam soils derived from volcanic ash and mixed alluvium in the sagebrush scrub. It is associated with big sagebrush, species of needlegrass, Indian rice grass, and rabbitbrush. In California, it is restricted to Mono County. The species also occurs in Nevada.

Description:

Long Valley milk-vetch is a slender-stemmed, perennial herb in the pea family (Fabaceae) with divided yellow-green leaves and whitish, purple-veined flowers.



Status:

Long Valley milk-vetch is known from approximately 20 sites in California where it is found on BLM, USFS, and LADWP lands. Threats to this species include excessive grazing and trampling, OHV use, and dumping. Raising the level of Crowley Lake could impact plants growing in that area.

The BLM prevents grazing of the occurrences during the peak growth period, and limits grazing during the rest of the year. The occurrences on BLM land are stable.

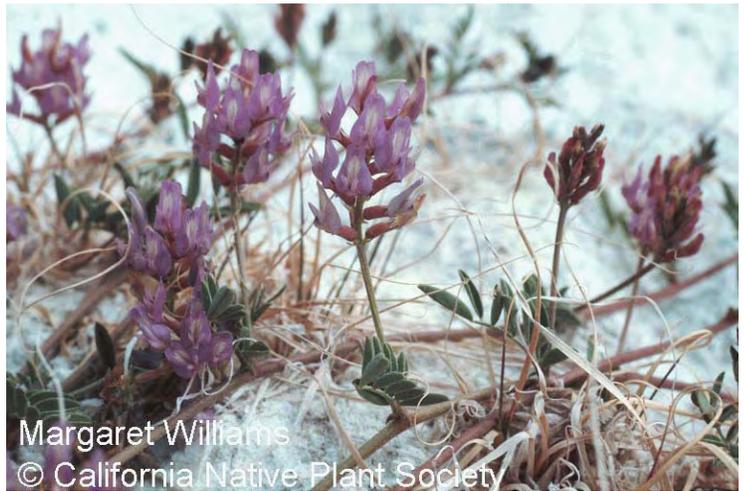
**Sodaville
milk-vetch**

*Astragalus
lentiginosus var.
sesquimetralis*

State: Endangered 1979
Federal: None

General Habitat:

This species is restricted to moist, open, alkaline hummocks and drainages near cool springs with salt grass, greasewood, and alkali sacaton.



Description:

Sodaville milk-vetch, a member of the pea family (Fabaceae), is a prostrate, perennial herb with divided leaves, an open inflorescence of purple flowers, and inflated, elongated seed pods.



Status:

Big Sand Spring in Inyo County is the only known occurrence of Sodaville milk-vetch in California. Sodaville milk-vetch also occurs at two sites in Nevada where it is considered a fully-protected species. Sodaville milk-vetch was proposed for federal listing in the 1990s. The proposed rule was withdrawn when Big Sand Spring was placed within Death Valley National Park. Prior to 1994, the site was owned and managed by BLM. The site was maintained within a cattle grazing allotment and a wild burro Herd Management Area by BLM.

The population was almost destroyed by feral burros and cattle before BLM erected established a 25-acre enclosure in 1985 to keep the animals from entering the site. The only milk-vetch plants remaining at that time were being protected by shrubs. An electric fence was erected in 1997 since the existing fence did not exclude cattle or burros. Cattle grazing was not permitted after 1996 and the lease was officially terminated in 2002. In 2001 and 2002, feral cattle and burros were removed from the area. Census data indicate milk-vetch plants have made a substantial comeback, from only 10 individuals in 1995 to 1,500 individuals in 1997, and 3,000 in 1998.

**Peirson's
milk-vetch**

Astragalus magdalenae
var. peirsonii

State: Endangered 1979
Federal: Threatened 1998

General Habitat:

Peirson's milkvetch occurs in open sand in the Algodones Dunes system in Imperial County, California. It is associated with two other listed species, Algodones Dunes sunflower (*Helianthus niveus* ssp. *tephrodes*) and Wiggins' croton (*Croton wigginsii*).

Description:

Peirson's milk-vetch is a stout, herbaceous perennial with a woody base. Its leaves are divided into numerous oblong leaflets. This purple-flowered member of the pea family (Fabaceae) is covered with fine, silky hairs and produces inflated pods.



Status:

Historically, Peirson's milkvetch was known from Borrego Valley in San Diego County and at a site southwest of the Salton Sea in Imperial County, but it has not been seen in these locations for years. A collection from the Yuma Dunes of Arizona thought to represent Peirson's milkvetch was found to be misidentified. In Mexico, Peirson's milkvetch is known from the Gran Desierto of northwestern Sonora and from northeastern Estado de Baja California.

Destruction of plants and modification of habitat associated with OHV activity is considered the primary threat to Peirson's milkvetch. Vehicles may have a direct impact on the plants by crushing and killing them or reducing their reproductive output. Vehicles can alter dune structure by altering hydrological traits of the dune, cover standing plants with encroaching sand, or expose standing plants by causing sand to fall away from the plants.

The Algodones Dunes has long been used as an off-highway vehicle recreational area with approximately 75 percent of the dune system open to off-highway vehicles (OHVs). The remainder of the dune system is within an Area of Critical Environmental Concern (ACEC) and closed to OHV use. The majority of Peirson's milk-vetch occurrences known in 1977 were in the open area. Subsequent surveys found significantly fewer plants. In March 2000, several conservation organizations brought suit against BLM for impacts to Peirson's milk-vetch. As a result of the lawsuit, a temporary closure of the Algodones Dunes (called Imperial Sand Dunes by BLM) was implemented. The closure was to remain in effect until BLM completed formal consultation with the USFWS under provisions of the National Environmental Policy Act (NEPA).

In 2001, BLM prepared a Biological Evaluation regarding the present management of Peirson's milk-vetch and submitted the evaluation to USFWS with its request for formal consultation. BLM then filed a notice of its intent to amend the California Desert Conservation Area Plan and to prepare a management plan for the Imperial Sand Dunes Recreation Area. This amendment would also designate the North Algodones Dunes as a wilderness area with restricted public access. The vehicle closure was extended until the management plan was completed. The draft management plan was released in March 2002 and has not been finalized. Later in 2002, a federal judge ordered USFWS to designate critical habitat for eight listed plants, including Peirson's milk-vetch.

The Department is collaborating on a research project for Peirson's milk-vetch. Research began in 2002. Six populations of Peirson's milk-vetch were selected for monitoring. Few seedlings were found. A suite of features, including associated plant species, herbivory, pollination vectors, direct human impacts, and demographics, were documented at each site. Soil samples were collected at each of the sites to evaluate microhabitat characteristics for the populations.

One pollinator was identified in the field, a native solitary bee. Insect predation of seed was also observed, but the insect was not identified. Seed germination was analyzed at Rancho Santa Ana Botanic Garden. Results of the experiment found that seeds that had been abraded (scarified) germinated readily. A thick impervious seed coat is common in many native species in the pea family. Abrasion of the seed coat facilitates water uptake and subsequent germination. Twenty plants were grown at the botanic garden for additional experiments. A high mortality rate, however, was documented with loss of 75% of seedling plants. Research is still ongoing.

Proposed critical habitat of approximately 52,000 acres was designated in August 2003. FWS has not yet developed a recovery plan or a conservation strategy for the milkvetch. Based on their current understanding of the species' biology, the primary conservation needs include: maintenance of the major occurrences to conserve genetic diversity; management of the species' habitat to prevent catastrophic population declines; and collection of additional information concerning recreational use-patterns in the Algodones Dunes, the direct and indirect effects of OHV use on this species, and biological factors affecting milk-vetch demographics.

Mono milk-vetch *Astragalus monoensis*

State: Rare 1982
Federal: None

General Habitat:

Mono milk-vetch is endemic to pumice flats from western Long Valley to the Mono Basin. It occurs in loose sandy or gravelly soil and is associated with Indian rice grass, western needlegrass, species of buckwheat, sand verbena, and Mono lupine, another endemic species.

Description:

Mono milk-vetch is a slender-stemmed, perennial herb in the pea family (Fabaceae) with divided yellow-green leaves and whitish, purple-veined flowers.



Status:

Mono milk-vetch is known from approximately 16 populations. Most of the sites are subject to the effects of seasonal cattle grazing, although light to moderate grazing may not threaten this plant. Mono milk-vetch is found on BLM, USFS, and LADWP lands. The BLM prevents grazing of the occurrences during the peak growth period, and limits grazing during the rest of the year. Current survey information for this plant is lacking. Mono milk-vetch is considered to be a Species of Concern by the USFWS. A Species of Concern is an informal term that refers to those species that might be declining or be in need of concentrated conservation actions to prevent decline.

**Ventura marsh
milk-vetch**

Astragalus pycnostachys
var. lanosissimus

State: Endangered 2000
Federal: Endangered 2001

General Habitat:

Historically, Ventura marsh milk-vetch occurred in back dune habitat, coastal meadows and near coastal salt marshes from Ventura County to Orange County. It is now known from a single site in degraded backdune habitat near the City of Oxnard. The population occurs with sparse vegetative cover provided primarily by coyote brush, mule fat, non-native sea fig, and non-native red brome.

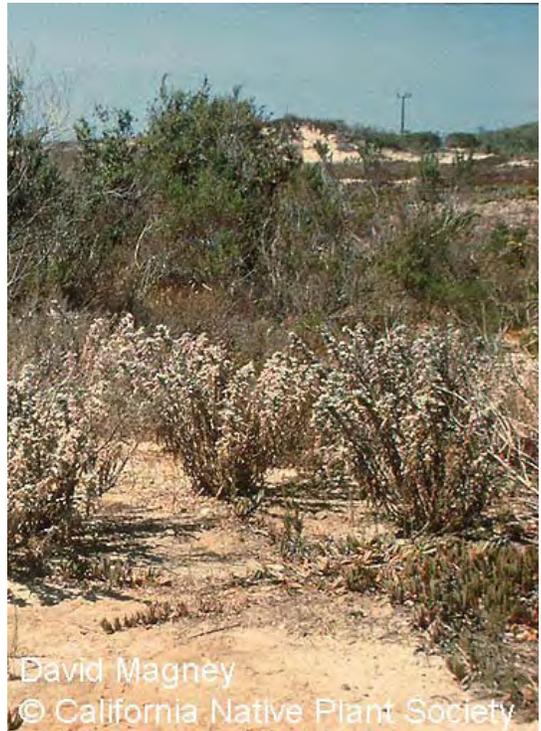
Description:

Ventura marsh milk-vetch is a short-lived, herbaceous perennial in the pea family (Fabaceae). It has a thick taproot and multiple erect, reddish stems that emerge from the root crown. Leaves are divided into 27-39 leaflets and are densely covered with silvery white hairs. The numerous yellowish-white to cream colored flowers are in dense clusters.

This variety is distinguished from *A. pycnostachyus* var. *pycnostachyus* (brine milk-vetch) by certain flower characteristics. It is distinguished from other local *Astragalus* species by its overall size, perennial growth form, size and shape of fruit, and flowering time.



Mary Meyer, DFG File Photo



David Magney
© California Native Plant Society

Status:

Over the last century seven historical occurrences were known to exist. Ventura marsh milk-vetch was extirpated from these sites and was believed to be extinct. It was rediscovered in 1997 in an area proposed for bioremediation of contaminated soils and subsequent urban development near the City of Oxnard in Ventura County. The entire population occurs on fill material at a closed oil-waste dump site and occupies about 2900 square feet. Since 1997, between 192 and 374 Ventura marsh milk-vetch individuals have been observed at the site. The number of reproductive adults has varied from as many as 97 to as few as 12. Studies show low levels of seed production in the wild. Although seed germination is successful, survivorship and recruitment to older

age classes is quite low. Continued survival of this species depends upon stabilizing the existing population and establishing additional populations in suitable protected coastal wetland sites.

Experimental populations have been established at two locations on lands managed by the California Department of Parks and Recreation and the University of California Reserve System. Based upon experimental results, survivorship and mortality in these habitat areas are being evaluated. Various research, germination, and propagation efforts are being undertaken by the Santa Barbara and Rancho Santa Ana Botanic Gardens, affiliates of the Center for Plant Conservation. Research at the University of California, Santa Barbara is focused on soil habitat requirements for the milk-vetch. Soil moisture will be monitored and selenium in the soil, plants, and oil/tar deposits will be analyzed. Water table salinity levels will also be assessed. Plant roots will also be examined for evidence of symbiotic nitrogen-fixing bacteria. Additional propagation and research efforts are in progress at the University of California's Coal Oil Point Reserve, funded largely by the private landowner of the only existing wild population of Ventura Marsh Milkvetch. Dialogue is continuing with the Pt. Mugu Naval Air Station, another potential introduction site.

On October 9, 2002, the USFWS proposed to designate approximately 420 acres of land in Ventura and Santa Barbara counties, at Mandalay near Oxnard, McGrath State Beach, and Carpenteria Salt Marsh, as critical habitat for the Ventura Marsh milk-vetch. Features identified as primary constituent elements of critical habitat for the milk-vetch include 1) native vegetation cover between 50 and 75 percent; 2) low densities of non-native annual plants and shrubs; 3) the presence of a high fresh or brackish water table; 4) fine-grained, well-drained soils composed primarily of sand with some clay and silt; and 5) non-saline or non-alkaline substrate conditions. Of primary importance is to ensure that areas designated support the ecological processes of which the plant's life cycle. Because Ventura Marsh milk-vetch appears to suffer from poor seed set, the maintenance of a pollinator community is critical.

**Coastal dunes
milk-vetch**

Astragalus tener
var. titi

State: Endangered 1982
Federal: Endangered 1998

General Habitat:

This plant grows in moist depressions on clay soils in coastal terrace grasslands and in coastal strand vegetation on sand dunes. Colonies of the milk-vetch occur on a relatively flat coastal terrace within 100 feet ft of the ocean beach and are exposed to ocean spray and periodic inundation. Coastal dunes milk-vetch grows in sandy soils fine sands that comprise a series of shallow swales on the terrace surface. Individual plants are found on the bottoms or sides of the swales with other low growing grasses and herbs, including the nonnative cut-leaf plantain.

Description:

Coastal dunes milk-vetch is a low, dwarf annual plant in the pea family (Fabaceae). It has slender stems, leaves divided into wedge-like or oval leaflets, terminal clusters of purple flowers, and straight or curved pods.



Status:

Coastal dunes milk-vetch is critically threatened and in danger of extinction. Historically, coastal dunes milk-vetch was known from seven sites in Monterey, Los Angeles, and San Diego counties. Only one population is currently known to occur; it is made up of approximately 11 scattered patches of plants that are separated by 17-Mile Drive on the western edge of the Monterey Peninsula. This population is highly fragmented. The small size of the population and human uses surrounding the population greatly increase its chance of extinction from random events (genetic drift, wave erosion during a storm event) or those associated with human activities (mowing, trampling, equestrian use). The species is also threatened by competition from the nonnative sea-fig, cut-leaf plantago, and Pansa sedge.

The land on which the milk-vetch occurs is owned by the Pebble Beach Company and the Monterey Peninsula Country Club. In 1989, the Pebble Beach Company constructed an enclosure on the west side of 17-mile Drive to protect plants on its property. Hundreds of individuals were found in the enclosure in 1998. No flowering individuals were observed in the enclosure in 2000, and no plants were observed in the enclosure in 2002. Multiple individuals flowered, however, outside of the enclosure, indicating that light disturbance facilitate seed germination. Although patches of suitable habitat occur in the vicinity of the existing population, these sites are surrounding by golf greens and a bank covered by sea-fig. Plants on the east side of 17-Mile Drive on country club property are vulnerable to equestrian use along trails, golfing activities, and potential effects of fertilizers and pesticides used in turf management. Coastal dunes milk-vetch is threatened by habitat alteration and

fragmentation, as well as by competition from non-native plants such as ice plant and cut-leaf plantain. A Draft Recovery Plan was published by the USFWS in 2002.

Trask's milk-vetch *Astragalus traskiae*

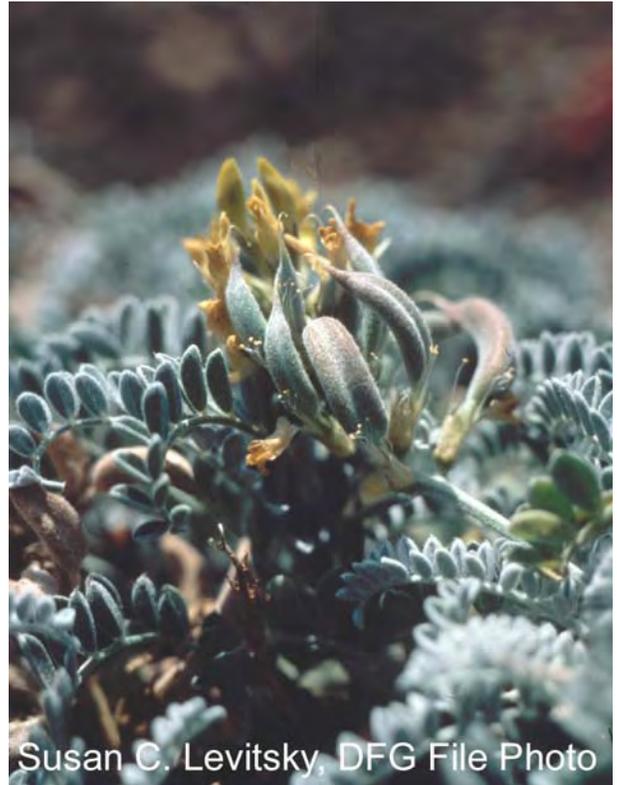
State: Rare 1979
Federal: None

General Habitat:

This species is restricted to Santa Barbara and San Nicolas Islands. On San Nicolas Island, Trask's milk-vetch is widespread and abundant around the perimeter of the island, especially in sand dunes, sandy coastal flats, and on open sandstone slopes. It occurs mostly at elevations between 50 and 800 feet.

Description:

Trask's milk-vetch is a spreading perennial herb in the pea family (Fabaceae) with evergreen leaves divided into many oval leaflets, yellowish-white flowers in small clusters, and gently curved pods. The plants are covered with short hairs that give them a gray-green color.



Susan C. Levitsky, DFG File Photo



Susan Cochrane Levitsky, DFG File Photo

Status:

The Navy's Environmental Division reviews all land use plans and activities that may affect sensitive species. Surveys were conducted in 1992 to determine the distribution, habitat preference, and population status of this species. Occurrences of this milk-vetch on Santa Barbara Island were intensively studied by Clark and Halvorson in the 1980s and they reported a severe decline in the populations due to drought and severe winter storms in 1988. The DFG has no recent data on this species.

Bakersfield smallscale

*Atriplex
tularensis*

State: Endangered 1987
Federal: None

General Habitat:

Bakersfield smallscale was restricted historically to a small area of south-central Kern County between Greenfield and Mettler. Associated species included alkali heath, glasswort, creeping wild-rye, iodine bush, scratchgrass, and saltgrass.

Description:

Bakersfield smallscale, a member of the goosefoot family (Chenopodiaceae), is an erect, branched annual covered with white scales. Tiny greenish flowers are produced throughout the plant. The reddish-brown seeds are enclosed in diamond-shaped bracts that are smooth on the surface but toothed on the margin.



Status:

Five of the six historically known populations have been destroyed by agricultural conversion of the habitat. First collected in the 1890s, the species had not been seen since the 1930s when it was rediscovered in 1983 at Kern Dry Lake. Since the discovery, the site had been leased and managed by TNC as the Kern Lake Preserve until the lease was discontinued by the private landowner. The plants are threatened by land conversion and lowering of the water table. This latter threat was greatly exacerbated by a series of drought years from 1987-1992. The plant was last observed in 1991.

The identity of the plants at the site has been questioned, because plants collected in the area historically differ in appearance from those observed in the 1980s. One opinion is that the plants are hybrids of Bakersfield smallscale and bractscale (*A. serenana*), which also grows in the area, and that pure Bakersfield smallscale no longer occurs. Another opinion is that *A. tularensis*, as originally described, was never a distinct species, but was a variant of bractscale that only appeared in high rainfall years. The Kern County Valley Floor Habitat Conservation Plan is expected to provide incentives for protecting the Gator Pond area. Other protection measures for Bakersfield saltbush are included in the USFWS Recovery Plan for Upland Species of the San Joaquin Valley, California, completed in 1998.

Encinitas baccharis *Baccharis vanessae*

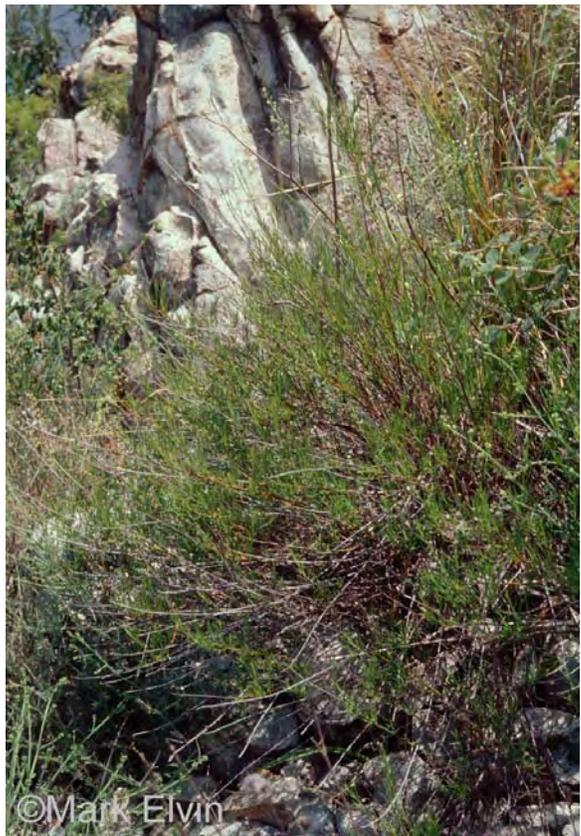
State: Rare 1982
State Endangered 1987
Federal: Threatened 1996

General Habitat:

This plant occurs on steep slopes in the southern maritime chaparral communities of San Diego County in the vicinity of Encinitas. Its range extends to Mount Woodson and the vicinity of Poway, with one population in the Santa Margarita Mountains of northern San Diego County where it is associated with mixed chaparral. Encinitas baccharis is associated with Del Mar manzanita, Mission manzanita, and Mojave yucca.

Description:

Encinitas baccharis is a slender stemmed, shrub in the sunflower family (Asteraceae) that grows to a little over 3.5 feet tall. It has alternate leaves, reflexed floral bracts, and heads of whitish flowers. Male and female flowers occur on different plants (dioecious).



Status:

Encinitas baccharis is currently known from 20 occurrences. A population was established in San Dieguito Park, but did not persist. This species has undergone rapid habitat loss due to residential development and agricultural conversion, and decline continues. A portion of the range of Encinitas baccharis occurs within the San Diego MSCP area. The MSCP will conserve 92% of all major populations within the Plan Area.

Encinitas baccharis is included in the San Diego Multiple Habitat Conservation Program (MHCP). The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. Within the MHCP, this species is known only from Carlsbad and Encinitas. The MHCP will conserve nearly 100% of known locations, major populations, and critical locations in the study area. In addition, approximately 67% of potential habitat will be

conserved. Specific guidelines in the MHCP for Encinitas include managing all conserved populations to control edge effects and implementing fire management plans to protect conserved populations from frequent or high-intensity fires and fire suppression activities while promoting natural regeneration following natural fire events. In addition, adequate preserve design for this species must include sufficient habitat to support appropriate pollinators.

This species is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. *Encinitas baccharis* is also covered in the San Diego Multiple Habitat Conservation Program NCCP. The species is covered in the Escondido subarea MHCP, and in October 2002, The Escondido Creek Conservancy acquired 345 acres of habitat in the vicinity of Lake Hodges in northern San Diego County. The parcel supports a population of *Encinitas baccharis*.

In 2003, three huge fires burned large areas of San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 64% of habitat suitable for *Encinitas baccharis* burned during the fire and resulted in impacts to some populations. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of *Encinitas baccharis*.

Bensoniella

Bensoniella oregana

State: Rare 1982

Federal: None

General Habitat:

Bensoniella is found only in Humboldt County in California and in Curry and Josephine counties in Oregon's Siskiyou Mountains. *Bensoniella* grows in the margins of moist, grassy meadows and in small openings in evergreen forests. Ecological conditions most important to the survival of *Bensoniella* include partial shade, moist soils derived from ancient sedimentary rock, high rain fall (approximately 100 to 140 inches per year), and summer fog. *Bensoniella* is associated with arrow-leaf groundsel, stream violet, wild ginger, blue wild-rye, and slender rush.

Description:

Bensoniella is a perennial herb in the saxifrage family (Saxifragaceae). It has basal, heart-shaped leaves, unbranched flowering stems, and small, saucer-shaped flowers with vivid orange anthers. *Bensoniella* resembles similar members of the Saxifrage Family, including piggy-back plant, foamflower, leafy-stemmed mitrewort, and large fringe-cup.



Status:

Bensoniella is limited to the Klamath Mountain Province and Coast Range of southwest Oregon and northwest California. There are approximately 86 *Bensoniella* occurrences in Oregon and six occurrences in California. The California occurrences are geographically isolated from the Oregon sites by approximately 110 miles. All six California sites occur within a six-mile radius of Snow Camp Mountain in central Humboldt County. There are four occurrences on private land and two in the Six Rivers National Forest. One of the Six Rivers National Forest sites is an experimental population established in 1980. A potential still exists to discover additional sites in the Coast Range and Klamath Mountain Province of Oregon and California.

Viability of *Bensoniella* in California is a concern because of the small size of populations, limited genetic variability (jeopardizing adaptive ability of individual known sites), isolation from Oregon populations, poor seed dispersal, habitat specificity, limited number of known sites (six total with two on federal land), and the lack of protection on private land. Of the four recently observed California occurrences, three are found on private land,

and one occurs on Six Rivers National Forest.

In California, documented impacts to the species include cattle grazing, salvage logging operations, increased exposure to light resulting from timber harvesting, firewood gathering, and the removal of woody debris by firewood gatherers. Additional threats include changes in hydrology, stream erosion, and soil compaction.

Nevin's barberry

Berberis nevinii

State:	Endangered	1987
Federal:	Endangered	1998

General Habitat:

Nevin's barberry occurs in two habitat types: gravelly wash margins in alluvial scrub, and on coarse soils in chaparral. This species typically is found between 900 and 2,000 ft in elevation. The native range of the species extends from the foothills of the San Gabriel Mountains of Los Angeles County to near the foothills of the Peninsular Ranges of southwestern Riverside County.

Description:

Nevin's barberry is a blue-green evergreen shrub in the barberry family (Berberidaceae). It has prickly compound leaves and yellow flowers that produce round yellow-red berries.



Status:

Nevin's barberry is currently known from more than 30 occurrences although the total number of plants is reportedly fewer than 1,000. Loss of habitat continues to be a major threat to this species. This species is dependent upon natural fire regimes which are interrupted or eliminated at the urban interface. The lack of reproduction and recruitment at most sites, and the very low number of individuals at most populations in the absence of fire are indicative of fire responsive species. Viable seed has been obtained from some populations and successfully grown in botanical gardens, but establishment in the wild appears limited.

The largest native populations, which collectively contain about 200 individuals, occur in Riverside County in the Vail Lake/Oak Mountain area. The majority of the known populations are on private lands in the Vail Lake region, although a few individuals occur on Bureau of Land Management (BLM) lands north of Vail Lake and in the Cleveland National Forest southeast of Vail Lake. Nevin's barberry is included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Conservation for this species will be achieved by inclusion of at least 8,000 acres of suitable chaparral and Riversidean alluvial fan sage scrub between 300 and 659 m in the Vail Lake area and the Agua Tibia Mountains Bioregion.

In Los Angeles County, another population of 130-250 individuals occurs on an alluvial terrace and on steep slopes in San Francisquito Canyon, Angeles National Forest. Another site was discovered on the Angeles National Forest in 1998 according to the U.S. Fish and Wildlife Service. The species was reported from the desert foothills near Ranchita, but was never relocated. The range of *Berberis nevinii* has been extensively surveyed, and additional populations are not likely to occur in the Vail Lake area. Searches for *B. nevinii*, based on published habitat parameters, revealed no additional plants on the San Bernardino National Forest.

This species is included in the San Diego Multiple Species Conservation Plan (MSCP). No known natural populations of Nevin's barberry occur within the MSCP planning area. However, the species persists at Spring Valley and within Torrey Pines State Reserve as two populations established from cultivated plants. These two populations will be conserved. Nevin's barberry is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. Nevin's barberry is in the horticultural trade. The species has been used in landscaping within its native range.

principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Feral pig eradication efforts will likely begin in late summer, 2003.

Island barberry is in cultivation, for example at the University of Santa Cruz arboretum and Santa Barbara Botanic Garden. The plants cultivated at the Santa Barbara Botanic Garden include a clone of at least one plant now extirpated on Santa Cruz Island and are part of the Center for Plant Conservation National Collection of Endangered Plants.

**Truckee
barberry**

Mahonia sonnei
(*Berberis sonnei*)

State	Endangered	1979
Federal	Delisted	2003

General Habitat:

When described, Truckee barberry was thought to occur in only one natural occurrence on alluvial granitic soils along the upper banks of the Truckee River in the town of Truckee, Nevada County.



Image of creeping barberry

Description:

Truckee barberry was described as an upright, evergreen shrub with divided spiny leaves, small clusters of yellow flowers, and blue-black berries. It is in the barberry family (Berberidaceae).

Status:

Truckee barberry is no longer recognized as a valid taxon; rather current scientific literature establishes that the species is a form of another species, creeping barberry (*Berberis aquifolium* var. *repens*). Creeping barberry is widespread in the western United States and Canada, and is not considered to be threatened or endangered within its range. The DFG is considering proposing Truckee barberry for delisting based on invalid taxonomy.

Sonoma sunshine

*Blennosperma
bakeri*

State: Endangered 1992
Federal: Endangered 1991

General Habitat:

Sonoma sunshine is a California endemic, restricted to grasslands within vernal pool and swale complexes on the Santa Rosa Plain in the Sonoma Valley of Sonoma County. It is associated with Burke's goldfields and Sebastopol meadowfoam.

Description:

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



Status:

Sonoma sunshine is known from 33 locations in the Cotati Valley and seven other sites in the Sonoma Valley, according to the USFWS. The majority of these occurrences are on private property. At least 30 percent of the historic occurrences of Sonoma sunshine have been eliminated or seriously damaged, and westward expansion of the City of Santa Rosa threatens 50 to 70 percent of the remaining Sonoma sunshine habitat. Housing development, agriculture, waste water irrigation, and long-term intensive livestock grazing have contributed to the decline and demise of most of the area's pools. In some cases pools spared in development projects in the Santa Rosa Plain area are declining in viability as a result of being within "postage-stamp" reserves surrounded by homes. Foot traffic, increased refuse, and altered hydrology due to lawn irrigation, have contributed to site quality reduction in some areas. Agricultural conversion (including discing, vineyards, and orchards) has destroyed or damaged other vernal pool areas. Only a few moderately-sized viable vernal pool areas remain in the region. The floristic quality of the remaining pools has declined in some areas due to long-term intensive grazing.

In order to resolve the conflicts with land use and wetland resources a Vernal Pool Task Force was formed. Composed of federal, state, and local agencies, local development and agricultural interests, and local environmental groups, the Task Force developed a Vernal Pool Ecosystem Preservation Plan. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan identifies areas for wetland and rare species protection, and areas

for wetland creation, restoration, or enhancement. This plan is currently being implemented.

To date, more than 23 separate properties, ranging in size from 1 acre to 174 acres, have been placed under the jurisdiction of DFG in cooperation with local agencies, such as the Sonoma County Agricultural Preservation and Open Space District (SCAPOS), for the protection of vernal pool species. Sonoma sunshine is protected with the DFG Todd Road Reserve contains 75 acres of vernal pools and associated uplands. A portion of the Carinalli Property near Laguna de Santa Rosa (150 acres) and a recent acquisition of an adjacent 75 acres both contain some vernal pool habitat and have been acquired under the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. At the DFG's Laguna de Santa Rosa Ecological Reserve, Sonoma sunshine occurs with two other State and federally listed endangered plant species: Burke's goldfields (*Lasthenia burkei*) and Sebastopol meadowfoam (*Limnanthes vinculans*).

Research on the vernal pool plants is ongoing, funded primarily by FWS Section 6 grants. For example, projects examined the biological and logistic characteristics of the reserve properties, developed a management framework for recovery of the listed plants, designed and installed a long-term mowing/phytomass removal experiment to improve habitat quality, and conducted trials for intensive management techniques, e.g. fire and herbicide. This scientific approach has been used to develop practical, large-scale prescriptions that can directly affect recovery of the listed plants and improve native plant cover in vernal pool and adjacent upland habitats. These prescriptions gain wider applicability when supported by experimental data from multiple years with variations in climate and plant cover. In another study, Dr. Joan M. Leong, Sonoma State University, studied pollinator visitation to translocated and natural populations of *Blennosperma bakeri*. Future studies may elucidate genetic variability within and between populations of Sonoma sunshine, Burke's goldfields, and Sebastopol meadowfoam.

**Point Reyes
blennosperma**

Blennosperma nanum
var. robustum

State: Rare 1978
Federal: None

General Habitat:

Point Reyes blennosperma occurs mostly on sandy soils in the coastal prairie habitat of the Point Reyes Peninsula in Marin County.

Description:

Point Reyes blennosperma, a member of the sunflower family (Asteraceae), is a yellow-flowered annual herb with hollow, sprawling stems.



Status:

Point Reyes blennosperma is known from approximately 15 populations, including approximately a dozen populations within Point Reyes National Seashore. One population occurs in Mendocino County in north coast bluff scrub overlying sand dunes. This population is entirely on private land; its status is unknown.

The effects of tule elk grazing on vegetation of Tomales Point following removal of cattle were studied at Point Reyes National Seashore. One of the goals of the study was to maintain viable populations of Point Reyes blennosperma and the Myrtle's silverspot butterfly. Point Reyes Blennosperma and San Francisco owl's clover were mapped and inventoried in 1983, and populations have been surveyed by California Native Plant Society teams on a nearly annual schedule since then. Results indicate that populations of these rare plants fluctuate in response to rainfall and summer drought. There is no apparent decline associated with tule elk presence, although the data need to be analyzed more fully to contrast trends on Tomales Point with those from other parts of the seashore.

Dwarf golden star *Bloomeria humilis*

State: Rare 1978

Federal: None

General Habitat:

Dwarf golden star occurs in coastal prairie and chaparral communities on open mesas and ocean bluffs in the Arroyo de la Cruz area of San Luis Obispo County. Associated State-listed species include the rare Hearst's ceanothus and maritime ceanothus, as well as the endangered Hearst's manzanita.

Description:

Dwarf golden star is a perennial herb in the lily family (Liliaceae) with an umbrella-shaped cluster of bright golden flowers on thin, thread-like stalks. It grows from an underground bulb, and produces one or two linear leaves.



Status:

Only two known occurrences of dwarf golden star are known to exist. Both known populations occur on the Hearst Ranch on land used primarily for cattle grazing. No surveys of the plants have been conducted in at least ten years to DFG's knowledge.

Dwarf golden star had been a federal candidate species in the 1990s and is still considered by FWS to be sensitive. In 1996, a number of candidate species were reclassified. According to the report published in the Federal Register, land uses at the Hearst Ranch, including light cattle grazing and periodic shrub removal, were not shown to be detrimental to the species. The report concluded that there were no known imminent threats to the species at that time.

Thread-leaved brodiaea

Brodiaea filifolia

State: Endangered 1982
Federal: Threatened 1998

General Habitat:

This species typically occurs on gentle hillsides, valleys, and floodplains in mesic, southern needlegrass grassland and alkali grassland plant communities in association with clay, loamy sand, or alkaline silty-clay soils. Sites occupied by this species are frequently intermixed with, or near, vernal pool complexes. The historical range of *B. filifolia* extends from the foothills of the San Gabriel Mountains at Glendora (Los Angeles County), east to Arrowhead Hot Springs in the western foothills of the San Bernardino Mountains (San Bernardino County), and south through eastern Orange and western Riverside Counties to Carlsbad in northwestern San Diego County, California.

Description:

Thread-leaved brodiaea, a member of the lily family (Liliaceae), produces several linear leaves from an underground corm and a leafless flowering stalk bearing blue to red-purple flowers.

Status:

Thread-leaved brodiaea is known from approximately 40 occurrences, many of which are threatened by continuing residential and commercial development in Southern California. Fewer than 2000 individuals occupy most sites and occurrences are often less than 10 acres in size. A number of habitat occurrences for the species have been lost in the past decade in northwestern San Diego County. Proposed residential/commercial developments in San Diego, Orange and Los Angeles counties threaten additional populations. Small populations of the species occur on the DFG's lands at the San Jacinto Wildlife Area in Riverside County and Carlsbad Highlands in San Diego County. A significant population occurs on TNC's Santa Rosa Plateau in western Riverside County, and a small population occurs in Aliso-Wood Canyons Regional Park in Orange County. The City of Glendora manages the Brodiaea Reserve which was established to protect thread-leaved Brodiaea. The Brodiaea Preserve constitutes the second largest preserve, after the TNC preserve, on the Santa Rosa Plateau.

A few efforts have been made to translocate populations of thread-leaved brodiaea from areas approved for development to new areas of presumably suitable but unoccupied habitat. Several of these have failed. The others are ongoing, and it will be several years before their outcome can be reasonably assessed. This species is covered in the San Diego Multiple Species Conservation Plan (MSCP) NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Thread-leaved brodiaea is



considered to be a narrow endemic species under the MSCP and 88 percent of its vernal pool habitat will be protected. Under the MSCP, 85 percent of the major populations will be conserved. The MHCP will protect this species by conserving about 90% of known locations and major populations, and assuming the critical locations in Carlsbad and San Marcos will be 100% conserved.

The MHCP includes specific conditions that must be met to adequately conserve thread-leaved brodiaea. These include conservation and management of the population in San Marcos; control of edge effects; protection of vernal pool hydrology through watershed management; implementation of fire management plans to protect populations from frequent or high-intensity fires and fire suppression activities; and enhancement of declining populations. The City of San Diego has implemented a monitoring for selected populations of San Diego thornmint within its portion of the San Diego Multiple Habitat Conservation Program preserve lands. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Thread-leaved brodiaea is also included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Twelve populations of thread-leaved brodiaea are known from western Riverside County along the San Jacinto River in Nuevo, Perris, and the San Jacinto Wildlife Area; on Salt Creek; on the Santa Rosa Plateau; and west of the Santa Rosa Plateau. These populations are primarily clustered into two complexes: one along the San Jacinto River near Perris and Lakeview, and the other on the Santa Rosa Plateau. The San Jacinto River floodplain supports about half of the remaining western Riverside County populations. A small population is known to occur in the Old Salt Creek drainage west of Hemet. The MSHCP will conserve thread-leaved brodiaea through protection of at least 6,900 acres of grassland, playas, and vernal pools within the San Jacinto River, Mystic Lake and Salt Creek portions of the MSHCP Conservation Area. At least 12 populations will be protected, with focus on core areas at Goetz Road (EO1), Perris Valley airport (EO2), Tenaja Road (EO3), Mesa de Colorado (EO5), Hemet vernal pools (EO 26), South SJWA (EO27), Squaw Mountain (EO29), Santa Rosa ranch (EO30), Slaughterhouse (EO31), North San Jacinto Wildlife Area (EO43) and Redondo Mesa (EO 52). Core areas represent large blocks of habitat with relatively intact ecological functions that support sensitive species. Floodplain processes will be maintained along the river in order to provide for the distribution of the species to shift over time as hydrologic conditions and seed bank sources change.

The species has been observed to hybridize with several other species of *Brodiaea* where they co-occur. Hybridization is facilitated by cross pollination from non-native honey bees. Studies on the biology of thread-leaved brodiaea are needed before adequate recovery strategies can be developed for this species.

Kaweah brodiaea *Brodiaea insignis*

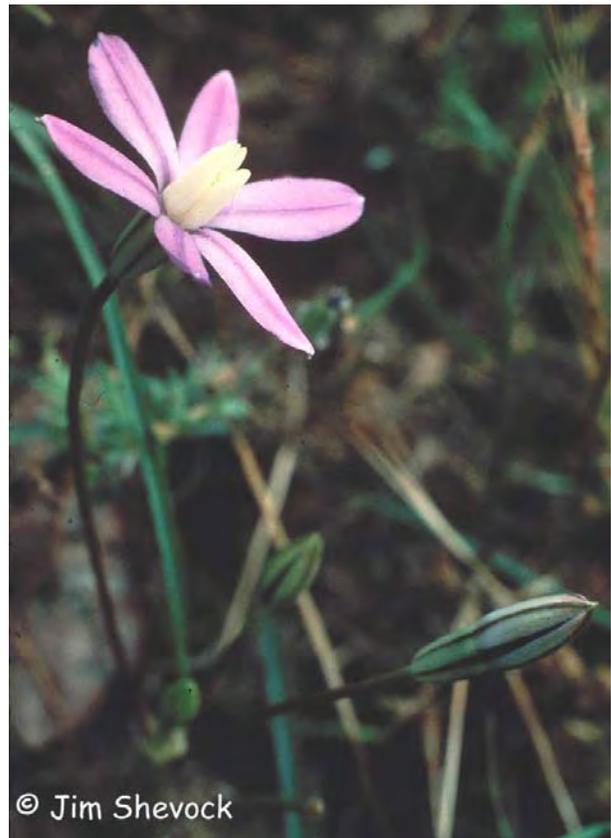
State: Endangered 1979
Federal: None

General Habitat:

This species is endemic to the Kaweah and Tule rivers' drainages in Tulare County, where it grows on granitic substrates and deep, clayey soils on south- and southwest-facing slopes in blue oak woodland and savannah.

Description:

Kaweah brodiaea is a showy, herbaceous perennial in the lily family (Liliaceae). From a fibrous corm, it produces several linear leaves which are crescent-shaped in cross-section, and a leafless stalk topped by a cluster of rose-purple to pink tubular flowers. It forms pink carpets in May and June within blue oak savannahs.



Status:

Fewer than 25 extant populations are known, of which 90 percent are on private land or roadsides. Populations occur at the DFG's Kaweah and Blue Ridge Ecological Reserves, in Sequoia National Forest, on Caltrans rights-of-way, and on private property. Kaweah brodiaea also occurs within the BLM's Case Mountain ACEC, located near Sequoia National Park, six miles east of Three Rivers, California. The ACEC encompasses 18,530 acres of land, including several hundred acres of suitable habitat for the brodiaea. There is currently no public vehicular access to the area. The number of flowering plants varies from year to year, and at least some amount of grazing appears to benefit the species by reducing competition by nonnative weeds.

Residential development, roadside maintenance activities, road widening, and intensive livestock activities threaten Kaweah brodiaea. In addition, water storage development in the Upper San Joaquin River drainage basin was assessed by USBR in 2003. Development of a dam on Dry Creek would have an adverse affect on a population of Kaweah brodiaea in the area.

Chinese Camp brodiaea

*Brodiaea
pallida*

State: Endangered 1978
Federal: Threatened 1998

General Habitat:

This species is confined to one occurrence southwest of Chinese Camp in Tuolumne County. *Brodiaea pallida* grows in overflow channels and seeps and springs in clays derived from serpentine soils.

Description:

Chinese Camp brodiaea is an herbaceous perennial in the lily family (Liliaceae). It forms an underground corm, linear basal leaves, and terminal clusters of rose pink to pale blue flowers. Chinese Camp brodiaea can spread by suckers.



Status:

Chinese Camp brodiaea is restricted to a narrow 10 to 20 foot-wide area along a half mile-long section of an intermittent stream entirely on private property. The entire population is scattered over approximately 65 acres. Occasional hybrids between Chinese camp brodiaea and a more common brodiaea from the area, *Brodiaea elegans*, have been observed. A portion of the population was destroyed prior to 1982. A subdivision has been proposed for the area that includes the Chinese Camp brodiaea population, which could disturb the hydrology upon which the species depends or increase disturbance from human activities, even if the plants are not directly affected by construction activities. In addition, species such as Chinese Camp brodiaea, that have very small populations and occupy only small areas, are vulnerable to decline and extinction due to genetic problems or random catastrophic events such as disease outbreaks, insect predation, or extended droughts. In 1994 a private landowner expressed interest in selling his Chinese Camp brodiaea habitat to the DFG, but after lengthy negotiations, no agreement was reached. A very small portion of the population along a road has been fenced and is being leased by CNPS in order to protect the plants.

Leafy reed grass

Calamagrostis foliosa

State: Rare 1979

Federal: None

General Habitat:

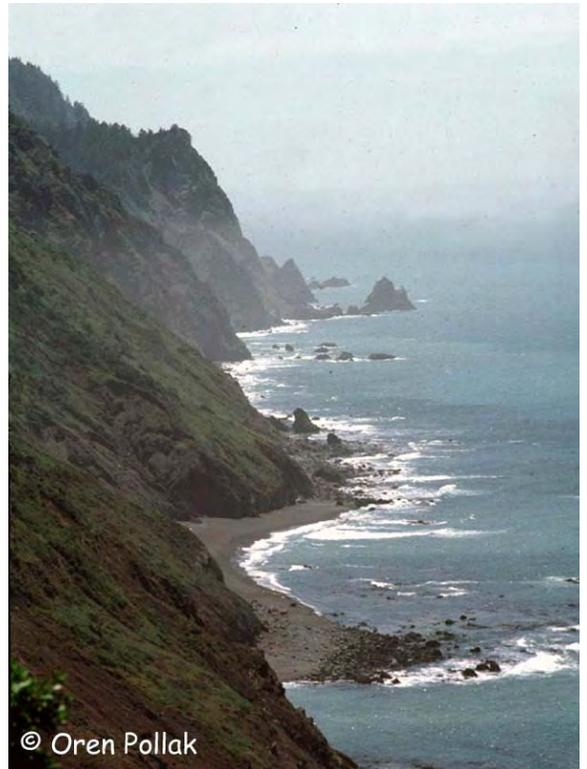
It is an early successional species found on rocky coastal bluffs, in riparian habitats and cliff slopes, and on steep road cuts in Mendocino, Humboldt, and Del Norte counties. It occurs on low nutrient, low moisture substrates which are unstable and eroding.

Description:

Leafy reed grass is a low-growing, tufted perennial member of the grass family (Poaceae) with compact, densely flowered inflorescences.



B. Dawson, BLM File Photo



© Oren Pollak

Status:

There are numerous occurrences of leafy reed grass, two-thirds of which are in BLM's King Range National Conservation Area. Other occurrences are within State parks and on private lands. Most extant leafy reed grass occurrences are inaccessible to livestock and humans, though a few may be subject to development. Leafy reed grass is widely available as an ornamental plant. The large number of known occurrences and the lack of threats to the species support removal of this species from the list of rare plants in California.

Dunn's mariposa lily

Calochortus dunnii

State: Rare 1979
Federal: None

General Habitat:

This species is known only from the Peninsular Ranges of San Diego County and adjacent Baja California Norte, Mexico. Rocky openings in chaparral or at the grassland/chaparral ecotone are the preferred habitat of this species. Dunn's mariposa lily is restricted to gabbro and metavolcanic soils. It is associated with Sonoma sage and chaparral pea.

Description:

Dunn's mariposa lily is an herbaceous perennial of the lily family (Liliaceae) that sprouts from a bulb. It has slender basal leaves, short stem leaves, and showy, bell-shaped white to pink flowers with a red spot at each petal's base.

Status:

Approximately 20 occurrences of Dunn's mariposa lily are known, some of which are small populations of only a few plants. Property ownership of this species habitat includes the Bureau of Land Management, California State Parks, National Forest land, and private property.

The principal threat to this species is overcollection. Introduction of wild turkeys to the area are also considered to be a threat because wild turkeys eat the bulbs. Several populations are adjacent to heavily used outdoor recreation areas and may need to be fenced to provide adequate protection for the plants. Recent proposals have been developed for introduction of non-native wild turkeys into the range of Dunn's mariposa lily. Potential impacts of turkey introductions on the growth and reproduction of small populations of Dunn's mariposa lily will be assessed. The diet of wild turkeys introduced into other parts of California includes related species of mariposa lilies.

Studies of the biology of Dunn's mariposa lily are needed before adequate recovery or management plans for Dunn's mariposa lily can be completed. This species is covered in the San Diego Multiple Species Conservation Plan NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. *Calochortus dunnii* is considered to be a narrow endemic species under the MSCP and 100 percent of its populations will be protected. Fifty-one percent of its major populations are found in the Otay Mesa area. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from



Orange County to the Mexican Border. The plants cultivated at Rancho Santa Ana Botanic Garden include as part of the Center for Plant Conservation National Collection of Endangered Plants.

Siskiyou mariposa lily *Calochortus*
persistens

State: Rare 1982
Federal: None

General Habitat:

Siskiyou mariposa lily is restricted to shallow, dry, rocky, and acidic soils on two disjunct ridge tops in the Klamath-Siskiyou Range on the California-Oregon border. *Calochortus persistens* plants occur in openings where there is little vegetative cover and litter layer is shallow or absent. Dominant shrubs are curl-leaf mountain mahogany, Oregon-grape, and bitter cherry, and lupine.

Description:

Siskiyou mariposa lily is an herbaceous perennial that arises from a bulb, with slender basal leaves, reduced stem leaves, and one or two striking lavender and yellow flowers.



Status:

Two historical populations are known: the type locality on Gunsight-Humbug Ridge, west of Yreka, Siskiyou County, California and the Bald Mountain site, west of Ashland, Jackson County, Oregon. In California, this species is currently found at nine separate sites on approximately 24 acres of Klamath National Forest and privately-owned lands that stretch for four miles along the Gunsight-Humbug Ridge. A 1982 census resulted in a California population estimate of 3,455 plants in nine separate occurrences. In 1987, 1,140 plants were counted in eight separate locations. In June 1995, all known California locations were surveyed resulting in an estimate of 3,000 plants. No plants have been seen at the Oregon site for the past four years.

In 2001, a petition was filed Klamath-Siskiyou Wildlands Center to list this species under the federal Endangered Species Act. The petition identified several major threats to the species. Major threats include fire suppression

resulting in shading; competition by native and non-native species; increased fuel loading; fragmentation by roads, fire breaks, tree plantations, and radio-tower facilities; maintenance and construction around radio towers and telephone relay station located on Gunsight Peak and Mahogany Point; and soil disturbance and exotic weed and grass species introduction as a result of heavy recreational use. For example, dyer's woad, a germination inhibitor, now affects over 90 percent of the known *Calochortus persistens* habitat in California.

Fire suppression since the 1955 Haystack Fire has resulted in shading and competition by native species including curl-leaf mountain mahogany and Oregon grape (Knapp 1995). Conifers appear to be encroaching as well. Fire suppression may have resulted in an increased fuel load that could result in complete destruction of habitat, should a high-intensity fire occur. Direct destruction of plants and habitat has occurred as a result of site maintenance around the Gunsight Peak radio installation in Spring 2000 and snow plowing to replace a power pole in the winter of 1999/2000. Road grading and controlled burning may also result in direct destruction of habitat.

Deer, rodent, and insect herbivory is common and causes significant losses to leaves, buds, flowers, and fruits. In a 1995 to 2000 demographic study, no seeds matured in 4 out of 6 years, due in large part to predation on reproductive structures according to Klamath National Forest. Unpublished data show that there has been no successful reproduction of *C. persistens* in the last five years (Klamath-Siskiyou Wildlands Center 2001). There is no evidence of asexual reproduction by bulbils or bulblets and plants do not begin to flower until 8 to 10 years of age (Klamath-Siskiyou Wildlands Center 2001).

The Klamath National Forest issued "Botanical Investigation and management Guidelines for *Calochortus persistens*" in 1987, and designated 100 ac as Special Habitat for *C. persistens* in 1994. Although the management goals set forth in the Klamath National Forest Land and Resource Management Plan must be implemented, currently there are no funds directly allocated to specific projects to reduce or eliminate dyer's woad. In their petition to list this species, the Klamath- Siskiyou Wildlands Center cites the fact that the management guidelines have not been implemented as one of the threats to the survival of the species.

Tiburon mariposa lily

Calochortus tiburonensis

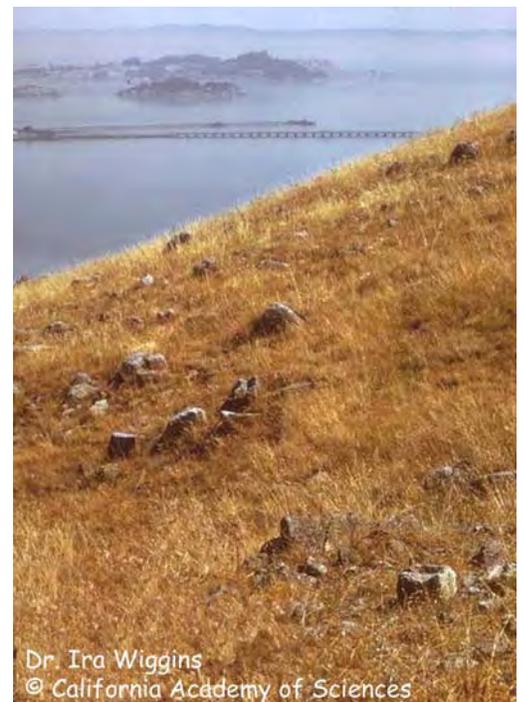
State:	Endangered	1978
State:	Threatened	1987
Federal:	Threatened	1995

General Habitat:

This mariposa lily is known only from serpentine grassland on Ring Mountain on the Tiburon Peninsula of Marin County.

Description:

Tiburon mariposa lily is a bulb-forming, perennial herb in the lily family (Liliaceae). It has a single persistent, basal, linear-oblong leaf 1-2 feet long. The flowering stem, about 20 inches tall, is usually branched and bears erect flowers in twos or threes at the ends of the branches. The three petals and three sepals are light yellow-green with reddish or purplish-brown markings. Long slender hairs on the upper surface and margins of the petals and the lack of wings on the capsule distinguish the Tiburon Mariposa lily from the other two *Calochortus* species found on the Tiburon Peninsula, the Oakland star-tulip or Mariposa lily and the yellow Mariposa lily.



Status:

Its distribution encompasses roughly three populations, all of which occur in the Ring Mountain Preserve. The Marin County Department of Parks, Open Space, and Cultural Services owns and manages the Preserve. In 1997, the DFG held two recovery workshops to address Tiburon mariposa lily and 11 other plants known from serpentine habitats in the San Francisco Bay Area. At one workshop, a graduate student reported on her research showing that the Tiburon mariposa lily's reproduction is highly dependent on its presumed primary pollinator, the bumblebee, so management activities that would affect the bee would also affect the plant. The highest priority recovery action for the plant identified by workshop participants is research into appropriate management practices to reduce competition from weedy species and to maintain high quality habitat. Management and recovery actions for Tiburon mariposa lily have been addressed in the federal Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998. At that time, more than 32,000 plants were seen.

**Stebbins'
morning glory**

Calystegia stebbinsii



State: Endangered 1981
Federal: Endangered 1996

General Habitat:

This member of the morning glory family (Convolvulaceae) grows primarily on the gabbro-derived soils of the Pine Hill gabbro formation in the Sierra Nevada foothills of El Dorado County and to a much lesser extent on serpentine-derived soils near Grass Valley in Nevada County. *Calystegia stebbinsii* in El Dorado County is associated with chaparral on gabbroic soils. It occurs within openings within chaparral, associated with whiteleaf manzanita. Stebbins' morning glory is often associated with two other state listed plants: Pine Hill ceanothus and Layne's butter-weed. In Nevada County it occurs on serpentine in chaparral associated with chamise, manzanita, and foothill pine.

Description:

Stebbins' morning glory is a perennial, herbaceous vine with long slender stems, deeply divided leaves, and large, funnel-shaped, white flowers.



Status:

Stebbins' morning glory is known from approximately 18 occurrences. Most occurrences are discontinuously scattered within two population centers in the northern and southern portions of the Pine Hill formation. The Pine Hill formation consists of approximately 30,000 acres; approximately half contains the habitat types that support the rare species. Stebbins' morning glory does not occur at the center of the formation on Pine Hill. It also occurs sparsely scattered along a narrow band over a distance of approximately 3.5 miles in Nevada County.

In the southern half of the Pine Hill gabbro formation, residential development has occurred in habitat near known colonies of the morning glory. These projects went through the development approval process before El Dorado County was aware of these species. Potential habitat near known colonies has also been cleared under ministerial grading permits.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (*Senecio layneae*), and El Dorado bedstraw (*Galium*

californicum ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large number of species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 acres have been preserved. Portions or all of 7 of the 19 occurrences are protected on public land.

In the northern portion of the gabbro soil formation, approximately 2,079 acres have been purchased and transferred to the DFG, BLM, or El Dorado County. This area includes a population of Stebbins' morning glory. A prescribed fire on nearby property held by BLM appears to have rejuvenated a dwindling population on that site. In the southern portion of the gabbro soil formation, approximately 454 acres have been purchased and transferred to BLM or El Dorado County. *Calystegia stebbinsii* appears to be an early successional species that occupies temporary openings on gabbro or serpentine and is eliminated as vegetation grows up around it. Preserves must include sufficient habitat to allow for expansion or shifts in occupied habitat.

Recovery is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. Fire or disturbance is needed for seed germination, and fire is needed to establish seedlings. Assuming recovery criteria are met, *Calystegia stebbinsii* could be delisted after three natural fire cycles (approximately 80 to 100 years).

White sedge

Carex albida

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

This species is restricted to the sphagnum bog at Pitkin Marsh in Sonoma County. White sedge is associated two other State listed endangered plants: Pitkin Marsh lily and Pitkin Marsh Indian paintbrush.

Description:

White sedge, a member of the sedge family (Cyperaceae), is a short, tufted, grass-like perennial herb. The triangular stems are 1.3 to 2 feet tall, and longer than the leaves. The leaves are flat, 1 to 2 inches wide, and have closed sheaths. The inflorescence consists of 4 to 7 oval to oblong spikelets that are 0.3 to 0.7 inches long.



Status:

White sedge was thought to be extinct until 1987, when a single population was found in a sphagnum bog in Sonoma County. The species has been extirpated from its four historical populations, all in Sonoma County. The single population, which is located on private land, has approximately 800 to 1,000 plants. This site is subject to persistent development pressures. Any change in the hydrology of the marsh, including draining, could eliminate the white sedge and other rare plant species there.

The City of Sebastopol General Plan includes a provision to reintroduce white sedge to the Laguna de Santa Rosa marshes where it once occurred. Pitkin Marsh is privately owned and the DFG has no recent information on this species.

Tompkins' sedge

Carex tompkinsii

State: Rare 1979
Federal: None

General Habitat:

Tompkin's sedge grows in soils derived from metamorphic or granitic rock in the Sierra Nevada in the Kings River Canyon in Fresno County and the Merced River Canyon in Mariposa County. It grows not only on steep, dry, south-facing rocky slopes, but also on shady, mesic, north-facing slopes, and occasionally in moist riparian areas.

Description:

Tompkins' sedge, a member of the sedge family (Cyperaceae), is a perennial, densely-tufted grass-like herb.

Status:

Many additional populations have been discovered since Tompkins' sedge was State-listed in 1979, and the species is now known to occur in a wider variety of habitat types than originally thought. In 1997, the species was reported from the Hetch Hetchy area in the Tuolumne River Canyon, and two new occurrences were discovered in Stanislaus National Forest in the area burned by the Ackerson Fire in 1996. Additionally, plants were transplanted along Highway 180 in the Kings River Canyon in Sequoia National Forest to serve as a seed source for revegetation efforts after the highway was damaged by flooding in January 1997. In 1998, the Forest Service removed this species from its Sensitive Species list because new populations have been discovered and because most plants grow in areas unlikely to experience human impacts. . Fires reduce competition and appear to invigorate Tompkins' sedge plants. Most occurrences are on public land within Sequoia and Sierra National Forests and Kings Canyon and Yosemite National Parks. The large number of known populations and the low level of threat to this species support its removal from the list of rare plants.



Tree-anemone

Carpenteria californica

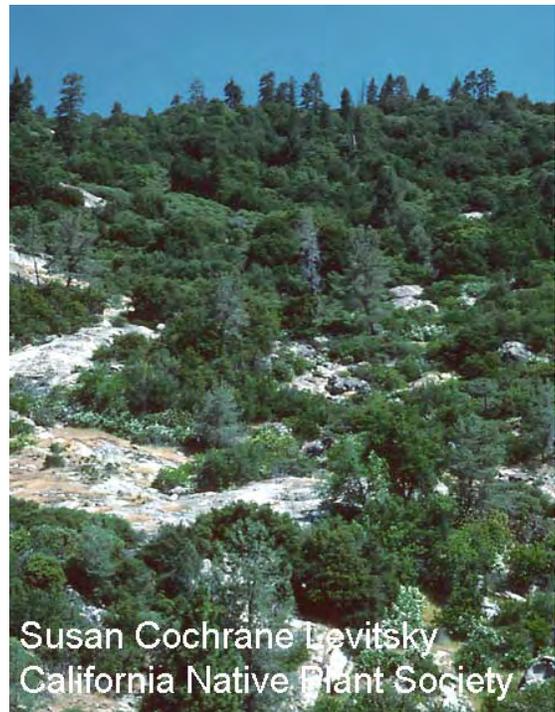
State: Threatened 1990
Federal: None

General Habitat:

Tree-anemone is an extremely localized endemic species occurring only on the west slope of the Sierra Nevada, between the San Joaquin and Kings Rivers in eastern Fresno County, California. It grows on well-drained granitic soils and is most abundant on north-facing ravines and drainages in chaparral and cismontane woodland communities. Most stands are in small drainages on dry rocky slopes, mixed with gray pine, interior live oak, chaparral whitethorn, and other representatives of the foothill woodland at the lower elevation limits of its range. At their upper elevational limit, carpenteria plants can be found growing with ponderosa pine, interior live oak, and other species of the lower yellow pine zone.

Description:

Tree-anemone, a member of the mock orange family (Philadelphaceae), is an erect to spreading evergreen shrub that grows to a height of three to 13 feet. It has glossy green leaves and pale bark that peels in large sheets in the fall. It has large and showy flowers with white petals and yellow centers.



Status:

The total range of the species covers an area of approximately 225 square miles, within which there are ten extant native populations. The total number of plants has been estimated at fewer than 5,000. About two-thirds of the existing plants occur on Sierra National Forest land, and carpenteria is classified as a sensitive plant by the USDA Forest Service.

Tree-anemone appears to require specific conditions for successful sexual reproduction. No seed germination or seedling establishment in nature had ever been observed until 1990 when germination occurred following the 1989 Powerhouse fire. Fire appears to be an important ecological requirement of this species. Burned tree-anemone

plants can resprout vigorously, and fires reduce competition from native shrubs and trees. Sierra National Forest is considering using prescribed burning to conserve tree-anemone, and USFS and USFWS staff are investigating incorporating a prescribed burn plan into a habitat conservation agreement or recovery plan.

It has been estimated that since the species was discovered in the 1840s, at least one-third of its distribution has been destroyed. Tree-anemone is threatened by residential development, fire suppression and fire at the wrong time of year, highway construction, OHV use, road maintenance, hydroelectric operations, and logging. USFS has established a Carpenteria Botanical Area that includes a portion of the largest tree-anemone occurrence, and its Backbone Creek Research Natural Area supports another population. A portion of a tree-anemone population is protected on the Black Mountain Preserve that was transferred from TNC to the Sierra Foothill Conservancy in 1997. Also in 1997, the Preserve was expanded through the addition of a conservation easement. In 1997, the small population was discovered in Madera County.

Tiburon Indian paintbrush

Castilleja affinis
ssp. neglecta

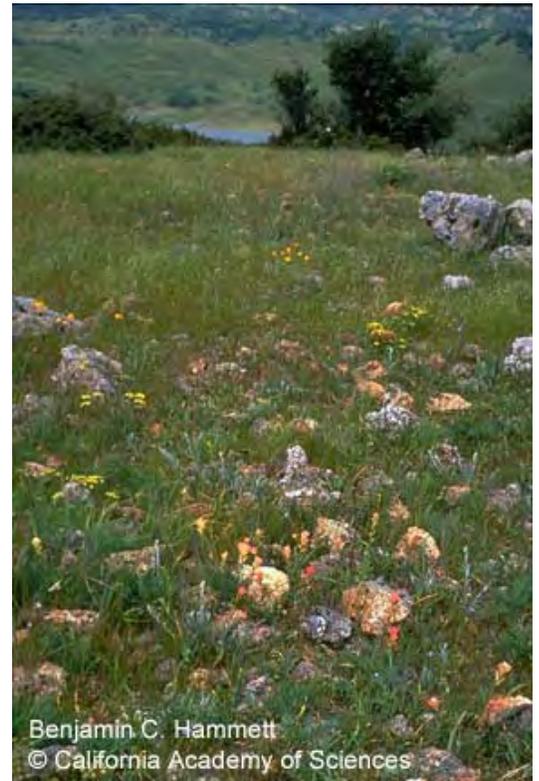
State:	Endangered	1990
Federal:	Endangered	1995

General Habitat:

Tiburon paintbrush grows in serpentine bunchgrass communities on north to west facing slopes. The range of the species is from Marin and Napa Counties to Santa Clara County.

Description:

Tiburon Indian paintbrush is a perennial herb in the figwort family (Scrophulariaceae) with woody basal stems, narrow lobed leaves, and showy yellow to red-yellow flowers that appear from March through June. It is a root hemiparasite, meaning its roots develop interconnections with the roots of other plants to increase water and nutrient flow.



Status:

There are seven known occurrences of the plant. Three occur on the Tiburon Peninsula in Marin County, with a total of approximately 250 plants in 1997. A portion of one of these three populations was destroyed by a residential development, and a portion of the plants formerly seen at a second population have not been observed in recent years. A bond issue that passed in 1997 allowed the purchase for open space of a parcel upslope from this latter population. Because the plants grow on thin, low-nutrient soils, preservation of this parcel was considered critical to protecting the Tiburon Indian paintbrush, as runoff containing herbicides and fertilizers from any homes built upslope could have eliminated the population. The Middle Ridge population on the Tiburon Peninsula may be impacted by human use (hiking and dog walking) in the area.

Approximately 550 plants occur at a private quarry in American Canyon in Napa County. Two sites, with a total of approximately 75 plants, occur on Golden Gate National Recreation Area lands in Marin County. One population exists on private land in Santa Clara County. A portion of this population has disappeared since 1993, possibly due to rooting by wild pigs, which was evident in 1999. Approximately 80 plants were observed at this location in 1999. The Marin County populations are threatened by residential development, foot traffic, and soil slumping. The Napa County population is threatened by gravel mining. Development projects threaten the Coyote Ridge population in Santa Clara County.

In 1997, the DFG held two recovery workshops to address Tiburon Indian paintbrush and 11 other plants known from serpentine habitats in the San Francisco Bay Area. Several participants volunteered to work to remove pampas grass and broom plants that are threatening the Tiburon Peninsula populations. Priority recovery actions identified by workshop participants included research into the management needs of the plant and protecting the populations on private lands.

Management and recovery actions for the species have been addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Succulent owl's-clover *Castilleja campestris*
ssp. succulenta

State: Endangered 1979
Federal: Threatened 1997

General Habitat:

This species grows in drying vernal pools in valley grassland areas of the San Joaquin Valley at the base of the Sierra Nevada foothills. Its discontinuous distribution extends through northern Fresno, western Madera, eastern Merced, southeastern San Joaquin, and Stanislaus counties.

Description:

Succulent owl's-clover is a succulent, hemiparasitic (partly parasitic) annual herb in the figwort family (Scrophulariaceae). It has brittle narrow leaves and heads of bright yellow flowers.



© Robert E. Preston, Ph.D..



© California Native Plant Society

Status:

Succulent owl's-clover is known from more than 60 occurrences. Nearly one-half of the currently known populations of fleshy owl's-clover are variously threatened by loss and degradation of habitat resulting from urban development, agricultural land conversion, discing, flood control projects, grazing and a highway expansion project. Twenty-two populations occur on private lands without protection for the species. Discing appears to have eliminated at least one population in Fresno County. Seven populations are protected at the Flying M Ranch in Merced County, where The Nature Conservancy has purchased conservation easements. Two other populations occur on lands managed by the U.S. Bureau of Reclamation and the U.S. Bureau of Land Management

Conversion of habitat to agriculture, urbanization, proposed gravel and aggregate mining, land fills, flood control, highway expansion, discing of vernal pools, competition from non-native weeds, and inappropriate grazing practices have all been cited as threats to succulent owl's clover. The type-locality of the species near Ryer in Merced

County has been destroyed.

In 1992, the DFG purchased land on Big Table Mountain in Fresno County that supports succulent owl's-clover. In 1995, Caltrans purchased a vernal pool complex in Madera County for mitigation purposes. Just prior to their acquisition by Caltrans, the pools had been disced. As a result of this disturbance, these pools have been invaded by upland plants, but they still support succulent owl's-clover and other rare species.

The proposed University of California Merced campus will directly affect succulent owl's-clover and other listed vernal pool species. This project plus associated residential development and access roads are threats to the primary and relatively extensive population in that area. Of the 12 occurrences recorded in the California Natural Diversity Database on the proposed campus and associated community, four are in the area that is expected to be developed within the next 15 years; these four occurrences include 76 percent occupied pools in the University planning area.

The small size of a number of populations renders the populations highly susceptible to chance events. Among the 24 populations of fleshy owl's-clover for which size estimates have been recently documented, ten consisted of fewer than 100 plants each at their peak size according to CNDDDB records.

In 2002, the report, **San Joaquin Valley and Adjacent Sierra Foothills Vernal Pool Geomorphic Classification and Conservation Prioritization**, was completed. The primary objective of this project was to develop a systematic framework for assessing ecological variation of vernal pools in the San Joaquin Valley, and the adjacent Sierra foothills. The framework provides conservation planners with information to focus active protection of vernal pools on complexes that represent the range of geomorphic¹ vernal pool types in the region, and those with viable populations of special status species. Information presented in this report will aid conservation of succulent owl's clover and associated vernal pool species.

**Mount Gleason
Indian paintbrush**

Castilleja gleasonii
(=*Castilleja pruinosa*)

State: Rare 1982
Federal: None

General Habitat:

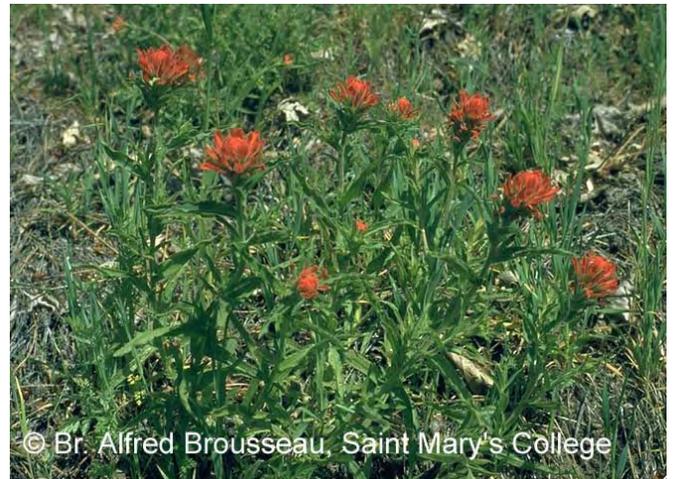
It occurs on open flats or slopes in the granitic soils of ponderosa pine forests and montane chaparral plant communities in the San Gabriel Mountains, Los Angeles County.

Description:

Mount Gleason Indian paintbrush is a grayish, hairy perennial herb with scarlet flowers in the figwort family (Scrophulariaceae).



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© Br. Alfred Brousseau, Saint Mary's College

Images are of *Castilleja pruinosa*.

Status:

There are six known occurrences near Mount Gleason in the Angeles National Forest. In 1997, a seventh occurrence was discovered in the Forest within the Knapp Ranch area, and in 1998, two additional occurrences were found in the Forest.

Under current taxonomic treatments, frosted Indian paintbrush (*Castilleja pruinosa*) plants with wide calyx lobes from the San Gabriel Mountains have been called Mt. Gleason Indian paintbrush. Mt. Gleason Indian paintbrush is no longer accepted as a distinct species and is thought to be derived from a hybrid of *Castilleja affinis* and wooly paintbrush (*Castilleja foliolosa*). Frosted Indian paintbrush and related species are part of a highly variable complex in need of further study.

**San Clemente Island
Indian paintbrush**

Castilleja grisea

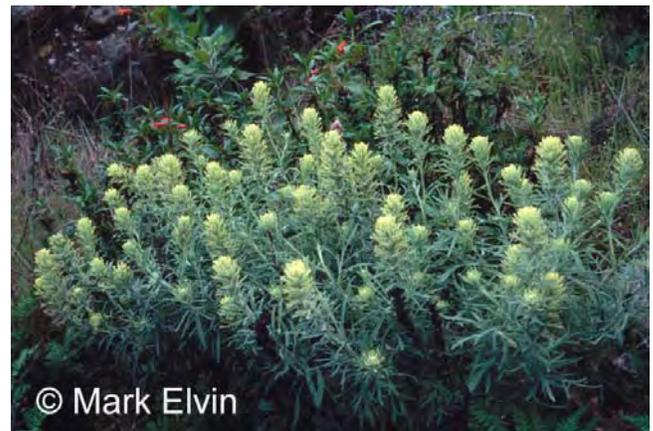
State: Endangered 1982
Federal: Endangered 1977

General Habitat:

San Clemente Island Indian paintbrush grows in maritime desert scrub on the rocky slopes and canyons of San Clemente Island, the southernmost of the eight Channel Islands off the coast of California. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island Indian paintbrush is a branched perennial herb in the figwort family (Scrophulariaceae). Plants are covered with matted hairs and produce elongated flower stalks of yellow flowers.



Status:

Early reports of this species described it as quite common on the cliffs of San Clemente Island. In 1963, it was noted that the species was only occasionally found along the coast and rarely in the canyon sides. By 1978, it was reported that only three plants were to be found on the island, in inaccessible areas on canyon walls. This decline was likely caused by ranching operations on the island during the past century, which resulted in overgrazing and elimination of much of the native vegetation. In addition, intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. Steep cliffs and canyon sides were likely the only refuge from these animals.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. This removal program may benefit the species. The last available information reported forty-four populations of San Clemente Island Indian paintbrush scattered around the island, about half containing fewer than 10 individuals. The DFG has no current information on the status of this species.

Pitkin Marsh Indian paintbrush

Castilleja uliginosa

State: Endangered 1978
Federal: None

General Habitat:

Pitkin Marsh Indian paintbrush is restricted to the freshwater marsh habitat of upper Pitkin Marsh in Sonoma County. This species is associated two other State listed endangered plants: Pitkin Marsh lily and white sedge.

Description:

Pitkin Marsh Indian paintbrush is an herbaceous perennial in the figwort family (Scrophulariaceae). This extremely rare plant produces several unbranched stems with simple hairs and a spike of yellow flowers.



Status:

Historically, Pitkin Marsh Indian paintbrush was restricted to the wet marsh habitat of upper Pitkin Marsh, Sonoma County. Reports from the 1950s suggest there was a larger population scattered throughout the area. Loss of marsh habitat has greatly reduced the distribution of this species. Since the late 1970s, only a single plant remains in the wild. Current taxonomic treatment places *Castilleja uliginosa* under a related species, *Castilleja miniata*.

Pitkin Marsh Indian paintbrush requires two plants for pollination, so the single known plant cannot reproduce. Under a MOU with the DFG, the Jepson Herbarium developed tissue cultures and other vegetative propagation techniques to increase Pitkin Marsh Indian paintbrush numbers. The U.C. Berkeley Botanic Garden propagated this plant from a cutting taken from the original plant by the late Dr. Larry Heckard. In addition, researchers have successfully hybridized and backcrossed the paintbrush with related species. In recent years, DFG personnel have not been allowed access to cut back competing vegetation or monitor the health of the single, fenced individual. This last wild plant is probably already gone. Protection of the current hydrology and control of competing vegetation will be necessary to maintain the habitat.

In late 1996, the DFG, Jepson Herbarium, and other interested parties met to develop a conservation strategy for this species. The conservation strategy includes a possible reintroduction project, contingent upon the success of propagating more plants for reintroduction and on a cooperative arrangement with the landowner.

California jewelflower

*Caulanthus
californicus*

State: Endangered 1987
Federal: Endangered 1990

General Habitat:

California jewelflower occurred historically in slightly alkaline sandy loam in native grasslands of the southern San Joaquin Valley and adjacent valleys. Native plant species, such as annual fescue, clovers, red maids, and goldfields comprise a high proportion of the vegetation at many of the known locations. California jewelflower has been reported from elevations ranging from approximately 75 to 900 meters and from level terrain to 25% slopes. Primary soil types at known sites are sub-alkaline, sandy loams.

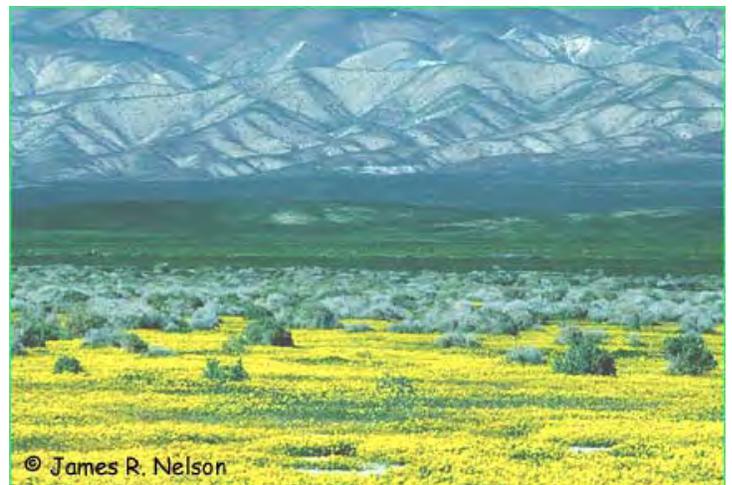
Description:

California jewelflower, a member of the mustard family (Brassicaceae), is an herbaceous annual that branches from the base, with upper leaves clasping the succulent stems, and purple-tipped (white upon opening) flowers arranged along one side of the stem.

Status:

The historical range of California jewelflower is based on specimens collected between 1880 and 1973. Nearly half of the collection sites were on the floor of the San Joaquin Valley in Fresno, Kern, and Tulare counties. Several other collections came from two smaller valleys southwest of the San Joaquin Valley: the Carrizo Plain (San Luis Obispo County) and the Cuyama Valley (Santa Barbara and Ventura counties). Three collections were from the Sierra Nevada foothills at the eastern margin of the San Joaquin Valley in Kern County. The remainder of the historical sites was in foothills west of the San Joaquin Valley, in Fresno, Kern, and Kings counties. As of 1986, all natural occurrences of California jewelflower on the San Joaquin and Cuyama Valley floors had been extirpated.

Today, known populations of California are confined to three areas in hilly terrain west of the San Joaquin Valley: the Carrizo Plain, Santa Barbara Canyon (adjacent to the Cuyama Valley in Santa Barbara County), and the Kreyenhagen Hills (Fresno County). The Carrizo Plain and Kreyenhagen Hills populations are on public land administered by the U.S. Bureau of Land Management, as is approximately 10% of the Santa Barbara Canyon population. Additional populations of California jewelflower may persist in the foothills of Fresno, Kern, and Kings



counties, where potential habitat remains in private rangeland. However, access to historical sites in these areas is limited, so the presence of the species has not been verified in over 50 years.

The primary reason for the decline of California jewelflower is loss of habitat, either through conversion to agriculture or by urbanization. Oilfield activity may also have eliminated sites in the foothills at the western margin of the San Joaquin Valley. Potential threats to the remaining populations include competition from introduced plant species, pesticide effects on pollinators, and small population size. California jewelflower on private land in the upper portion of Santa Barbara Canyon is subject to cattle grazing throughout the growing season, but the magnitude of threat posed by livestock is unknown.

The Carrizo Plain population is on public lands managed as part of the Carrizo Plain Natural Area, a cooperative effort between BLM, TNC, and the DFG. The Cuyama Valley population consists of 19 known sites west of the Cuyama River, both north and south of Santa Barbara Canyon. BLM owns seven of these 19 sites and has fenced them to protect them from unauthorized grazing. The remaining 12 sites are on private land. On the Carrizo Plain, California jewelflower occurs primarily on the burrow systems of giant kangaroo rats, another endangered species. Although the kangaroo rats damage some of the jewelflowers, the rat's activities appear to reduce mulch and non-native seeds within their precincts, especially during the dry season, which may promote jewelflower the following year.

As is typical of annuals, both plant size and population size in California jewelflower can vary dramatically, depending on site and weather conditions. Seeds of California jewelflower begin to germinate in the fall when the rainy season begins, but additional seedlings may continue to emerge for several months. The seedlings develop into rosettes (clusters of leaves at ground level) during the winter months, and the stem elongates as flower buds begin to appear in February or March. Flowering and seed set continue until the plants die, which may occur as late as May in years of favorable rainfall and temperatures. The flowers are pollinated by insects. Seed-dispersal agents are not known, but those that have been suggested for *Caulanthus* and related genera include gravity, seed-eating animals, wind, and water. California jewelflower probably forms a persistent seed bank.

Several experimental introductions of California jewelflower have been attempted in Kern, Santa Barbara, and Tulare counties, but none of the populations have persisted. In all instances, the number of plants at each site has declined precipitously following initial seeding. Protection measures for California jewelflower are included in the USFWS Recovery Plan for Upland Species of the San Joaquin Valley, California, completed in 1998.

**Slender-pod
jewelflower**

Caulanthus stenocarpus

State Rare 1979
Federal None

General Habitat:
None

Description:
None

Status:

When listed as rare by the Fish and Game Commission in 1979, slender pod jewelflower was considered to be a distinct species, known from only approximately four reported locations in San Diego County and an unknown number of sites in Baja California. This "species" has since been determined to have been described from a mixed herbarium sheet containing material from *Caulanthus heterophyllus* var. *heterophyllus* and *Guillenia lasiophylla*, another mustard. The DFG has drafted a petition to delist this species.

Hearst's ceanothus

*Ceanothus
hearstiorum*

State: Rare 1981
Federal: None

General Habitat:

It grows in coastal prairie and chaparral in the Arroyo de la Cruz region of San Luis Obispo County. It is associated with a number of State-listed plants including Hearst's manzanita and maritime ceanothus. The soil varies from a near adobe through red clay on hard pan to a gray sand-rock composite. It receives summer fog and rainfall of about 20-30 inches.

Description:

Hearst's ceanothus is a prostrate, mat-forming evergreen shrub in the buckthorn family (Rhamnaceae) with bright green leaves and deep blue flowers.

Status:

All five known occurrences of Hearst's ceanothus are located on the Hearst Ranch, owned by the Hearst Corporation, in San Luis Obispo County. The DFG's most recent information on the species dates from the mid-1980s. A historical threat has been the conversion of habitat to grazing land; the DFG has no current information regarding this or other potential threats.



Maritime ceanothus

*Ceanothus
maritimus*

State: Rare 1978
Federal: None

General Habitat:

Maritime chaparral occurs grows on old ocean beaches and bluffs near Arroyo de la Cruz, San Luis Obispo County. Associated species include Hearst's ceanothus and Hearst's manzanita. The soil varies from a near adobe through red clay on hard pan to a gray sand-rock composite. It receives summer fog and rainfall of about 20-30 inches.

Description:

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



Status:

All occurrences of maritime ceanothus are located on the Hearst Ranch, owned by the Hearst Corporation, in San Luis Obispo County. In the mid-1980s, several of the occurrences were noted to have declined substantially. The DFG has no recent information on this species.

Mason's ceanothus

Ceanothus masonii

State: Rare 1978
Federal: None

General Habitat:

This member of the buckthorn family (Rhamnaceae) occurs in chaparral on Franciscan sandstone. The entire global distribution of Mason's ceanothus is on Bolinas Ridge in Marin County. It is associated with leather oak, bush monkeyflower, chaparral pea, and other species of ceanothus.

Description:

Mason's ceanothus is an erect, spreading, evergreen shrub with shiny opposite leaves and dark blue to violet flowers. Some plants appear to be intermediate between *Ceanothus gloriosus* var. *exaltatus* with which it grows.



Status:

This species is closely related to *Ceanothus gloriosus* var. *exaltatus*; taxonomic work is needed. The only known occurrence of Mason's ceanothus is owned jointly by Golden Gate National Recreation Area and Marin Municipal Water District, and thus is afforded some protection. Mason's ceanothus depends on fire to reproduce. Long-term fire suppression may be detrimental to this species as plants are overtopped by taller shrubs in the absence of fire. DFG has no recent information on the status of this plant.

Vail Lake ceanothus

*Ceanothus
ophiochilus*

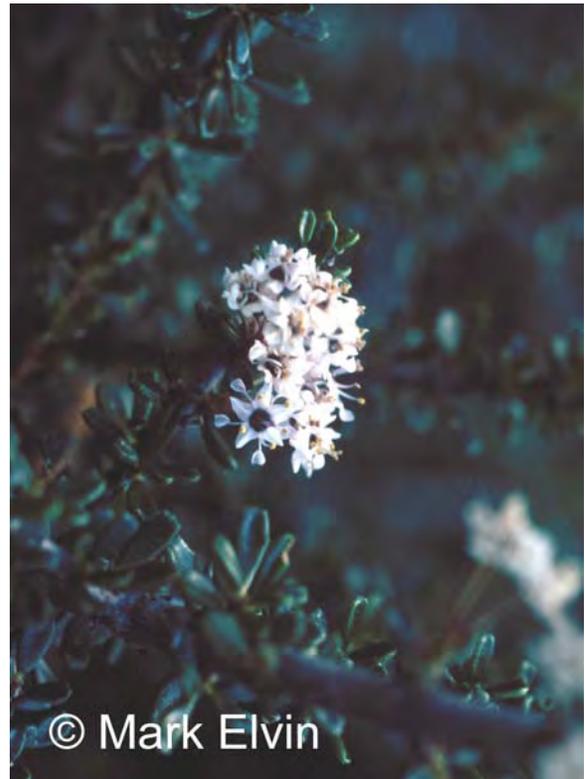
State: Endangered 1994
Federal: Threatened 1998

General Habitat:

Ceanothus ophiochilus is found on metavolcanic or gabbroic soils on north facing slopes in chamise chaparral elevations of 2000-3000 feet.

Description:

Vail Lake ceanothus is a rounded, rigidly-branched shrub in the buckthorn family (Rhamnaceae) with pale blue to pinkish-lavender flowers. It superficially resembles chamise with which it grows.



Status:

This species was first discovered during a spring 1989 botanical survey of the property surrounding Vail Lake in southwestern Riverside County. Two additional populations of Vail Lake ceanothus were discovered in 1993 within the Agua Tibia Wilderness of the Cleveland National Forest, also in southwestern Riverside County. Both populations include hybrids between Vail Lake ceanothus and the common hoaryleaf ceanothus (*Ceanothus crassifolius*). All occurrences of the species are on north-facing slopes and on soils derived from an unusual pyroxenite-rich rock outcrop that may be gabbroic in origin. Soil on the outcrop is nutrient poor and constitutes harsh growing conditions for most plants. Extensive botanical surveys have been conducted in the Agua Tibia Mountains, but to date, no other populations have been found. The Agua Tibia Wilderness supports approximately 2,000 to 4,000 individuals in the northern stand and 6,000 to 12,000 individuals in the southern stand.

While the Cleveland National Forest populations of Vail Lake ceanothus are adequately protected within National Wilderness, the Vail Lake population, the most genetically pure occurrence, has been threatened for nearly a decade by the potential for residential development of the area surrounding Vail Lake. Multi-agency efforts to acquire the Vail Lake property as public open space, and an attempt to establish the property as a conservation

bank, to date, have been unsuccessful. Studies of the effects of fire frequency on the establishment, survival and reproduction of Vail Lake ceanothus are critically needed. Unlike some chaparral shrubs, Vail Lake ceanothus lacks the ability to crown-sprout following a wildfire and reproduces only from seed stored in the soil. Information from studies on the ecology of this species will be essential to the development of recovery strategies and management plans, as well as the design of an adequate preserve for Vail Lake ceanothus. There is the potential for serious decline should the Vail Lake population be lost. Vail Lake ceanothus is included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Conservation for this species will be achieved by inclusion of at least 13,290 acres of suitable chaparral habitat and three known localities (representing 54 records) within large blocks of habitat in the MSHCP Conservation Area.

Specimens of Vail Lake ceanothus are grown by Rancho Santa Ana Botanic Garden for the Center for Plant Conservation National Plant Collection.

**Pine Hill
ceanothus**

Ceanothus roderickii

State: Rare 1982
Federal: Endangered 1996

General Habitat:

This ceanothus occurs on red clay soils of the Pine Hill gabbro formation within openings in chaparral in the Sierra foothills of El Dorado County. It is commonly associated with two other State-listed plants: Stebbins' morning glory and Layne's butterweed. It also occurs in habitats near Pine Hill flannelbush and El Dorado bedstraw.

Description:

Pine Hill ceanothus is an evergreen shrub in the buckthorn family (Rhamnaceae) with prostrate branches radiating from a central trunk as in a wagon wheel, and small white flowers tinged with blue. Stems root where they touch the ground.



Daniel Burmester, DFG File Photo



© 1972 Dean Van Taylor



Daniel Burmester, DFG File Photo

Status:

There are approximately 15 occurrences of Pine Hill ceanothus. Portions of four occurrences of Pine Hill ceanothus are protected. Two of these sites are in the vicinity of Salmon Falls, to the north and south of the South Fork of the American River, and managed by BLM and the DFG. Another site is 240 acres managed by the DFG on Pine Hill. Continued losses of habitat are occurring through grading being conducted under ministerial grading permits that are not subject to review under the California Environmental Quality Act; development of telecommunications facilities on property managed by CDF on top of Pine Hill; and urban development in the

vicinity of Cameron Park and Shingle Springs.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (*Senecio layneae*), and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 areas have been preserved.

In the northern portion of the gabbro soil formation, approximately 2,079 acres have been purchased and transferred to the DFG, BLM, or El Dorado County. This area includes a population of Stebbins' morning glory. A prescribed fire on nearby property held by BLM appears to have rejuvenated a dwindling population on that site. In the southern portion of the gabbro soil formation, approximately 454 acres have been purchased and transferred to BLM or El Dorado County.

The rapidly growing community of Cameron Park, California, located in the Sierra foothills outside of Sacramento, is a community at high risk of wildfires. Heavy fuel loads of manzanita, toyon, chamise and other chaparral vegetation in and around the community are an annual concern for firefighters and residents alike. In an effort to mitigate the situation, the BLM Folsom Field Office has initiated the Cameron Park Phase I fuels project on its Pine Hill Preserve situated in the hills above the town. The BLM, in concert with cooperating agencies, developed a plan to reduce the fuel load while protecting and even benefiting the sensitive plants. Many of the plants, including *Ceanothus roderickii*, may benefit from fuel reduction activities and the reproduction following fire.

Ceanothus roderickii does not appear to be an early seral species; however survival and growth of seedlings under shrub canopy is poor. Without fire, seed germination is poor. Recovery is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. Assuming recovery criteria are met, *Ceanothus roderickii* could be downlisted after three natural fire cycles (approximately 80 to 100 years).

Santa Catalina Island mountain mahogany

Cercocarpus traskiae

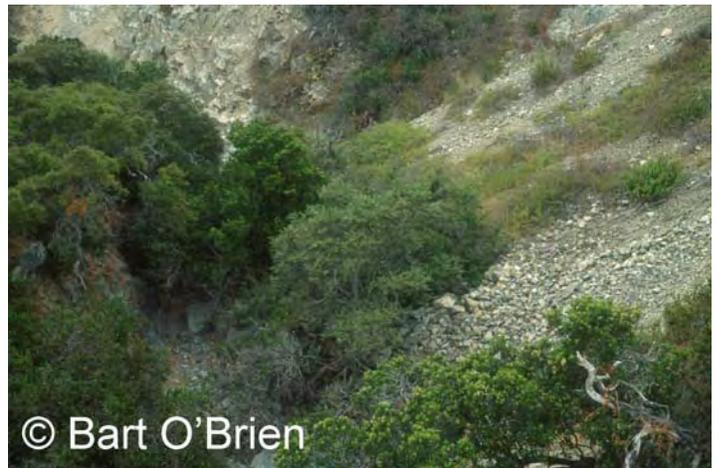
State: Endangered 1982
Federal: Endangered 1997

General Habitat:

Santa Catalina Island mountain mahogany is endemic to Santa Catalina Island, one of the Channel Islands off the coast of southern California. It is found in Wild Boar Gully in the Salta Verde region of the island, on the slopes of a steep-sided, narrow, dry arroyo in a coastal sage scrub community with sausserite gabbro soils.

Description:

Santa Catalina Island mountain mahogany is a small, evergreen tree in the rose family (Rosaceae). Plants have clusters of small greenish flowers and leathery leaves that are white-woolly beneath.



Status:

When first described in 1897, the only known population of Santa Catalina Island mountain mahogany was comprised of 40 to 50 mature plants. Today, the natural distribution is limited to one small population of seven trees in Wild Boar Gully in the Salta Verde region of the island.

Browsing by introduced deer and goats and rooting by feral pigs has disturbed the soil and inhibited the establishment and growth of seedlings. The Santa Catalina Island Conservancy owns and manages the island and is carrying out protection and recovery actions. The individual trees were fenced in 1988 with enclosures of varying sizes. In the two largest fenced enclosures, a total of several hundred seedlings of varying ages were evident in 1995. Enclosures around the remaining trees are smaller and few or no seedlings were observed. In 1999, the Conservancy fenced the entire perimeter of Wild Boar Gully, enclosing 112 acres. The Conservancy conducts yearly monitoring of the population. Their management goal is to increase the population by two trees of sapling size or larger every five years.

Genetically, Santa Catalina Island mountain mahogany is threatened by both inbreeding depression and genetic assimilation through hybridization. Two individuals were found to be hybrids with the more common island mountain mahogany (*C. betuloides* var. *blancheae*) in a 1989 study. The establishment of additional populations outside Wild Boar Gully, in areas where the probability of hybridization is minimal, will be important to the long-term survival of this species.

of populations for this species to two. Though no surveys have been done for the population on private land, the site at Red Hill Road supported tens of thousands of individuals in 1996, indicating that 1984 fencing from OHVs has resulted in increased numbers. Although the OHV grant has run out, the DFG will continue to gather data on the experimental restoration project.

The research also revealed that using bulbs as propagules resulted in extremely high survival (approximately 90 percent) after two winters; however, the effort needed to procure the bulbs in the summer (dormant) season was very high. Propagation by seed was successful, although seedlings grow extremely slowly and take years to mature and produce seed.

Critical habitat for Camatta Canyon amole was designated by FWS in October 2002.

Howell's spineflower

*Chorizanthe
howellii*

State: Threatened 1987
Federal: Endangered 1992

General Habitat:

This member of the buckwheat family (Polygonaceae) is generally restricted to northern dune scrub habitat in Mendocino County and occurs with the State-listed endangered Menzies' wallflower and the rare North coast phacelia.



Description:

Howell's spineflower is a small, shaggy-haired annual with spine-enclosed clusters of tiny white and rose-colored flowers. Plants branch from the base and produce basal, oblong leaves.



Status:

Howell's spineflower is known from six populations in the vicinity of MacKerricher State Park in the Ten Mile Dunes north of Fort Bragg, Mendocino County.

The DPR is conducting dune restoration, including removal of invasive non-native species such as ice plant, which will improve some habitat for Howell's spineflower. In 1998, abundant spineflower emerged in areas from which iceplant and European beachgrass was removed. MacKerricher State Park is proposing to reconstruct or reroute a 16-foot wide, paved trail through occupied habitat although trampling by horses and people continues to threaten the plant. The USFWS completed a recovery plan for Howell's spineflower and six other coastal plants in 1998.

Orcutt's spineflower

*Chorizanthe
orcuttiana*

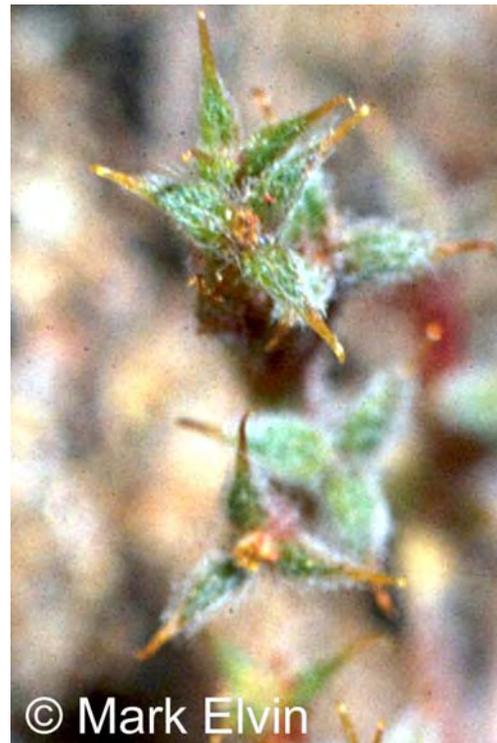
State: Endangered 1979
Federal: Endangered 1996

General Habitat:

Orcutt's spineflower is restricted to openings in coastal chaparral in neutral to slightly acidic, fine, sandy soils derived from eroded ferruginous sandstone where competition for resources is low. The historic range of Orcutt's spineflower extended from Oceanside south to Point Loma in coastal San Diego County. It is now found only on U.S. Navy land at Point Loma.

Description:

Orcutt's spineflower is a prostrate annual herb in the buckwheat family (Polygonaceae). It has basal leaves, leaf-like bracts in pairs, and small yellow flowers. One-seeded fruits are produced in late spring and the seeds germinate after the seasonal winter rains. The vegetative stage occurs from late fall until early spring with the reproductive stage occurring in April.



Status:

Historically, this species was known from ten occurrences and was thought to be extinct until it was found in 1979 at Torrey Pines State Reserve and later at Oakcrest Community Park. The Torrey Pines State Reserve population was last seen in 1987 despite the continued presence of suitable habitat and several efforts to relocate this occurrence. In the spring of 1997 a population of Orcutt's spineflower was rediscovered on U.S. Navy lands at Point Loma. Much of the original habitat for Orcutt's spineflower in coastal San Diego County has been eliminated by residential and commercial development.

Because of the small population size of Orcutt's spineflower, there is very little known of its biology or reproduction. It is theorized that the possible means of pollination is insects and that it is closely associated with California spineflower (*Mucronea californica*) although there have been no definitive studies on the breeding or symbiotic relations performed. It is believed that the causes for rarity of Orcutt's spineflower are the loss of required specialized habitat with few competitors, reduced fitness due to the low number of individuals, and possible germination requirements that may not be met each year causing population size to fluctuate.

The Soil Ecology and Research Group at San Diego State University have initiated habitat restoration work at Point Loma. This project is ongoing and entails removal of ice plant, installation of erosion control, and outplanting of native perennials. The goal of this project is create suitable habitat for the natural expansion of the spineflower. This species is covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border and in the San Diego Multiple Habitat Conservation Program NCCP.

**San Fernando
Valley spineflower**

Chorizanthe parryi
var. fernandina

State: Endangered 2002
Federal: None

General Habitat:

San Fernando Valley spineflower is restricted to open sites (less than 50% plant cover) in coastal sage scrub and chaparral of Los Angeles and Ventura Counties. At both sites it is found on well-drained soils on mesas and alluvial fans.



Description:

San Fernando Valley spineflower is a low-growing herbaceous annual in the buckwheat family (Polygonaceae). This species produces a rosette of basal leaves from which flowering stems arise. Small clusters of white flowers are produced at the ends of branches. Flowers are enclosed in involucre that have straight spines.



Status:

San Fernando Valley spineflower is restricted to two population centers in Ventura and Los Angeles Counties. Both areas are in private ownership and have been proposed for residential and commercial development. Historically, the spineflower was known from approximately 10 sites in the San Fernando Valley and Los Angeles areas. Until it was rediscovered at Ahmanson Ranch in Ventura County in May 1999, the plant had been last seen in 1929 and was thought to be extinct. The spineflower was found subsequently at Newhall Ranch in Los Angeles County during biological surveys for the Newhall Ranch Specific Plan. Plants at both sites occur in annual grassland in openings of coastal sage scrub and chaparral vegetation. Grazing has occurred at Ahmanson Ranch and is ongoing at Newhall Ranch.

The Department is working closely with both property owners to ensure protection for the San Fernando Valley spineflower. Ahmanson Ranch is conducting experiments on the spineflower to determine habitat parameters and expand the existing colonies onto new sites. Experiments are on-going. Germination occurred in experimental plots at the Ahmanson Ranch in early spring 2003. The long-term survivorship of plants in the experimental plots will not be known until several growing seasons have passed. Seeds have been placed in conservation storage at Rancho Santa Ana Botanic Garden.

A Conservation Easement between the Newhall Ranch and the Department has recently been finalized. This Conservation Easement protects 64 acres of occupied spineflower habitat at Airport Mesa and Grapevine Mesa, two of the three populations centers within the Newhall Ranch Specific Plan. A management plan for the preserves is being developed.

**Sonoma
spineflower**

*Chorizanthe
valida*

State: Endangered 1990

Federal: Endangered 1992

General Habitat:

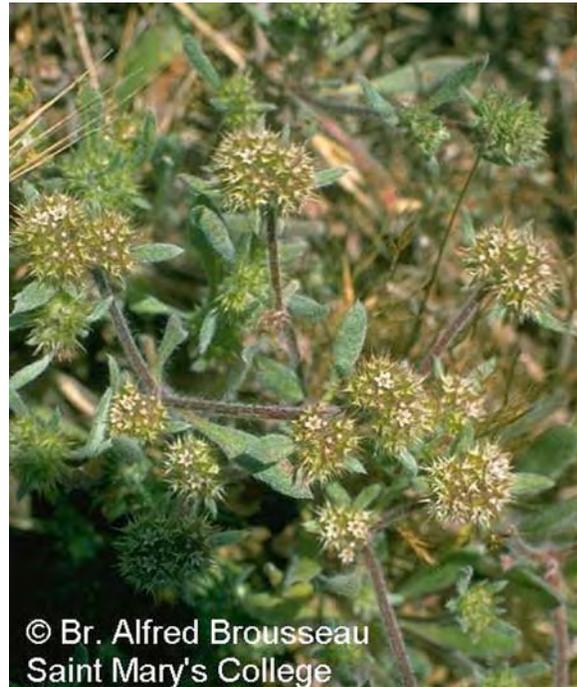
The only extant population of Sonoma spineflower is in the Lunny pasture by Abbott's Lagoon in Point Reyes National Seashore. The population occurs exclusively in the sandy coastal prairie soil at an elevation of about 40 feet. Plants associated with Sonoma spineflower include two species of concern—Point Reyes horkelia and Gairdner's yampah. Other associated species include coyote brush, large-flowered linanthus and several annual grasses.

Description:

Sonoma spineflower is an ascending or erect annual herb in the buckwheat family (Polygonaceae). It grows up to one foot tall and has highly branched slender soft-hairy stems. The small (less than 1-inch) leaves are egg-shaped, with the widest part at the tip of the leaf. Conspicuous spiny red and white bracts (stiff scaly or leaf-like appendages) are associated with the flowers, which are clustered at the ends of stems in spiny masses. The inconspicuous flowers are less than 1/3 inch long and have six white to rose petal-like appendages which are unequal in size. Flowers bloom from June to August.

Status:

Until its rediscovery in 1980, Sonoma spineflower was thought to be extinct. The distribution of Sonoma spineflower is limited to one site in Marin County, just south of Abbott's Lagoon on a working cattle ranch within Point Reyes National Seashore. This species occupies less than 2.5 acres of land within an enclosed pasture of about 360 acres, and consists of the main, native population and a reintroduction plot. In the past, the main population has exceeded 20,000 individuals. California Native Plant Society volunteers census the main population of the Sonoma spineflower each year. The Point Reyes National Seashore Association and NPS vegetation managers established a second population in 2000. By consulting historical records, soil maps, and local plant taxonomists, and by conducting field searches to identify potentially suitable habitat, the vegetation managers of the national



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Saint Mary's College



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seashore identified suitable sites for trial plantings with seeds from the existing population. A second population was established in 2000. Seeds on the trial plot yielded 34 plants, all of which produced flowers; many flowers later set seed. With additional funds from the Point Reyes National Seashore Association in 2000, the natural resource managers of the national seashore established two more plots within 565 feet (200 meters) of the first trial plot and planted them with seed from the first population. Seeds were also placed in long-term storage in the seed bank facility of the Rancho Santa Ana Botanical Garden.

The NPS believes there is a high degree of natural variability in plant numbers from year to year, and the overall population trend is unknown. Plant collections from the 1800s indicate that the spineflower formerly had a much broader range in Marin and Sonoma Counties. Intensive agriculture and urbanization since the early 1900s have significantly altered the habitat. Information from research suggests that today the species is limited by its dependence on grazing by cattle or wildlife, which reduces competition with nonnative plants, and its restriction to well-drained, disturbed, sandy soils. These ecological requirements, in addition to narrow endemism, render the plant particularly vulnerable to events such as disease outbreak, fire, flood, and other circumstances that could eliminate the population and cause extinction.

The USFWS completed a recovery plan for the Sonoma spineflower and six other coastal plants in 1998. NPS is attempting to secure funding to develop and implement repeatable monitoring protocols for the species.

Ashland thistle

Cirsium ciliolatum

State: Endangered 1982
Federal: None

General Habitat:

California populations are known from the vicinity of Montague in Siskiyou County, and populations occur in southern Oregon. This thistle often grows in dry plains and open grassland habitats, where the soils are thin with rocky outcrops present.

Description:

Ashland thistle is a perennial member of the sunflower family (Asteraceae), with a tall stem, short lateral branches, and yellowish-white flower heads.



Status:

There are only five known occurrences of Ashland thistle in California. All are on private land in agricultural areas devoted to grazing or grain production. Most occurrences tend to have numbers of individuals ranging from 10 to 100. An introduced beetle used as a biological control of Italian thistle, musk thistle, and milk thistle is also attracted to *Cirsium* species and may be a threat to Ashland thistle. There have been no surveys of the five known occurrences for this species in over 12 years. Efforts to locate Ashland thistle on BLM parcels in the Montague area resulted only in finds of peregrine thistle (*Cirsium cymosum*). Surveys of all known occurrences are needed, as is a monitoring program to determine the trend of Ashland thistle. The limited occurrences and small number of individuals per occurrence suggest instability with a potential for decline for this species.

Ashland thistle is a BLM and USFS sensitive species. Additional population biology and distribution information is necessary to determine this species rarity and extirpation status. According to the BLM, the taxonomy of Ashland thistle is still in question which could result in this species being rarer than currently considered. Threats to this species include rural development, power line corridor development, and overgrazing. These threats are aggravated as much of the existing habitat is privately owned and therefore not protected.

Seeds from Ashland thistle have been placed in conservation storage at Berry Botanic Garden in Oregon.

species in April 1997, and as a result of recommendations made at that meeting, Caltrans and SFWD have initiated pampas grass control programs to try to prevent further degradation of populations on their property. These eradication efforts will need to continue. Management and recovery actions for the species are addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Chorro Creek bog thistle

Cirsium fontinale
var. obispoense

State: Endangered 1993
Federal: Endangered 1994

General Habitat:

Chorro Creek bog thistle is of extremely limited distribution, found only in perennial seeps and springs in serpentine in western San Luis Obispo County.

Description:

Chorro Creek bog thistle is a perennial in the sunflower family (Asteraceae). First year plants form a large rosette; in the second or third year, the plant produces a branching stalk up to six feet in height and bearing numerous heads of whitish to pinkish-lavender tinged flowers. Its nodding flower heads and glandular hairs on the leaves separate it from other thistles that occur in the area. Chorro Creek bog thistle is closely related to fountain thistle (*Cirsium fontinale* var. *fontinale*), which is found only in San Mateo County.



Status:

Ten populations of Chorro Creek bog thistle are known; nine populations occur within a five-mile radius of the City of San Luis Obispo, and one other about 30 miles to the northwest. Three populations are on publicly-owned property, one each managed by California Polytechnic State University, San Luis Obispo, the City of San Luis Obispo (only a portion of population), and the California National Guard.

The National Guard has been monitoring the population at Camp San Luis Obispo since fencing the population from cattle grazing in October of 1994. Monitoring data indicated that in the absence of grazing by cattle, various native wetland species increased, coupled with a drastic decrease in recruitment of Chorro Creek bog thistle, resulting in an overall decline in numbers of the thistle. However, recruitment of thistle into grazed wetland areas outside of the cattle enclosure was observed. Beginning in January 1998, cattle were allowed access to about half of the population of bog thistle. Two years later, the number of plants doubled in the grazed area and remained approximately the same in the ungrazed area. Although the cows eat and trample many of the plants, the increased recruitment under controlled grazing more than makes up for the impact. Protection measures for Chorro Creek bog thistle are included in the USFWS Recovery Plan for Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California, completed in 1998.

La Graciosa thistle

*Cirsium
loncholepis*

State: Threatened 1990
Federal: Endangered 2000

General Habitat:

La Graciosa this is a member of the sunflower family (Asteraceae). It is largely restricted to back dune and coastal wetlands of southern San Luis Obispo County and northern Santa Barbara County, from the Pismo Dunes lake area and south historically to the Santa Ynez River. The Guadalupe Dune complex, in which the majority of the species occurs, extends inland only up to two miles. Deflation areas behind the foredunes often intersect the water table, creating wetlands and back dune lakes. *Cirsium loncholepis* is found in wet soils surrounding the dune lakes and in the moist dune swales, where it is often associated with rushes, tules, and willow.

Description:

La Graciosa thistle is a short-lived, spreading, mound-like or erect and often fleshy, spiny member of the sunflower family (Asteraceae). Plants are from four to 39 inches tall, with purplish flower heads occurring in wide, tight clusters at the tips of the stems. This species closely resembles Indian thistle (*Cirsium brevistylum*), a taller plant with the upper portion covered with cobwebby hairs.

Status:

There are approximately 17 known locations for La Graciosa thistle in San Luis and Santa Barbara counties. The historic distribution of the species included extensive areas in the Orcutt region that have been converted from wetland habitat to agricultural uses or otherwise developed. Large populations, similar to an existing one at the mouth of the Santa Maria River, likely occurred in these areas prior to their conversion. Historic maps show the area covered with extensive wetlands, which no longer exist. One small population has been reported from moist openings in coastal scrub habitat in a coastal drainage in southern Monterey County.

The populations in the dune systems are small and isolated, and show a reduced reproductive vigor. Several have declined significantly in size in recent years, and a population south of Oso Flaco Lake may have been extirpated by encroaching vegetation. At least one population on Unocal property in the Guadalupe Dunes just north of the Santa Maria River and the population at the mouth of the Santa Maria River are at risk from long-term soil and water contamination on Unocal's property. Surveys in 1998 of five known population locations found that all of them were much reduced or apparently extirpated since surveys were conducted in 1990.

Ongoing threats to this species include groundwater pumping, oil field development, competition from nonnative plants, browsing by rabbits, recreation facility development, and trampling. Cattle grazing in the riparian habitat



at the mouth of the Santa Maria River may reduce the competition from other species, but the long-term effects of livestock use on the habitat are unknown. All but one population of La Graciosa thistle are on private lands. In 1999, the DFG met with DPR and the Land Conservancy of San Luis Obispo County to outline a program of European beach grass and Veldt grass removal within the Guadalupe Dunes. It is expected that at least one population of La Graciosa thistle will benefit from this program, to be conducted by the Land Conservancy. Restoration projects implemented at the Guadalupe Oil Field by Unocal will also benefit this species.

Critical habitat for this species was proposed in 2002 and has not been finalized due to questions about the taxonomy of this species. Recent research on *C. loncholepis* raises significant questions regarding the taxonomy of the species. The taxonomic relationship between *C. loncholepis* and *C. scariosum* (elk thistle), which is widespread in montane wetland areas in California, is under review according to Dr. David Keil, California Polytechnic University, San Luis Obispo, California. *Cirsium loncholepis* may be proposed as a new taxon, *C. scariosum* var. *citrinum*, in The Flora of North America, which will be submitted for peer review in December of 2002.

Surf thistle

Cirsium rothophilum

State: Threatened 1990

Federal: None

General Habitat:

Surf thistle is endemic to the dunes of the central California coast, from the Nipomo Dunes of southern San Luis Obispo County to Point Concepcion in Santa Barbara County. It grows in coastal foredunes on the slopes of transverse ridges in areas of active sand accumulation. At the southern extreme of its range, it is found in sand at the bases or tops of cliffs. Associate species include coast buckwheat, ambrosia, and coast sundrops.

Description:

Surf thistle is a low-growing, short-lived perennial in the sunflower family (Asteraceae) with whitish flowers in dense heads. It is characterized by large rosettes of spiny, white-woolly, deeply lobed and undulating leaves. The deep roots and white-woolly herbage are adaptations to the physical stresses of the dune habitat, such as high light intensity and sand movement and abrasion. Flowering occurs between May and July.



Status:

Surf thistle is known from approximately 22 sites. It was proposed for federal listing in the 1990s. The species was considered to be threatened by oil production, missile facility construction, beach users, recreational vehicles, cattle, and non-native ice plants. Approximately 57 percent of the recorded locations, with 80 percent of the total number of plants, are on Vandenberg Air Force Base within designated special management areas for the western snowy plover a listed threatened species. The protection and management of these western snowy plover areas by the Air Force have also protected the Surf thistle sufficiently to stabilize the population, and federal listing was not pursued. However, activities promulgated under implementation of Homeland Security could alter the manner in which the air force base is managed.

Several populations on Unocal property in the foredunes of the Guadalupe Dunes just north of the Santa Maria River are at risk from long-term soil and water contamination on Unocal's property. Restoration projects implemented at the Guadalupe Oil Field by Unocal will benefit this species.

In 1999, the DFG met with DPR and the Land Conservancy of San Luis Obispo County to outline a program of European beach grass and Veldt grass removal within the Guadalupe Dunes. It is expected that at least one

population of surf thistle will benefit from this program, to be conducted by the Land Conservancy. The Nature Conservancy has turned over management of Oso Flaco Lake to California State Parks, and a new organization called the Dunes Center is attempting to unite all major landowners in the Guadalupe-Nipomo Dunes Complex under one administrative body with the goal of preserving this open space and ecology of natural and endangered species in the dunes. Private, county, state, and corporate owners are represented within the preserve. An interpretive center is being built to aid in educating the public about the unique dune system; docent-led tours are also given to help educate the public about the dunes.

Presidio clarkia *Clarkia franciscana*

State: Endangered 1978
Federal: Endangered 1995

General Habitat:

This member of the evening-primrose family (Onagraceae) occurs is restricted to serpentine soils within the coastal prairie grassland community at San Francisco's Presidio and in the Oakland Hills of Alameda County. At one location within the Presidio, this species grows in association with the State and federally-listed Endangered Presidio manzanita.

Description:

Presidio clarkia is a slender branched annual species with stems about 12 inches tall and with few, small, slender entire lance-shaped leaves. The sparse flowers have four wedge-shaped petals that are lavender to pink. The middle of the flower is lighter in color with a reddish-purple basal spot. Blooming time is from May to July.



Status:

Presidio clarkia occurs in San Francisco and Alameda Counties. It is known from only three sites within a mile of each other in Alameda County and from two sites at the Presidio. Current ownership includes EBRPD, NPS, and private landowners.

There is ongoing monitoring of the two populations at the Presidio. Park resource managers have undertaken an aggressive program of habitat protection and restoration of the endangered Presidio clarkia. Restoration efforts have centered on the expansion of potentially suitable habitat through the removal of invasive non-native weeds, including more than 100 non-native trees. To ensure the effectiveness of future management efforts, this project will evaluate the effectiveness of potential techniques for removing the introduced duff and thatch thereby providing suitable habitat for clarkia to expand into. Research and funding is required to determine the most ecologically sensitive, sustainable and effective method to remove the duff and thatch layers. Two potential methods of removal are fire and manual or mechanical scraping. In the "scraping" experimental design, the organic horizon was removed by raking and shoveling during summer 1998, and any plant material that establishes after scraping is manually removed before seeding occurs. Although EBRPD has removed nonnative trees and other vegetation that threaten the population at Redwood Regional Park, the three populations of *Clarkia franciscana* in Alameda County are all threatened by nonnative species such as annual non-native grasses, pampas grasses and

French broom.

Genetic comparisons made between the Presidio and Oakland populations concluded that at least one of the Oakland populations is indigenous and was not planted. Although the discovery of the Oakland populations has greatly increased the likelihood that Presidio clarkia can be protected, its numbers are still so low that extinction remains a distinct possibility.

Presidio clarkia is maintained by the University of California Botanic Garden for the Center for Plant Conservation National Plant Collection. Management and recovery actions for the species have been addressed in the USFWS Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area, finalized in 1998.

Vine Hill clarkia

Clarkia imbricata

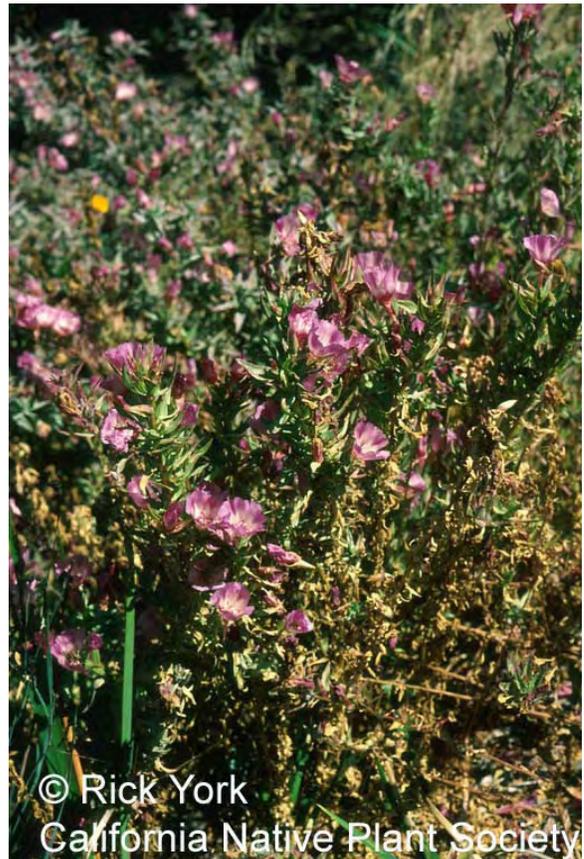
State: Endangered 1978
Federal: Endangered 1997

General Habitat:

This species has been found in valley grasslands, meadows, and chaparral in sandy loam soils. Historically, it was known from only two natural occurrences in the Vine Hill area of Sonoma County.

Description:

Vine Hill clarkia, a member of the evening primrose family (Onagraceae), is a late-blooming, slender annual herb. Stems grow to 2.5 feet in height. This plant is densely leafy with smooth leaf margins and lanced-shaped leaves. The leaves grow ascending and overlapping one another. Flowers bloom from June through July. Each flower has a conspicuous funnel-shaped tube at its base and four fan-shaped lavender petals with a v-shaped purple spot extending from the middle to the upper margin of the petal. The flowers are grouped closely together.



Status:

Vine Hill clarkia has never been abundant. This plant is now known from only two sites. One population is natural and the other was propagated from cuttings. The two populations are about 1 mile apart. The two populations have a total number of plants ranging from 2,000 to 5,000, as is typical for an annual plant. Both populations occur on private lands. The native population of Vine Hill clarkia was formerly split between two privately owned parcels. Until several years ago, TNC had cooperative agreements with both landowners to protect the population. Since then, the soil on one of the parcels was scraped, and the plants there have been extirpated. The other parcel was sold in 1997 and a portion of the Vine Hill clarkia habitat on this second parcel was disturbed. Plants may not reestablish on the disturbed soil based on prior observations that the plant depends on the presence of an undisturbed soil crust. The DFG is seeking cooperation to protect this last remaining portion of the native population of Vine Hill clarkia.

The introduced population of Vine Hill clarkia is in a preserve owned by the California Native Plant Society

(CNPS). Although CNPS has attempted to discourage unauthorized collection by fencing the preserve and by not publicizing the exact location of the site, trespassers have damaged the fence, trampled the vegetation, and collected seed of Vine Hill clarkia on several occasions. Vine Hill clarkia is also threatened by genetic contamination from introduced hybrid clarkias and by encroaching non-native plants.

Vine Hill clarkia is maintained by the University of California Botanic Garden for the Center for Plant Conservation National Plant Collection. Seed from this species is available commercially.

Merced clarkia

Clarkia lingulata

State: Rare 1988
State Endangered 1989
Federal:

General Habitat:

The distribution of Merced clarkia consists of only two populations along Highway 140 in the Merced River Canyon of Mariposa County. It occurs on steep, north-facing hillsides in the understory of pine/oak foothill woodlands. It is associated with *Clarkia dudleyana*, Chinese houses, poison oak, and elegant madia.

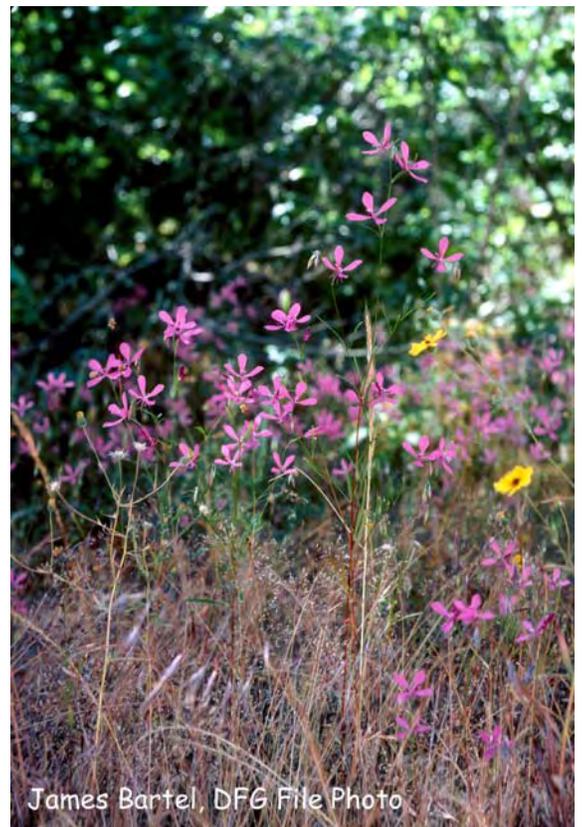
Description:

Merced clarkia is a slender annual herb in the evening primrose family (Onagraceae) with bright pink flowers. It reaches approximate two feet in height.

Status:

Merced clarkia is known from two sites in Merced County. The species was considered to be threatened by road construction and maintenance activities, power line maintenance activities, and landslides, and had been proposed for federal listing in the 1990s. Herbicide spraying along the highway right-of-way and management of stockpiled soils from landslides had been threats to this species. However, implementation of protection measures through a Memorandum of Understanding signed by the Forest Service, Caltrans, DFG, and Pacific Gas and Electric reduced the level of threats to the Merced clarkia. The available information indicated that the degree of the threats to the Merced clarkia did not warrant issuance of a proposed rule or continuation of candidate status for this species.

USFS annually monitors the Merced Clarkia populations. Merced Clarkia had vigorous populations in 1995, but 1996 and 1997 were successively poorer years. The lowest numbers ever observed by Sierra National Forest personnel were in 1997, probably due to the lack of rainfall during the entire spring after the massive flooding in early January. In 1997, the DFG, USFS, and CSU - Fresno, initiated a study of the genetics of Merced clarkia. Genetics studies have continued to date. In 1998, the last reported monitoring date, both Merced clarkia populations had returned to full vigor.



Pismo clarkia

Clarkia speciosa ssp.
immaculata

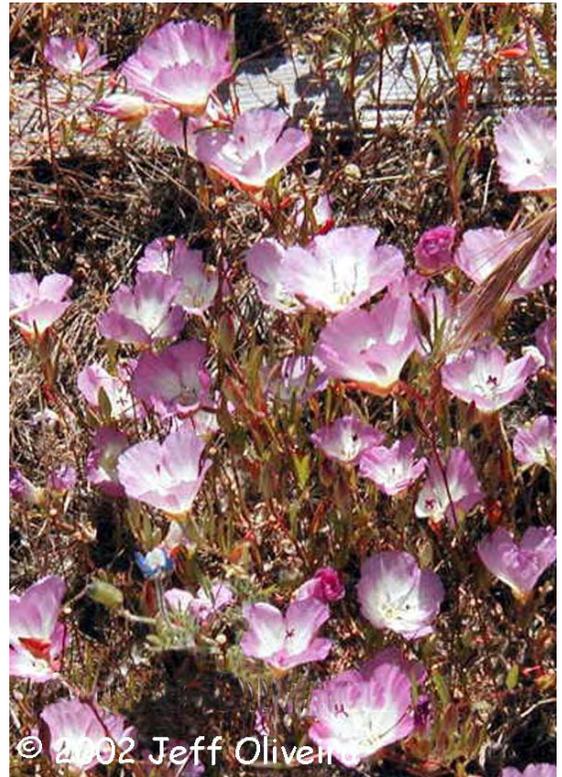
State: Rare 1978
Federal: Endangered 1994

General Habitat:

This species grows is found on pockets of dry sandy soils, possibly ancient sand dunes, within grassy openings in chaparral and oak woodlands.

Description:

Pismo clarkia, a member of the four o'clock family (Onagraceae), is an erect or decumbent herb, with branched stems up to 20 inches long. The fan-shaped petals are white or cream-colored at the base, streaking into pinkish or reddish-lavender in the upper part. It is distinguished from the subspecies *speciosa* by its larger flowers and the pattern of petal color. The plant flowers from May to July.



Status:

This plant is known 14 occurrences in the Pismo Beach area of San Luis Obispo County. All sites are on private land. Portions of two occurrences have been extirpated by residential development, and development has been proposed for six of the other sites. Additional threats to some of the sites include grazing, road construction and maintenance, and fiber optic cable installation. One site was extirpated in the early 1990s, although an attempt is being made to establish a population at a new site using seed that was collected from the plants before their habitat was destroyed. The DFG has not been able to obtain data on the success or failure of this site, however. In 1998, a new location was discovered on the Nipomo Mesa north of Black Lake Canyon. A conservation easement was acquired and will be given to the City of San Luis Obispo to conserve Indian Knob, which supports a population of Pismo clarkia and the State- and federally-listed endangered Indian Knob mountain balm (*Eriodictyon altissimum*). Protection measures for Pismo clarkia are included in the USFWS Recovery Plan for Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California, completed in 1998. In January 2001, The Nature Conservancy purchased a conservation easement on the 1,488-acre John Guidetti Ranch. The conservation agreement protects the ranch, which lies south of San Luis Obispo within the city's greenbelt area, and contains maritime chaparral, coast live oak woodlands, and native grasslands that harbor a variety of native animals and plants, including the endangered Indian Knob mountain balm and Pismo clarkia.

Springville clarkia

*Clarkia
springvillensis*

State: Endangered 1979
Federal: Threatened 1998

General Habitat:

Springville clarkia is found on granitic soils in openings in the blue oak (*Quercus douglasii*) woodlands and on road banks in the Tule and Kaweah River drainages. It can be found at elevations between 1,200 and 3,000 feet. All known populations are found in Tulare County. The population is found within a 43 square mile area.

Description:

Springville clarkia (*Clarkia springvillensis*) is an erect annual herb belonging to the evening-primrose family (Onagraceae). The plant can grow to 3 feet in height. Its stems are usually branched. The bright green leaves can grow to 3 inches long and 1 inch wide. Lavender-pink flowers appear in May to July and have a characteristic purple spot at the base of the flower. Features on the outside of the flower that separate this clarkia from others growing near it include color and the absence of long hairs. It is associated with speckled clarkia (*Clarkia cylindrica*), Lobb's poppy, common madia, blue dicks, and introduced grasses.

Status:

Springville clarkia is currently known from approximately 23 occurrences (20 confirmed in 1998) on Sequoia National Forest lands, as well as on Bureau of Land Management (BLM), California Department of Fish and Game (CDFG), Tulare County, and private lands. Eight occurrences are located on the Sequoia NF (in the Middle Tule, West Bear Creek, and Rancheria grazing allotments). The populations are clustered near the North and Middle Forks of the Tule River northeast of Springville. One population occurs at the DFG's Springville Ecological Reserve. Plants found 16 miles to the northwest near Salt Creek, a tributary of the Kaweah River near Three Rivers may represent another species. Springville clarkia is threatened by urban development, heavy livestock grazing, and roadway maintenance activities. Due to its few populations and low numbers, the species is vulnerable to extirpation from random events. Springville clarkia is a late-blooming species that may not develop mature seeds before its grassland habitat is mowed annually for fire protection.

In 1993, the DFG funded research that found that the species had a fair amount of genetic diversity despite its small population size and considerable annual fluctuation in population numbers. Subsequent studies found that the seed bank maintained a higher genetic diversity than was expressed in the flowering plants. The report concluded that the seed bank not only maintained the genetic diversity of the species, but also served to slow differentiation of populations.



Clarkia capsules

Habitat

In response to an unusually cool, wet spring in 1998, a delayed but unusually extensive flush of growth was observed for nearly all species, including Springville clarkia. Based on field observations, almost all previously surveyed occurrences were much larger in both numbers of individuals and area covered. Because seed dispersal is generally restricted to an area near the parent plants, this may be interpreted as further evidence of a dormant seedbank, which was produced by more abundant, widespread plants in previous years of optimal conditions. The periodic "suppression and release" of an extended seedbank may also indicate that environmental conditions such as available water, particularly during a critical time of growth, may be one of the most critical factors influencing seed germination, plant vigor and yearly fluctuations in population sizes.

Occurrences of Springville clarkia on and adjacent to Sequoia NF are monitored annually. Palatability of the species to livestock is presumably moderate, as the species appears to be incidentally but not preferentially grazed. Evidence of grazing and trampling has been documented at more heavily used sites in certain years, indicating that Springville clarkia may be at high risk of impact from grazing. Competition from introduced annual grasses and forbs, such as star thistle, and dense chamise, may be equal impact to grazing. Use of grazing to control non-native species and reduce the build-up of thatch has been suggested as a means of improving conditions for Springville clarkia. Reintroduction of fire into the ecosystem by means of carefully timed controlled burns may also benefit the species by reducing competition from other species without seriously impacting Springville clarkia populations. Cooperative research studies among the several agency and private land owners are needed to examine the effects on the species of various timings and intensities of grazing and prescription burning to determine the most effective regimes.

Grazing management on the Sequoia NF West Bear, East Bear and Rancheria allotments was modified for the 1999 and 2000 grazing seasons, after Springville Clarkia was listed as a threatened species by the U.S. Fish and Wildlife Service in 1998 even though the species was listed by DFG as endangered in 1979. Known Springville Clarkia populations are found on the West Bear Creek and Rancheria allotments. East Bear Creek does not have known populations of Clarkia but it is managed in conjunction with West Bear Creek and there is generally drift between the two allotments. The Middle Tule Allotment and Lumereau Administrative Pasture had populations discovered or suspected populations confirmed in 2000. Populations of Springville clarkia on the Middle Tule Allotment are in an area not used by the existing livestock and no changes were made to this operation. The Lumereau Pasture is used by Forest Service stock and exchange of use with a local packer. Use was modified to reduce from 60 head of horses to 6. With the lower number of stock, past experience indicates that the stock do not use the upper portion of the pasture where the clarkia were found. Lumereau Pasture will be used only by Forest Service stock and from approximately October 1 to June 1 in the 2001 grazing season. The clarkia population will be monitored during the period of use and operations modified as needed.

Most *Clarkia springvillensis* occurrences on National Forest system lands exist within the urban-wildland intermix zone ("threat" zone). Project-specific NEPA analysis and BAs will be prepared for fuels treatments projects. Sequoia NF has taken measures to protect Springville clarkia from livestock as described in the Biological Assessment for the Sierra Nevada Forest Plan Amendment Final Environmental Impact Statement. Populations near special use roads are fenced and excluded from further disturbance. However, plants have established outside of the fences, indicating that some disturbance may be important. This role of disturbance in the survivorship of Springville clarkia is being studied at the CDFG Clarkia Reserve. Populations that have migrated outside of the exclosures have been protected through education and training of the special use permittee. The effects of moderate intensity prescribed burns on undiscovered populations of Springville clarkia are unknown but likely to be beneficial if conducted at the appropriate time of year. Such activities will be evaluated on a case-by-case basis in biological assessments prepared by the Forest Service and in consultation with the Fish and Wildlife Service.

The effects of livestock grazing on Springville clarkia are undocumented. Anecdotal information is variable.

Heavy livestock grazing was identified as a possible threat in the publication of the proposed listing and final rule. There also has been some speculation that either early season grazing or late season after seed dispersal may be beneficial by controlling highly competitive non-native grasses. Field observations indicate that ungrazed stalks with intact dehisced seed capsules of Springville clarkia were left with little or no grazing after surrounding forage was removed. This would indicate low palatability and low potential for adverse effect other than trampling.

The Clarkia reserve, managed by the California Department of Fish and Game, had until 1999 received light to moderate trespass use by horses and cattle. Populations of *Clarkia springvillensis* have persisted there, although they may have been crowded by the invasive weed tocalote in some years. Fenced populations in the Middle Tule Allotment appear to have migrated outside of the fenced exclosures and disappeared inside in some years. Removal of early competing non-native annual grasses is usually considered to be beneficial to forbs such as *Clarkia springvillensis*. High residual dry matter may favor grasses over forbs and may contribute to high intensity fire. However, fire intensity effects on *Clarkia springvillensis* are unknown as well. Currently the Sequoia National Forest is cooperating with the Department of Fish and Game to investigate response of *Clarkia springvillensis* to wildfire.

**Salt marsh
bird's-beak**

*Cordylanthus
maritimus ssp.
maritimus*

State: Endangered 1979
Federal: Endangered 1978

General Habitat:

Salt marsh bird's-beak grows in the higher reaches of coastal salt marshes to intertidal and brackish areas influenced by freshwater input. Some plants occur in non-tidal areas or in areas of perched water tables; there may be different ecotypes. It is associated with pickleweed, salt grass, alkali heath, and poverty weed.

Description:

Salt marsh bird's-beak is a diffusely branched annual herb with grayish-green, tinged purple hairy leaves. This member of the figwort family (Scrophulariaceae) has spikes of bee pollinated flowers with two-lipped petals. Upper petals are beak-like with yellowish tips, and lower petals have a purplish pouch. The plants are hemiparasitic, obtaining moisture and nutrients from the roots of host plants such as salt grass.

Status:

Historically, salt marsh bird's-beak was widespread in coastal salt marshes from Morro Bay in San Luis Obispo County to San Diego County and northern Baja California Norte. Presently, it occurs only in scattered sites at fewer than 10 remnant salt marshes. Half of the original occurrences are now extirpated. In California, it is currently found at Tijuana Estuary and Sweetwater Marsh in San Diego County, Upper Newport Bay, Mugu Lagoon in Ventura County, Carpinteria Marsh in Santa Barbara County, Morro Bay in San Luis Obispo County, and possibly Anaheim Bay in Orange County.

A recently completed restoration plan has been developed for the privately owned Ormond Beach population which, if implemented, is expected to improve habitat for the bird's-beak and other associated species. A project to restore salt marsh habitat and expand the salt marsh bird's-beak population is also in progress at Carpinteria Salt Marsh by the University of California Natural Reserve System. Maintenance of appropriate hydrological conditions for this species continues to be one of the most challenging management issues. The interaction between tidal flows and local surface and subsurface freshwater flows is complex and important to the species' survival. Recently approved water diversions from Calleguas Creek may substantially reduce freshwater input into Mugu Lagoon and impair efforts being planned by the military to expand habitat for salt marsh bird's-beak. This species is also found in the DFG's Upper Newport Bay Ecological Reserve and the



management plan addresses the conservation of the plant. Salt marsh bird's-beak is highly vulnerable to loss of genetic variation, and future reintroduction attempts should strive to create contiguous patches of plants or to periodically reseed existing patches. Maintenance of nearby upland habitat supporting native pollinators is important to the species' survival. Several non-native competitors are displacing salt marsh bird's beak from their habitat, including sea lavender and several exotic grasses.

This species is covered in the San Diego Multiple Species Conservation Plan NCCP. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Salt marsh bird's-beak is considered to be a narrow endemic species under the MSCP and all populations will be conserved. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

off-road vehicle use), erosion, and grazing. Soft bird's-beak is also threatened by non-native invasive species that compete directly with native marsh species in the upper intertidal area. For example, salt marsh cord grass has impacted habitat for soft bird's-beak at Southampton Marsh in Benicia State Recreation Area as has perennial pepperweed at DFG's Grizzly Island Wildlife Area in Suisun Marsh. The CA Department of Parks & Recreation is developing a Habitat Conservation Plan for the Benicia State Recreation Area as well as monitoring for soft bird's-beak.

Mount Diablo *Cordylanthus nidularius*
bird's-beak

State: Rare 1978
Federal: None

General Habitat:

Mount Diablo bird's-beak occurs on bare ground in openings of serpentine chaparral on Mt. Diablo, Contra Costa County. It is associated with big berry manzanita, Mt. Diablo fairy lantern, Brewer's dwarf-flax, and native grasses.

Description:

Mount Diablo bird's-beak, a member of the figwort family (Scrophulariaceae), is a prostrate to ascending, branched, mat-forming annual. Its leaves are very narrow with linear divisions, and has small white and purple-veined flowers.



Status:

Cordylanthus nidularius forms an interlacing, unbroken mat over the serpentine chaparral habitat in which it grows. The entire global distribution of this unusual bird's-beak consists of one occurrence on the northeast slope of Mount Diablo in Contra Costa County, within Mount Diablo State Park. This population is stable, although it appears to require some disturbance. Disturbed sites, such as fire breaks, road edges, and post-fire landscapes, support the best populations of this species.

Mt. Diablo bird's-beak is considered to be a species of concern by the FWS and is addressed in the 2003 Recovery Plan for Chaparral and Scrub Community Species East of San Francisco Bay, CA. It is being considered for coverage in the East Contra Costa County HCP/NCCP. There is no current management plan for this species and annual surveys within the park are sporadic. To prepare a meaningful management plan, certain aspects of this plant's biology still need to be investigated. For example, it will be essential to understand the population dynamics of this species. The root host, pollinators, and seed germination requirements are unknown, among other aspects of the species' biology. Any naturally occurring event could lead to a drastic reduction in population size and possible extirpation. To buffer the effects of naturally occurring events, discovering or establishing populations that are disjunct from the current known population may prove essential. Human-caused threats also need to be identified, addressed, and monitored as part of a management plan. Additionally, the role of fire should be addressed immediately, both as a research need and a management tool.

The California Department of Parks and Recreation has proposed a prescribed burn that would encompass this area. This controlled burn should take place only under the most rigorous research and monitoring framework with

the research results used to improve the chances for long-term persistence of this species. Collection and banking of seed in Center for Plant Conservation certified botanic gardens is also a high-priority action for *Cordylanthus nidularius*. Seed banking is prudent to guard against extinction of the species from chance catastrophic events and to provide material for enhancement efforts in existing populations, reintroductions, and/or introductions to new sites. Other important conservation activities for *C. nidularius* include research on seed germination and propagation techniques to assist in establishing refugia populations.

Palmate-bracted bird's-beak

*Cordylanthus
palmatus*

State: Endangered 1984
Federal: Endangered 1986

General Habitat:

This species is confined to the saline-alkaline soils and is a component of Valley Sink Scrub and Alkali Meadow natural communities in relatively undisturbed, seasonally flooded lowlands in the Central and Livermore valleys. Palmate-bracted bird's-beak is associated with iodine bush, alkali heath, pickleweed, and saltgrass. This species occupies a narrow zone of favorable conditions based on soil pH, salinity, and moisture content.

Description:

Palmate-bracted bird's-beak is a pale green-gray annual herb in the figwort family (Scrophulariaceae). It branches from the base, and the leaves and bracts are covered by salt deposits extruded from special glands. Flowers are white and enclosed in pale purple leaf-like bracts. *Cordylanthus* species are *hemiparasitic*, meaning that they manufacture their own food but obtain additional water and nutrients from the roots of other (host) plants. Several species serve as host plants for *Cordylanthus palmatus*. This species flowers from May until October.

Status:

Palmate-bracted bird's-beak is restricted to seasonally-flooded, saline-alkali soils in lowland plains and basins at elevations of less than 509 ft. Within these areas, palmate-bracted bird's-beak grows primarily along the edges of channels and drainages, with a few individuals scattered in seasonally-wet depressions, *alkali scalds* (barren areas with a surface crust of salts), and grassy areas. The combination of hemiparasitism, salt excretion, and a deep root system allows palmate-bracted bird's-beak to grow during the hot, dry months after most other annuals have died. Under natural conditions, this species occurs on neutral to alkaline soils. Bumblebees are the primary pollinators of palmate-bracted bird's-beak, and both self- and cross-pollination can contribute to seed-set. Individual plants can produce up to 1,000 seeds in a single growing season, which form a persistent seedbank. The number of plants in a population varies annually in response to environmental conditions, particularly precipitation.

Historically, the species is known from scattered locations in Fresno and Madera counties in the San Joaquin Valley, San Joaquin, Yolo, and Colusa counties in the Sacramento Valley and the Livermore Valley area of Alameda County. It is currently known to occur in seven locations in the Sacramento, Livermore and San Joaquin Valleys. From north to south, these are Sacramento National Wildlife Refuge (NWR) in Glenn County, Delevan NWR in Colusa County, Colusa NWR in Colusa County, the Woodland area, Springtown Alkali Sink near Livermore, western



Madera County, and the combined Alkali Sink Ecological Reserve and Mendota Wildlife Management Area. The total occupied surface area over the seven locations is estimated at less than 741 acres.

The Springtown Alkali Sink Ecological Reserve, located north of Livermore in Alameda County, supports a large and genetically diverse population. The population occurs on lands owned by the Federal Communication Commission, the City of Livermore, and private landowners. Because *Cordylanthus palmatus* occupies a narrow ecotone between upland and wetland, maintaining the hydrologic functioning of this system is important to maintaining the bird's-beak at the site. Many of the existing colonies are degraded by motorcycle and bicycle use and by heavy grazing. Increased public use of the site, a direct result of development of the area surrounding Springtown, further degrades the habitat.

The principal threats to palmate-bracted bird's-beak include habitat conversion, development, alteration of site hydrology, and introduction of non-native grasses. Protection measures for palmate-bracted bird's-beak are included in the USFWS Recovery Plan for Upland Species of the San Joaquin Valley, California. The plan was completed in 1998.

Seaside bird's-beak *Cordylanthus*
rigidus ssp.
littoralis

State: Endangered 1982
Federal: None

General Habitat:

Seaside bird's-beak grows in sandy soils of stabilized dunes in closed-cone pine forest, cismontane woodland, or maritime chaparral from Monterey to Santa Barbara Counties. Plants thrive in areas of recent surface soil disturbance or in areas with reduced levels of competition from shrubs and herbaceous plants. Associate species include coast live oak, black sage, and manzanita.

Description:

Seaside bird's-beak is a bushy annual herb in the figwort family (Scrophulariaceae). The yellowish green branches and leaves are covered with fine hairs, and its pale yellow flowers are clustered at the ends of branches.



Status:

The historic distribution of this bird's-beak was, until recently, thought to be restricted to northern Monterey County; the base closure of Fort Ord resulted in the protection of several of these populations. In the early 1980s, several collections were identified from Burton Mesa in Santa Barbara County. About 10 sites are known at present on publicly and privately owned lands and on Vandenberg Air Force Base. At some of the Santa Barbara County sites, subspecies *littoralis* hybridizes with subspecies *rigidus*. A population was later identified on Vandenberg AFB. In Santa Barbara County, populations of seaside bird's-beak are located on land managed and conserved by DPR at the La Purissima Mission State Park. Several populations of this species are also protected on the 5,125-acre Burton Mesa Management Area which was acquired by the State Lands Commission and surrounds the small community of Vandenberg Village.

There is currently little information on the status of these populations. Prescribed burning, wildfires, vegetation fuel break construction, invasive species, and recreational activities on protected lands may pose a threat to the rare Burton Mesa chaparral plant community and populations of seaside bird's-beak found there. High fire frequency and out-of-season burning may adversely affect the species. Fires, ground disturbing activities and recreational use contribute to the spread of invasive species like pampas grass, iceplant, and veldt grass, which are capable of overtaking bird's-beak habitat.

Wiggin's croton

Croton wigginsii

State: Rare 1982
Federal: None

General Habitat:

Wiggins' croton occurs in stabilized and partially stabilized sand dunes in the Algodones Dunes in southeast Imperial County, where it occurs primarily on the west side of the dune system. It is associated with several sensitive plant species, including sand food, Peirson's milkvetch, and Algodones Dunes sunflower. Wiggins' croton also occurs in Baja California Norte and Sonora, Mexico.

Description:

Wiggin's croton is a silver-haired, much branched, perennial shrub in the spurge family (Euphorbiaceae). Male and female flowers are produced on separate plants.



Status:

Wiggin's croton is known from only two occurrences in the Algodones Dunes system of Imperial County. Approximately 75 percent of the dune system remains open to OHVs, which poses a major threat to the species. The remaining portion of the Algodones Dunes is been designated as the North Algodones Dunes Wilderness under the California Desert Protection Act and is closed to OHV activity.

In the 1990s, DFG staff collaborated with the BLM, CNPS, and the USFWS to conduct spring monitoring surveys for Wiggins' croton and four other plant species of concern in the Algodones Dunes. The purpose of the surveys was to establish and monitor transects across the dunes, both within the OHV open areas and the North Algodones Dunes Wilderness, for the presence and size of plant populations in those areas. As of 2000, monitoring data showed that the abundance of *Croton wigginsii*, did not fluctuate much from year-to-year in response to annual rainfall. Based on statistical analyses, the researchers concluded that Wiggins' croton appears to be able to maintain its population over at least two low-rainfall years. The species was significantly more abundant in 1998 than in 1977, mostly as a result of increases in the open area. Unlike the other sensitive species in the Algodones Dunes, Wiggins' croton responds well to moderate levels of disturbance. The observed increase in plant numbers could be the result of OHV disturbance in the open area, but is probably more likely the result of differences in rainfall amounts between the northern and southern dunes during periods of establishment or of other unknown factors.

**Bristlecone
cryptantha**

Cryptantha roosiorum

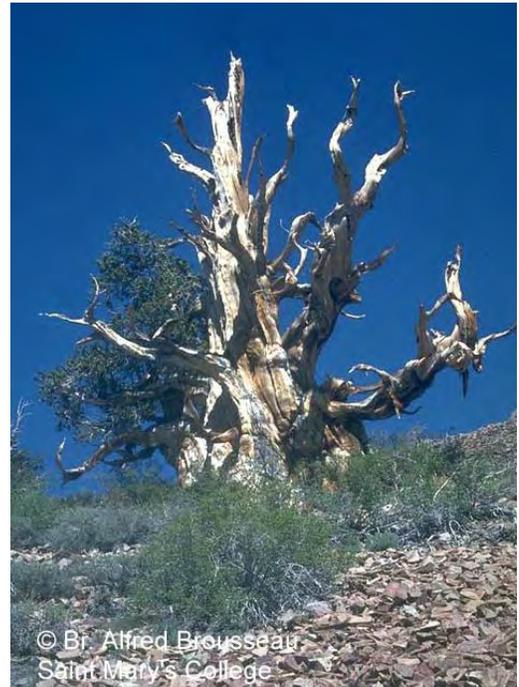
State: Rare 1982
Federal: None

General Habitat:

This diminutive perennial plant is found on gentle slopes or flats of dolomite or limestone in open sunny sites of the limber pine or bristlecone pine community in the Inyo Mountains of Inyo County. Associate species include sagebrush, penstemon, and species of milkvetch.

Description:

Bristlecone cryptantha is a member of the borage family (Boraginaceae). It occurs as dense cushions of grayish leaves with compact heads of small white flowers.



Status:

Bristlecone cryptantha is known from two occurrences in Inyo County where it is common within its habitat. DFG has no recent information on this species.

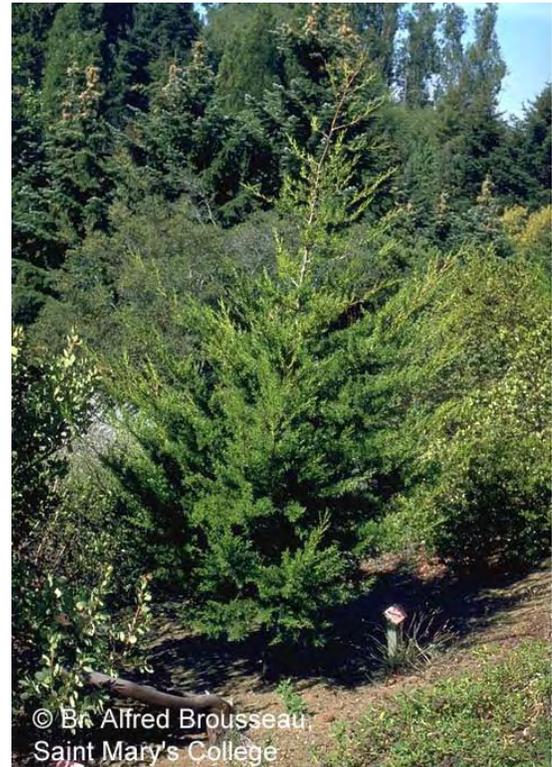
Santa Cruz cypress

*Cupressus
abramsiana*

State: Endangered 1979
Federal: Endangered 1987

General Habitat:

Santa Cruz cypress is restricted to a localized area within the Santa Cruz Mountains. It also occurs at Butano Ridge in San Mateo County. Habitat for Santa Cruz cypress consists of chaparral and closed-cone cypress and pine forest within a mosaic of redwood and mixed evergreen forest. The groves grow atop old marine sandstones and granitic soils within an area influenced by a Mediterranean-type climate and with little to no coastal fog. Associated species include knobcone pine, canyon live oak, bush poppy, chamise, ceanothus, and manzanita.



Description:

This erect, densely branched tree, a member of the cypress family (Cupressaceae) attains a height of up to 34 feet and typically develops a compact, symmetrical, pyramidal crown. The mature foliage of Santa Cruz cypress is scale-like and rich light green and its bark is gray and fibrous. The trees annually produce numerous female cones near the growing branch tip. These cones, which are firmly attached to the branch, remain closed and retain their seeds until the tree or supporting branch dies, generally as a result of fire.



Status:

Santa Cruz cypress is known from eight occurrences in Santa Cruz and San Mateo Counties. In Santa Cruz County, it occurs near Bonny Doon, Eagle Rack, and Braken Brae Creek, and between Majors and Laguna Creeks. It occurs on Butano Ridge in San Mateo County. Its distribution suggests that Santa Cruz cypress is a relict species, representing a type of vegetation widespread during glacial times but now confined to scattered sites.

A Draft Recovery Plan was published by the Service in April 1997. Land use plans and ordinances of Santa Cruz County and San Mateo County afford some protection to the species, although three populations, including half of the Bonny Doon population, and more than half of all of the individual plants occur on private lands. The remainder of the plants are protected within State or county parks, and watershed management plans have begun for some of these areas. Management of the Zayante sand hills in Santa Cruz County will protect a stand of this species, as well as two listed species of insect also found there.

Logging, agricultural conversion, residential development, changes in natural fire regime, and introduction of non-native species, such as broom and pampas grass, have impacted Santa Cruz cypress. This species is available commercially as a nursery plant.

July gold

Dedeckera eurekaensis

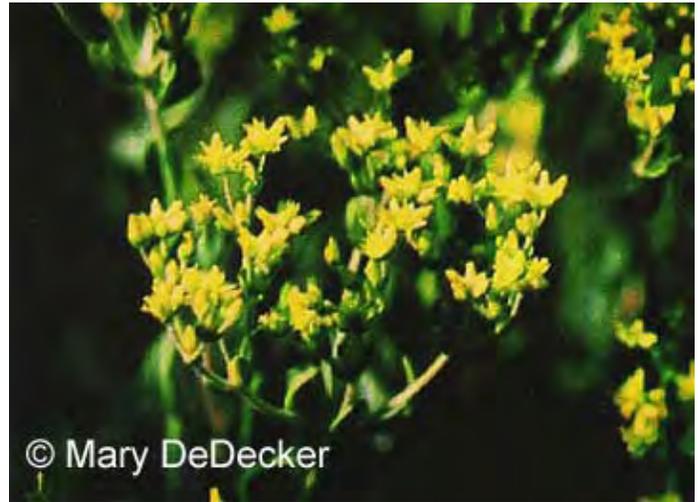
State: Rare 1978
Federal: None

General Habitat:

July gold occurs on rocky ridges, cliffs, talus slopes, and washes in mixed desert shrub and shadscale scrub. It commonly occurs on limestone or on rubble derived from limestone.

Description:

July gold is a low, rounded, densely-branched shrub in the buckwheat family (Polygonaceae). Plants are covered with small, olive-green leaves and, when in bloom, masses of tiny golden flowers. This species flowers in July and August.



Status:

July gold is known from about 20 occurrences. Most of the occurrences are in remote areas along the sides of steep canyon walls above the effects of flash floods. July gold has probably existed for hundreds of thousands of years without any significant genetic modifications. The species has very low seed production and research found that the successful seed set of July gold is less than 2.5% of the flowers produced annually. However, a single shrub can produce as many as 10,000 flowers each year. Even with only a minute survival rate of these seeds, the successful replacement of a shrub that can live up to 140 years is obviously enough to allow the long-term survival of the species. Long-term survivorship may also be conferred by the exceedingly high genetic variability found in the species. Individual plants share less than 70 percent of their genes.

Mineral exploration and OHV use have the potential to impact July gold. The majority of the populations occur on land managed by the Bureau of Land Management. A smaller number of populations are on the Inyo National Forest and in Death Valley National Park.

Baker's larkspur

Delphinium bakeri

State:	Rare	1979
Federal:	Endangered	2000

General Habitat:

Baker's larkspur grows on decomposed shale within coastal scrub plant community, at an elevation of 400 to 500 feet. Historically, it was known from Coleman Valley in Sonoma County and from near Tomales in Marin County. There is one known populations currently remaining, along a roadside in Marin County

Description:

Baker's larkspur is an erect, leafy-stemmed perennial in the buttercup family (Ranunculaceae) with shallowly five-parted leaves that occur primarily along the upper third of the stem. It grows from a thickened, tuber-like, fleshy cluster of roots, to a height of 26 inches. In April and May it produces showy, bright blue and white irregularly shaped flowers.



Status:

Although Baker's larkspur has always been rare, habitat losses have nearly caused its extinction. Baker's larkspur was once known from several populations in Marin and Sonoma counties, which were extirpated by extensive livestock grazing, roadside maintenance activities, and conversion of its habitat to cultivated farmland. The single remaining population is extremely small and privately owned, occurring on a steep road bank. It is threatened by roadside maintenance, overcollection, and grazing. Because the species has been reduced to a single population of fewer than 100 individuals, it is exceptionally vulnerable to chance catastrophic events, such as fire or insect outbreak.

In 2000 and 2001, surveys found approximately 65 plants at the site. In 2002, 85 plants were found, many of

which were seedlings. In late May, 2002, when the plants were partially in seed, the population was mowed by a county roadside maintenance crew. The impact this mowing will have on the population is not yet known. In 2004, an intense wildfire burned through the population. The status of the plants is not currently known.

Research is currently underway at the Illinois Natural History Survey and UC Berkeley to test the genetic variability of the species. Preliminary results indicate that the species has lower levels of genetic diversity in general compared to other rare and more common larkspur species. Efforts are also underway to collect seed and propagate it at the University of California Botanical Garden to produce a cultivated population for use in conservation efforts and research. Unfortunately, both projects experienced setbacks due to the 2002 mowing incident.

The USFWS designated critical habitat for this species in 2003.

Baker's larkspur is in danger of becoming extinct in the wild due. The extremely restricted distribution of this species and high level of immediate threat support uplisting from State-rare to State-endangered.

Cuyamaca larkspur

*Delphinium
hesperium ssp.
cuyamacae*

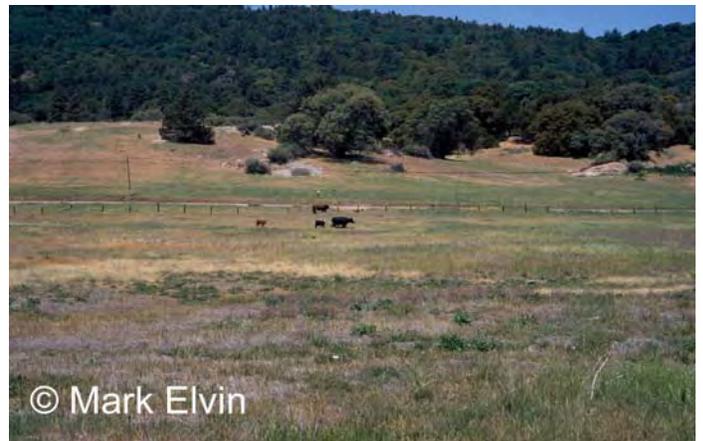
State: Rare 1982
Federal: None

General Habitat:

This larkspur is found in moist, relatively densely vegetated meadows. Known locations in San Diego County include Cuyamaca Lake, Laguna Mountain Recreational Area, and Palomar Mountain. It is found with deer grass in low, moist areas within the grassy meadows bordering Cuyamaca Lake and nearby areas in eastern San Diego County. It is also found in the San Jacinto Mountains of Riverside County.

Description:

Cuyamaca larkspur is a herbaceous perennial in the buttercup family (Ranunculaceae) with erect leafy stems that produce dense blue-violet blooms.



Status:

Approximately 20 occurrences of Cuyamaca larkspur are known and nearly 70 percent of these are found within the boundaries of Cuyamaca Rancho State Park.

DPR established the Cuyamaca Meadows Natural Preserve within the Park in 1990 to provide protection to Cuyamaca larkspur habitat as well as habitats for other listed plant species found in that portion of the State Park. Following two years of extended negotiations, in 1996 the DFG entered into an interagency MOU with USFWS, Helix Water District, Lake Cuyamaca Recreation and Park District, DPR, and USFS to protect Cuyamaca larkspur and two State-listed endangered species. These species, Cuyamaca Lake downingia (*Downingia concolor* var. *brevior*) and Parish's meadowfoam (*Limnanthes gracilis* var. *parishii*), occur in the Cuyamaca Valley and other portions of the Cuyamaca, Laguna and Palomar Mountains in eastern San Diego County. The MOU identifies

particular actions to be taken by each of the signatory land managers to preserve and protect the populations of Cuyamaca larkspur on their lands. Development, grazing, highway maintenance activities, and recreational and trail development are threats to Cuyamaca larkspur.

In 2003, the huge Cedar Fire burned a large portion of central San Diego County including the Cuyamaca Mountains and the area around Cuyamaca Lake. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 13% of suitable habitat was burned during the fire. However, the ability to precisely locate vernal pool complexes within the fire perimeter was limited. Botanists visiting Cuyamaca Lake during the spring in 2004 found a dense carpet of wildflowers covering the meadows at the lake. Few of the grasslands supporting vernal pools burned with a high intensity and impacts to sensitive species found in these pools were not severe.

Yellow larkspur *Delphinium luteum*

State: Rare 1979
Federal: Endangered 2000

General Habitat:

Yellow larkspur occurs on steep, rocky outcrops within the coastal sage scrub plant community near the town of Bodega Bay, Sonoma County, from sea level to 300 feet in elevation. There are also several unconfirmed populations just to the south in Marin County.

Description:

Yellow larkspur is an herbaceous perennial in the buttercup family (Ranunculaceae), with fleshy basal leaves, and growing to 22 inches tall. Its distinctive yellow flowers, which bloom from March to May, are cornucopia-shaped, with the posterior sepal elongated into a spur. Yellow larkspur is pollinated by hummingbirds; although it is self-compatible, it requires visitation by hummingbirds or insects for good seed set.



Status:

Although the distribution of yellow larkspur has always been restricted to fewer than a dozen occurrences near the town of Bodega Bay in Sonoma County, impacts due to rock quarrying activities, overcollection, residential development, and sheep grazing have reduced the species to near extinction. Only two confirmed populations of genetically pure yellow larkspur are remaining in the wild, both very small and on private land. Several additional populations appear to be hybrids with other larkspur species. Further research on these potential hybrid populations is needed. Several unconfirmed populations of yellow larkspur have also been reported to occur in Marin County. Further investigation into these potential occurrences is also needed.

Counts of one population between 1985 and 2000 found between 50 and 130 plants, with the number fluctuating from year to year. The other population contained between 8 and 50 plants from 1983-1987. That site has not been accessible since 1987, and no current population numbers are available; however, the management of the site does appear to be compatible with the continued existence of the species. Due to its restricted range and small population size, yellow larkspur is threatened by chance catastrophic events, such as fire or insect outbreak.

Two ex situ populations are in cultivation in Sonoma County and at the University of California Botanical Garden at Berkeley. The plants are easily grown in cultivation.

Recent genetic research on the species found that it is not of recent hybrid origin. Only one wild population was

sampled and it has the most genetic diversity, but the cultivated populations contain several alleles and markers not found in the wild population that could be used to establish new populations or enhance diversity of wild populations.

The USFWS designated critical habitat for this species in 2003.

The extremely restricted distribution of this species, high level of threat, and lack of formally protected populations would support uplisting from State-rare to State-endangered.

San Clemente Island larkspur *Delphinium variegatum var. kinkiense*

State: Endangered 1979

Federal: Endangered 1977

General Habitat:

San Clemente Island larkspur is endemic to San Clemente Island, the southernmost of the eight Channel Islands off the coast of southern California. It occurs in gently sloping annual and native perennial grasslands, primarily on the eastern slopes of the island, at an elevation of 150-1500 feet. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island larkspur is a perennial herb in the buttercup family (Ranunculaceae). Plants have a woody, branching root and divided, basal leaves. Elongated flower stalks, reaching 16-20 inches tall, produce white to pale violet flowers from March to May. Another rare species endemic to the island, Thorne's larkspur (*D. variegatum var. thornei*) is distinguishable from San Clemente Island larkspur only by the color of the flowers; Thorne's larkspur has light to bright blue flowers, while San Clemente Island larkspur's are white to pale violet. Populations that occur in the center of the island have individual plants with white, bright blue, and intermediate flower colors, suggesting that the two subspecies may be hybridizing.

Status:

San Clemente Island larkspur occurs in highly localized colonies, primarily on the northern and eastern end of the island; lone individuals are not usually observed. San Clemente Island larkspur populations have been highly impacted by grazing, rooting, and habitat disturbance. Ranching operations during the past century resulted in overgrazing and elimination of much of the native vegetation on the island. Intense grazing, rooting, and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. The grassland areas where San Clemente Island



larkspur occurs suffered particularly high levels of grubbing activity by feral pigs due to the presence of other rhizomatous and bulbous perennials, favorite food-stuff of the pigs. In 1985 it was reported that the type locality of the species had been extirpated due to pig rooting.

There are no longer ranching operations on the island. Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program.

The latest information available for this species documents 10 occupied sites in grasslands on the eastern slopes of San Clemente Island. The status of the species may be improving since the removal of grazing and feral animals. However, sites that were extirpated due to grazing and rooting may require reintroduction efforts to become reestablished. DFG has no current information on the status of this species.

The U.S. Fish and Wildlife Service completed a recovery plan for this and other Channel Island species in 1984.

**Geyser's
dichanthelium**

*Dichanthelium
lanuginosum var.
thermale*

State: Endangered 1978
Federal: None

General Habitat:

It is found only in the Big Sulfur Creek drainage of The Geysers area, Sonoma County. It is restricted to the hydrothermally altered soil of geothermal areas where it is adapted to the high acidity, high soil moisture, and high soil temperatures at these sites.

Description:

Geyser's dichanthelium, a member of the grass family (Poaceae), is a tufted, velvet-haired, perennial grass.



© Rick York, California Native Plant Society



Susan Cochran Levitsky, DFG File Photo

Status:

Geyser's dichanthelium is known from eight occurrences in the Geysers area of Sonoma County. The principal threat to this species is habitat alteration due to geothermal exploration and development. Road and culvert construction, erosion, and introduction of non-native species have also affected this species. The DFG and the California Energy Commission have been working with private companies to avoid disturbance to the plant within the Little Geysers Natural Area, and the main owner/operator is conducting yearly demographic monitoring of the plants under an MOU with DFG. Most recent surveys at the Little Geysers Natural area found 110,000 plants.

Recent research characterized temporal and spatial variations in soil temperature and its relationship to survivorship. Small changes in soil temperature facilitated plant establishment and expansion into areas not previously colonized due to high heat or dryness. Favorable soil temperatures promoted seed germination, growth, and plant maturation. Although drought and absence of heat inhibited seed germination, absence of heat from steam restricted germination when other conditions were favorable. Alteration of subsurface heat and water from steam extraction could adversely affect this species. The researchers concluded that management

should focus on maintaining conditions that permit a dynamic response of Geyser's dichanthelium populations to perturbations in its habitat.

Current taxonomic treatments do not recognize Geyer's dichanthelium as a distinct species. It is considered to be a species of panicgrass (*Panicum acuminatum* var. *acuminatum*).

Beach spectacle pod *Dithyrea maritima*

State: Threatened 1990
Federal: None

General Habitat:

Beach spectacle pod is found in small transverse foredunes within approximately 50-300 meters from the surf, from San Luis Obispo County south to Baja California, Mexico. Beach spectacle pod is usually found in areas of these fragile dunes where the sand is relatively unstable. Common associates include sand verbena and dune dandelion.

Description:

Beach spectacle pod is a small, low growing, white-flowered perennial herb in the mustard family (Brassicaceae). Its unique twin-fruited seed pods have two side by side sections, each surrounded by a rim, giving this plant its common name.



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Status:

Although historically ranging from San Luis Obispo County as far south as Los Angeles County and possibly Baja California, Mexico, this species currently occurs in the dunes of San Luis Obispo and Santa Barbara counties and on San Nicolas and San Miguel Islands.

San Miguel Island is part of the Channel Islands National Park, and is managed by the National Park Service. At the one known population on San Miguel Island, 700-1000 plants were seen in 1998. The U.S. Navy owns and manages San Nicolas Island, and the Navy's Environmental Division reviews all land use plans and activities that may affect sensitive species. This island supports several healthy populations of this plant, which are limited to the sand dune communities on the west and southwest coasts. Surveys in 1998 found less than 1000 plants at each occurrence. Expanding northern elephant seal populations are trampling some dune occurrences of this plant on the island. The Navy surveys beach spectacle pod populations regularly, and a study is being conducted to identify factors limiting population growth on the island.

Several populations on Unocal property in the foredunes of the Guadalupe Dunes just north of the Santa Maria River are at risk from long-term soil and water contamination from a diluting substance on Unocal's property. The habitat is also at risk from invasion of non-native species. A program of dunegrass and Veldt grass removal within

the Guadalupe Dunes began in 1999. This effort, conducted by the Land Conservancy of San Luis Obispo County, is expected to improve areas of beach spectacle pod habitat. In 2000, approximately 2,500 plants were observed at this location. The Dunes Center, a new organization, is attempting to unite all major landowners in the Dunes Complex under one administrative body with the goal of preserving this open space and the rare species found there. Private, county, state, and corporate owners are represented within the preserve. An interpretive center is being built to aid in educating the public about the unique dune system; docent-led tours are also given to help educate the public about the dunes.

Several populations of beach spectacle-pod have also been observed on Vandenberg AFB in Santa Barbara County, which is managed by DOD.

Slender-horned spineflower

Dodecahema leptoceras

State: Endangered 1982
Federal: Endangered 1987

General Habitat:

Slender-horned spineflower is known from alluvial fans, floodplains, stream terraces, washes and associated benches in San Bernardino and Riverside Counties. It is generally restricted to silty substrates low in organic matter in open areas in alluvial fan scrub. It is associated with other species of spineflower, brittlebush, California buckwheat, yucca, white sage and lemonade berry. Cryptogamic crusts are frequently present in areas occupied by slender-horned spineflower.



© James Reveal

Description:

Slender-horned spineflower is in the buckwheat family (Polygonaceae). It is a small annual with a rosette of leaves and spreading flowering stems. Slender-horned spineflower is distinguished from other spineflowers by the presence of 6 terminal awns and 6 hooked basal awns on each involucre. The involucre is a group of bracts that have been fused together to enclose approximately three to five white to pink flowers. Slender-horned spineflower blooms from April to June.



Susan Cochran Levitsky, DFG File Photo

Status:

Slender-horned spineflower is threatened primarily by loss of habitat and habitat fragmentation. Impacts include gravel mining, construction of flood control facilities, OHV use of fan habitat, urbanization, and competition from aggressive non-native species. Long-term conservation of this species will entail protection of an adequate amount of habitat to buffer the species against random extinction events, as well as protect the dynamic floodplain processes to which the species is adapted.

Slender-horned spineflower is typically found in sandy soil in association with mature alluvial scrub although it is associated with gravel soil in chamise chaparral in the Vail Lake area. The ideal habitat appears to be a terrace or bench that receives overbank deposits every 50 to 100 years. It is known from approximately 20 populations. Four areas supporting the species are found in Riverside County. The largest of these appears to be a population composed of several subgroups at Arroyo Seco and Kolb Creek along the north flank of the Agua Tibia Mountains and at Vail Lake. The Santa Ana River may support as many as 22 subpopulations, although eight of those have not been seen in recent years. Protected populations occur on public lands at Santa Ana River, Bautista Creek, and Arroyo Seco Creek in San Bernardino and Riverside counties. Most of the remaining populations on private lands. A draft recovery plan for slender-horned spineflower was released by USFWS in 1997; it has not been finalized.

Slender-horned spineflower is included as a narrow endemic species in the Western Riverside Multiple Species

Habitat Conservation Plan (MSHCP). This species is dependent on mature alluvial scrub that is maintained by periodic flooding and sediment transport and only occurs along Arroyo Seco and Kolb Creeks, Temescal Wash at Indian Creek, central Bautista Creek, Vail Lake and the upper San Jacinto River near Valle Vista and Hemet. Conservation for this species will be achieved by protecting at least 8,350 acres of chaparral and Riversidean alluvial fan sage scrub between 200 and 700 m in the Vail Lake Narrow Endemic Species survey area and Agua Tibia Mountains Bioregion. In addition, at least 11 of the known populations of this species will be included in the MSHCP Conservation Area. Management will also focus on maintaining and enhancing fluvial processes of Arroyo Seco and Kolb Creeks, Temescal Wash at Indian Creek, central Bautista Creek, and the San Jacinto River. Particular management emphasis will be given to flood control measures, sand and gravel mining, trampling, off-road vehicle use, and competition from non-native plant species.

**Cuyamaca Lake
downingia**

Downingia concolor
var. brevior



State: Endangered 1982
Federal: None

General Habitat:

Cuyamaca Lake downingia grows only in vernal moist swales and pools of Cuyamaca Lake and Cuyamaca Valley in the Cuyamaca Mountains of eastern San Diego County. It is associated with the State-listed endangered Parish's meadowfoam, and State-listed rare Cuyamaca larkspur.

Description:

Cuyamaca Lake downingia is a member of the bellflower family (Campanulaceae). This plant is a small annual herb with stems from two to eight inches long. Its flowers are blue and white and have a dark purple blotch at the base of the petals. Cuyamaca Lake downingia flowers from May to July.



Status:

Cuyamaca Lake downingia is known from three occurrences, one of which may be extirpated. It occurs in vernal pools and swales on the margins of Cuyamaca Lake and adjacent low lying areas. Plant numbers and their locations within the Cuyamaca Valley vary widely from year to year, depending upon seasonal rainfall and standing water levels. A small portion of the known population is found within Cuyamaca Rancho State Park and on private property at the eastern end of Cuyamaca Lake. The vast majority of the species habitat occurs on land owned by the Helix Water District and managed jointly by the Water District and the Lake Cuyamaca Recreation and Park District.

In 1990, DPR established the Cuyamaca Meadows Natural Preserve within Cuyamaca Rancho State Park to provide additional protection to Cuyamaca Lake downingia habitat as well as habitats for other rare species found in that portion of the State Park. In 1996, following two years of extended negotiations, DFG became a signatory to the "Conservation Agreement for the Preservation of Cuyamaca Lake Downingia (*Downingia concolor* var. *brevior*) and Parish's Meadowfoam (*Limnanthes gracilis* ssp. *parishi*)."

The other signatories are the Helix Water District, Lake Cuyamaca Recreation and Park District, California Department of Parks and Recreation (State Parks), the FWS, and the U.S. Forest Service. The conservation agreement identifies particular actions to be taken by each of the signatory land managers to preserve and protect the populations of Cuyamaca Lake downingia on their lands.

In 2003, the huge Cedar Fire burned a large portion of central San Diego County including the Cuyamaca Mountains and around Cuyamaca Lake. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. However, the ability to precisely locate vernal pool complexes within the fire perimeter was

limited. Botanists visiting Cuyamaca Lake during the spring in 2004 found a dense carpet of wildflowers covering the meadows at the lake. Few of the grasslands supporting vernal pools burned with a high intensity and impacts to sensitive species found in these pools were not severe.

Short-leaved dudleya

Dudleya brevifolia
(= *Dudleya blochmaniae*
ssp. brevifolia)

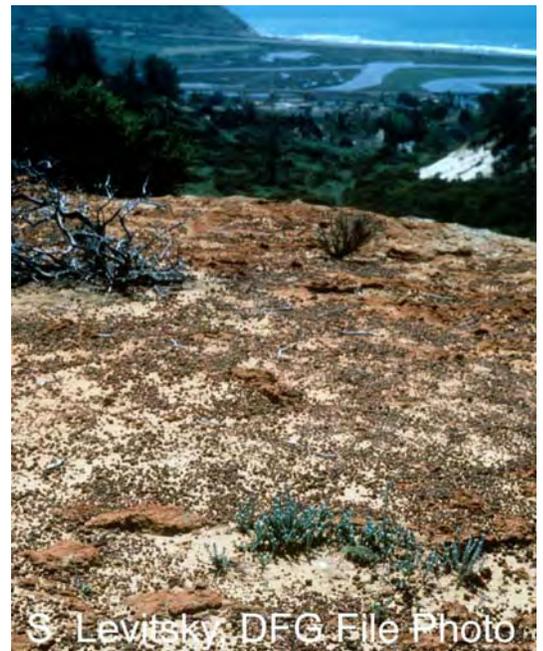
State: Endangered 1982
Federal: None

General Habitat:

Short-leaved dudleya is restricted to openings in the maritime chaparral community of western San Diego County. Its habitat is dominated by cryptobiotic crust species such as lichens, mosses, and ashy spike-moss. It occurs on extremely shallow, sandy soils that overlay a cemented sandstone hardpan, often at the edges of canyons.

Description:

Short-leaved dudleya is a tiny succulent perennial plant with a rosette of leaves that sprout from a corm. This member of the stonecrop family (Crassulaceae) produces short stalks of white flowers with red or purple markings.



Status:

Short-leaved dudleya is known from only five extant occurrences on sandstone mesas of the Del Mar and La Jolla region of San Diego County. The largest populations are found in the main portion of Torrey Pines State Park and within the Carmel Mountain Preserve. Smaller populations are found at Crest Canyon in Del Mar Heights, Skeleton Canyon at U.C. San Diego, and the Torrey Pines State Park extension north of Peñasquitos Lagoon. Three populations were destroyed by urbanization and development.

In 1997, USFWS withdrew its Proposed Rule to list short-leaved dudleya as endangered since it receives protection under the Multiple Species Conservation Program (MSCP) of southern San Diego County. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Short-

leaved dudleya is considered to be a narrow endemic species under the MSCP and 98 percent of major short-leaved dudleya populations will be conserved. The City of San Diego prepared a Subarea Plan under the MSCP to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. Management directives for this species require specific measures to maintain and increase populations, reduce or eliminate threats to the species, and address ecological relationships of the species.

Short-leaved dudleya is the focal species for conservation on Carmel Mountain, which is largely in City of San Diego ownership. The Carmel Mountain Preserve was established to protect the sensitive biological resources in the area. A management plan was developed for the Preserve in accordance with the MSCP and the Subarea Plan. All subpopulations on Carmel Mountain have suffered from past and ongoing disturbances such as road grading, and off-road vehicle, horse, bicycle, and foot traffic. Access by illegal off-road vehicles is still possible from a San Diego Gas & Electric (SDG&E) access road. Bicycle, hikers, and horse use is uncontrolled and traverses short-leaved dudleya habitat. Because short-leaved dudleya grows in openings that are favored as overlooks by hikers, trampling by people and dogs is a considerable threat to these occurrences and site-specific measures to lessen these impacts are needed. In addition, these disturbances are damaging and removing the surrounding cryptogamic crust. Removing or disturbing the lichen and moss crust facilitates weed invasion. Following initial disturbance, pocket gophers frequently move into the area to feed on the non-natives and the gopher burrowing promotes additional weed growth.

The goals of the Carmel Mountain Preserve Plan are to: 1) Eliminate vehicle, horse, and foot traffic in short-leaved dudleya habitat; 2) Restore the associated disturbed habitat, including roads through habitat; 3) Maintain and expand self-sustaining populations of short-leaved dudleya within the Preserve to ensure their long-term existence; 4) Preserve, protect, restore, and enhance the sandstone terraces that constitute habitat for species associated with the dudleya; and 5) Establish new populations with a minimum of 10,000 short-leaved dudleya on appropriate sandstone terraces on Carmel Mountain. Exotic plant control and promoting an assemblage of native pollinators are important aspects of proposed restoration activities.

The City conducts annual quantitative monitoring of short-leaved dudleya. Census numbers generated through the MSCP monitoring program for the three subpopulations of short-leaved dudleya on Carmel Mountain show an increase in the number of flowering individuals in 2001 from the two previous years. Approximately 66,637 individuals were found in 2001, 23,500 in 2000, and 27,000 in 1999. These numbers likely reflect responses of the populations to the timing and amount of rainfall each of those years and probably do not indicate an actual increase in population numbers in light of the continued disturbance and ongoing weed invasion. In 1999 and 2000 rainfall was well below average and long dry periods of up to several weeks occurred in midwinter.

The species is included in the San Diego Multiple Habitat Conservation Program (MHCP) as a narrow endemic species. The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. All major populations will be conserved under the MHCP. Conservation of occupied habitat, suitable adjacent habitat that supports pollinators, and unoccupied habitat that may support a persistent seedbank will contribute to the recovery of the species. An estimated 472 acres (75%) of potentially suitable habitat for this species will be conserved in the MHCP area. In addition, any newly detected localities for this species would be conserved inside the planning area and a minimum 80% would be conserved outside of the planning area.

The MHCP includes specific conditions that must be met to adequately conserve the species and allow for limited incidental take. These conditions include conservation of at least five self-sustaining, distinct populations within the geographic range of the species; conservation of any newly-discovered populations or experimental populations; management of all populations as a metapopulation to conserve genetic variability within in the species; limiting edge effects at populations sites; implementing fire management plans to protect conserved

populations from frequent or high-intensity fires and fire suppression activities; enhancing declining populations through adaptive management; and conducting intensive surveys prior to potential impacts.

This species is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. According to the SDG&E Subregional Plan, the short-leaved dudleya is adequately conserved by the Subregional Plan because impacts will be avoided unless deemed necessary for emergencies or repairs. Pursuant to the SDG&E NCCP, narrow endemic species may not be impacted for non-emergency work without consultation with the USFWS and DFG. If impacts are unavoidable, state of the art conservation practices will be used to determine the best impact minimization and mitigation method consistent with SDG&E operational protocols.

Marcescent dudleya *Dudleya cymosa*
ssp. marcescens

State: Rare 1978
Federal: Threatened 1997

General Habitat:

Marcescent dudleya grows on rocky volcanic cliffs and canyon walls in the Santa Monica Mountains from Hidden Valley to Malibu Creek State Park. It typically occurs on the lower reaches of sheer volcanic rock surfaces and canyon walls adjacent to perennial streams. In most locations, the topographic relief has precluded soil formation; therefore, the dudleya may be the only vascular plant occurring in a microhabitat which is otherwise dominated by mosses and lichens.

Description:

Marcescent dudleya is a succulent perennial in the stonecrop family (Crassulaceae). It has a basal rosette of leaves. The rosette leaves are 0.6 to 1.6 in long; floral stems are 1.6 to 4 in tall; corollas are bright yellow to yellow with red markings to bright red. *Dudleya cymosa* ssp. *marcescens* is distinguished from other subspecies of *D. cymosa* by the habit of the rosette leaves withering in the summer.

Status:

Marcescent dudleya is known from nine occurrences and the total number of known individuals is estimated to be fewer than 1,000. Ownership is divided between NPS, DPR, and private individuals. Threats to the species include urban development; recreational activities such as rock climbing and bouldering; alteration of surrounding vegetation and natural fire patterns; and illegal collecting for garden or horticultural uses. A draft recovery plan has been prepared for this and five other species of plants from the mountains surrounding the Los Angeles Basin.

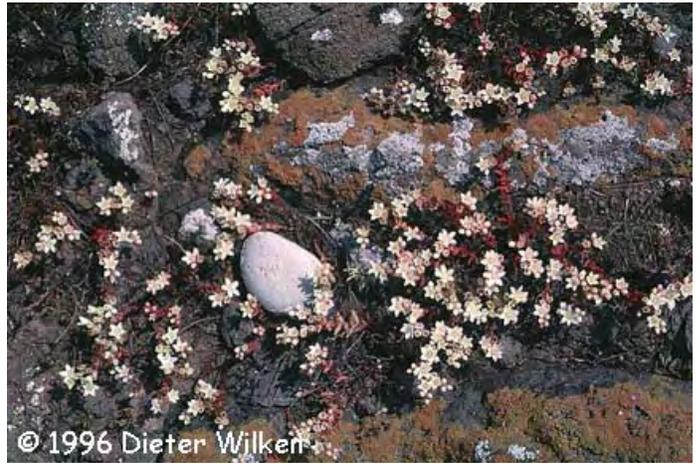


Santa Cruz Island *Dudleya nesiotica*
dudleya

State: Rare 1979
Federal: Threatened 1997

General Habitat:

Santa Cruz Island dudleya is known only from the west end of Santa Cruz Island, growing on sea bluffs and coastal terraces near Fraser Point.



Description:

Santa Cruz Island dudleya is a succulent perennial in the stonecrop family (Crassulaceae) with a basal rosette of leaves, and a flower stalk of white flowers with erect petals.



Status:

Santa Cruz Island dudleya is known from only one extensive population occupying about 32 acres. Since 1994, Santa Barbara Botanic Garden has been conducting monitoring as well as research on the life history and ecological requirements of Santa Cruz Island dudleya. Their recent estimates, based on random transects with multiple observers, found the population to be in excess of 50,000 plants, with as many as 80,000 in flower during a recent estimate. Their research findings suggest that herbivory by feral pigs and disturbance by pig rooting pose the greatest threats to the species. The species is also vulnerable to soil loss. Despite these threats, the population currently appears to be stable. Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%).

In 1997, TNC drafted operating principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Sequential, island-wide eradication of feral pigs by zone hunting is proposed. Zones would be established by temporary fencing. Sensitive plants and vegetation would also be fenced during eradication activities. Following fennel control and eradication of feral pigs from a given zone, protection of irreplaceable island resources would be immediate.

The final recovery plant for Santa Cruz Island dudleya and twelve other island plants was released by the USFWS in 2001.

Laguna Beach dudleya *Dudleya stolonifera*

State:	Rare	1979
State:	Threatened	1987
Federal:	Threatened	1998

General Habitat:

Laguna Beach dudleya is found only in the vicinity of Laguna Beach (Orange County) on steep cliffs in canyons. It is primarily restricted to weathered sandstone rock outcrops on cliffs in microhabitats within coastal sage scrub or chaparral. Associated species include California polypody fern, *Dudleya lanceolata*, and *Dudleya multicaulis*.

Description:

Laguna Beach dudleya is a succulent perennial member of the stonecrop family (Crassulaceae) and has basal rosettes of flat, oblong, bright green leaves arising from a woody base. Its flowers have bright yellow-green petals that are fused near their base. This species is distinguished by its branching stolons (horizontal stems that root at the nodes) and lateral vegetative branches that arise from the basal rosette.



Status:

Laguna Beach dudleya is known from nine occurrences, all but one on privately owned land. Two of the occurrences represent historic collections. The range of the species lies entirely within the boundaries of the Central/Coastal subregion of the Orange County Natural Communities Conservation Planning (NCCP). One of the four major populations is within the lands designated as a preserve within the Central/Coastal subregion. This population is on DFG's Laguna Laurel Ecological Reserve, which predates the NCCP program. Three major populations, representing about 70 percent of the individuals of this species, are found on private lands managed by nonparticipating landowners. One minor population is within lands designated as a preserve within the Central/Coastal subregion.

Santa Barbara Island dudleya *Dudleya traskiae*

State:	Endangered	1979
Federal:	Endangered	1978

General Habitat:

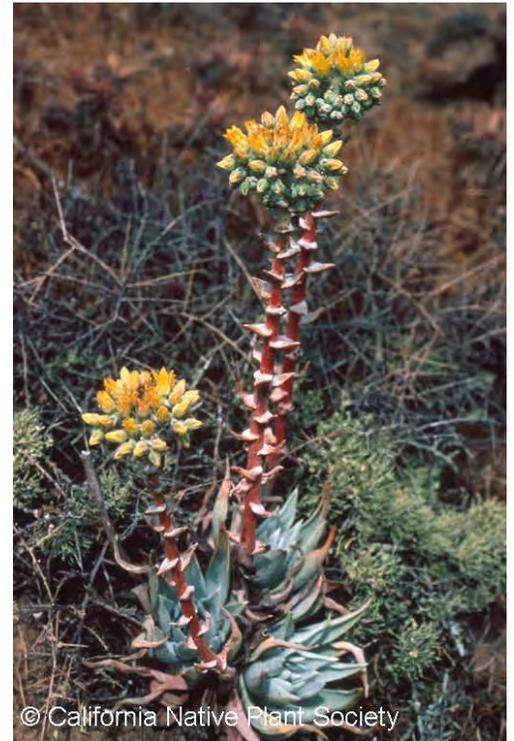
Santa Barbara Island dudleya is endemic to Santa Barbara Island, the smallest of the Channel Islands off the coast of southern California. It is restricted to steep, rocky slopes and outcrops within canyons, within the coastal bluff scrub plant community.

Description:

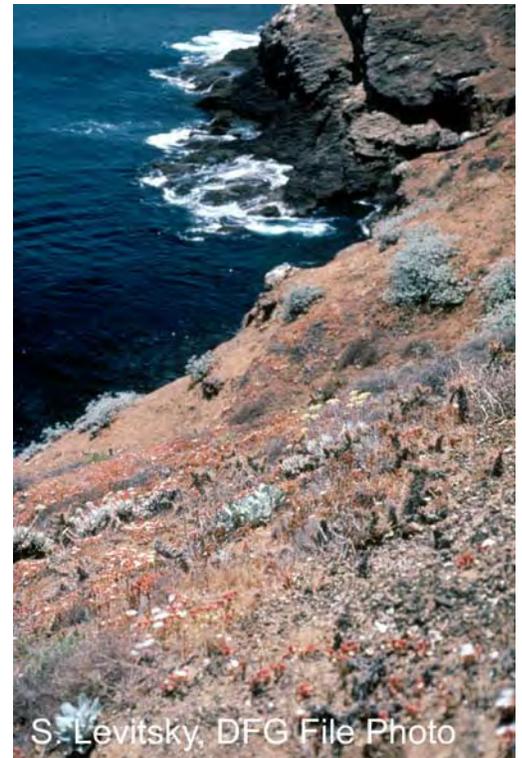
Santa Barbara Island dudleya is a small, succulent perennial in the stonecrop family (Crassulaceae). The plants have short stems and basal rosettes of broad, thickened leaves and yellow flowers on short stalks.

Status:

Santa Barbara Island dudleya is known from four populations on Santa Barbara Island where approximately 500 plants are reported by NPS. In the past, grazing by goats and rabbits, soil erosion caused by these animals, and plant collecting seriously threatened the native flora of Santa Barbara Island. Shortly after acquiring Santa Barbara Island, NPS eliminated the introduced exotic herbivores and, as a result, the native vegetation is recovering. The overall trend for Santa Barbara Island dudleya appears to be one of stability, since the primary threat, herbivory, has been removed. However, numbers are low enough that extirpation of some populations is a continued threat.



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S. Levitsky, DFG File Photo

Santa Ana River woolly-star

*Eriastrum
densifolium ssp.
sanctorum*



State: Endangered 1987
Federal: Endangered 1987

General Habitat:

Santa Ana River woolly-star occurs in alluvial fan scrub vegetation in the Santa Ana River drainage. It is restricted to the sandy soils of river flood plains or terraced alluvial deposits. Associate species include white sage, scalebroom, and California buckwheat. It is also associated with slender-horned spineflower, an endangered species.

Description:

Santa Ana River woolly-star is a much-branched, erect, shrub of the phlox family (Polemoniaceae). It occasionally reaches one three feet in height. This plant has gray-green stem and leaves. The bright blue flowers are contained in heads of about 20 blossoms each.



Status:

Historically, the Santa Ana River woolly-star was known to extend along 60 river miles in Orange, Riverside and San Bernardino counties, but now plants occupy only about 18 linear miles of river floodplain along the Santa Ana River mainstem, City Creek, and Plunge Creek. Populations exhibiting intermediate characteristics between the subspecies *sanctorum* and a more widespread subspecies occur in the vicinity of Lytle and Cajon washes. The Santa Ana River woolly-star is one of five subspecies of the perennial sub-shrub *Eriastrum densifolium*. This species exhibits complex morphological variation and the subspecies are difficult to distinguish although a study of nineteen quantitative characters showed that the Santa Ana River woolly star has a significantly longer corolla than that of the other four subspecies. A genetic study showed no major discontinuity between the Santa Ana River woolly-star and other subspecies. Instead, genetic variation within *E. densifolium* is a continuum and differentiation among populations is related to geographic distance and not morphological characteristics.

The biggest threat to the continued existence of the Santa Ana River woolly-star stems from the construction of the Seven Oaks dam, which was completed in 1999. Although Seven Oaks Dam impedes sediment transport and reduces the magnitude, frequency, and extent of floods, the system still retains partial fluvial dynamics because contributions from Mill Creek are not impeded by a dam or debris basin. Nevertheless, completion of the dam substantially reduced the historic floodplain areas necessary to support the species, which germinates only on clean sand. Without habitat-rejuvenating flooding events, open, sandy substrates eventually will close in with vegetation, which is anticipated to make these areas eventually unsuitable for woolly-stars.

The Woolly-Star Preservation Area was established in 1988 by the U.S. Army Corps of Engineers in an attempt to minimize the effects of Seven Oaks Dam on the federally endangered Santa Ana River woolly-star along the

Santa Ana River. Approximately 764 acres of alluvial fan scrub in the wash near the low-flow channel of the river were designated for preservation as mitigation because these sections of the wash were thought to have the highest potential to maintain the hydrology necessary for the periodic regeneration of early phases of alluvial fan sage scrub. The preservation area is also included in the FWS critical habitat designation for the endangered San Bernardino kangaroo rat (*Dipodomys merriami parvus*).

Santa Ana River woolly-star is also directly threatened by sand and gravel mining, which removes large areas of intact habitat, alters river hydrology, fragments remaining populations and generates dust which is believed to reduce pollination activity and speed up the expansion of competing vegetation. Considerable scientific information has been obtained on woolly-star pollinators, which are essential to seed production. An array of pollinators have been identified, including giant flower loving flies, sphinx moths, digger bees, hummingbirds, and others.

Santa Ana River woolly-star is conserved in the Western Riverside County Multiple Species Habitat Conservation Plan. This species is restricted to open washes and early-successional alluvial fan scrub on open slopes above main watercourses on fluvial deposits where flooding and scouring occur at a frequency that allows the persistence of open shrub lands. The Santa Ana River woolly-star has a narrowly restricted distribution within the Plan Area (Santa Ana River) and thus requires species-specific monitoring and management in order to ensure species persistence within the Plan Area. Conservation for this species will be achieved by including at least 2,340 acres of Riversidean alluvial fan sage scrub between 150 and 580 m in the Riverside Lowlands Bioregion. At least three populations in the Santa Ana River floodplain will be included in the MSHCP Conservation Area. Alluvial processes will be maintained in order to provide for the distribution of the species to shift over time as hydrologic conditions and seed bank sources change. Specific management actions will focus on conservation of the natural the natural river bottom and banks, with a 500 foot buffer zone of alluvial terraces and riparian habitat. Tributaries to the Santa Ana River in Riverside County at their confluences with the Santa Ana River will also be protected.

Tracy's eriastrum

Eriastrum tracyi

State: Rare 1982
Federal: None

General Habitat:

Tracy's eriastrum occurs in open, dry gravelly flats within closed-cone forest, chaparral, and serpentine scrub in Trinity, Tehama, Glenn, Lake, Colusa, and Santa Clara Counties. Associated species include deer brush, California juniper, sagebrush, golden bush, and annual grasses.

Description:

Tracy's eriastrum is a slender, brittle annual in the phlox family (Polemoniaceae). It grows a half foot high and produces light blue to white flowers in the spring.



Status:

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

Indian Knob mountainbalm

Eriodictyon altissimum

State: Endangered 1979
Federal: Endangered 1995

General Habitat:

This shrub is restricted to a limited area in the coastal region of San Luis Obispo County. It grows on shallow, sandy soils derived from siliceous sandstone in coast live oak woodland and coast maritime chaparral. It is associated with Morro manzanita, Pismo manzanita, coast live oak, and chamise.

Description:

Indian Knob mountainbalm is an evergreen shrub of the waterleaf family (Hydrophyllaceae). It reaches a height of approximately six to 13 feet. It is characterized by long, narrow sticky leaves and clusters of tubular pale lavender flowers. As with other fire-adapted chaparral plants, *E. altissimum* produces new growth primarily from rhizomatous suckers.



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Mary Ann Showers, DPR File Photo

Status:

Indian Knob mountainbalm is known from six occurrences. The species ranges from the south end of Morro Bay to Indian Knob between San Luis Obispo and Arroyo Grande. The rugged terrain in the Irish Hills (between Mono Bay and Indian Knob) has precluded extensive botanical surveying that may have identified other stands of *E. altissimum*. In January 2001, The Nature Conservancy purchased a conservation easement on the 1,488-acre John Guidetti Ranch. The conservation agreement protects the ranch, which lies south of San Luis Obispo within the city's greenbelt area, and contains maritime chaparral, coast live oak woodlands, and native grasslands that harbor a variety of native animals and plants, including the endangered Indian Knob mountain balm and Pismo clarkia (*Clarkia speciosa* ssp. *immaculata*).

In 2002, FWS awarded a grant DFG to assist in the purchase of property in the vicinity of Los Osos. This property consists of ancient stabilized dunes that support several sensitive plant communities including coastal dune scrub and maritime chaparral. The dunes provide habitat for the federally endangered Indian Knob mountain balm, Morro shoulderband snail, and Morro Bay kangaroo rat. Protection measures for Indian Knob mountainbalm are included in the 1998 USFWS Recovery Plan for Morro Shoulderband Snail and Four Plants from Western San Luis Obispo County, California.

Lompoc yerba santa

Eriodictyon capitatum

State: Rare 1979
Federal: Endangered 2000

General Habitat:

Lompoc yerba santa is found on shallow, acidic soils in maritime chaparral and southern bishop pine forest in the Santa Ynez Mountains, the Solomon Hills, in Pine Canyon, and on Burton Mesa in Santa Barbara County. Associated species include manzanita, black sage, ceanothus, and bush poppy.

Description:

Lompoc yerba santa is an evergreen shrub with smooth, sticky leaves, and branched inflorescences of tubular, lavender flowers. It is in the waterleaf family (Hydrophyllaceae).



Status:

The four known locations of *Eriodictyon capitatum* occur in western Santa Barbara County. Fire management practices, invasive non-native plant species, low seed productivity, and naturally occurring catastrophic events pose significant threats to the long-term survival of this species. Based on the presence of appropriate soils and associated species, other populations may occur, but have not yet been detected by botanists. Final critical habitat was designated in 2002.

Lompoc yerba santa produces few seed; however, it spreads vegetatively from rhizomes. New stems, called ramets, arise from the rhizomes. Recent observations by FWS staff show that new stems can occur more than 100 feet from the near ramet, indicating an extensive root system. Based on enzyme analysis, one researcher found that all of the Santa Ynez Mountains groups and one of the Vandenberg AFB groups were comprised of several genetically distinct individuals. These "individuals" are referred to as "genets." An individual genet can be composed of many ramets. The other Vandenberg AFN groups constituted one genetic individual (genet) spread over a wide area. The Solomon Hills location was inaccessible and not analyzed. Other genetic individuals may be present as viable seed in the soil seed bank.

This species apparently does not reproduce from seed following fire although stems can resprout after burns. It appears to respond well to ongoing disturbance along roads and near facilities associated with fire control practices in the Solomon Hills. However, ongoing vegetation removal for fire control may destroy individual ramets or the root structure of plants. Similarly, prescribed fire management activities outside of the normal fire season may result in mortality of plants and seeds. It is not known how these activities may affect sexual reproduction and influence the expression of the soil seed bank.

Trinity buckwheat *Eriogonum alpinum*

State: Endangered 1979
Federal: None

General Habitat:

Trinity buckwheat is found only the slopes of Scott Mountain (where known only from the type collection), Cory Peak, and Mt. Eddy on the border of Siskiyou and Trinity Counties, California. It is restricted to high elevation serpentine talus and scree slopes with little soil development. It occurs in subalpine forest with Jeffrey pine, foxtail pine, and whitebark pine. Understory associates include spreading phlox, jewelflower, and sedum.

Description:

Trinity buckwheat is a short, perennial herb in the buckwheat family (Polygonaceae). The plants are covered with a dense white felt and bear clusters of yellow flowers on short leafless stems.



Status:

Trinity buckwheat is known from eight occurrences. All known occurrences are managed by the Klamath and Shasta-Trinity National Forests and periodically monitored as part of their sensitive plant program. The lack of commercial timber and steep alpine slopes precludes impacts from timber harvesting or grazing activities. Limited threats may occur from mining or ski area development, although most sites are very difficult to access. The last mining operation in the area was abandoned in 1988, and no future mining activities are currently planned. Trinity buckwheat is a FWS Plant Species of Concern.

**Butterworth's
buckwheat**

*Eriogonum
butterworthianum*

State: Rare 1979
Federal: None

General Habitat:

Butterworth's buckwheat occurs in crevices of dry sandstone outcrops within chaparral or mixed evergreen forests in the Santa Lucia Mountains. It is found near the headwaters of the Arroyo Seco in Monterey County. It is associated with woolly Indian paintbrush and bush monkeyflower.

Description:

Butterworth's buckwheat is a low, spreading, woody perennial herb in the buckwheat family (Polygonaceae) with reddish-brown leaves covered by white felt on both surfaces and small, yellowish flowers with reddish midribs.



Status:

Butterworth's buckwheat is known from five occurrences from the headwaters of Arroyo Seco Creek on the Monterey Ranger District, Los Padres National Forest. Little information is available on the ecology or population biology of this species. Population trends in the late 1990s appeared to be stable according to the Forest Service. Abundance estimates for each occurrence ranged from 50 to fewer than 1,000 individual plants. Updated surveys and a management plan are needed.

According to the Forest Service, Butterworth's buckwheat has low vulnerability on National Forest System lands and the primary threat to the species is from foot traffic on trails or high visitor use areas near populations. Such populations could be monitored and, if these populations appear to be in decline, measures such as signage, visitor education, or restrictions to visitor access could be implemented.

Conejo buckwheat

Eriogonum crocatum

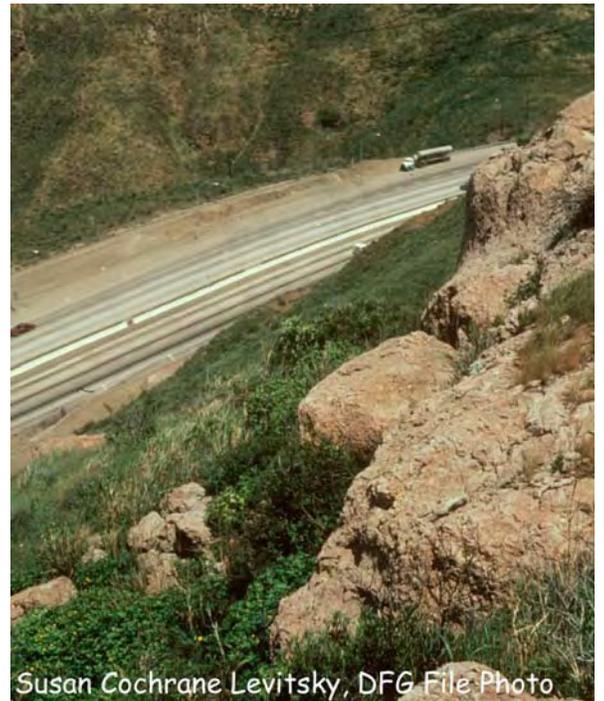
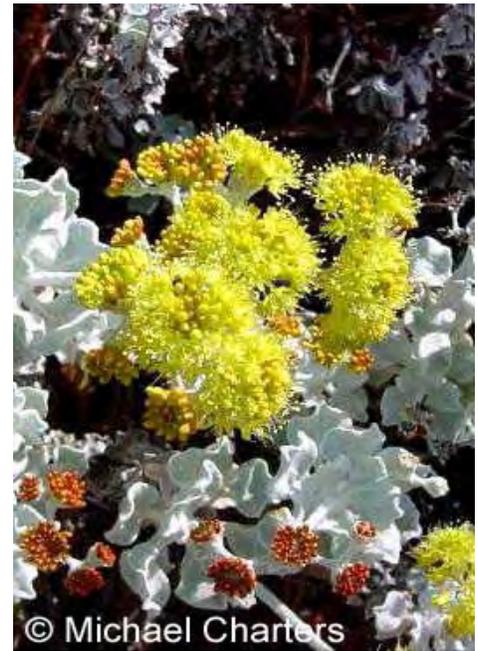
State: Rare 1979
Federal: None

General Habitat:

Conejo buckwheat is found on dry slopes of volcanic rock within coastal sage scrub and chaparral plant communities. The coastal sage scrub is dominated by California sagebrush, California buckwheat, giant coreopsis, and purple sage. It is associated with the federally-listed Threatened Verity's dudleya on Conejo Mountain. Conejo buckwheat is endemic to Ventura County.

Description:

Conejo buckwheat, a member of the buckwheat family (Polygonaceae), is a short, loosely branched, woolly perennial with bright sulfur-yellow flowers.

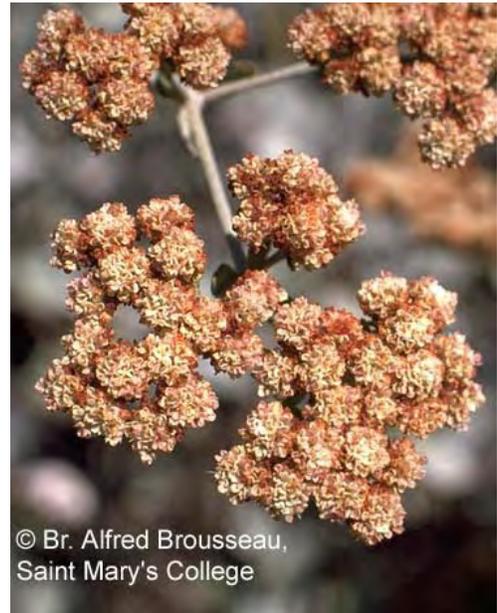


Status:

About a dozen occurrences of this species are known; these are restricted to Conejo Grade and Long Grade of the Santa Monica Mountains in Ventura County. Most are very small and on private lands. Threats include residential development in the area, rock quarrying, and trampling by hikers.

**Santa Barbara
Island buckwheat**

Eriogonum giganteum
var. compactum



State: Rare 1979
Federal: None

General Habitat:

It grows on rocky sea bluffs and within the coastal grasslands on Santa Barbara Island and Sutil Island in Channel Islands National Park.

Description:

Santa Barbara Island buckwheat is a rounded, shrubby, white-woolly perennial in the buckwheat family (Polygonaceae) with stout flowering stems and small white flowers in a dense, horizontal flower stalk.



Status:

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

In the past, grazing by goats and rabbits, soil erosion caused by these animals, and plant collecting seriously threatened Santa Barbara Island buckwheat. Shortly after acquiring Santa Barbara Island, NPS eliminated the introduced exotic herbivores and, as a result, the native vegetation is recovering. NPS supported a monitoring program, funded in part by a federal Section 6 Grant from USFWS, which was conducted from 1985 to 1989. During this period, nine of 11 sites were monitored. Numbers of individuals increased at some sites and decreased at others, with the total population at nine sites estimated to be fewer than 4,000 individuals. Current information on these populations is needed.

Santa Barbara Island buckwheat is grown at Santa Barbara Botanic Garden as part of their Island Display.

**San Nicolas Island
buckwheat**

Eriogonum grande
var. timorum



State: Endangered 1979
Federal: None

General Habitat:

This subspecies is endemic to the east and southeastern slopes of San Nicolas Island, one of California's Channel Islands. Plants are found in a variety of habitats, including exposed sandstone ridgetops and slopes, coastal flats, and sandy canyon walls and bottoms.

Description:

San Nicolas Island buckwheat is a short, white-woolly perennial with a woody base, wavy or curled leaves, and clusters of white flowers. It is in the buckwheat family (Polygonaceae).

Status:

Sheep ranching practices at the turn of the century diminished many native species, including San Nicolas Island buckwheat, and encouraged the spread of invasive nonnative species. The U.S. Navy has owned the island since 1933, and has conducted operations and construction projects that have modified the island's vegetation over the years. Currently, the Navy's Environmental Division reviews all land use plans and activities that may affect sensitive species. Surveys were conducted in 1992 to determine the distribution, habitat preference and population status of this species. Regular removal of introduced species of buckwheat is done to prevent potential hybridization with San Nicolas Island buckwheat.

No current information is available on the status of San Nicolas Island buckwheat.

Kellogg's buckwheat

Eriogonum kelloggii

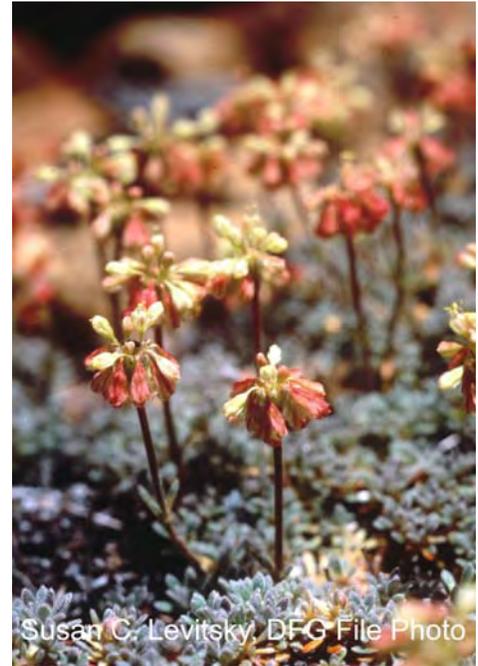
State: Endangered 1982
Federal:

General Habitat:

This species is known only from the Red Mountain and Little Red Mountain areas of Mendocino County. It occurs on serpentine soil found in open rocky areas in chaparral and montane coniferous forest. It is associated with McDonald's rock cress, a State and federally-listed Endangered species, Red Mountain campion, and Eastwood's sedum.

Description:

Kellogg's buckwheat, a member of the buckwheat family (Polygonaceae), is a low, spreading, loosely-matted perennial, with short, erect inflorescences bearing white flowers with reddish midribs.



Status:

Kellogg's buckwheat is known from five occurrences. Much of Red Mountain is administered by BLM, but because of chromium and nickel deposits, extensive mining claims exist. Although the region has been recognized by BLM as an Area of Critical Environmental Concern, it remains open to mining and the rare plants are unprotected. Further studies are being conducted to determine the location and size of existing Kellogg's buckwheat colonies and their associates on Red Mountain serpentines. Populations of this species occur on private land and on BLM land, and a small area of this species' habitat occurs within the DFG's Little Red Mountain Ecological Reserve.

**Thorne's
buckwheat**

Eriogonum thornei

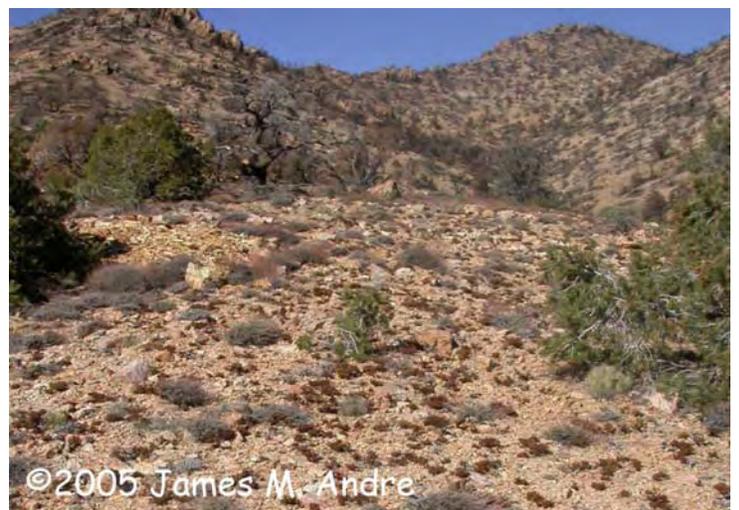
State: Endangered 1979
Federal: None

General Habitat:

Thorne's buckwheat is found in pinyon-juniper woodland in two canyons in the New York Mountains of the eastern Mojave Desert in San Bernardino County. It grows on sandy loam soil derived from weathered quartz monzonite that is high in copper. It is associated with Wright's buckwheat, cory cactus, pinyon pine, Utah juniper, and banana yucca.

Description:

Thorne's buckwheat, a low spreading subshrub in the buckwheat family (Polygonaceae), has leaves that are felty below and soft-shaggy above, and bears white to pink flowers in a compact flower stalk.



Status:

Thorne's buckwheat is known from one site in the Fourth of July Canyon in the New York Mountains of eastern San Bernardino County. Although it has been reported from a second site, this location has not been verified in the field. Fourth of July Canyon is within the Mojave National Preserve. Past mining activities negatively impacted Thorne's buckwheat, and because mining claims exist in the species' habitat, there is potential for renewed mining activity which could threaten this plant. BLM has withdrawn the area from future mining claims. Originally listed as

Eriogonum ericifolium var. *thornei*, current taxonomic treatment elevates var. *thornei* to species level as *Eriogonum thornei*. Data from collections of *Eriogonum thornei* outside of California indicate that it found on limestone and volcanic gravels; however, California plants grow on soils derived from weathered granite. Information on the natural history of the species is needed to accurately determine its taxonomic classification and habitat, as well as its current status.

**Twisselmann's
buckwheat**

*Eriogonum
twisselmannii*

State: Rare 1982
Federal: None

General Habitat:

Twisselmann's buckwheat is endemic to Slate Mountain and The Needles in Sequoia National Forest. This species grows on open, granitic outcrops in the montane conifer forest of the southern Sierra Nevada. It is associated with pinemat manzanita, Newberry's penstemon, and Sierra onion.

Description:

Twisselmann's buckwheat, a member of the buckwheat family (Polygonaceae), is low, spreading, loosely-matted, woody perennial. Leaves are in rosettes at the base of the flowering stems. Pale yellow flowers, borne in head-like clusters, are produced from June to September.



James Shevock, DFG File Photo



Larry Norris, DFG File Photo

Status:

Twisselmann's buckwheat is known from 13 occurrences, all located on USFS land. The species is a FWS Plant Species of Concern. There are no known threats to this species due to its remote location.

Congdon's woolly sunflower

*Eriophyllum
congdonii*

State: Rare 1982
Federal: None

General Habitat:

Congdon's woolly sunflower occurs on in cracks of metamorphic rock outcrops, scree, and talus within chaparral and oak woodlands of the Merced River Canyon in Mariposa County. It is associated with Yosemite onion and Congdon's lewisia, two listed species, as well as jewel flower, goldfields, and common woolly sunflower.

Description:

Congdon's woolly sunflower is an erect, freely branched annual with heads of yellow flowers and gray foliage covered with dense hairs. It is in the sunflower family (Asteraceae)



Status:

Congdon's woolly sunflower is known from 14 occurrences in Sierra and Stanislaus National Forests and in Yosemite National Park. The occurrences are primarily in inaccessible areas or in areas managed for dispersed recreation. Trail construction, road maintenance, mining, and salvage logging operations could constitute threats to this species. Congdon's woolly sunflower is a FWS Plant Species of Concern.

San Mateo woolly sunflower

Eriophyllum latilobum

State: Endangered 1992
Federal: Endangered 1995

General Habitat:

San Mateo woolly sunflower occurs in shaded conditions in the understory of coast live oak woodland. Overstory species include coast live oak, buckeye, and California bay. Understory associates are foothill needlegrass, white fairy lanterns, and golden yarrow.

Description:

San Mateo woolly sunflower is a bushy perennial of the aster family (Asteraceae) with leafy stems 12 to 16 inches high. The upper surfaces of the deeply three-cleft leaves are a smooth dark green and the lower surfaces are covered with densely interwoven white hairs. The golden flower heads, which bloom in May and June, are borne in loose clusters.

Status:

San Mateo woolly sunflower is a highly restricted endemic whose distribution is limited to one occurrence of several hundred individuals in the Crystal Springs area of San Mateo County.

San Mateo woolly sunflower is threatened by many factors. Dumping of garden debris and downhill seepage of pesticides from homeowners living above the population may have a negative impact. The plant also is threatened by competition with nonnative plants. The steep slopes along Crystal Springs Road provide a very unstable habitat for San Mateo woolly sunflower. The slopes are subject to erosion and soil slippage. After soil slippage occurs, road maintenance crews remove the slumped soil, which may contain mature individuals, seedlings, and/or seeds. The road cut is then reshaped, which may damage plants remaining on the banks. In 2002, utility corridor maintenance crews sprayed and killed a significant portion of one of six remaining subpopulations of San Mateo woolly sunflower located along a sewer line easement in San Francisco Watershed lands. That population is recovering although invasive weeds now form a dense cover in disturbed areas. Remediation is ongoing.

Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.



**San Diego
button-celery**

Eryngium aristulatum
var. parishii



State: Endangered 1979
Federal: Endangered 1993

General Habitat:

This species is restricted in California to vernal pools and vernal moist areas in San Diego and Riverside counties; it is also known from Baja California Norte. Associated State-listed species include San Diego mesa mint, California Orcutt grass, and Otay mesa mint.

Description:

San Diego button-celery, a member of the carrot family (Apiaceae), is an herbaceous perennial with heads of greenish flowers and spine-tipped bract margins at the base of the flower stalk.



Status:

San Diego button-celery was known from almost 80 occurrences; however, fewer than half are still in existence. Loss of habitat due to development, construction activities, and recreational use, are the principal threats to this species. Land ownership is under the Department of Defense, San Diego County, the City of San Diego, TNC, CALTRANS, and other private landowners. Protection measures for San Diego button-celery are provided in the USFWS's Recovery Plan for Vernal Pools of Southern California, released in 1998. Additional protection may be afforded this species through protection of pools that support species of fairy shrimp. The San Diego National Wildlife Refuge Vernal Pools Unit provides habitat for several listed species including the San Diego mesa mint, San Diego button celery, and California Orcutt grass, as well as two species of vernal pool fairy shrimp.

The pools at Marine Corps Air Station Miramar, California, which represent 80% of the remaining pools in San Diego County, support San Diego mesa mint, San Diego button celery, and the San Diego fairy shrimp. While under Navy ownership, Navy resource managers and local scientists used aerial photographs and field inspections to identify sites at Miramar where vernal pools once existed but had been damaged before the Navy bought the land. Thirty-three of the pools were then restored, by carefully excavating fill material without damaging the hard clay underneath. Seeds, soil, and other fill material were then added to the restored pools. The soils, which had been collected from vernal pools in an off-base area that was about to be developed, held seeds from the mesa mint and button celery, as well as eggs from the fairy shrimp. Both seeds and eggs often lie dormant for months or even years awaiting the next rainfall. This successful project added significant vernal pool habitat without impacting the military mission.

This species is included in the Multiple Species Conservation Program (MSCP) of southern San Diego County. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental

groups. San Diego button celery is considered to be a narrow endemic species and 82 percent of the major populations are covered under the MSCP. There are also important populations that are found on military installations throughout the county. The City of San Diego prepared a Subarea Plan under the MSCP to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. Management directives for this species require specific measures to maintain and increase populations, reduce or eliminate threats to the species, and address ecological relationships of the species.

San Diego button celery is one of several vernal pool species targeted for conservation on Del Mar Mesa. Del Mar Mesa has been the subject of biological study for many years, particularly the unique type of vernal pools that are found there. Unlike other vernal pools in San Diego County, those on Del Mar Mesa Preserve are almost exclusively found within chaparral habitats, versus other pools that may occur in coastal sage scrub or grasslands. Numerous vernal pools occur on Del Mar mesa. Vernal pools located away from existing roads and trails in the chaparral vegetation are the least disturbed or weedy. A portion of the vernal pools on Del Mar mesa have been damaged by road grading, off-road vehicle traffic, and creation of new trails by mountain bikes riders. Levels of damage to the pools range from pools that are undisturbed relatively to pools that have been nearly eliminated by past road grading and associated vehicle traffic. Pools that have been the most severely impacted are located in and adjacent to roads and unauthorized trails through the DFG vernal pool preserve area and along the graded access roads west of the preserve. In some cases vernal pools along the graded roads have been bisected and formerly contiguous sections of pools are now divided by the access road. The DFG owns 81 acres within the Preserve.

A detailed vernal pool restoration and enhancement plan is outlined in the Subarea Plan. Enhancement would involve restoring the natural hydrology to disturbed pools, removal of exotic plants, and the reintroduction of plant propagules for the button celery, San Diego mesa mint, and spreading navarretia. San Diego button-celery is one of the few perennial species found in vernal pools. While the plant can reproduce clonally, it relies largely on seed germination for successful reproduction. If restored pools have the hydrologic conditions suitable for the San Diego fairy shrimp, seed for vernal pool plants could also be introduced. The Del Mar Mesa Preserve was established to protect the sensitive biological resources in the area. A management plan was developed for the Preserve in accordance with the MSCP and the Subarea Plan. The population on Del Mar Mesa is likely subject to edge effects such as vehicular and recreational activity, road grading, and weed invasion. Protection will include directing all activities to less sensitive areas when possible. Seed collected from button-celery plants in the Del Mar Mesa Preserve would be used to inoculate restored vernal pools.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 17% of habitat suitable for San Diego thorn-mint burned during the fires. Eleven vernal pool complexes burned in the Cedar Fire and two complexes burned in the Otay Fire. Twenty-four pools or swales that supported San Diego button celery were impacted. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on Marine Corps Air Station Miramar, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on San Diego button celery.

This species is included in the San Diego Multiple Habitat Conservation Program NCCP, as well as the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border. San Diego button-celery is also included in the Western Riverside MSHCP where four vernal pools on the Santa Rosa Plateau support the button-celery. Within western Riverside County, San Diego button-celery is known only from four populations on the Santa Rosa Plateau within the Santa Rosa Plateau Preserve. Two populations are on Mesa de Colorado, and two are on Mesa de Burro. The populations contain fewer than 1,000 individuals. The known populations and the watersheds in which the vernal pools occur will be conserved under the Western Riverside MSHCP. Additional populations are not expected to be found in the planning area.

Loch Lomond *Eryngium constancei*
button-celery

State: Endangered 1987
Federal: Endangered 1986

General Habitat:

Loch Lomond button-celery is endemic to Lake and Sonoma Counties and is restricted to vernal pools. At Loch Lomond, the vernal pool is surrounded by ponderosa pine and black oak. Vernal pools associates include Bogg's Lake hedge hyssop, two listed species of navarretia, quillwort, and downingia.

Description:

Loch Lomond button-celery, also known as Loch Lomond coyote-thistle, is a perennial herb of the carrot family (Apiaceae). It annually produces slender, weak, leafless flowering stalks up to 12 inches in height from its over-wintering rootstock. The basal leaves range from 4 to 8 inches in length. Slender petioles (the stalk that connects the leaf to the rest of the plant), 3 to 5 inches in length and usually longer than the leaf blade, bear diminutive spines. A dense "down" of minute hairs, unique to this species, covers the leaves and especially the stalks. This character together with the species' sparse flowers, which bloom from April to June, distinguish it from its closest relative, *Eryngium aristulatum* var. *aristulatum*, and all other species of western North American *Eryngium*.

Status:

Loch Lomond button-celery is known from three occurrences in Lake and Sonoma Counties. One occurrence is in the DFG's Loch Lomond Ecological Reserve in Lake County. Loch Lomond coyote-thistle grows abundantly within the borders of the meadow-like bed of the Loch Lomond Lake. The occurrence covers approximately 6 acres, at an elevation 2,800 feet. Cabins and State Route 175 largely encircle the southern and eastern sides of the lake bed. The pool has been fenced to prevent OHV access. Another population of Loch Lomond button-celery was discovered in 1996 in two spring-fed, shallow pools in Sonoma County. A berm has been built to prevent runoff into the pools at this location from increased sedimentation due to logging in the area. A third population was discovered in Lake County in 1997. This population was threatened by soil erosion into its pool habitat due to vegetation removal along the edges; it is also risk from planned reservoir construction. This species continues to be threatened by habitat conversion in the watershed, for example, to vineyards.



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Delta button-celery

*Eryngium
racemosum*

State: Endangered 1981
Federal: None

General Habitat:

Delta button-celery occurs on heavy clay to silty soils in seasonally flooded flood plains and swales. It is associated with spikerush, salt grass, lippia, and cocklebur.



Description:

Delta button-celery, a member of the carrot family (Apiaceae), is a slender, prostrate herb with greenish, rounded flower heads.



Status:

Delta button-celery is reported from 28 occurrences, seven of which are historic or likely extirpated. The historical distribution of Delta button-celery includes Calaveras, Merced, Stanislaus, and San Joaquin counties. Known populations occur on private land, USFWS National Wildlife Refuges, and the DFG's North Grasslands and Los Baños Wildlife Areas. Delta button-celery is adapted to seasonal inundation of its habitat. Prolonged inundation during the spring and summer will adversely affect this species. The species is also threatened by grazing, channel maintenance activities, and dredging.

Delta button-celery occurrences have been extirpated by flood control activities and conversion of lowlands to agriculture, including all of the occurrences in San Joaquin County and most in Stanislaus County. Most of this species' remaining occurrences are in Contra Costa, Calaveras, and Merced County. In Merced County, it occurs along the historical floodplain of the San Joaquin River. Friant Dam on the San Joaquin River and an extensive levee system have greatly reduced the frequency and intensity of flooding of Delta button-celery's floodplain habitat.

Surveys for Delta button-celery were conducted during the planning phases for the U.C. Merced campus. Very little potentially suitable habitat was found in the regional study area. Areas of potential habitat could exist along the margins of the Merced River and Chowchilla Rivers, as well as along some of the larger creeks, leaking irrigation canals, and stock ponds. Delta button-celery has been recorded from the vicinity of Turlock Lake Reservoir immediately to the north of the campus area in southeastern Stanislaus County and further surveys are warranted.

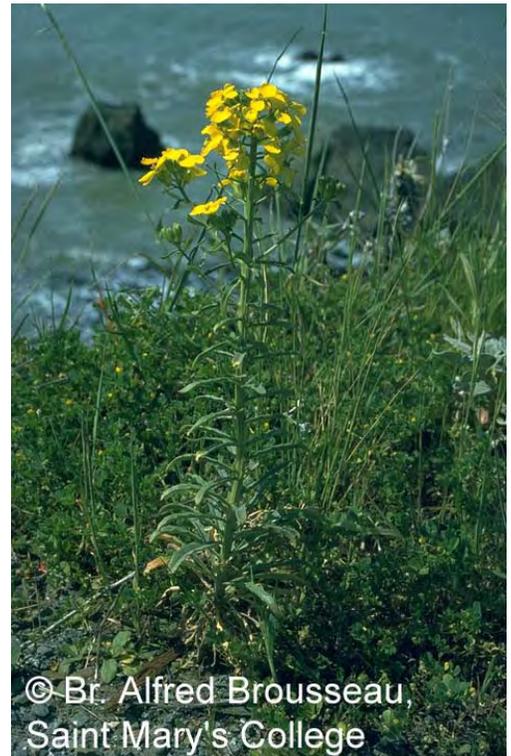
The species is addressed in the Merced River Corridor Restoration Plan.

Contra Costa wallflower *Erysimum capitatum* var.
angustatum

State: Endangered 1978
Federal: Endangered 1978

General Habitat:

Contra Costa wallflower occurs in loose sand in semi-stabilized dunes and on clay lenses along the San Joaquin River near Antioch in Contra Costa County and at Brannan Island State Recreation Area. Its habitat at the Antioch Dunes constitutes a remnant of a unique dune system. Vegetation consists of scattered native herbaceous plants and grasses on the dunes. Common native plants in the dunes include elegant clarkia, California poppy, California croton, gumplant, deerweed, California matchweed, and silver bush lupine. The Antioch Dunes evening primrose, an Endangered species, occurs here as well. Many of the plants that comprise the unique stand have desert affinities.



Description:

Contra Costa wallflower is an erect, coarse-stemmed, biennial herb in the mustard family (Brassicaceae). Plants grow from a somewhat woody base that typically elongates into multiple branched stems 8-32 inches tall in mature plants. The elongated woody base distinguishes this subspecies of *E. capitatum* from related subspecies. The lower leaves are lance-like to linear, up to 6 inches long and nearly half an inch wide, with minute teeth. Leaves taper to a petiole at base. Yellow four-petaled flowers, which bloom from March to July of the second year, resemble those of garden wallflowers. The slender pod-like fruit (silique) is dry when ripe and up to 4 inches long.

Status:

The Contra Costa wallflower is restricted two populations, one at the Antioch Dunes National Wildlife Refuge (Refuge) and the other on adjoining PG&E and Kemwater properties. The historic range of the species is not known. The Refuge, which consists of 55 acres of stabilized sand dunes, was established in 1980. Along with the adjacent 12 acres of Pacific Gas and Electric Company (PG&E) land, the site is a relict of what was once a larger dune system that hosted a unique assemblage of plants, insects, and reptiles. The Refuge provides protection and critical habitat for three endangered species: Lange's metalmark butterfly (*Apodemia mormo langei*), Contra Costa wallflower, and Antioch Dunes evening-primrose. The Final Comprehensive Conservation Plan for the Antioch Dunes National Wildlife Refuge was released by the USFWS in 2002. The USFWS recovery plan for this species calls for enhancement of existing populations of Contra Costa wallflower and establishment of new populations within its historic range.

Little is known about the reproductive phenology of the wallflower. Germination may occur in October, and leafing from October through December. Budding occurs in February, while flowering begins in March, peaking in April or May. Fruiting begins in April and peaks in July. Seeds are dispersed by wind, beginning in mid-May and peaking in September. A variety of different insect species have been observed visiting the plant

and carrying pollen away with them. Unlike other members of the Mustard Family, which are typically pollinated by specialized insects, the wallflower does not require a specific pollinator.

Research on the Antioch Dunes populations had determined that seed production can be substantially reduced by environmental limitations such as low pollination rates and seed predation by insects. This species retains a large seed bank in the soil and shows some ability to grow on the clay substrate that remains in areas where overlying sand has been stripped away. However, an attempt to experimentally establish plants on this clay substrate was unsuccessful.

Although current populations of wallflower at the Refuge seem to be concentrated on steep, north-facing slopes by the river, wallflower at one time grew on flat terrain in an excavated area within the dunes on the Kemwater property. There are individual plants growing 160 to 660 feet away from the river bank in a flat hard pan area of the Refuge. In these areas the hard pan has been broken and the loose, sandy soil below has been exposed. A large stand of wallflower is found on the East PG&E parcel adjacent to the Refuge. This stand is atop and over a ledge leading down to the San Joaquin River. Although their population is now self-sustaining, overall, the wallflower appears to be more physically restricted within the dunes than the primrose.

In 1999, the population peaked at 11,567 individuals, the greatest number of wallflowers ever counted on the Refuge. It is possible that the increase in the number of mature plants was due to the influence of El Niño during the winter of 1997-98. Seeds that germinated that winter would have reached reproductive maturity in 1999 and germination or survival may have been higher than normal as a result of increased rainfall. About 1000 plants were observed in 2000. Population survey results indicate that the total number of mature plants is highly variable year to year.

Historically, many factors have contributed to the decline of these species, including OHV use, development, and sand mining of the dunes. Currently the primary threat to these species is the stabilization of the dunes and the encroachment of non-native vegetation such as rip-gut brome grass, yellow starthistle, and vetch.

The wallflower is grown at the Botanic Garden at Tilden Regional Park.

Menzies' wallflower *Erysimum menziesii*

State: Endangered 1984
Federal: Endangered 1992

General Habitat:

Menzies' wallflower is found in coastal strand, coastal dunes, central dune scrub, and northern dune scrub on loose sand lacking in organic matter and minerals. Habitat also occurs in recent bluff scrub, and open, sparsely vegetated dunes. The species has high exposure to strong wind, salt spray, and occasional wave action from storms and high tides. Associated species include beach primrose, beach morning-glory, beach-bur, and yellow sand verbena. Iceplant is also associated with the Monterey populations.

Description:

Menzies' wallflower is a biennial or perennial herb in the Mustard Family (Brassicaceae). Flowers are fragrant and pale to bright yellow. Each plant usually has several flowering stems from 1-6 inches tall. The fleshy leaves form a basal rosette and are somewhat spoon-shaped and abruptly narrow to the leaf stalk. The fruit consists of very long, narrow pods, 1-5 inches long.



Yadon's wallflower



Humboldt Bay wallflower



Menzies' wallflower

Status:

When first listed, Menzies' wallflower was treated as a single species distributed in coastal dune systems from Monterey County to Oregon. Research has shown that this species is a complex, comprised of four subspecies, three of which are rare. The three rare subspecies (ssp. *menziesii*, ssp. *eurekaense*, and ssp. *yadonii*) are endemic to three counties in northern California and are known from sixteen populations consisting of 33,300 individuals. The fourth subspecies, cream-colored wallflower (ssp. *concinnum*), is not listed; its distribution extends from southern Oregon to Point Reyes in Mendocino County into southern Oregon. These subspecies are primarily differentiated by geographic location.

Menzie's wallflower is distinguished by flower stalks that are 1.2-3.5 inches long and the longest fruits are usually less 3.1 inches, whereas **Humboldt Bay wallflower** has flower stalks that are 0.4-0.6 inch long, and the longest fruits are usually greater than 3.1 inches in length. The leaves of Menzies' wallflower are generally lobed or irregularly toothed and the flowers are rich yellow. **Yadon's wallflower** differs from the other subspecies because it blooms in summer (June-August), whereas the other subspecies bloom in winter or spring, and tends to be perennial with a branched caudex. **Cream-colored wallflower** can be distinguished from *Erysimum menziesii* ssp. *eurekaense* by its sharply toothed and fleshy leaves.

Menzies' wallflower (*Erysimum menziesii* ssp. *menziesii*) is located in Monterey and Mendocino Counties where it is found in coastal strand, coastal dunes, central dune scrub, and northern dune scrub. In Monterey, the species occurs on coastal strand, close to the high tide line, but protected from wave action. Habitat also occurs in recent bluff scrub, and open, sparsely vegetated dunes. The species has high exposure to strong wind, salt spray, and occasional wave action from storms and high tides. The substrate is loose sand lacking in organic matter and minerals.

Menzies' wallflower occurs in ten isolated populations along the Monterey Peninsula from Pt. Piños to Cypress Pt. Extant Monterey County populations have recorded occurrences in Pacific Grove, Asilomar State Park, Spyglass Hill, Pt. Piños Lighthouse, Signal Hill Road, Bird Rock Road (east of 17 Mile Drive) and Spanish Bay Golf Course. The Mendocino County populations range from Ten Mile River south to Ft. Bragg. Many of the populations are found at MacKerricher State Park. The largest recorded population of 1,426 acres occurs at the Ten Mile River site in Mendocino County. The MacKerricher State Park Ten Mile Dunes Restoration Plan has been completed. Menzies' wallflower was revegetated after an archaeological dig that took place in the park.

Yadon's wallflower (*Erysimum menziesii* ssp. *yadonii*) is restricted to four populations in the vicinity of the Marina Dunes near Salinas River in Monterey County. The flower petals are rich yellow. This subspecies occurs in coastal dunes, foredunes, and coastal strand.

Protection of Menzies' and Yadon's wallflower populations in Monterey County is afforded by land use planning policies. The Monterey County LUP has established policies allowing for only resource-dependent uses within habitats known to support rare and endangered species. The LUP also recognizes dune habitat, in general, as an environmentally sensitive habitat, with or without rare and endangered species. Resource-dependent uses are allowed within environmentally sensitive habitat if such uses will not cause significant disruption of habitat values. For proposed land divisions or developments, the County requires the protection of environmentally sensitive habitat through deed restrictions or dedications of permanent conservation easements.

For populations on lands in the Cities of Marina and Pacific Grove, LUPs provide for the protection and restoration of native dune habitat and vegetation and the habitat of recognized rare and endangered species. The City's policies specify that primary habitat areas for sensitive species be protected and preserved. Development within secondary or support habitat areas is allowed, so long as it does not significantly impact primary habitat areas. Where development is proposed on parcels containing rare and endangered species, parcel owners are required to develop and execute a management plan which will protect the identified plant species. Populations within the dune system at the former Ft. Ord and will be addressed under re-use plans for this facility.

Many comprehensive studies have been completed for The Marina Dunes of Monterey County. The DPR conducted a population enhancement project at Marina and Asilomar State Beaches in Monterey County during a period from July 1985 through July 1988. Habitat restoration for Yadon's wallflower at Marina State Beach has resulted in an increase from less than 100 plants in 1985 to over 7,000 in 1994 (the last year for which numbers are available), and habitat restoration is continuing. DPR also has a Management and Recovery Plan for Asilomar State Park. In 1986, there were 200 Menzies' wallflower plants at Asilomar, and in 1998, there were over 8,000 due to habitat restoration and protection activities. Habitat protection measures such as boardwalks, fences, and signs

have been implemented at Marina State Beach and Asilomar State Park to reduce recreational use. The Pebble Beach Company has established endangered species management areas where Menzies wallflower establishment experiments are being monitored at Spanish Bay.

Humboldt Bay wallflower (*ssp. eurekaense*) occurs on coastal dunes and foredunes around Humboldt Bay in Humboldt County. It grows on flanks or crests of dunes, open sand areas, sparsely vegetated dunes, and the borders of lupine scrub. The species can tolerate some sand movement. The associated vegetation community is composed of low-growing shrubby and herbaceous species. Common associate species are beach sagewort, dune goldenrod, coast buckwheat, yellow sand verbena, beach pea, and seashore bluegrass. This subspecies is distinguished from the other subspecies due by its more dentate leaves, longer stems, and longer narrower fruits. The leaves are not as fleshy as those of Menzies' wallflower and the flowers are light yellow.

Five occurrences are recorded from the Lanphere-Christensen Dunes Preserve, northwest of Mad River Slough, north of Manila (Samoa Peninsula), U.S. Coast Guard Station (Samoa Peninsula), and the South Spit (Humboldt Bay). The subspecies has also been mapped as occurring in 12 stands in three subpopulations on the Samoa Peninsula. The Humboldt Bay wallflower population at The Nature Conservancy Lanphere-Christensen Dunes Preserve is managed by controlling yellow bush-lupine and European beachgrass. An EPA-mandated study (the Menzies Wallflower Research Program) funded by Louisiana-Pacific Corp. and Simpson Timber Co., administered by Humboldt State University and implemented cooperatively with TNC, has resulted in the development of habitat management measures that include removal of non-native plants, restoration, and habitat protection activities. A National Sciences Foundation project implemented by Michigan State University and TNC focused on the demographics and genetics of the subspecies. The County and City of Eureka have several policies relating to the protection of sensitive resources.

The Humboldt County Local Coastal Program prohibits vehicles above the wave slope except in the Samoa Dunes Recreational Area. Vehicles are allowed on privately-held lands in and around the City of Eureka and there has been only partial enforcement of the local ordinance, and ORVs continue to have an impact. The County has recently adopted a management plan for the north and south spits of Humboldt Bay; the north spit area supports the two listed species. The plan designates certain areas for vehicular access on the beach and dunes as well as vehicle-free zones. This plan addresses access on public lands as well as access to/from adjacent BLM lands (Samoa and Manila dunes), private lands and the Lanphere-Christensen Dunes Preserve. The plan recommends management actions to restore degraded dune habitat areas, including removal of invasive, non-native plant species, fencing of rare plant habitat areas and limiting public access, however, the recommendations of the plan remain unfunded. Recovery objectives for these species will require the prevention of habitat loss and degradation through the implementation of these codes and ordinances.

The Eureka Dunes Protected Area, an 80-acre site on the North Spit of Humboldt Bay, is owned by the city of Eureka and managed by TNC. The development of the Eureka Dunes Habitat Mitigation Bank Phase II Enhancement Plan was funded by the State Coastal Conservancy and developed by TNC. However, management has been limited to fencing sensitive habitat and protection from ORVs, while the site faces severe threats from exotic species invasions. The BLM has two small restoration projects to reduce the threat of lupine and beachgrass. They have fenced 37 acres of habitat on the Samoa Peninsula.

In 1998, USFWS analyzed the results of a survey conducted by TNC in 1997 of the plants (*E. m. ssp. eurekaense*) on the North Spit of Humboldt Bay. That population had increased 43% since 1988. The increase was not uniform, and some populations had declined during the 9-year period. An endemic fungus known as white crucifer rust, which infests Menzies' wallflower around Humboldt Bay, was seen to decrease over the 9-year period. A complete census of the North and South Spits will be conducted again in 2004. In 1998, a previously unknown population of approximately 500 plants was found on the Elk River spit in Humboldt County. OHV tracks and invasive species are present on the site. The population does not appear to be infected with white crucifer rust.

Santa Cruz wallflower

Erysimum teretifolium

State: Endangered 1981
Federal: Endangered 1994

General Habitat:

Ben Lomond wallflower is endemic to pockets of sandstone soils in Santa Cruz County. It is found in open areas referred to as "sand parklands" within northern maritime chaparral and maritime coast ponderosa pine forest. The best populations are found on ridgelines where underlying fossilized sand dollar beds inhibit the growth of all but herbaceous perennials and annuals. Ben Lomond wallflower is associated with other listed species: Ben Lomond spineflower, Zayante band-winged grasshopper, and Mount Hermon June beetle.

Description:

Ben Lomond wallflower is a short-lived perennial plant, or occasionally an annual, of the mustard family (Brassicaceae). Seedlings form a basal rosette of leaves which then wither as the main stem develops. Flowers are deep yellow and clustered in a terminal spike. Petals are 0.5 to 1.0 inch long. The fruit is a slender capsule, 4.0 inches in length and covered with three-parted hairs. Characteristics that separate this plant from other wallflowers include simple, narrowly linear leaves that have small marginal teeth and a purplish cast.

Status:

Historical and continuing threats to the Ben Lomond wallflower include the direct removal and fragmentation of habitat by sand quarrying, residential development, and recreational impacts. Fire suppression is also changing Ben Lomond wallflower's habitat in the sandhills by allowing the growth of other plant species that shade out the wallflower.

Ben Lomond wallflower is known from 17 populations in the vicinity of Ben Lomond, Scotts Valley, Felton, Bonny Doon, and Glenwood in Santa Cruz County. Only three populations are protected. One population occurs at Quail Hollow Ranch County Park, which is jointly owned by the County of Santa Cruz and the California Department of Fish and Game. The population near Bonny Doon is on the Bonny Doon Ecological Preserve owned by California Department of Fish and Game. One population is located near Olympia Quarry, operated by RMC Lonestar, is within a conservation easement. The remainder of populations are on private land. The majority of these populations have not been monitored for five to ten years.



Research is ongoing to investigate the relationship between the listed species and exotic annual plant species, all of which respond positively to disturbance. Under natural conditions, disturbance can enhance diversity by creating openings that favor the persistence of native species adapted to disturbance. However, colonization by non-native species directly and indirectly affects the distribution and survivorship on sensitive native plants. For example, in the absence of fire, ponderosa pine increases in cover to the exclusion of the wallflower and Ben Lomond spineflower.

An experiment testing the effects of shade, leaf litter, and proximity to trees on the germination, survivorship, growth, and reproduction of the endangered species indicated that leaf litter has an over-riding negative effect on the demographic success of both the spineflower and Ben Lomond wallflower. Fire enhanced native plant cover and the population growth of the two endangered plants directly by removing accumulated litter that inhibits establishment and survivorship. This experiment also showed that fire disproportionately reduced exotic plant cover and indirectly facilitated endangered plant performance. A separate experiment showed that small-scale soil disturbance such as trails and gopher activity, increased native plant cover and the demographic performance of the two endangered species by the same direct and indirect mechanisms.

In 1998, USFWS released a recovery plan on Santa Cruz wallflower and Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*), the two previously mentioned insect species, and Scotts Valley polygonum (*Polygonum hickmanii*). Specific recovery actions for Ben Lomond wallflower include: 1) a Habitat Conservation Plan with the County of Santa Cruz that minimizes disturbance from sand mining and residential development; 2) Development and implementation of management plans for State-owned units (Quail Hollow Ranch County Park and Bonny Doon Ecological Reserve); 3) Conduct research focusing on causes of reproductive failure and how to increase reproductive success; and 4) Manage for reduction of succession of woody species into occupied habitat. Current projects involving the wallflower include implementation of recovery strategies outlined in the recovery plan. Critical Habitat for the Zayante band-winged grasshopper was designated in 2002. The critical habitat designation also includes habitat for the Ben Lomond wallflower.

The Santa Cruz sandhills ecosystem is also the focus of an intensive, coordinated land acquisition program. Acquisition funds are provided by the federal government and property is purchased from willing sellers. Acquisition priorities are set by a consortium of state and federal agencies, local government representatives, conservation organizations, and local landowners. The goal is to acquire and consolidate acreage supporting the unique sandhills ecosystem.

Pine Hill flannelbush

*Fremontodendron
decumbens*

State: Rare 1979
Federal: Endangered 1996

General Habitat:

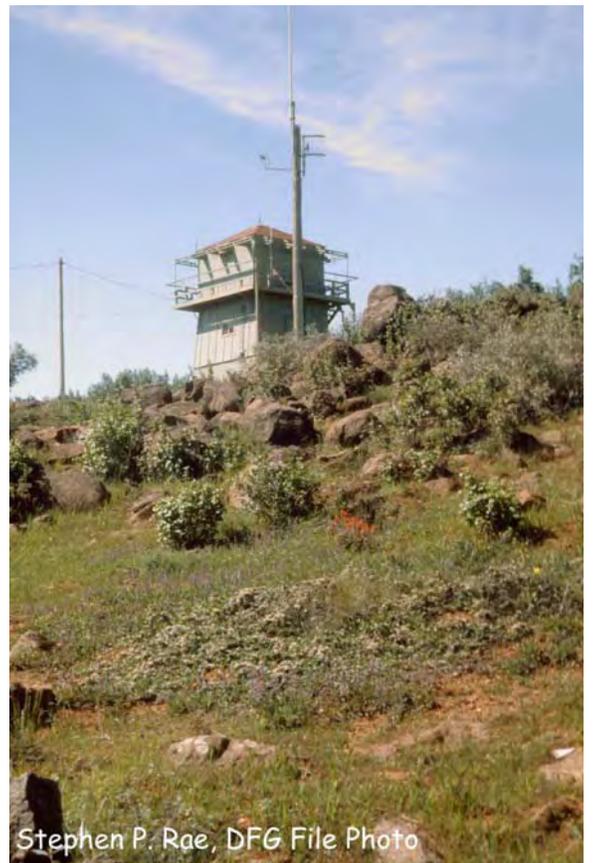
Pine Hill flannelbush grows on reddish clay soils derived from gabbro. It is found in chaparral and black oak woodland of Pine Hill and on a few Sierra Nevada foothill ridges within one mile of Pine Hill in El Dorado County. Three State and federally listed rare plants grow in the same general areas as this species: El Dorado bedstraw, Pine Hill ceanothus, and Layne's butterweed.

Description:

Fremontodendron californicum ssp. *decumbens* is a low-growing, many-branched, spreading shrub of the cacao family (Sterculiaceae) growing to 4 feet tall. Dense star-shaped hairs cover the leaves and the younger twigs and branchlets. Its leaves shallowly or deeply lobed. Pine Hill flannelbush produces flower buds in late winter. Showy copper-orange flowers appear from late April to early July.



Dan Burnmaster, DFG File Photo



Stephen P. Rae, DFG File Photo

Status:

Fremontodendron californicum ssp. *decumbens* only occurs in the central part of the Pine Hill formation within 1.25 kilometers (2 miles) of Pine Hill. Fire is needed to maintain habitat for this species. Preservation of the pollinating fauna (native solitary bees) and dispersal fauna (ants) is also important to the survival and recovery of *F. californicum* ssp. *decumbens*. The total population is estimated to comprise only 500 individuals. Habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance (all mainly due to

urbanization) are the major threats facing the gabbro soil plants. Proposed residential or commercial development within the Pine Hill formation threatens most of the remaining sites within the Pine Hill formation and adjacent serpentine in western El Dorado County,

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large of number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 acres have been preserved.

Pine Hill flannelbush is a shrub that persists through a fire cycle and requires fire for seed germination. It cannot establish seedlings without fire, and reproduction from seed is likely necessary to maintain genetic diversity and establish plants at new locations within the boundaries of the current populations. Recovery of the gabbro soil plants is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. A high priority recovery task for *Fremontodendron californicum* ssp. *decumbens* is the collection and banking of seed in Center for Plant Conservation certified botanic gardens. Assuming recovery criteria are met, *Fremontodendron californicum* ssp. *decumbens* could be downlisted after two natural fire cycles (approximately 60 years).

Mexican flannelbush

*Fremontodendron
mexicanum*

State: Rare 1982
Federal: Endangered 1998

General Habitat:

Mexican flannelbush occurs in southern mixed chaparral and Tecate cypress woodland in Cedar Canyon on Otay Mesa in San Diego County. It is usually scattered along dry canyon bottoms with sycamore and toyon.

Description:

Mexican flannelbush, a member of the cacao family (Sterculiaceae), is a stiff, robust, evergreen tree-like shrub with bright orange flowers. Leaves are lobed, the undersides covered with dense yellowish hairs. Mexican flannelbush is distinguished from California flannelbush by its orange sepals with basal pits that generally lacking long hairs, and shiny black, smooth seeds that lack outgrowths. It flowers between March and August.



Status:

Mexican flannelbush is known primarily from historic collections. Only two occurrences are extant. Its historic range includes Baja California Norte, Mexico. Occurrences of Mexican flannelbush are owned by BLM and private landowners. At the present time, there are no specific management plans for this species. This species is adapted to fire and resprouts from the base and the effects of fire on seed germination are not known. In 2003, the huge Otay Fire burned a large area of south-central San Diego County including Cedar Canyon where a large stand is located. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 60% of habitat suitable habitat for the flannelbush burned during the fire. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of Mexican flannelbush.

Mexican flannelbush is a showy plant that is used as a drought-tolerant ornamental shrub in gardens. It is often sold as a hybrid with California flannelbush ("California Glory") or Pine Hill flannelbush. Potential hybridization of horticultural stock with native Mexican flannelbush could adversely impact the species. Habitat loss and fragmentation and alteration of natural fire regimes are ongoing threats to this species.

Roderick's fritillary

*Fritillaria
roderickii*

State: Endangered 1979
Federal: None

General Habitat:

This showy wildflower is found in heavy clay soils in the oak woodland community near Boonville and in coastal prairies near sea bluffs south of Point Arena, Mendocino County. It is associated with checkerbloom, beach strawberry, iris, and gumplant.

Description:

Roderick's fritillary, a member of the lily family (Liliaceae), is a slender perennial that arises from a bulb, with narrow, basal leaves and nodding, greenish-brown to purplish-brown flowers.



Status:

Roderick's fritillary is known from approximately seven occurrences, one of which is believed to be extirpated. One is in the Boonville Cemetery, with approximately 340 plants at last count reported to the DFG (1992). One, near the coast and privately owned with a portion in a CALTRANS right-of-way, was partially destroyed during work to improve State Highway 1; some plants were transplanted in 1985 during construction. None of those plants survived. CALTRANS now works to avoid impacts to the plants within its right-of-way at this location. Another population, first reported in 1992 from private land and consisting of 1000 plants, had declined sharply by 1998. The DFG's most recent information for the majority of populations dates from the late 1980s and early 1990s. There are no management plans for the species. Threats to this species include bulb collecting, prolonged grazing, and habitat conversion. Current taxonomic treatments place *Fritillaria roderickii* as a synonym under *Fritillaria biflora*.

Striped adobe lily

Fritillaria striata

State: Threatened 1987
Federal: None

General Habitat:

Striped adobe lily grows on heavy clay soils in open annual grasslands and blue oak woodlands of the southern Sierra Nevada foothills of eastern Tulare and Kern counties. It is associated with montia, fiddleneck, blue dicks, and soap plant.

Description:

Striped adobe lily, a member of the lily family (Liliaceae), is a slender, bulbous perennial with fragrant, white to pink bell-shaped flowers with burgundy stripes.

Status:

At least 18 extant populations are known. The known populations are scattered throughout the range of the species. All populations occur on private land.

Conversion of habitat for agricultural uses has eliminated at least four populations of striped adobe lily. Expansion of citrus orchards threatens three populations at lower elevations on the slopes of Lewis Hill near Frazier Valley. Although heavy grazing has negatively impacted some populations, light grazing and avoidance during the flowering period appears to benefit the species. Road maintenance activities and urbanization threaten other populations. Striped adobe lily is protected in the Sierra Los Tulares Land Trust Lewis Hill Preserve near Porterville, Tulare County. San Joaquin adobe sunburst (*Pseudobahia peirsonii*), another listed species, also occurs within the preserve. Cattle grazing is used as a management tool on the preserve which is protected by a conservation easement.



Borrego bedstraw

*Galium
angustifolium
ssp. borregoense*

State: Rare 1979
Federal: None

General Habitat:

Borrego bedstraw is found primarily on north-facing steep walls and rocky slopes of canyons and on hillsides in Anza-Borrego Desert State Park in eastern San Diego County. Associate species include sugar bush, California buckwheat, white sage, staghorn cholla, agave, and California juniper.

Description:

Borrego bedstraw is a slender, low-growing perennial in the madder family (Rubiaceae) with wiry, square stems that are woody at the base and with a pyramidal cluster of yellowish flowers.

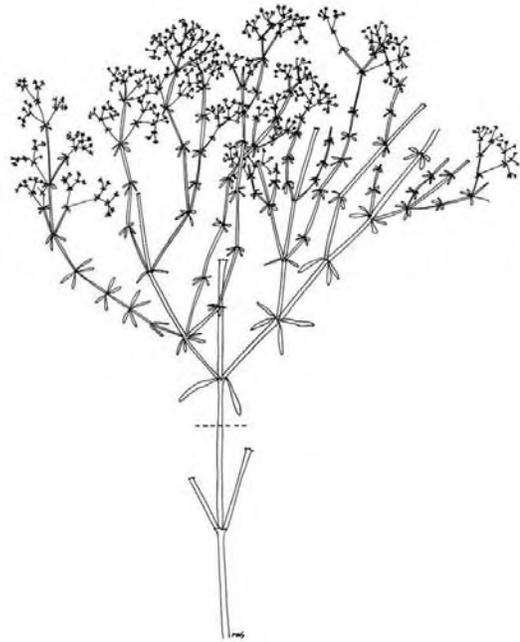


Illustration by Mary Ann Showers, DFG



© John Crossley
Culp Valley habitat. Image courtesy of John Crossley at <http://www.americansouthwest.net>

Status:

Surveys conducted in the spring of 1998 by the DPR as part of the preparation of a Resource Inventory for Anza-Borrego Desert State Park found Borrego bedstraw at 22 locations, primarily within the Culp Valley - Hellhole Canyon region, the Granite Mountain region, and the Pinyon Mountain area. Additional studies are needed to better understand the ecology and reproductive biology of Borrego bedstraw. Continued monitoring of the known populations would help provide information necessary for the development of a management strategy. Within Anza-Borrego Desert State Park, there are moderate threats to approximately one-third of the known populations from camping, hiking and vehicular activities. Although historical records are lacking, it is probable that this subspecies has always been rare. Habitat in which *Galium angustifolium* occurs is being threatened by foxtail chess, an invasive annual grass.

Box bedstraw

Galium buxifolium

State: Rare 1979

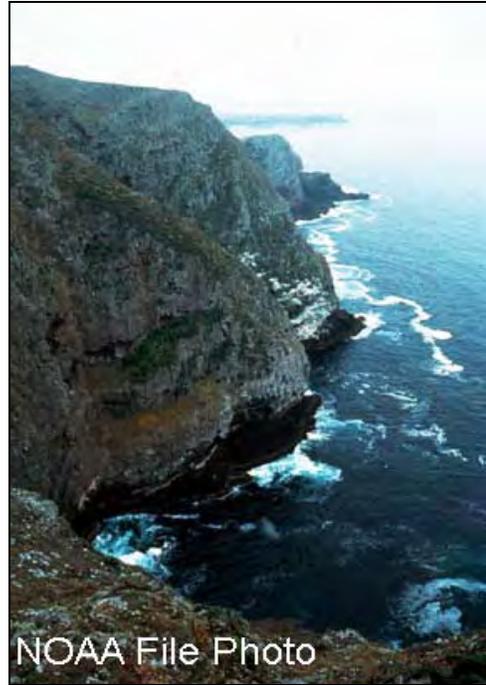
Federal: Endangered 1997

General Habitat:

Box bedstraw grows on north-facing, relatively moist rocky bluffs in coastal bluff scrub on San Miguel Island or in closed-cone pine forest plant communities on Santa Cruz Island. Associated species include island buckwheat, San Miguel Island locoweed, giant coreopsis, and bush monkeyflower.

Description:

A member of the madder family (Rubiaceae), box bedstraw is a rounded subshrub growing up to two feet tall, with numerous leafy branches. Its leaves have conspicuous lateral veins and hairs on the lower surface. Its small pale yellow flowers bloom from March to July, and its fruits are distinguished by a covering of tiny, upward-curving hairs.



Status:

Box bedstraw is endemic to the Channel Islands, found only on Santa Cruz and San Miguel islands. Santa Cruz Island is owned and managed by TNC and NPS. San Miguel Island is owned by the Navy and managed by NPS. Box bedstraw is known from ten occurrences on the two islands. The seven extant occurrences on Santa Cruz Island were last monitored in the 1980s. The largest of the populations had fewer than 50 plants. One occurrence has been extirpated. The two occurrences on San Miguel Island were monitored in 1998. At that time, the occurrences contained 300 and 121 individuals, respectively. Five historic locations on San Miguel Island were also surveyed by NPS in 1998, but no plants were found. These occurrences are presumed to be extirpated.

Current management of Santa Cruz Island is divided between TNC and NPS who coordinated to develop the Santa Cruz Island Primary Restoration Plan. This plan is designed to protect the unique natural and cultural resources of Santa Cruz Island and to initiate recovery of the island ecosystem. Eradication of feral pigs and control of fennel are two principal components of this plan. Elimination of feral pigs and the massive infestation of fennel are anticipated to create new sites that would be colonized by native species, including box bedstraw. The expansion of listed species into previously unoccupied habitat now dominated by weeds is one of the principal goals of the 2001 USFWS Recovery Plan for the Channel Island plants. Box bedstraw occurs adjacent to a fennel treatment area. The use of fire or herbicides in the control of fennel would be closely monitored to ensure that box bedstraw is not adversely affected.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed (*Senecio layneae*), and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve will be expanding around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements and if the program continues to receive support from local public agencies. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large number of species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*), which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 acres have been preserved.

It is hoped that easements can be obtained to protect: 1) a greater proportion of the bedstraw population on Pine Hill, 2) portions of two populations in the Cameron Park-Shingle Springs area, and 3) a population near the south fork of the American River, but the outcome of these efforts remains to be seen. A special preserve in the southern portion of the Pine Hill formation has been established to protect El Dorado bedstraw; planning of this 60-acre preserve has been complicated by uncertainty in precise species localities and the subdivision of the area into small parcels with various owners. The location of the preserve will be determined in the future pending confirmation of localities of the species and availability of willing sellers.

Recovery under the Recovery Plan is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. The response of El Dorado bedstraw to fire is not known at this time. A high priority recovery task for *Galium californicum* ssp. *sierrae* is the collection and banking of seed in Center for Plant Conservation-certified botanic gardens. Collections are prudent to guard against extinction of the species from chance catastrophic events and to provide potential material for enhancement efforts in existing populations, repatriations (returns to locations formerly occupied), and/or introductions to new sites. Directed surveys for *Galium californicum* ssp. *sierrae* will need to be conducted in the Cameron Park area to refine the location of the *Galium* specialty preserve, and northwest of Salmon Falls and at Martel Creek to verify historical or reported locations. Assuming recovery criteria are met, *Galium californicum* ssp. *sierrae* could be downlisted after 60 years.

**San Clemente
Island bedstraw**

Galium catalinense
ssp. acrispum

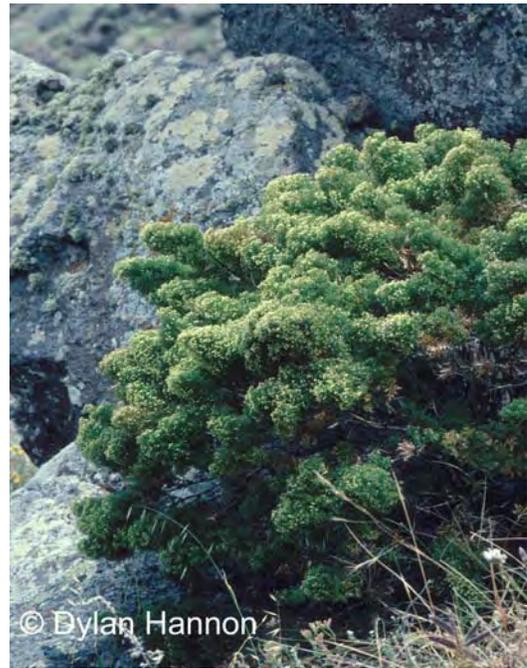
State: Endangered 1982
Federal: None

General Habitat:

San Clemente Island bedstraw grows on steep, rocky cliffs and slopes overlooking the sea, or in adjoining canyons on San Clemente Island.

Description:

San Clemente Island bedstraw is a small shrub in the madder family (Rubiaceae) with four small leaves in a whorl and clusters of tiny white or greenish-yellow flowers.



Status:

San Clemente Island bedstraw is endemic to San Clemente Island, the southernmost of the eight Channel Islands.

Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation before the distribution of several rare plants were determined. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. Steep, rocky slopes offered the only refuge for San Clemente Island bedstraw. Erosion of canyon slopes, caused in part by loss of vegetation, has eliminated some of the cliff refuges.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. Current management may result in a move toward population stability for San Clemente Island bedstraw. DFG has no recent information on the status of this plant.

Sand gilia *Gilia tenuiflora* ssp.
arenaria

State: Threatened 1987

Federal: Endangered 1992

General Habitat:

Sand gilia occurs in sandy soils of dune scrub and maritime chaparral habitat in the coastal dunes of Monterey County. This species is typically associated with dune scrub vegetation in sites with protection from strong winds and salt spray. The species is adapted to some levels of disturbance and is usually tolerant of small amounts drifting sand. Dune scrub species include silver beach lupine, beach sagewort, coast buckwheat and mock heather. Sensitive species found growing with sand gilia include State-listed endangered Menzies' wallflower and the federally threatened Monterey spineflower.

Description:

Sand gilia is a short, sticky-haired annual herb in the phlox family (Polemoniaceae). It has an erect central stem with a basal rosette of leaves, and produces purple funnel-shaped flowers with narrow petal lobes and a purple throat. Sand gilia is distinguished from the other three subspecies of *G. tenuiflora* by its relatively large fruit capsules and stamens which are only slightly exerted from the corolla. Sand gilia is known to locally intergrade with *G. tenuiflora* ssp. *tenuiflora* at the more inland areas of its distribution at Ft. Ord.

Status:

Sand gilia species is known from approximately 30 populations in the dunes and stabilized inland dunes along Monterey Bay. The populations occur on public and private land. Seeds have been collected for seed banking by the Rancho Santa Ana Botanic Garden and for individuals conducting research or restoration. An experimental population at the Spanish Bay golf course was not successful. Overall, the species is threatened by the degradation of suitable habitat from encroachment of invasive, non-native plant species, commercial and/or residential development, sand mining, and trampling by equestrians and pedestrians. ORV activities have historically degraded habitat for the species.

Known populations of sand gilia on lands within Monterey County jurisdiction are addressed under Policy 2.3 of the North County Land Use Plan (LUP). Under the LUP only resource-dependent uses are allowed in coastal dunes or in habitats known to support rare or endangered species. To ensure that land uses on property adjacent to these sensitive resources, the County requires the protection of environmentally sensitive habitat through deed



restrictions or dedications of permanent conservation easements.

Populations of sand gilia within the City of Marina are similarly protected. Implementation of the City's LUP provides for the protection and restoration of native dune habitat and vegetation and the habitat of recognized rare and endangered species. Primary habitat areas for sensitive species are protected and preserved. If development in these areas is proposed, the parcel owner is required to prepare and implement a management plan which will protect the identified plant species. Development within secondary or support habitat areas is allowed, so long as it does not significantly impact primary habitat areas. The City of Sand City's LUP specifies the intent to protect and preserve endangered species habitat. The City is developing an HCP for a portion of its planning area that will protect a small area of occupied habitat for Monterey spineflower and sand gilia.

DPR has implemented management actions for populations of sand gilia on state park system lands in the Monterey Bay area. These activities include control of invasive, non-native species (non-native grasses and iceplant), mitigation and monitoring of human use impacts, altering visitor use patterns, and the restoration of the native vegetation of the dunes. DPR has also incorporated fencing and boardwalks that impede trampling by equestrians and hikers and has implemented dune restoration activities at Marina, Asilomar, and Salinas River State Beaches.

A substantial number of populations and individuals are found on Fort Ord. Base closure of Ft. Ord has resulted in the transfer of management of some of the habitat for this species to the BLM, University of California, and the California Department of Parks and Recreation to be managed as open space. A sand gilia restoration plan has been prepared by DPR to increase the Ft. Ord coastal population by 14,000 to 18,000 individuals as part of an effort to restore 700 acres of coastal dune habitat. The Navy is undertaking a dune restoration project that will restore native dunes and create native habitats in degraded areas at the Naval Postgraduate School. One of the main objectives of the restoration effort is to eradicate non-native plant species such as iceplant and riggut brome. The population dynamics of sand gilia is being studied by Dr. Laurel Fox at Fort Ord, now a research and teaching facility administered as one of the University of California Natural Reserves. Dr. Fox found that rainfall profoundly influences seed germination, seedling survival, and reproduction.

In 2002, Salinas River National Wildlife Refuge released its *Comprehensive Conservation Plan*. Sand gilia populations on the preserve represent the northernmost documented population of the species. Management objectives include removal of exotic species and restoration of dune scrub vegetation. By 2010, develop habitat management strategies to preserve and enhance populations of high-priority special-status species on the Refuge. The impacts of public use on special status species will also be monitored. These strategies will include detailed prescriptions for habitat management, protocols to monitor the status of these species, and methods to evaluate the effectiveness of management actions.

Boggs Lake hedge-hyssop

Gratiola heterosepala

State: Endangered 1978
Federal: None

General Habitat:

Boggs Lake hedge-hyssop is found in shallow waters or moist clay soils of vernal pools and lake margins in scattered sites from Modoc County south to Fresno County. One population is known from Lake County, Oregon. South of San Joaquin County, it has not been reported from any valley floor vernal pools, but it does occur in five vernal pools in the Fresno County-Madera County Table Mountain complex near Friant. Bogg's Lake hedge-hyssop also co-occurs with a number of other listed species, including species of Orcutt grass (slender, Sacramento, hairy and San Joaquin Valley), Greene's tuctoria, succulent owl's-clover, and many-flowered navarretia. It is also associated with bractless hedge-hyssop (*Gratiola ebracteata*).

Description:

Boggs Lake hedge-hyssop is a small, semi-aquatic, herbaceous annual in the figwort family (Scrophulariaceae). It has opposite leaves, blunt, unequal sepals, and yellow and white flowers on short stalks. It blooms from April to June.



Status:

When first described in 1954, Boggs Lake hedge-hyssop was known only from Boggs Lake in Lake County, and until the late 1980s, from only a limited number of occurrences in vernal pool habitat in the State. Surveys of vernal pool habitat in recent years have located many additional occurrences of this species, and it is now known from more than 80 occurrences. The distribution of Bogg's Lake hedge-hyssop populations is patchy throughout its range, even in areas of suitable habitat. Uneven distribution and abundance may be due to artificial or natural factors, including historic land management practices (e.g., disking or land leveling) and site characteristics such as soil types and landforms. Due to the brief survey window for finding Bogg's Lake hedge-hyssop, and because the plants are small and inconspicuous, it is likely that other undiscovered populations exist.

Boggs Lake hedge-hyssop occurs in vernal pools on private land and on lands owned and managed by agencies and organizations including the DFG, BLM, DPR, TNC, and USFS. In addition, many of the known sites occur at the edges of reservoirs and stock ponds, which should be considered temporary habitat at best. Although the known number of occurrences of Boggs Lake hedge-hyssop has increased as more surveys have been conducted, both the quality and quantity of available habitat have declined during the same time period as vernal pools have been removed for agricultural and urban development and damaged by overgrazing, invasion by weedy species, and off-road vehicle traffic. Populations have also been disturbed or extirpated by hydrologic alteration and by discing and grading. For example, populations in Modoc County are threatened by competition from Medusa-head (*Taeniatherum caput-medusae*). Similarly, populations on USFS or BLM lands may be impacted by logging activities, fire suppression activities, herbicide drift, road construction, grazing and trampling, and recreational activities. In addition to external threats, small populations of Boggs Lake hedge-hyssop with few individuals are threatened by random extinction events. Populations undergoing rapid declines with limited recovery may presage such an event.

There is no formalized management strategy for Boggs Lake hedge hyssop. Critical habitat designations as part of the FWS Vernal Pool Recovery Plan will afford the species some protection when it occurs with a federally-listed species. Information on life history and microhabitat requirements is currently lacking. Information about its adaptation to environmental perturbations is also needed. Focused studies could identify potential threats to the species as well as methods to ensure its survivorship. Such studies include an assessment of grazing regimes and its relationship to reproductive success; demographics; pollination ecology; genetic analyses of disjunct populations; and reserve criteria.

Orcutt's hazardia

Hazardia orcuttii

State: Threatened 2002
Federal: None

General Habitat:

Orcutt's hazardia is associated with clay soils in Diegan coastal sage scrub, mixed chaparral, or southern maritime chaparral on coastal hills and mesas in San Diego County and Baja California, Mexico. All known occurrences are found in a relatively frost-free zone within 8 miles of the coast and below 650 feet elevation.

Description:

Orcutt's hazardia is a perennial evergreen shrub in the sunflower family (Asteraceae). Growing from approximately two to six feet tall, it has open woody branches, small leathery leaves, and yellow flowers that bloom from August to October.



Status:

The entire worldwide distribution of Orcutt's hazardia consists of approximately fourteen populations scattered along 175 miles of coastline between Encinitas, California and Colonet, Mexico.

The status of Orcutt's hazardia in Baja California, Mexico is unknown. The species occurs entirely in a region of northern Baja that is highly impacted, fragmented and rapidly developing, with massive land conversion occurring, and there are no formally protected populations of Orcutt's hazardia in Baja California.

In California, Orcutt's hazardia is restricted to one natural population, approximately 37 miles north of the nearest Baja population. This population, consisting of approximately 600 individuals, is restricted to a four-acre mesa top at the western edge of the Manchester Mitigation Bank (Manchester), at Lux Canyon in Encinitas, San Diego County, California. The Department holds a conservation easement on the land, and the Center for Natural Lands Management (CNLM) holds the title and manages the property. Although this population occurs on protected land, it is still threatened by recreational use of the area, invasion by weeds, fire, and the small population size and small habitat area. The population currently appears to be stable, but due to the small size of the population, and proximity to a residential neighborhood, risk of extirpation due to chance events is high.

Recently, efforts began to establish additional populations of Orcutt's hazardia in San Diego County. Seed was collected from Manchester in 2001 for propagation. Approximately 250 new plants were planted on the eastern

edge of the mesa at Manchester in January, 2003. In April 2003, 50 plants were planted at another property owned and managed by CNLM, Kelly Ranch, near the eastern end of Agua Hedionda Lagoon, in Carlsbad, California. The new populations, if successful, will help guard against extirpation of the species from California if a wildfire or other chance event were to eliminate the natural population. Efforts to identify additional suitable sites for establishment of new populations are on-going. In addition, research on the life history and ecological requirements of the species began in 2003.

Orcutt's hazardia is considered a Narrow Endemic under the San Diego Multiple Habitat Conservation Program (MHCP). The Multiple Habitat Conservation Program (MHCP) is a comprehensive, multiple jurisdictional planning program designed to create, manage, and monitor an ecosystem preserve in northwestern San Diego County. The MHCP encompasses seven incorporated cities, Carlsbad, Encinitas, Escondido, Oceanside, San Marcos, Solana Beach, and Vista, which will implement their portions of the MHCP plan through citywide "subarea" plans. The Encinitas population of Orcutt's hazardia is considered both a major population and critical location for this species. Approximately 70% of nearby suitable habitat will be conserved under the MHCP. Specific guidelines in the MHCP for Orcutt's hazardia include managing all conserved populations to control edge effects; implementing fire management plans to promote regeneration while protecting individual plants and habitat from frequent or high-intensity fires and fire suppression activities; enhancing declining populations through adaptive management; restoring damaged habitat.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County; however, Orcutt's hazardia was not affected by these fires.

Algodones Dunes sunflower *Helianthus niveus*
ssp. tephrodes

State: Endangered 1979

Federal:

General Habitat:

Algodones Dunes sunflower occurs on stabilized to partly stabilized sand dunes in the Algodones Dunes system of Imperial County. It is associated with a number of sensitive species including Peirson's milkvetch, an endangered species, sand food, Wiggins' croton, and giant Spanish needle.

Description:

Algodones Dunes sunflower is a silvery-white, semi-shrubby perennial in the sunflower family (Asteraceae) with a woody base, large hairy leaves, and reddish-purple centered flowers surrounded with bright yellow rays. Plants form long tap roots and can grow up to one meter in height. Algodones Dunes sunflower is distinguished from the related gray desert sunflower (*Helianthus niveus* var. *canescens*) by its soft white hairs. Hairs of the gray desert sunflower are stiff and bristly.



Status:

Algodones Dunes sunflower is restricted to the Algodones Dunes system of southeastern Imperial County. The dune system is under the ownership of BLM. A portion of the Algodones Dunes is designated the North Algodones Dunes Wilderness under the California Desert Protection Act and is closed to OHV activity. Nearly 75 percent of the dune system remains open to OHVs, however, which poses a major threat to the species. Recreational OHV activity has destroyed a large portion of the vegetation in areas of the Algodones Dunes open to public use. Management needs include focusing on enforcing laws regarding illegal off-road vehicular use and initiate planning strategies that allow for plant conservation. Research needs include understanding abiotic/biotic influences on population dynamics.

BLM initiated a monitoring study of the special status plants of the Algodones Dunes in 1998. Data were collected in spring and summer of 1998, 1999, and 2000. The monitoring study was initiated to better understand the effects of management, particularly off-highway vehicle (OHV) use, of the dunes, which has remained relatively unchanged since 1977. The information from the monitoring will be used, along with other information, to develop a new Recreation Area Management Plan for the dunes. Abundance measurements of Algodones Dunes sunflower suggest that it appears to maintain itself after establishment through years of below normal precipitation. Its abundance was higher in 1998 than in 1977, and it maintained the 1998 level of abundance in

1999 and 2000. The higher abundance in 1998 was entirely the result of increases in the open area. The species declined in abundance in the closed area between 1977 and 1998; like the rest of the dunes the 1998 closed area values were maintained into 1999 and 2000. The disparate response of this species in the closed and open areas may be due to differential rainfall amounts in the northern and southern dune areas or to other unknown factors. Except for 1977 the responses in the open and closed areas were parallel.

Red Rock tarplant *Hemizonia arida*
(*Deinandra arida*)

State: Rare 1982
Federal:

General Habitat:

Red Rock tarplant occurs in Mojave Desert scrub in open moist sites in the El Paso Mountains on the western Mojave Desert. It is associated with California buckwheat, burro bush, burro weed, and senna.

Description:

Red Rock tarplant is a resinous annual in the sunflower family (Asteraceae). It is branched and mildly odorous. This species possesses yellow ray and disk flowers. Red Rock tarplant can be differentiated from other similar species by the combination of yellow anthers, absence of bracts on all seeds, a solid, not hollow, stem, and soft, hairy leaves. Current taxonomic treatments classify *Hemizonia arida* as *Deinandra arida*.



Status:

Red Rock tarplant is known from five occurrences. The species is a local endemic to Red Rock Canyon and adjacent south-draining canyons of the Mojave Desert in Kern County.

Red Rock tarplant is well protected by DPR and is not currently significantly threatened. According to DPR, populations are stable or increasing and their prospects for survival appear excellent. Red Rock Canyon State Park has established two natural preserves to protect Red Rock tarplant, and rock barriers, signs, and patrols have been established to restrict OHVs from tarplant habitat. The Park also controls tamarisk which can colonize habitat for the tarplant.

Red Rock tarplant is threatened by disruption of its habitat by OHVs, mineral exploration, and competition from tamarisk, a non-native tree that invades desert wetlands. It is also subject to herbivory during the dry summer and fall months when other green food is scarce.

Otay tarplant

Hemizonia conjugens
(*Deinandra conjugens*)

State: Endangered 1979
Federal: Threatened 1998

General Habitat:

Otay tarplant grows on clay soils in grassland, coastal sage scrub, and maritime succulent scrub. Its distribution is strongly correlated with soils having a clay content of 25% or more.

Species with which it is associated include California sagebrush, bush mallow, California buckwheat, species of sage, sugar bush, jojoba, and opuntia. The historic range of the species is in San Diego County from the Mexican border north to the Spring and Paradise Valleys, east to Otay Lakes Reservoir.

Description:

Otay tarplant is a member of the sunflower family (Asteraceae). It is an aromatic, glandular, and much-branched herbaceous annual with mostly solitary, yellow flower heads. Its leaves are deep green to gray green and covered with soft shaggy hairs. Otay tarplant occurs within the range of two other tarplants (*Hemizonia fasciculata* and *H. paniculata*). It can be distinguished from these species by the number of ray flowers, black anthers, and ridges on the bracts of the flower head (phyllaries). Current taxonomic treatment classifies this species as *Deinandra conjugens*.

Status:

Otay tarplant is known from approximately 30 occurrences. It has a limited distribution consisting of at least 25 historical populations near Otay Mesa in southern San Diego County and one population in Estado de Baja California, Mexico, near the United States border. Three of the 25 historic populations of Otay tarplant are considered to be extirpated. At the time the species was listed in 1998, FWS estimated that 70 percent of the suitable habitat for this species within its known range had been lost to development or agriculture. In the June 2001, FWS proposed critical habitat designation for the Otay tarplant. The habitat was designed to ensure that self-sustaining populations of the tarplant would be maintained. Final critical habitat was designated in December 2002.

Otay tarplant is covered under HCPs in San Diego County: the San Diego Gas and Electric Company HCP, the City of San Diego Subarea Plan, and the County of San Diego Multiple Species Conservation Plan (MSCP). The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Otay tarplant is considered to be a narrow endemic species under the MSCP and 66 percent of the major populations will be conserved. The City of Chula Vista Subarea MSCP and the Sweetwater Authority HCP also include Otay tarplant. The City of Chula Vista's draft Subarea Plan conserves several large population areas in a configuration that will maintain connectivity within and among these populations. Under the Chula Vista Subarea Plan, preserve design provides for 100 percent conservation of major populations of Otay tarplant in the Otay River Valley and varying degrees of conservation in the Wolf Canyon area, Rollings Hills Ranch, Bella Lago, and the San Miguel Ranch. Additional areas supporting the tarplant will be including in mitigation banks. Management of these



populations will take into account the extreme fluctuations of plant numbers annually.

In 2003, the huge Otay Fire burned a large area of south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, a small portion of Otay tarplant critical habitat burned during the fire. The impacts of the Otay fire were analyzed according to personal communications; areas around Proctor Valley and Otay Lakes had burned but that Otay Mesa and Marron Valley had not burned. Post-fire monitoring will be necessary to determine if there will be any long-term effects of the fire on Otay tarplant.

to Gaviota tarplant would be avoided or adequately mitigated. In their role as the lead permitting agency for the California Environmental Quality Act, Santa Barbara County has worked with DFG and the petroleum industry over the past decade to develop a strategy to mitigate for impacts to the tarplant resulting from oil and gas activities in the Gaviota area. At least two decommissioning efforts will be undertaken in the near future in areas where Gaviota tarplant has been found within the last three years. These include the decommissioning of Texaco's Hollister Ranch facility pipelines that stretch from Gaviota west to Saint Augustine, and Unocal's production facilities from Point Conception east to the Cojo Marine Terminal. The County will be working with DFG, FWS, and the California Coastal Commission to ensure appropriate measures are taken to conserve the *D. increescens* ssp. *villosa*, as well as other federally listed wildlife species that occur in these areas. Unocal is proposing to restore disturbed areas and contribute towards DFG's Gaviota Tarplant Ecological Reserve, which was established to compensate for impacts resulting from previous oil and gas activities along the Gaviota Coast.

Critical habitat for the Gaviota tarplant was designated in 2002. The primary constituent elements of critical habitat are: (1) Sandy soils associated with coastal terraces adjacent to the coast or uplifted marine sediments at interior sites up to 3.5 miles inland from the coast; and (2) Plant communities that support associated species, including needlegrass grassland and coastal sage scrub communities, particularly where species of needlegrass, California sagebrush, coyote bush, sawtooth golden bush, and California buckwheat occur. Military lands at Vandenberg AFB were not included in the designation of critical habitat. FWS can exclude these lands if measures to ensure conservation of the tarplant are implemented on the military lands. The Air Force has developed a Draft Integrated Natural Resources Management Plan (INRMP) for Vandenberg. Although measures to provide for the conservation of Gaviota tarplant are not currently included in the draft INRMP, the Air Force has committed to incorporate into their INRMP, and implement, specific measures that will address the conservation of the tarplant and its habitat at Vandenberg AFB. Based on this commitment, FWS determined that lands on Vandenberg Air Force Base should be excluded from critical habitat designation because the benefits of exclusion outweigh the benefits of inclusion and will not cause the extinction of the species.

**Santa Susana
tarplant**

Hemizonia minthornii
(*Deinandra minthornii*)

State: Rare 1978
Federal: None

General Habitat:

Santa Susanna tarplant grows in crevices of sandstone bluffs and outcrops in chaparral and coastal sage scrub in the Santa Susana and Santa Monica Mountains of Los Angeles and Ventura counties. It is associated with black sage, California sagebrush, California buckwheat, and bush mallow.

Description:

Santa Susanna tarplant is a perennial subshrub in the sunflower family (Asteraceae) with slender ascending stems, sticky leaves, and yellow flower heads.



Status:

Santa Susanna tarplant is known from more than 25 occurrences of varying size; however one-fourth of these have not been seen in many years and their status is unknown. Land ownership is both private and public (LADWP, Santa Monica Mountains Conservancy, and Rancho Simi Park and Recreation District). Its occurrence in Thousand Oaks is limited to the North Ranch Open Space.

Santa Susanna tarplant appears to be locally common within its limited geographic range around Santa Susana Pass. The species' affinity for steep, rocky terrain has afforded some protection for its habitat. Populations in the Santa Monica Mountains are far more localized and isolated. Threats to this species include loss of habitat due to development (housing, road, golf course, etc.), recreational activities, and grazing. Current taxonomic treatment classifies Santa Susanna tarplant as *Deinandra minthornii*.

Mojave tarplant *Hemizonia mohavensis*
(*Deinandra mohavensis*)

State: Endangered 1981
Federal: None

General Habitat:

Mojave tarplant generally occurs in ephemeral drainages and riparian corridors surrounded by coastal sage scrub and chaparral in San Diego, San Bernardino, Kern, and Riverside Counties. It is found in grassy swales and seeps on the arid slopes of the Peninsular Range, (including the San Jacinto Mountains). It typically occurs in clay, silty, or gravelly soils along low gradient stretches of intermittent drainages. Associated riparian species include willow, sycamore, ash, deer grass, and rush. Peak flowering is from August through October.

Description:

Mojave tarplant is a sparsely branched, aromatic, sticky annual herb of the sunflower family (Asteraceae) with yellow flower heads arranged in compact clusters. Despite early floras that described the species as growing to 18 inches in height, it actually can be up to four feet in height in good conditions.

Status:

Mojave tarplant was thought to be extinct for more than 50 years when it was rediscovered in 1994 at several sites within the Peninsular Ranges. Today, Mojave tarplant is known from approximately 15 highly localized populations on private land, and in Cleveland National Forest and San Bernardino National Forest. Five-rayed tarplants at Red Rock Canyon that were previously reported as Kellogg's tarplant (*Hemizonia kelloggii*) may actually be Mojave tarplant.

The distribution of Mojave tarplant appears highly discontinuous. Most known sites are within the belt of desert edge chaparral and the others are on arid coastal facing slopes where rainfall and fog are infrequent. The species is locally common, but only in a few very restricted habitat patches. Populations fluctuate in response to environmental conditions. All the known extant populations are relatively small, occupying a total area of no more than two to three square miles. Within this small area, the actual size of occupied habitat is even smaller. Populations are very strongly restricted to low damp areas and are seldom found more than several feet from the bottom of a drainage way or a seep. It is possible that additional populations remain to be discovered within the range of the species.

Mojave tarplant is included in the Western Riverside Multiple Species Habitat Conservation Plan (MSHCP). Within the Plan Area, Mojave tarplant is restricted to low sand bars in river beds, along stream channels and in ephemeral grassy areas in riparian scrub and chaparral at elevations between 850 m to 1,575 m in the San Jacinto Mountains Bioregion. Seven of the eight recorded occurrences of this species are within MSHCP Conservation Area. Conservation for this species will be achieved by inclusion of at least 80,160 acres of suitable habitat and five known localities (six records at four localities within the San Jacinto Mountains and Foothills and one record



**Marin western
flax**

*Hesperolinon
congestum*

State: Threatened 1992
Federal: Threatened 1995

General Habitat:

It is found on serpentine ridges covered with bunchgrass from Marin County to San Mateo County and in a serpentine chaparral association in Marin County. In San Mateo County it is associated with purple needlegrass, squirreltail, soap plant, clarkia, and fountain thistle. In Marin County, it is associated with Tiburon Indian paintbrush, Tiburon mariposa lily, native grasses, and soap plant on Ring Mountain, and with gumplant, buckwheat, and brodiaea on Bolinas Ridge.

Description:

Marin western flax, also known as Marin dwarf-flax, is a delicate annual plant in the flax family (Linaceae), with congested clusters of small rose to whitish flowers. It has slender, threadlike stems, 4-16 inches tall. The leaves are linear. Flowers bloom from May to July. Sepals are hairy and the five petals are rose to whitish. The anthers are deep pink to purple. This helps distinguish Marin dwarf-flax from California dwarf-flax, found in the same geographic area, which has white to rose anthers, as well as hairless sepals. Two other species that are found in the same region are small-flower dwarf-flax and slender dwarf-flax. They differ from Marin dwarf-flax in having hairless sepals and a long, open inflorescence.

Status:

Marin western flax is known from approximately 20 occurrences. Residential development and road and freeway construction have eliminated five of the historically known populations of Marin western flax. Existing threats include residential and recreational development, foot traffic and competition with nonnative species (non-native annual grasses, goat grass, broom, pampas grass, and yellow star thistle). Serpentine outcrops in the San Francisco Bay area are limited and at least 20 percent of those outcrops have already been eliminated as plant habitat due to development. The pressure to build more houses, roads, and other facilities for humans is great. Serpentine habitats also have been fragmented by the construction of roads. Habitat fragmentation increases the risks of extinction due to chance events such as fire, flood, landslide, pest or disease outbreaks, severe drought, or other natural or human-caused disaster.



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Extensive searches of suitable habitat have been conducted with very limited results. No management plan for this species has been developed. In San Francisco, Marin dwarf flax has been collected historically at Laurel Hill Cemetery (1912), on Mt. Davidson, Lone Mountain, Inspiration Point, and above Baker Beach. The populations at Laurel Hills, Mt. Davidson, and possibly Inspiration Point have been extirpated. Only the Baker's Beach population persists. The National Park Service has initiated efforts to preserve this population and is in the process of developing a management plan for the species through consultation with the U.S. Fish and Wildlife Service. In San Mateo County, a population is protected within a County Park; another population occurs on San Francisco Water District land. NPS, which manages two occurrences within the Golden Gate National Recreation Area in San Francisco, is restoring one historical site by eradicating eucalyptus and other non-native trees. Research is needed to determine appropriate habitat management practices to conserve Marin western flax. Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.

Lake County western flax

*Hesperolinon
didymocarpum*

State: Endangered 1981
Federal: None

General Habitat:

This member of the flax family (Linaceae) is known only from serpentine soils in the Big Canyon drainage north of Middletown, Lake County. The surrounding plant community includes grassland and chaparral.

Description:

Lake County western flax is an erect, narrow-stemmed, annual herb with widely spreading branches and open inflorescences of white to pink flowers. It is associated with other species of *Hesperolinon* and can hybridize with them.



Status:

Lake County dwarf flax is currently known from six occurrences in a six square mile area. All occurrences are on private property and subject to moderate to heavy cattle grazing. Grazing reduces seed production in some populations. Increased grazing or other land use changes, such as reservoir or pond construction, could seriously endanger Lake County western flax. Because it is limited in distribution and occurs in small populations, Lake County western flax is also in danger due random extinction events. DFG has no recent information on the status of this plant.

Santa Cruz tarplant

*Holocarpha
macradenia*

State: Endangered 1979
Federal: Threatened 2000

General Habitat:

Santa Cruz tarplant is known from grasslands and prairies found on coastal terraces below 400 feet in elevation. Historically, it has been documented from Monterey County north to Marin. It typically grows on deep loam and sandy loam soils with a subsurface clay component, which hold moisture longer into the growing season compared to the surrounding sandy soils. Currently known Santa Cruz tarplant populations are frequently associated with non-native grasses. Native associates include rushes, California oatgrass, and other tarplants. At some locations, the plant is found with other rare species, including the state-endangered San Francisco popcorn flower and the federally-endangered Ohlone tiger beetle.

Description:

Santa Cruz tarplant is an aromatic and glandular annual herb in the sunflower family (Asteraceae), growing four to 20 inches tall. Small plants may produce a single yellow daisy-like flower head on a single stem, while larger plants have a rigid main stem and lateral branches that grow to the height of the main stem and produce many flowers. The leaves are linear and larger at the base of the plant (up to five inches), getting smaller as they go up the stem. Santa Cruz tarplant produces numerous (40 to 90) central disk flowers, many more than any related species.

Status:

Santa Cruz tarplant was once found in most San Francisco Bay Area counties and south to Monterey County. Its distribution has been severely reduced due to the destruction and alteration of coastal prairie habitat, primarily due to urban development and land management practices that favor competing, invasive, non-native species. All natural populations in the counties surrounding San Francisco Bay have been extirpated. The last remaining native population in this area, known as the Pinole Vista population, consisting of 10,000 plants, was eliminated in 1993 by commercial development. Santa Cruz tarplant is currently known from approximately 13 native and 8 experimentally seeded populations in Contra Costa, Monterey, and Santa Cruz Counties. Seven native occurrences are located near the cities of Santa Cruz and Soquel, and six are located near Watsonville. Some of the native populations may represent separate, fragmented patches of what historically was a single, larger population. The eight experimentally seeded populations are located at Wildcat Canyon Regional Park in Richmond, Contra Costa County. Very recently, three additional population introductions were attempted in Santa Cruz and Monterey counties, but were unsuccessful.



In 1982, seed salvaged from a development site in Pinole was introduced to 22 sites in Wildcat Canyon Regional Park and onto East Bay Municipal Utilities District (EBMUD) lands. These introduction sites have been monitored fairly regularly for the past 17 years by EBRPD, EBMUD, CNPS volunteers, and DFG staff. Although a number of populations did well for a few years, only eight have persisted, and only one has consistently supported large numbers of individuals. In 2002, this population supported almost 30,000 plants, the largest it has been since the initial seeding. Artichoke thistle, a noxious weed, has been a problem at Wildcat, and began encroaching on several of the Santa Cruz tarplant sites. EBRPD has been implementing an artichoke thistle control program.

Most recent surveys at the thirteen natural populations found 10,000+ plants at three of the populations, 1001-10,000 plants at four populations, and 1000 or fewer plants at four populations. Two populations had no standing plants. The number and location of standing plants in a population can vary greatly from year to year due to a number of factors, including rainfall, temperature, soil conditions, disturbance factors, and the extent and nature of the seed bank. Each population is comprised of not only the standing plants each year, but a persistent soil seed bank which can be very large and often covers an area much greater than the visible population of standing plants. The seed bank is very important to the species' year-to-year and long-term survival, and the extent of seed bank reserves is variable from population to population.

Management activities can affect the health of the populations and influence the balance between the number of plants and the extent of seed bank reserves. In many areas the disturbance factors with which coastal California grassland vegetation evolved, including large mammal disturbances, Native American burning practices for the past 10,000 years, and cattle grazing for about the past 250 years, have been removed. This has led to an increase in live vegetation, an increase in litter, and a reduction of soil disturbance. As a result, the abundance of non-native species has increased, and the species richness and abundance of native species has decreased. This trend has led to the decline of many native species, including Santa Cruz tarplant. Active management is required to reverse the trend. Several studies on Santa Cruz tarplant's demography, life history, and potential management techniques have recently been conducted by researchers at UC Berkeley and UC Santa Cruz, partially funded through a USFWS Section 6 Grant.

Burning, mowing, grazing and scraping habitat have been utilized to mimic the natural disturbance regimes with the hope of enhancing populations at several sites, with variable results. Results indicate that management activities that result in the removal of thatch cover and expose areas of bare ground are most effective. Recent research on using grazing as a tool to manage grasslands found that response to disturbance varied from site to site, and a matrix of different disturbance regimes must be created to maintain native grassland species. Where habitat is still intact, management favorable to the species can reverse decline of this species and allow seeds in the dormant seed bank of the species to germinate and grow. The ability to provide appropriate management for the remaining occurrences of Santa Cruz tarplant will be pivotal in the recovery of the species.

The USFWS designated 2902 acres of critical habitat for the species in Contra Costa, Santa Cruz, and Monterey counties on October 16, 2002.

Tahquitz ivesia

Ivesia callida

State: Rare 1992
Federal:

General Habitat:

This member of the rose family (Rosaceae) is found on near vertical slopes of decomposing granitic outcrops in the San Jacinto Mountains of Riverside County. Tahquitz ivesia is associated with sugar pine, white fir, canyon live oak, mountain mahogany, Parish's silene, and California fuchsia.

Description:

Tahquitz ivesia is a spreading dwarf perennial, with glandular, hairy, divided leaves, and small white flowers on a short flowering stalk.



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Status:

Previously presumed extinct, this plant was rediscovered in 1980 at two sites in the San Jacinto Wilderness Area of the San Bernardino National Forest.

Human disturbances are unlikely due to the relative inaccessibility of the rocky habitat of Tahquitz ivesia. Potential threats include disturbance during fire suppression actions, trail building, and rock climbing activities. There are no management or protection plans for this species, although USFS is aware of the populations. DFG monitored both occurrences in 1988. A 1994 field survey found the plants to be thriving and stable.

Burke's goldfields

Lasthenia burkei

State: Endangered 1979
Federal: Endangered 1991

General Habitat:

Burke's goldfields is restricted to vernal pools and swales and is known only from southern portions of Lake and Mendocino counties and from northeastern Sonoma County. It is associated with Sonoma sunshine and Sebastopol meadowfoam.

Description:

Burke's goldfields is an erect, herbaceous annual in the Sunflower Family (Asteraceae). It has with narrow opposite leaves and small heads of yellow flowers. This species can be easily confused with other goldfields (*Lasthenia*). It can be separated from similar members of the genus by other species by the type of bristles on the seed.



Status:

Historically, 39 populations were known from the Cotati valley, 2 sites in Lake county, and one site in Mendocino County. The occurrence in Mendocino County is most likely extirpated. It is currently reported from about 20 populations. Urbanization, conversion of land to row crops, widening along Highway 101, effluent irrigation, and overgrazing by sheep and cattle have impacted this species in Sonoma County. Less than 30 percent of its historic occurrences remain. The species has been nearly extirpated in the Windsor area, although it had previously been quite extensive there. Gully erosion at Manning Flat in Lake County is destroying the habitat there.

In recent years, many development projects have been approved in the Santa Rosa area, with significant impacts to Burke's goldfields and other vernal pool species. In order to resolve the conflicts with land use and wetland resources a Vernal Pool Task Force was formed. Composed of federal, state, and local agencies, local development and agricultural interests, and local environmental groups, the Task Force developed a Vernal Pool Ecosystem Preservation Plan. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan identifies areas for wetland and rare species protection, and areas wetland creation, restoration, or enhancement. This plan is currently being implemented.

To date, more than 23 separate properties, ranging in size from 1 acre to 174 acres, have been placed under the jurisdiction of DFG in cooperation with local agencies, such as the Sonoma County Agricultural Preservation and Open Space District (SCAPOS), for the protection of vernal pool species. Burke's goldfields is protected at the DFG Laguna de Santa Rosa Ecological Reserve. Burke's goldfields was known to occur at the DFG's Todd Road Ecological Preserve in Santa Rosa, but has not been seen in several years, possibly due to the cessation of grazing and subsequent invasion by non-native annual grasses. A grazing plan is being developed by the Department.

Research on the vernal pool plants is ongoing, funded primarily by FWS Section 6 grants. For example, projects examined the biological and logistic characteristics of the reserve properties, developed a management framework for recovery of the listed plants, designed and installed a long-term mowing/phytomass removal experiment to improve habitat quality, and conducted trials for intensive management techniques, e.g. fire and herbicide. This scientific approach has been used to develop practical, large-scale prescriptions that can directly affect recovery of the listed plants and improve native plant cover in vernal pool and adjacent upland habitats. These prescriptions gain wider applicability when supported by experimental data from multiple years with variations in climate and plant cover.

Beach layia

Layia carnosa

State: Endangered 1990
Federal: Endangered 1992

General Habitat:

Beach layia is restricted to coastal sand dunes from Santa Barbara to Humboldt Counties. In northern California, it occurs in northern dune scrub community; in Monterey County, the species occurs in the central dune scrub community. It generally occurs behind the northern foredune community, occupying sparsely vegetated open areas on semi-stabilized dunes. The species will also occur in open areas, such as along trails and roads. The cover of associated vegetation protects the species from sand dune movement and erosion. Associated species include coast buckwheat, beach pea, beach sagewort, dune bluegrass, dune goldenrod, sand verbena, and beach-bur.

Description:

Beach layia is a small, succulent annual herb in the sunflower family (Asteraceae). It has low spreading branches and heads of small white to pink ray flowers and yellow disk flowers. The leaves and branches have sticky glands that allow sand to adhere to the plant. Beach layia can spread to more than 15 inches across. Several characteristics distinguish *L. carnosa* from other similar species: fleshy leaves, inconspicuous flower heads with short, white ray flowers and yellow disk flowers, and bristles around the top of the one-seeded fruit.



Status:

This plant is known to occur on five dune systems along the California coastline: in northern Santa Barbara County, on the Monterey Peninsula, at Point Reyes in Marin County, and in two dune systems in Humboldt County. Beach layia has been extirpated from at least four historic sites, and was assumed extirpated from Santa Barbara County until discoveries of two occurrences roughly 300 yards apart on Vandenberg Air Force Base. A new occurrence with 10-15 plants was discovered in 1999 on NPS land in Humboldt County. Beach layia is now known from 20 occurrences, 12 of which are at Point Reyes National Seashore. At various sites the species occurs with other State-listed plants, including Menzies' wallflower (*Erysimum menziesii*) and Tidestrom's lupine (*Lupinus*

tidestromi). Threats include residential development, grazing, trampling, OHVs, and encroachment by non-native plants. Beach layia has shown a steady decrease in numbers since 1989 on the Lanphere-Christensen Dunes in Humboldt County, and habitat for the species is being lost to invasion by ice plant, European beachgrass, and non-native annual grasses. The species is addressed in the 2001 *Draft Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula*.

Counties in which beach layia occur have implemented various management and conservation practices to preserve this plant and its habitat. Within Monterey County jurisdiction, Policy 2.3 of the North County Land Use Plan (LUP) relates to environmentally sensitive habitats. The Monterey County LUP has established policies allowing for only resource-dependent uses within habitats known to support rare and endangered species. Land uses adjacent to locations of environmentally sensitive habitats are required to be compatible within the long-term maintenance of the resource. For proposed land divisions or developments, the County requires the protection of environmentally sensitive habitat through deed restrictions or dedications of permanent conservation easements.

On lands in the City of Marina, implementation of the City's LUP policies will provide for the protection and restoration of native dune habitat and vegetation and the habitat of recognized rare and endangered species. The City's policies specify that primary habitat areas for sensitive species be protected and preserved. Development within secondary or support habitat areas are allowed, so long as it does not significantly impact primary habitat areas. Where development is proposed on parcels containing rare and endangered species, parcel owners are required to develop and execute a management plan which will protect the identified plant species. For populations on lands in the City of Sand City, the City's LUP specifies the intent to protect and preserve endangered species habitat. Protective measures will need to be developed and implemented for beach layia and other sensitive plants.

As part of the Marin Countywide Plan, conservation zones and sub-zones have been established for coastal areas that include populations of beach layia. Successful recovery will include the reduction of habitat loss through the conformance of the restrictions and review procedures that have been adopted for each zone. Conservation zones are subject to a development review checklist that requires conservation measures, such as clustered development, dedicated open space easements and undeveloped greenbelt areas. Point Reyes National Park is in the process of developing monitoring protocols for beach layia. Their objective is to establish baseline population data and to use this information to assess changes in population dynamics over time.

In Humboldt County, the County and City of Eureka have several policies relating to the protection of sensitive resources. The Humboldt County Local Coastal Program prohibits vehicles above the wave slope except in the Samoa Dunes Recreational Area; however, vehicles are allowed on privately-held lands in and around the City of Eureka. The County has recently adopted a management plan for the north and south spits of Humboldt Bay; the north spit area supports beach layia. The plan designates certain areas for vehicular access on the beach and dunes as well as vehicle-free zones. This plan addresses access on public lands as well as access to/from adjacent BLM lands, private lands and the Lanphere-Christensen Dunes Preserve. The plan recommends management actions to restore degraded dune habitat areas, including removal of invasive, non-native plant species, fencing of rare plant habitat areas and limiting public access.

TNC's Lanphere-Christensen Dunes Preserve is fenced and patrolled to control trespass by ORV users. Dune restoration activities at the Preserve, including removal of European beach grass, have allowed native dune species to flourish. After initiating restoration in 1992, native plant cover increased 47% by 1997 without the assistance of active re-planting. TNC is also conducting native plant restoration activities on the North Spit of Humboldt Bay. One population on the Samoa Peninsula occurs on land managed by the BLM and the City of Eureka. BLM manages the property and has fenced an area for the protection of beach layia.

San Francisco lessingia

*Lessingia
germanorum*

State: Endangered 1990
Federal: Endangered 1997

General Habitat:

This species occurs in unvegetated openings of stabilized sand dunes or in sandy soils derived from the erosion of sandy coastal deposits. San Francisco lessingia is adapted to disturbance and may have been an early colonizer in secondary blow-outs in dune succession. Associate species include dune gilia, coast fiddleneck, dune evening-primrose, and sand-mat.

Description:

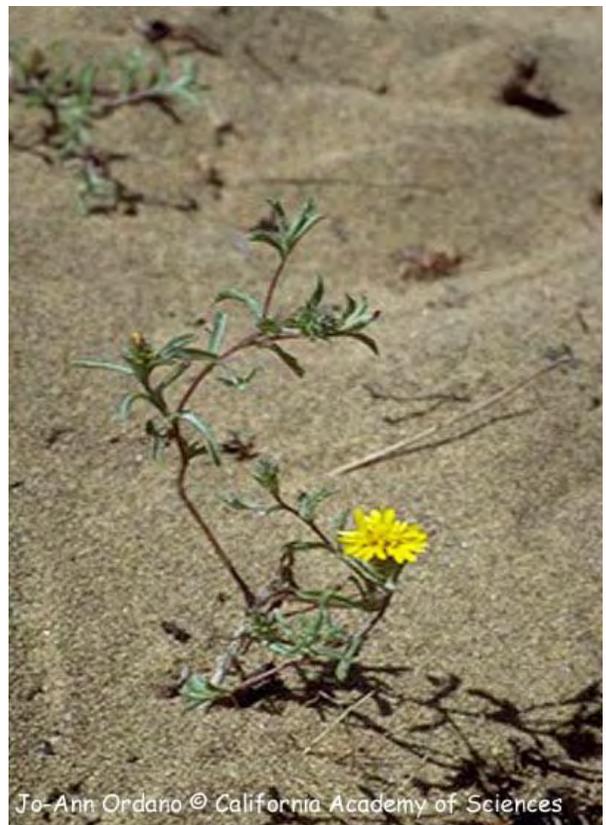
San Francisco lessingia, a member of the sunflower family (Asteraceae), is a slender, annual herb with clusters of lemon-yellow flowers. Plants develop a low, spreading bushy appearance following the development of basal leaves. Flowers usually open during the summer, with peak flowering in August and September.

Status:

Historic collections of San Francisco lessingia are all from the San Francisco area, including northern San Mateo County. San Francisco lessingia is known from six sites in San Francisco, including one experimental population. The species is also known from a population in Daly City on San Bruno Mountain. The Daly City population was discovered in 1989. The San Bruno Mountain Habitat Conservation Plan was adopted before San Francisco lessingia was listed and does not include or protect the Daly City site on which the plant occurs.

Loss of habitat and alteration of ecological processes that support that habitat are the principal threats to San Francisco lessingia. Another ongoing threat to the species is colonization of remaining habitat by invasive non-native species including ice plant, rip gut brome, and veldt grass. Volunteer efforts have also contributed to ongoing weed removal and the restoration of native dune scrub habitat. At the Presidio, the NPS has been actively managing habitat for the species, and the populations are increasing in both suitable habitat area and population size.

San Francisco lessingia is one of the species included in the USFWS' 2003 *Draft Recovery Plan for Coastal Plants of the Northern San Francisco Peninsula*. The recovery strategy for San Francisco lessingia is based



primarily on protecting and expanding the existing populations within native coastal dune scrub vegetation, followed by active reintroduction and expansion of San Francisco lessingia in unoccupied, restored or enhanced habitat within its historic range. According to the Recovery Plan, neither protection of existing populations nor restoration and reintroduction projects would alone be sufficient to recover the species in the long-term. Recovery of San Francisco lessingia will require that appropriate vegetation composition, structure, and dynamics be established and maintained on suitable dune topography. In particular, areas of diverse dune topographic relief and exposure are needed for a mosaic of dune scrub and patches of bare or sparsely vegetated dune sand (blowouts) in various stages of recolonization by native dune scrub vegetation. The ecological and physical processes that maintain these features operate only at relatively large spatial scales compared with the small remnant patches of San Francisco lessingia at the time of listing. Thus, any preserves established for this species will need to be of adequate size to provide suitable habitat and a dynamic dune/dune scrub system, as well as buffer the effects of surrounding areas. San Francisco lessingia reserves are proposed at dune complexes in the Presidio, at the Daly City site, and at remnant dunes of Sutro Heights and Sunset Heights.

Congdon's lewisia

Lewisia congdonii

State: Rare 1982
Federal: None

General Habitat:

It grows on moist, shaded, north-facing slopes of metamorphic rock in the chaparral and oak woodland plant communities of the Merced River Canyon in Mariposa County, and along the Kings River Canyon in Fresno County. Associated species include Yosemite onion, selaginella, brodiaea, and shooting star.

Description:

Congdon's lewisia, a perennial member of the purslane family (Portulacaceae), has a basal rosette of semi-succulent leaves and produces rose-colored flowers.



Status:

Fewer than ten occurrences of Congdon's lewisia are known. The majority of occurrences are inaccessible on cliff faces and talus slopes. Populations near roads may be subject to herbicide spraying, road improvement and maintenance, and trash dumping although not documented in field surveys. Additional field surveys may result in the discovery of new populations in suitable habitat between the presently known, scattered occurrences.

In 1994, a multi-agency MOU for the conservation and protection of sensitive species in the Merced River Canyon was signed by the DFG, USFS, BLM, CALTRANS, and PG&E. The MOU specifies guidelines for highway and power line maintenance and repair, notification requirements, species monitoring, and annual reviews. The MOU emphasizes protection measures for State listed endangered Merced clarkia (*Clarkia lingulata*) but also improves protection for Congdon's lewisia and other species.

Congdon's lewisia is considered to be a sensitive plant by Yosemite National Park and BLM. It is also available in the horticultural trade.

Mason's lilaepsis

Lilaeopsis masonii

State: Rare 1979

Federal: None

General Habitat:

Mason's lilaepsis grows in tidal zones, on mud-banks and flats along sloughs and rivers, in freshwater marshes, brackish marshes, and in riparian scrub, that are, in some way, influenced by saline water. This species is semi-aquatic and is usually found on saturated clay soils that are regularly inundated by waves and tidal action. It often grows with other rare plants such as delta mudwort, Suisun Marsh aster, and delta tule pea. Mason's lilaepsis occurs in the northeastern portion of San Francisco Bay, in Alameda, Contra Costa, and Napa counties, as well as in Suisun Bay and the Sacramento-San Joaquin river delta, in Solano, San Joaquin, and Sacramento counties.

Description:

Mason's lilaepsis is a minute, turf-forming, perennial plant in the carrot family (Apiaceae). The thread-like leaves with obscure internal cross-walls are tufted on creeping stems. The inflorescences are few- to several-flowered umbels of tiny white or maroon flowers. It spreads by rhizomes. Mason's lilaepsis is a colonizing species on newly deposited or exposed sediments. It blooms April through November.



Status:

The known distribution of Mason's lilaepsis extends from the margins of the Napa River in Napa County, east to the channels and sloughs of the Sacramento-San Joaquin Delta in Contra Costa, Solano, Sacramento, Yolo, and San Joaquin counties. Mason's lilaepsis is threatened by erosion, bank and channel-stabilization, flood-control projects, widening of Delta channels for water transport, dredging and dumping of spoils, boat wake overwash, recreation (e.g. fishing trails), and in some areas, by water hyacinth. Currently, approximately 145 occurrences of Mason's lilaepsis are recorded, some as small as one square foot, although DFG does not know how many of these still exist. Continuing threats include levee maintenance and construction. Although much of the habitat is privately owned, several State and federal agencies have jurisdiction over the Delta waterways. The DFG owns one site in Solano County.

Western lily

Lilium occidentale

State: Endangered 1982
Federal: Endangered 1994

General Habitat:

Western lily grows at the edges of sphagnum bogs and in forest or thicket openings along the margins of ephemeral ponds and small channels. It also grows in coastal prairie and scrub near the ocean where fog is common. In California, this showy lily is known from near the southern perimeter of Humboldt Bay, Humboldt County, and from several sites approximately 90 miles to the north in Del Norte County. The range of the species extends north to Coos County, Oregon. Herb and grass associates include Pacific reed grass, sedge, gentian, and California pitcher-plant. Common shrub associates are wax-myrtle, Labrador tea, huckleberry, and salal. Tree associates include coast pine, Sitka spruce, and Port Orford cedar.

Description:

Western lily, a perennial in the lily family (Liliaceae), grows from a short unbranched, rhizomatous bulb, reaching a height of up to 5 feet. Leaves grow along the unbranched stem singly or in whorls and are long and pointed. The nodding flowers are red to deep orange, with yellow to green centers in the shape of a star and spotted with purple. This species can be distinguished from similar native lilies by the combination of nodding red flowers with yellow to green centers in the shape of a star, highly backward-curved petals, stamens closely surrounding the pistil, and an unbranched rhizomatous bulb.

Status:

Western lily has an extremely restricted distribution within two miles of the coast from Hauser, Coos County, Oregon to Loleta, Humboldt County, California. This range encompasses approximately the southern one-third of the Oregon coast and the northern 100 miles of the California coast. Historically, western lily was known from about 58 occurrences in California and Oregon. The plant is currently known from seven widely separated regions along the coast, and occurs in approximately 30 small isolated, densely clumped populations. Of the 16 populations reported from California, five have not been seen in over 20 years. Human activities such as draining of wetlands, clearing of land, elimination of beaver, and stabilization of moving sand areas have interrupted the natural processes of bog and wetland creation. As late-stage bogs and coastal scrub go through succession to forest, lily



habitat is eliminated with little new habitat being created. Western lily has also been impacted by bulb collecting, livestock grazing, and extensive browsing by native mammals. Another significant threat is the loss of genetic variability due to small population size. Research has shown that populations below an effective size of about 5,000 western lily individuals will generally maintain insufficient adaptive genetic variability for long-term evolution in response to a changing environment, and those below 500 individual plants will experience accumulation of mildly deleterious mutations due to random drift, expression of inbreeding depression, and crossing incompatibility due to loss of genes.

In California, degradation of soils by agricultural plowing over the past century and a half may have been the largest single factor contributing to loss of habitat. The potential for future development continues to pose a serious threat to the species throughout its range, and is likely to increase. By far the largest known western lily population is partly on private land near Crescent City, California, much of which has been subdivided. This population is being impacted by grazing and residential development on surrounding lands. The western lily occurs in early successional bogs or coastal scrub on poorly drained soils, usually those underlain by an iron pan or poorly permeable clay layer. Young plants almost always establish under shrub cover, but the lily is shaded out if the canopy cover is greater than 50 percent or shrubs are over six feet high. There is some indication that western lily populations have been maintained in the past by periodic fires, perhaps set by Native Americans. Charcoal is abundant in the soil at several of the Oregon populations, indicating past fires. Fires are now rare events in these areas.

In 1997, the *Draft Recovery Plan for Western Lily* was developed by the USFWS Oregon State office. Under recovery criteria presented in the plan, the western lily can be downlisted to threatened when at least 20 viable populations are protected and managed to assure their continued existence. The 20 populations must be distributed among six recovery areas, roughly in proportion to their original relative abundances. For the purposes of this plan, a viable population includes at least 1,000 flowering plants, and a population structure indicating stable or increasing plant numbers. Management actions need to ensure recovery include on-site conservation that manages habitats to maintain to prevent or reverse encroachment by trees and shrubs.

Using Section 6 funds, a research project with California State University, Humboldt was initiated in 1998 to evaluate two vegetation management techniques, controlled late season grazing and manual removal, and to develop strategies for maintaining and expanding suitable habitat for the western lily. In 1999, the DFG formed a western lily working group to share information and develop recovery goals with the USFWS, the BLM, the Oregon Department of Agriculture, the Oregon DPR, TNC, local counties and cities and other interested parties. The Section 6 vegetation management project was implemented at the DFG Table Bluff Ecological Reserve and the Crescent City Marsh Wildlife Area.

Monitoring data for the populations at Table Bluff show that western lily has exhibited a dramatic decline in total of number plants, particularly juveniles, probably as a result of deer browsing. The greatest increase in seedlings occurred in plots where deer were excluded. Chemical treatments to remove brush were not successful in increasing population size. The low to moderate intensity grazing treatments appeared to be successful in reducing vegetation cover and creating conditions favorable to the establishment and survivorship of the lily. The population of western lily at the Crescent City Marsh Wildlife Area also declined over the same period of time. No single cause could be identified. Continued annual monitoring of western lily in the experimental plots is recommended. Continued monitoring of the vegetation structure is also recommended.

In addition to habitat manipulation to benefit the species, researchers at Berry Botanic Garden in Oregon implemented a reintroduction experiment in the fall of 1996 on BLM land in Oregon. This project was designed to examine the effects of propagule type (bulbs, new and old seeds) and substrate surface at time of planting (intact ground cover, versus bare ground) on emergence and subsequent plant and population growth rates. Areas in which ground cover was left intact supported higher emergence rates than did the areas in which ground cover was removed. Propagule type, but not ground cover treatment affected leaf area: bulbs emerged in significantly

higher rates than did either new or old seeds, and plants from bulbs were larger than plants from both old and new seeds, which did not differ from one another in size. In the first two years, source population affected emergence, but not leaf area, a pattern reversed in 1999. The experiments showed that, over the first four years, bulbs had higher survival than plants seeded directly. Initial results showed that plants grown from old seed survived better during the first year than those grown from new seed. This trend, however, reversed in subsequent years and using bulbs may be a more successful way to establish new plants.

Pitkin Marsh lily

Lilium pardalinum
ssp. pitkinense

State: Endangered 1978
Federal: Endangered 1997

General Habitat:

Pitkin Marsh lily is restricted to freshwater marshes in the vicinity of Sebastopol and Cunningham in Sonoma County. It occurs in moist soil in grassland under oaks and is associated with California dogwood, western azalea, Bigelow sneezeweed, blue-eyed grass, sedges, and rushes. It is also associated with several sensitive species including white sedge and Pitkin Marsh Indian paintbrush.

Description:

Pitkin Marsh lily is a large herbaceous perennial with tall slender stems, narrow whorled leaves, and showy, nodding yellow-orange flowers with deep maroon dots and red tips. This member of the lily family (Liliaceae) arises from a rhizome. This species is distinguished from the more common leopard lily (*Lilium pardalinum* ssp. *pardalinum*) by its shorter petals and anthers.



Status:

Pitkin Marsh lily is known from three occurrences in the vicinity of Sebastopol and Cunningham, only two of which have been seen recently. These occurrences are on private land near fresh water marshes in the vicinity of Sebastopol and Cunningham. The owners of one property have denied researchers access to the population there since 1975. It is presumed that the plants still exist there, but there is no way of determining the number of individuals remaining. The second known site was nearly destroyed by development in 1960s, but approximately 200 plants remain. A major subdivision is planned in the surrounding area, but a "conservation easement" agreement between the California Department of Fish and Game and the landowner will help to preserve this population. At the third known site, where this had once been a common species, only two plants remain. This loss was due in part to wetland filling, but was primarily because of the removal of plants and bulbs for horticultural use. Owners of the latter two sites entered into voluntary protection agreements with The Nature Conservancy in 1989.

In 1998, the Cunningham Marsh Conservation Easement was established to protect marsh habitat and uplands from a proposed subdivision development on adjacent land. Cunningham Marsh contains a suite of sensitive plants and listed species, including Pitkin Marsh lily. Under the easement agreement, DFG has jurisdiction over preservation of the 19-acre site; the Milo Baker Chapter of CNPS assumed responsibility for monitoring and

maintaining the Pitkin Marsh lily population within the easement. It was hoped that removal of the extreme grazing pressures, a condition of the 1998 conservation easement agreement, would allow some of these native plants to recover. However, removal of cattle from the marsh facilitated invasion by non-native grasses, and Himalayan blackberry has taken over the entire riparian corridor, forming large, dense thickets. Without removal of these aggressive competitors, it is doubtful that the sensitive and rare species will be able to reestablish populations. In 2002, California Native Plant Society members participated in vegetation clearing at the Cunningham Marsh Preserve. Volunteers removed invasive velvet grass, cut back crowding shrubs, and installed or repaired animal enclosures around Pitkin Marsh lilies there. A similar project in 2001 appeared to help the lilies to thrive.

The Sonoma County Department of Planning has designated the marshes in which this species grows as "critical habitat." This designation requires that any construction must be separated from the wetland boundaries by a minimum of 50 ft although the requirement for a 50-ft setback can be waived if the setback would make the land unsuitable for construction.

Habitat loss due to urbanization is a primary threat to the Pitkin Marsh lily. Changes in hydrologic regime and the resultant change in vegetation, introduction of non-native species, land clearing and draining operations, cattle grazing, and horticultural bulb collecting have impacted all Pitkin Marsh lily populations. Pitkin Marsh lily is maintained by the Berry Botanic Garden as part of the Center for Plant Conservation National Plant Collection.

Baker's meadowfoam *Limnanthes bakeri*

State: Rare 1978
Federal: None

General Habitat:

The primary habitat for this species is seasonally saturated or inundated clay soil in low swales, roadside ditches, and along margins of marshy areas. Its distribution is restricted to Mendocino County near Laytonville, Ukiah, and Little Lake Valley near Willits. It is associated with other species of meadowfoam, popcornflower, rushes, and sedges.



Description:

Baker's meadowfoam is an herbaceous annual in the false mermaid family (Limnanthaceae) with dissected leaves and funnel-shaped flowers of white or cream



Status:

Approximately 20 occurrences of Baker's meadowfoam are known. Population numbers range from fewer than 10 plants to millions. All populations are on private land. The owners of several sites are cooperating in the conservation of this species. The greatest potential threats to this plant are residential development, alteration of local drainage patterns and hydrology, and agricultural conversion. An occurrence at Covelo was destroyed by development.

Most of the habitat for Baker's meadowfoam is used for grazing. Some discing has occurred, but meadowfoam populations appear to tolerate light disturbance or grazing. Through an MOU between the DFG and CALTRANS, completed in 1997, a study resulted in the analyses of genetic variation between and within populations and assessed germination, dormancy, population size, and vigor of Baker's meadowfoam populations. Previously unknown populations were also discovered as a result of the study. Results are being used to evaluate impacts caused by the proposed realignment of State Highway 101 around the City of Willits in Little Lake Valley, which supports most Baker's meadowfoam populations. The 2001 Mendocino County Regional Transportation Plan Draft Program Environmental Impact Report found that three of the four alternatives proposed would impact populations of Baker's meadowfoam. The City of Willits has proposed a new wastewater treatment facility much needed for environmental protection of the wetlands from the current marginal treatment facility. This too would impact the Baker's meadowfoam.

**Point Reyes
meadowfoam**

Limnanthes douglasii
var. sulphurea

State: Endangered 1982
Federal: None

General Habitat:

This species occurs primarily in vernal moist depressions in open, rolling coastal prairies and meadows. It occurs in Marin and San Mateo Counties. It is associated with rushes, buttercup, horsetail, and cinquefoil. Much of its habitat is dominated by non-native annual grasses.

Description:

Point Reyes meadowfoam, a member of the false mermaid family (Limnanthaceae), is an herbaceous annual with three- to five-lobed leaves and bell-shaped, yellow flowers.



Status:

Point Reyes meadowfoam is known from 11 occurrences. All but one of these occurrences is within Point Reyes National Seashore in Marin County. The remaining population is on private property near Pescadero in San Mateo County. Population numbers fluctuate on an annual basis making an assessment of overall population size difficult. Intensive cattle grazing and related habitat degradation are the principal threats to the populations within Point Reyes National Seashore while road grading or maintenance could impact the population in San Mateo County. Point Reyes meadowfoam seed is available in the horticultural trade.

County meadowfoam. They found that 96 percent of genetic diversity in Butte County meadowfoam existed among populations and that little variability was evident within populations. An average regeneration time (germination, growth, seed production) for the meadowfoam was estimated at two years and that a seed would be transferred between populations once every 100 to 200 years. Although considerable morphological variability has been observed within populations, it apparently is attributable to differences in environmental response by plants of the same genetic makeup. To ensure long term survivorship of the species and its genetic component, conservation of the species throughout its range is absolutely essential.

Under its original design, the Highway 149 project would have impacted vernal pools and Butte County meadowfoam. This project will expand Highway 149 from two lanes to a four-lane expressway between Highway 70 and Highway 99. Twelve subpopulations of the meadowfoam have been identified within the project area. The alternative to avoid Butte County meadow was ultimately selected as the preferred alternative.

In the September 2002, FWS issued a proposed rule to designate critical habitat for four vernal pool crustacean species and vernal pool plants. That rule was finalized in August 2003, but excluded Butte County from critical habitat designation. It is not known how this decision will affect long term conservation of Butte County meadowfoam. A recovery plan has not been written for this species and it is not yet included in any large habitat conservation planning effort. Butte County is preparing a Habitat Conservation Plan (HCP) that would regulate impacts on habitats within the county. Until the county HCP is completed, mitigation of individual projects for impacts to the Butte County meadowfoam may not result in the conservation of the species in large preserves. Smaller habitat areas normally set aside on a project by project basis are often not viable preserves, lacking protection for the hydrologic features or surrounding upland habitat essential for vernal pools.

Some land acquisition to protect Butte County meadowfoam has occurred. In 2002, the U.S. Bureau of Reclamation, Central Valley Project Conservation Program, provided funds to acquire 264 acres of vernal pools supporting Butte County meadowfoam and vernal pool invertebrates. In 2003, the Dove Ridge Conservation was certified by the USFWS for mitigation for projects in Tehama and Butte Counties. The 2,400-acre conservation bank contains over 200 acres of vernal pool habitat that support Butte County meadowfoam, the vernal pool fairy shrimp, and the vernal pool tadpole shrimp.

**Parish's
meadowfoam**

Limnanthes gracilis
var. parishii

State: Endangered 1979
Federal: None

General Habitat:

This species is known from the montane meadows of northern and eastern San Diego County, as well as the Santa Rosa Plateau region in western Riverside County. It is a plant of moist habitats, often growing in vernal pools, wet meadows, and near springs and seeps. Its habitat is dominated primarily by annuals and herbaceous perennials rather than grasses. It is associated with downingia, buttercup, delphinium, and blennosperma.

Description:

Parish's meadowfoam is a small, herbaceous annual in the meadowfoam family (Limnanthaceae) with wide-spreading branches, divided leaves, and white bowl-shaped flowers that fade to pink.



Roxanne Bittman, California Native Plant Society



Roxanne Bittman © California Native Plant Society

Status:

Parish's meadowfoam is known from fewer than 30 occurrences, many of which have not been observed in more than ten years. The occurrences are centered primarily in Cuyamaca Valley and the Laguna Mountains in eastern San Diego County, Palomar Mountain in Cleveland National Forest in northern San Diego County, and on the Santa Rosa Plateau Preserve in Riverside County. A significant amount of habitat for Parish's meadowfoam was probably lost in Cuyamaca Valley in the 1880s with the construction of Cuyamaca Dam and the permanent inundation of Cuyamaca Lake over a portion of what previously had been a vernal lake.

DPR established the Cuyamaca Meadows Natural Preserve within Cuyamaca Rancho State Park in 1990 to provide additional protection to Parish's meadowfoam habitat as well as habitats for other rare species found in that portion of the State Park. In 1996, following two years of extended negotiations, the DFG entered into an agreement with USFWS, Helix Water District, Lake Cuyamaca Recreation and Park District, DPR and USFS to protect Parish's meadowfoam, State-listed endangered Cuyamaca Lake downingia (*Downingia concolor* var. *brevior*), and State-listed rare Cuyamaca larkspur (*Delphinium hesperium* ssp. *cuyamaca*).

The MOU identifies particular actions to be taken by each of the signatory land managers to preserve and protect the populations of Parish's meadowfoam on their lands. Grazing, highway maintenance activities, and recreational and trail development are threats to Parish's meadowfoam. This agreement was entitled "Conservation Agreement for the Preservation of Cuyamaca Lake Downingia (*Downingia concolor* var. *brevior*) and Parish's Meadowfoam (*Limnanthes gracilis* ssp. *parishii*)." The Conservation Agreement addresses threats to both species and recovery actions through a combination of measures. These measures address impacts resulting from alteration of hydrology in the Cuyamaca Valley, grazing, recreational activities, and off-road vehicle (ORV) access over the majority of the range of these two plant species. Because implementation of the measures in this

conservation agreement significantly reduces the risks to Cuyamaca Lake downingia and Parish's meadowfoam, FWS concluded that federal listing was not warranted.

In 2003, the huge Cedar Fire burned a large portion of central San Diego County including the Cuyamaca Mountains and the area around Cuyamaca Lake. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 13% of suitable habitat was burned during the fire. However, the ability to precisely locate vernal pool complexes within the fire perimeter was limited. Botanists visiting Cuyamaca Lake during the spring in 2004 found a dense carpet of wildflowers covering the meadows at the lake. Few of the grasslands supporting vernal pools burned with a high intensity and impacts to sensitive species found in these pools were not severe.

Parish's meadowfoam is a covered species under the Riverside County Multiple Species Habitat Conservation Plan. It is restricted to the vernal pools on the Santa Rosa Plateau within the planning area. The MSHCP proposes to protect the watershed of the Santa Rosa Plateau to ensure conservation of the vernal pool species on the plateau.

Parish's meadowfoam is one of the focal species identified by the South Coast Wildlands Project (SCWP). SCWP is a non-profit organization dedicated to ensuring functional habitat connectivity across the South Coast Ecoregion which extends from San Diego County into Baja California, Mexico. Their mission is to protect, connect, and restore the rich natural heritage of the South Coast Ecoregion by establishing a system of connected wildlands.

Sebastopol meadowfoam *Limnanthes vinculans*

State: Endangered 1979
Federal: Endangered 1991

General Habitat:

Sebastopol meadowfoam grows in seasonally wet meadows, pastures, and vernal pools, primarily in the drainage of the Laguna de Santa Rosa in Sonoma County. Sebastopol meadowfoam often occurs with two other State and federally listed endangered plants: Burke's goldfields and Sonoma sunshine.

Description:

Sebastopol meadowfoam is a small annual herb in the False Mermaid Family (Limnathaceae). It has bowl-shaped white flowers. Although the first leaves are narrow and undivided, leaves on the mature plant have three to five undivided leaflets along each side of a long stalk (petiole). The shape of the leaves distinguishes Sebastopol meadowfoam from other members of the *Limnanthes* genus.



Status:

Limnanthes vinculans is currently reported from about 30 occurrences. Populations occur on privately owned lands as well as lands owned by CALTRANS, the U.S. Army, and the City of Santa Rosa. DFG protects populations at its Laguna de Santa Rosa Ecological Reserve and one of its nearby extensions. The majority of occurrences, however, are on private land within five miles of the City of Santa Rosa.

Primary threats to the species consist of activities that result in the destruction of the plants or hydrologic changes in their habitats. Such activities include urbanization, industrial development, agricultural land conversion, off-highway vehicle use, horseback riding, trampling by grazing cattle and road widening.

Housing development, agriculture, waste water irrigation, and long-term intensive livestock grazing have contributed to the decline and demise of most of the area's pools. In some cases pools spared in development projects in the Santa Rosa Plain area are declining in viability as a result of being within "postage-stamp" reserves surrounded by homes. Altered hydrology due to lawn irrigation, increased refuse, and foot traffic have contributed to site quality reduction in some areas. Agriculture (including discing, vineyards, and orchards) has destroyed or damaged other vernal pool areas. Only a few moderately-sized viable vernal pool areas remain in the region. The floristic quality of the remaining pools has declined in some areas due to long-term intensive grazing.

In order to resolve the conflicts with land use and wetland resources a Vernal Pool Task Force was formed. Composed of federal, state, and local agencies, local development and agricultural interests, and local environmental groups, the Task Force developed a Vernal Pool Ecosystem Preservation Plan. The Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan identifies areas for wetland and rare species protection, and areas wetland creation, restoration, or enhancement. This plan is currently being implemented.

To date, more than 23 separate properties, ranging in size from 1 acre to 174 acres, have been placed under the

jurisdiction of DFG in cooperation with local agencies, such as the Sonoma County Agricultural Preservation and Open Space District (SCAPOS), for the protection of vernal pool species. Sonoma sunshine is protected with the DFG Todd Road Reserve contains 75 acres of vernal pools and associated uplands. A portion of the Carinalli Property near Laguna de Santa Rosa (150 acres) and a recent acquisition of an adjacent 75 acres both contain some vernal pool habitat and have been acquired under the Santa Rosa Plain Vernal Pool Ecosystem Preservation Plan. At the DFG's Laguna de Santa Rosa Ecological Reserve, Sonoma sunshine occurs with two other State and federally listed endangered plant species: Burke's goldfields (*Lasthenia burkei*) and Sonoma sunshine (*Blennosperma bakeri*).

Approved mitigation focuses on preservation and restoration of existing habitat. Some recent acquisitions and approved preservation banks protect Sebastopol meadowfoam, although the remaining populations continue to be significantly threatened by urban development and agriculture. Conservation easements have also been used to protect Sebastopol meadowfoam. For example, landowners donated a conservation easement over their seven acres in the Cunningham Marsh area of Sebastopol to the Sonoma Land Trust. Sebastopol meadowfoam occurs in vernal pools on this property.

In 1993, Rancho Santa Ana Botanic Garden created 30 small vernal pools as part of their plant display as well as part of a long term gene flow study by the Garden's Research Department and Endangered Species Program. Artificial vernal pools have also been created by the University of California's Botanic Garden. Because these pools require careful tending it has been concluded that recreated pools are not self-sustaining and therefore not a viable option to replace the loss of naturally occurring vernal pools. Although creation of vernal pools is used as a management or mitigation tool in the Santa Rosa area, the long term success or failure of these created pools cannot yet be determined.

Research on the vernal pool plants is ongoing, funded primarily by FWS Section 6 grants. For example, projects examined the biological and logistic characteristics of the reserve properties, developed a management framework for recovery of the listed plants, designed and installed a long-term mowing/phytomass removal experiment to improve habitat quality, and conducted trials for intensive management techniques, e.g. fire and herbicide. This scientific approach has been used to assess practical, large-scale prescriptions that can directly affect recovery of the listed plants and improve native plant cover in vernal pool and adjacent upland habitats. These prescriptions gain wider applicability when supported by experimental data from multiple years with variations in climate and plant cover.

One ongoing study has examined several treatments, mowing, fire, and selective herbicides, to improve vernal pool habitat. Mowing and phytomass removal was initiated in 2000 as a practical way to improve native vegetation and water quality and reduce fire hazard. The treatment was repeated in 2001. No treatment effects were detected, possibly due to low levels of precipitation and the short duration of the treatment (only two years). In 2002, large patches of Sebastopol meadowfoam appeared in plots that had been mowed and mulched as well as mowed and raked where none had been before. A similar positive effect was observed in 2001 after a wildfire had burned a portion of one of the study sites in 2000: Sebastopol meadowfoam was dense and extensive in the burned area. Future studies may elucidate genetic variability within and between populations of Sonoma sunshine, Burke's goldfields, and Sebastopol meadowfoam.

**San Clemente Island
woodland star**

*Lithophragma
maximum*

State: Endangered 1982
Federal: Endangered 1997

General Habitat:

San Clemente Island woodland star occurs in moist habitats primarily on north-facing slopes in nearly inaccessible canyons on the east side of San Clemente Island, the southernmost of the eight Channel Islands. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island woodland star is a rhizomatous, perennial herb in the saxifrage family (Saxifragaceae), with basal, three-lobed leaves. Each plant produces two or three stout flowering stems, 16-24 inches tall, and each flowering stem produces 20 or more white to pinkish bell-shaped flowers that bloom from April to June.

Status:

This species is extremely rare and was thought to be extinct until it was rediscovered in 1979. Today, about 200 plants are thought to remain in the wild, all in deeply incised canyons on the southeastern portion of San Clemente Island.

Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. Inaccessible areas such as deeply incised canyons were likely the only refuge from these animals. Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program.

A propagation program may be needed to achieve recovery for this species.



San Clemente Island *Lotus argophyllus*
bird's-foot trefoil *var. adsurgens*

State: Endangered 1979
Federal: None

General Habitat:

This subspecies grows on marine terraces in the cholla phase of maritime desert scrub vegetation on San Clemente Island, the southernmost of the eight Channel Islands. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island bird's-foot trefoil is an erect, shrubby perennial with crowded silvery leaves, short fruits, and small yellow-orange flowers. It is a member of the pea family (Fabaceae).



Status:

San Clemente Island bird's-foot trefoil is endemic to San Clemente Island. Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation before the distribution of several rare plants were determined. Intense grazing by goats reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. San Clemente Island bird's-foot trefoil inhabits only a few sites on the southern tip of San Clemente Island. Each site has fewer than 50 individuals. DFG has no current information on the status of this species.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range, but military operations have only occasionally directly affected this plant. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program.

Recent research found a low degree of hybridization between *Lotus* species on San Clemente Island. Although hybridization was not extensive, it may still pose a long-term threat to the survival of San Clemente Island bird's-foot trefoil.

**Santa Cruz Island
bird's-foot trefoil**

Lotus argophyllus
var. niveus



State: Endangered 1981
Federal: None

General Habitat:

This subspecies is found only on Santa Cruz Island, the largest of the Channel Islands. It grows on rocky slopes, stony flood plains, and dry canyon streambeds in coastal sage or chaparral plant communities.

Description:

Santa Cruz Island bird's-foot trefoil is a low, much-branched perennial covered with silvery silky hairs. The plants have divided leaves and produce yellow and brown or purple flowers. It is a member of the pea family (Fabaceae).

Status:

Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%). In 1997, TNC drafted operating principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. Long-term grazing by sheep had degraded much of the native vegetation on Santa Cruz Island, and weedy exotic plants became established. TNC initiated a program to remove feral sheep from the island, which has been successful. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Feral pig eradication efforts will likely begin in late summer, 2003.

As a result of the elimination of sheep grazing, Santa Cruz Island bird's-foot trefoil populations have recovered, especially on high ground within floodplain areas. DFG has no recent information on the population numbers or status of individual populations of this plant.

**San Clemente
Island lotus**

*Lotus
dendroideus* var.
traskiae



State: Endangered 1982
Federal: Endangered 1977

General Habitat:

San Clemente Island lotus grows on open, grassy north-facing slopes at canyon mouths and on hillsides at several sites on San Clemente Island, the southernmost of the eight Channel Islands. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island lotus, also known as San Clemente Island broom, is a perennial subshrub in the pea family (Fabaceae). It has erect, glabrous branches, leaflets usually in threes, and yellow or red-tinged flowers.



Status:

The extent of the historic distribution of San Clemente Island lotus is unknown. Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. There are about 30 known occurrences of San Clemente Island lotus.

Currently, the U.S. Navy, which has jurisdiction over San Clemente Island, uses it as a bombing and gunnery range. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. Many populations have increased slightly in size since the removal of the feral animals. Recent research found a low degree of hybridization between *Lotus* species on San Clemente Island. Although hybridization was not extensive, it may still pose a potential long-term threat to San Clemente Island lotus.

Mariposa lupine

Lupinus citrinus
var. deflexus

State: Threatened 1990
Federal: None

General Habitat:

Mariposa lupine grows on decomposed granitic sands on ridgetops and hillsides in openings in foothill woodlands from 1,400 to 1,900 ft in elevation on the western slope of the Sierra Nevada in southwestern Mariposa County, south of the town of Mariposa. It is associated with foothill pine, Mariposa manzanita, Sierra whitethorn, and sky lupine, harlequin lupine.

Description:

Mariposa lupine is an erect, diffusely-branched annual herb belonging to the pea family (Fabaceae). They are short, hairy to hairless, and have palmately compound leaves. The six to nine leaflets are about one-third as wide as they are long and are linear or spatula-shaped with blunt tips. White flowers that may have pink or lavender tips appear from April through May.



Dan Hamon, DFG File Photo



Dan Hamon, DFG File Photo



Miriam Warner, DFG File Photo



Dan Hamon, DFG File Photo

Status:

The six occurrences of Mariposa lupine occur on private lands in Mariposa County over 15 sq mi area. Two of the six occurrences grow with *Calyptridium pulchellum*, a Federal threatened species. Four of the six occurrences are protected by a voluntary landowner agreement with TNC. Mariposa lupine had been proposed for listing by FWS in 1994, but the proposal was withdrawn in 1998. At the time of the proposed rule, FWS cited threats from urbanization and, potentially, overgrazing. Subsequently, the Service was not been able to verify that overgrazing occurs at the grazed sites where Mariposa lupine occurs. Continued or future urbanization may threaten at least two occurrences of this species.

Milo Baker's lupine *Lupinus milo-bakeri*

State: Rare 1978
State Threatened 1987
Federal:

General Habitat:

Milo Baker's lupine occurs in the wet roadside ditches and streams of Round Valley near the town of Covelo in Mendocino County, and in the Bear Valley region of Colusa County. Associated species include blackberry, wild grape, and poison oak. Much of its habitat is dominated by non-native weeds.

Description:

Milo Baker's lupine, a member of the pea family (Fabaceae), is a tall, herbaceous annual with pale blue to yellow flowers and silky leaves.



Status:

Approximately a dozen known occurrences of this species are known; most are in Mendocino County. Four occurrences in Mendocino County populations have been extirpated. This species is threatened primarily by highway maintenance activities including herbicide application and road widening. Milo Baker's lupine occurs on private land and on Caltrans highway rights-of-way. Information is needed on the status of this plant.

Nipomo Mesa lupine

*Lupinus
nipomensis*

State:	Endangered	1987
Federal:	Endangered	2000

General Habitat:

Nipomo Mesa lupine is restricted to dry sandy flats within stabilized, coastal back dune habitat in the southwestern corner of San Luis Obispo County, west of Nipomo Mesa. Nipomo Mesa lupine occurs in two types of habitat: high quality and degraded. The high quality habitat areas are situated in dune swales and contain both native annuals and widely spaced individuals of mock heather. The degraded areas have been either physically degraded or invaded by non-native weedy species. Nipomo Mesa lupine requires pockets of bare sand, probably indicating a low tolerance for competition.

Description:

Nipomo Mesa lupine is an annual herb in the pea family (Fabaceae). It is hairy, with decumbent stems growing 4-8 inches tall, leaves with 5-7 leaflets, and pink flowers.



Status:

Nipomo Mesa lupine is known from one extended population, made up of 5 occurrences and fewer than 700 plants. At least three historically known populations have been extirpated, including the type-locality. The general trend for this species has been one of decline.

The central portion of the species' distribution is occupied by UNOCAL's Santa Maria Refinery; all occurrences are found within one mile of the refinery. Principle threats include facility disaster, continued coastal development, OHV activity, and expansion of introduced weedy plants, particularly veldt grass and ice plant. All but one existing occurrence are on private land and remain unprotected.

A program of dune grass and veldt grass removal within the Guadalupe Dunes began in 1999. This effort, conducted by the Land Conservancy of San Luis Obispo County, has improved areas of Nipomo Mesa lupine habitat, helping to stabilize the declining occurrences. More recently, the USFWS has committed to sponsoring a seed conservation program in collaboration with the Center for Plant Conservation. In addition, they are initiating efforts to determine whether suitable habitat for the lupine occurs on the Guadalupe-Nipomo National Wildlife Refuge, located just south of the known population, in the first phase of an effort to introduce and establish new lupine populations there.

Father Crowley's lupine

Lupinus padre-crowleyi

State: Rare 1981
Federal: None

General Habitat:

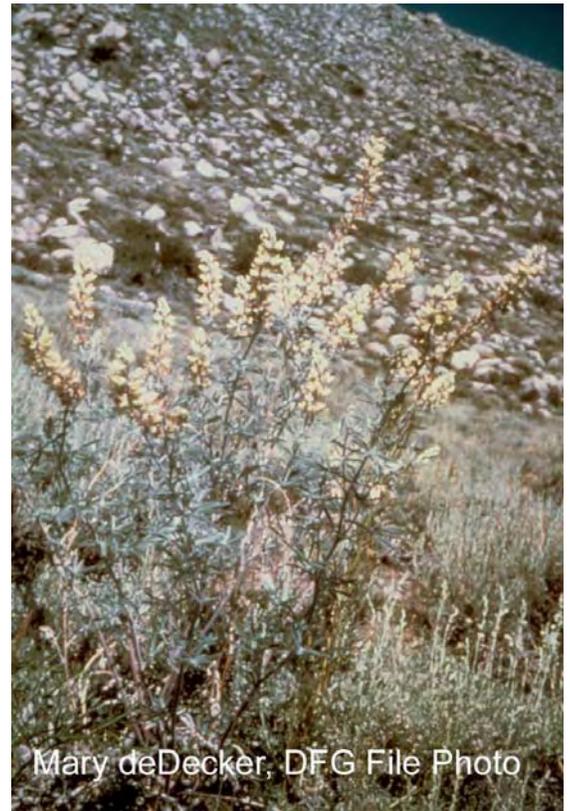
Father Crowley's lupine is associated decomposed granite in Great Basin scrub and open conifer/sagebrush vegetation on the eastern slope of the Sierra Nevada in Inyo County. It is associated with big sagebrush, bitterbrush, Jeffrey pine, white fir, buckwheat, and spurred lupine. This species also occurs in avalanche chutes with quaking aspen and lodgepole pine, as well as with water birch and quaking aspen in a riparian zone along a creek.

Description:

Father Crowley's lupine is a bushy herbaceous perennial in the pea family (Fabaceae). It is covered with gray, spreading hairs and has creamy white flowers. Its leaves are divided into seven to eight leaflets.

Status:

There are six reported occurrences of Father Crowley's lupine. Two occurrences have not been observed since 1950 and the remainder dates from the 1980s. Four of the reported populations consist of about 10 subpopulations. Local subpopulations are generally comprised of scattered individuals on steep avalanche chutes, in sunny sites in drainages, and in valley bottoms. All known sites are within Inyo National Forest. In 1998, the Inyo National Forest collected seed from a population of Father Crowley's lupine for propagation and outplanting in the area of a former airstrip that was being restored. DFG has no recent information on the status of this species.



Tidestrom's lupine

*Lupinus
tidestromii* var.
tidestromii

State: Endangered 1987
Federal: Endangered 1992

General Habitat:

Tidestrom's lupine occurs on partially stabilized coastal dunes of the Monterey Peninsula in Monterey County, near Dillon Beach in Marin County, at Point Reyes National Seashore, and an isolated colony near the mouth of the Russian River in Sonoma County. This member of the pea family (Fabaceae) is sometimes associated with two other State-listed endangered plants: Menzies' wallflower (*Erysimum menziesii* ssp. *menziesii*) and beach layia (*Layia carnososa*).

Description:

Tidestrom's lupine is a prostrate perennial herb with whorls of light blue to lavender flowers, black-spotted pods, and bright yellow roots. The fan shaped leaves have 3-5 narrow leaflets, each less than 1 inch long. The stems and leaves have short hairs. Bright yellow roots, prostrate habit, small leaflets and dense hairs on the foliage distinguish clover lupine from lupines of coastal dunes (e.g. *Lupinus variicolor*, *L. littoralis*, *L. chamissonis*, *L. arboreus*). Some botanists distinguish between Pt. Reyes clover lupine (*L. tidestromii* var. *layneae*) and Tidestrom's lupine (*L. tidestromii* var. *tidestromii*). The *Jepson Manual* treats *L. tidestromii* as a single, variable species, called Tidestrom's lupine.

Status:

There are approximately 18 extant, natural occurrences of the species, one introduced occurrence, and two extirpated, historical occurrences of Tidestrom's lupine. One population of Tidestrom's lupine on private property, Lawson's Landing in the Tomales Dunes in Marin County, disappeared in the early 1990s due to overgrazing, according to the botanists familiar with the site.

In 1996, the DFG held a recovery workshop for seven coastal plants, including Tidestrom's lupine. At the workshop, participants discussed current threats, including residential development, trampling, and OHVs. In addition to these threats, non-native species such as ice plant (*Carpobrotus edulis*) and European beach grass (*Ammophila arenaria*) threaten Tidestrom's lupine at all occurrences. For example, the southernmost population is located at Pebble Beach in Monterey County. Several of the occurrences on the Monterey Peninsula are on



remnant dunes in the yards of private residences. One population is surrounded by golf course where the dunes are being overrun by ice plant. Local botanists do not consider this population to be viable.

Another significant threat to Tidestrom's lupine on the Monterey Peninsula is hybridization with silver bush lupine (*Lupinus chamissonis*). Silver bush lupine does not naturally occur on the Monterey Peninsula. It was introduced at Asilomar State Beach and Conference Grounds in the early 1970s by a horticulturist employed by the operator of the conference grounds. He also planted it on several residential properties in the dunes between Pt. Pinos and Cypress Pt. as part of "dune restoration" landscaping projects. In about 1988, the Pebble Beach Company introduced silver beach lupine into the Spanish Bay Resort dunes, as part of their golf course dune revegetation project. Hybrids between these two species were first observed about 12 years ago in areas at Asilomar occupied by both Tidestrom's and silver bush lupines. In the last five years there was an explosion of these hybrid-like plants. Both the silver bush lupine and the hybrid-like plants are very invasive, encroaching readily into areas occupied by Tidestrom's lupines.

Two years ago, researchers hired by DPR confirmed through isoenzyme profile assay analysis and taxonomic analysis that the new plant is a hybrid between silver bush lupine and Tidestrom's lupine. In 1999, plant pathologists used thin layer electrophoresis to screen lupine samples and identify the off-type lupine plants. This study has now been expanded to include areas where Tidestrom's lupine and silver bush lupine naturally occur together (Pt. Reyes and Goat Rock Dunes). Besides developing a photographic key, a Monterey botanist and local expert is preparing a taxonomic key to aid in the identification of the different lupines. Supervised crews are hand-pulling the hybrid plants on state park land as well as at Spanish Bay. Private property owners who have silver bush lupines on their property are also being contacted to request their permission to remove silver bush lupines and replace them with other appropriate natives. Although many hybrid plants have been removed, constant monitoring will be required to remove new seedlings and to limit the expansion of the silver bush lupine hybrid.

NPS has started a dune restoration program at Point Reyes National Seashore, which will benefit the seven Tidestrom's lupine occurrences there. Over summer 2001 and 2002, Point Reyes National Seashore initiated the first stages of a three-year coastal dune restoration project which includes removal of European beachgrass and iceplant. These nonnatives form a thick mat that excludes native plants and animals, such as the western snowy plover. Restoration targets 30 acres near Abbotts Lagoon, a site that harbors the largest dune remnants in the park and is one of the prime attractions for park visitors.

The USFWS completed a recovery plan for Tidestrom's lupine and six other coastal plants in 1998.

**Laguna Mountains
aster**

*Machaeranthera
asteroides var.
lagunensis*

State: Rare 1979
Federal: None

General Habitat:

Laguna Mountains aster occurs on dry, sandy loam soils in openings of Jeffrey pine/black oak forest in a localized area of the southern Laguna Mountains in San Diego County. It is associated with Wright's buckwheat, yarrow, bedstraw, penstemon, and California brome.

Description:

Laguna Mountains aster is an herbaceous perennial in the sunflower family (Asteraceae). It has stout, branching stems covered with fine, gray hairs, and large lavender flowers.



Fred Sproul, DFG File Photo



Fred Sproul, DFG File Photo

Status:

This species is restricted to a small area near the community of Mount Laguna and Wooded Hill. A fire in 1989 may have promoted an expanded population. The sole reported occurrence of this species is on Cleveland National Forest land. USFS has developed a management strategy to reduce or eliminate threats to this species. Threats include heavy grazing, which prevents seed set, recreational activities, and roadside maintenance. Fencing to exclude cattle, and light soil disturbance to stimulate colonization by seedlings, have been suggested as management measures for this species. CNPS reports of this plant in Baja California have not been verified.

In 2003, the huge Cedar Fire burned a large area of central San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 21% of habitat suitable for Laguna Mountains aster burned during the fire. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of Laguna Mountains aster.

**San Clemente
Island bush
mallow**

*Malacothamnus
clementinus*

State: Endangered 1982
Federal: Endangered 1977

General Habitat:

San Clemente Island bush mallow is found on sedimentary rock walls and ridges of San Clemente Island, the southernmost of the eight Channel Islands off the coast of southern California. The maritime climate of the Channel Islands is characterized by hot, dry summers and mild, wet winters with periodic severe droughts and frequent fog.

Description:

San Clemente Island bush mallow, a member of the mallow family (Malvaceae), is a rounded, evergreen shrub with numerous ascending branches, large leaves that are lobed and hairy, and inflorescences of crowded, pink flowers.



Status:

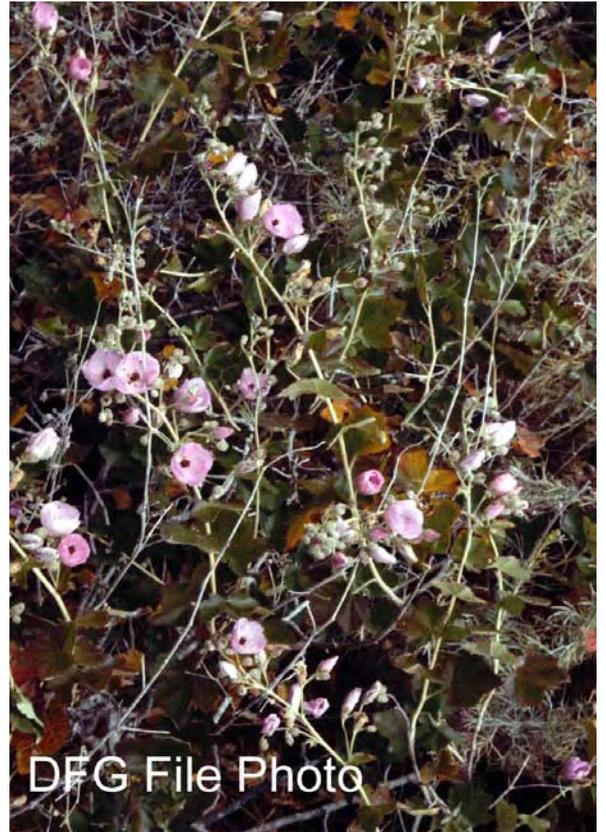
San Clemente Island bush mallow is endemic to San Clemente Island. Ranching operations on the island during the past century resulted in overgrazing and elimination of much of the native vegetation. Intense grazing and disturbance by feral goats and pigs reduced native plant cover, spread non-native plants, and degraded soil structure, causing erosion and destruction of seed banks. The surviving populations of San Clemente Island bush mallow are restricted to cliffs and steep slopes that isolated them from feral goat and pig browsing. The total population of San Clemente Island bush mallow is so small that it remains critically endangered.

Currently, the U.S. Navy manages San Clemente Island. The Navy has removed goats and pigs as part of its Feral Animal Removal Program, and the condition of the native vegetation has improved since the completion of the program. The Navy currently uses the island as a bombing and gunnery range. One canyon containing San Clemente Island bush mallow habitat is in an area used as a bombing impact zone, resulting in increased erosion and potentially posing a direct threat to the plants.

San Clemente Island bush mallow is grown at Santa Barbara Botanic Garden as part of their Island Display. It is also cultivated horticulturally and sold as a garden plant.

Santa Cruz Island bush mallow

Malacothamnus fasciculatus var. *nesioticus*



State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Santa Cruz Island bush mallow grows on a dry, south-facing canyon slope on the west end of Santa Cruz Island in coastal sage scrub vegetation.

Description:

Santa Cruz Island bush mallow is a tall evergreen shrub with slender, wand-like branches covered with woolly hairs, large, lobed leaves, and open inflorescences of rose-colored flowers. Genetic studies confirm that Santa Cruz Island bush mallow is a distinct variety in the mallow family (Malvaceae).

Status:

Santa Cruz Island bush mallow, endemic to Santa Cruz Island, is known from four occurrences. Santa Barbara Botanic Garden has been conducting research on the life history and ecological requirements of the species since 1994. Their studies suggest that the plant is a long-lived rhizomatous perennial, with most recruitment occurring by means of offshoots from underground rhizomes, and little to no recruitment occurring from seed. Genetic analysis has demonstrated that each occurrence is made up of a number of shrubs; however, these shrubs represent a much smaller number of clones. The Central Valley population contains 19 individual shrubs, consisting of only three genotypes or three clones; while a second population, consisting of about 50 individuals, represents 10 clones.

Research by the Santa Barbara Botanic Garden indicates that feral pigs are the greatest threat to the long-term survival of the species. Soil loss and habitat alteration also threaten the populations. Santa Cruz Island is owned and managed by TNC (75%) and NPS (25%). In 1997, TNC drafted operating principles and ecological goals for the biological management of Santa Cruz Island. Island managers and resource specialists recognized that the island habitats had been substantially altered by historic activities, including impacts from feral pigs and grazing animals, invasion by non-native plant species, and changes in historic fire regimes. More recently, NPS and TNC coordinated to develop the Santa Cruz Island Primary Restoration Plan. The purpose of the Restoration Plan is to protect the unique natural and cultural resources of Santa Cruz Island from continued degradation and to initiate recovery of the island ecosystem by eradicating feral pigs from the island and controlling fennel, a widespread weed. Feral pig eradication efforts began in late summer, 2003.

SBBG maintains an *ex situ* population of this species, including plants from all four populations, which provides information on the growth rates of the plants, and serves as a source of seed for conservation and recovery efforts. The USFWS completed a recovery plan for Santa Cruz Island bush mallow and twelve other island plants in 1999.

Rock lady *Maurandya petrophila*

State: Rare 1982
Federal:

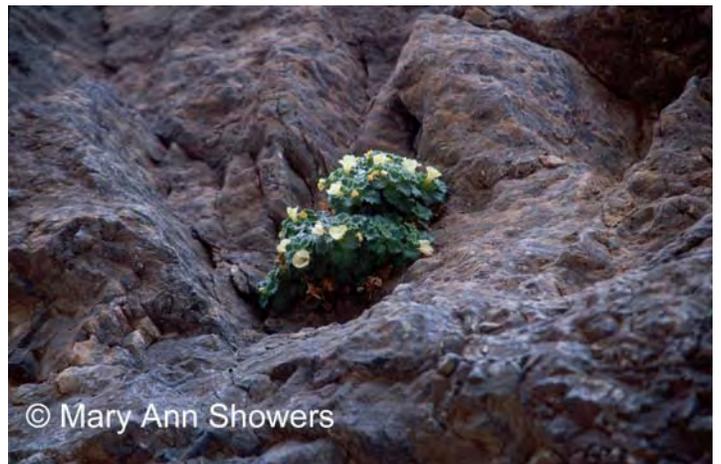
General Habitat:

Rock lady is found in the transition zone of the mixed desert scrub and creosote bush scrub plant communities in canyons in the Grapevine Mountains in Inyo County. It grows as scattered individuals in limestone rock crevices of steep canyon walls.



Description:

Rock lady is a soft-hairy, herbaceous perennial in the figwort family (Scrophulariaceae). It has short, hanging stems from a woody base, rounded, bristly leaves, and creamy yellow flowers



Status:

Rock lady is endemic to Death Valley National Park where it occurs in Titus and Fall Canyons. Only 26 individuals were documented in 1998; however approximately 700 individuals have now been located by National Park Service botanists. Suitable habitat for this species exists in other canyons and additional plants may be found. Several plants in Titus Canyon were damaged recently flames from an illegal campfire. Park Service staff removed the fire remains and cleared the site. Little is known of the ecology or population biology of rock lady.

The genus *Maurandya* is now classified as *Holmgrenanthe*.

Willow monardella

*Monardella
linoides ssp.
viminea*

State: Endangered 1979
Federal: Endangered 1998

General Habitat:

Willow monardella is found along drainages and floodplains in coastal sage scrub or riparian scrub. In California, it occurs primarily in the Miramar area of San Diego County. One population occurs near Arroyo Jatay in northern Baja California, Mexico. Associate species include California buckwheat, coast live oak, sycamore, California sagebrush, and mule fat.

Description:

Willow monardella is an aromatic perennial subshrub in the mint family (Lamiaceae) with erect stems from a woody base. The leaves of this species are narrow. Pale white to rose-colored flowers are borne in dense terminal heads subtended by greenish-white, often rose-tipped bracts. This taxon can be distinguished from other members of the genus by its gray-green, hairy stem and its conspicuously gland-dotted flower bracts. Plants found in the vicinity of Otay Mountain, including the plants located during the survey, are morphologically distinct from populations in the Kearny Mesa area and may represent a distinct taxon.

Status:

About half of all known occurrences of willow monardella in California have been extirpated. Willow monardella is currently known from approximately 14 extant occurrences in California. The population in Baja California is threatened by land use practices. For example, coastal scrub vegetation in northern Baja California is being grazed, burned to increase grass production, and rapidly converted to row-crop agriculture or condominiums, campgrounds and resort housing.

The majority of extant sites in California are on private or Department of Defense lands, have few plants, and have not been observed in many years. A few occurrences; under the jurisdiction of the City or County of San Diego. Because willow monardella occurs in washes and floodplains, it is highly vulnerable to changes in drainage patterns and hydrology, instream gravel mining, and flood control projects. Other threats include OHV activities, fire suppression, development of habitat, dumping, highway construction, and invasion of non-native species. Changes in hydrology also result in siltation and changes in native vegetation, such as invasion by willows, that constitute additional threats to this species.



Early attempts to translocate this plant as part of mitigation for highway construction have all failed. Another attempt at reintroduction was started in 2001 in Switzer Canyon. Willowy monardella was extirpated from Switzer Canyon as a result of changes brought about by the surrounding development. Three one-gallon size plants were installed on a sandy bank north of the creek, about 2 feet above the creek bottom. The plants were fenced to reduce rabbit predation. The status of this project is not known.

This species is covered in the San Diego Multiple Species Conservation Plan (MSCP). The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Willowy monardella is considered to be a narrow endemic species under the MSCP and 100 percent of the major populations will be conserved. This species is known from City of San Diego MSCP lands in a number of localities, most of which are in the central part of the City.

Most of the known localities were monitored by City staff or by volunteer efforts in 2001 and 2002. These localities include Sycamore Canyon, Lopez Canyon, and Marron Valley. In 2001, surveys found 247 clumps of plants: 1) two flowering clumps along a drainage in the southeast corner of lower Otay Lake on lands conserved for watershed management; 2) sixty-six clumps along drainages in the Marron Valley within a City of San Diego mitigation bank; 3) eight flowering clumps of willowy monardella in Lopez Canyon, which is highly disturbed and subject to erosion from adjacent urban development; and 4) 170 flowering clumps in Sycamore Canyon population within open space proposed for preservation. Monitoring in 2002 found a total of 302 flowering, non-flowering, and dead or dormant plants: 1) two flowering clumps at lower Otay Lake; 2) 103 plants in Marron Valley - 57 flowering, 41 non-flowering, and five dead or dormant; 3) 44 willowy monardella in Lopez Canyon, including seven flowering, 36 non-flowering, and one dead or dormant; and 4) 153 plants in Sycamore Canyon including 39 in flower, 89 non-flowering, and 25 dead or dormant plants.

Working with the Friends of Los Peñasquitos Canyon (Friends) and the California Native Plant Society (CNPS), the City of San Diego secured a grant from the U.S. Fish and Wildlife Service and the DFG to restore the hydrology of Lopez Canyon for the protection and reestablishment of willowy monardella. Currently the City and the Friends are collecting seed from various populations occurring on publicly owned land. In 2001, the Friends constructed gabion walls to prevent undercutting of the alluvial benches on which the willowy monardella occurs. The seed and other source material will be used to establish new populations. The Friends and the CNPS have already partnered to reduce other threats to the mint, including controlling exotic weeds and caging it to prevent herbivory of the rare flowers and seed by wildlife. In addition, both groups have been conducting annual censuses of the plants for about seven or eight years. The City's MSCP staff has joined the groups in surveying these plants in the last several years. The Friends and CNPS have also helped survey other known and potentially new populations of this plant on the County's Goodan Ranch, the City's General Dynamics Open Space, Marine Corps Air Station Miramar, and the Otay area.

In 2003, the huge Cedar and Otay Fires burned large areas of central and south San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 6% of habitat suitable for willowy monardella burned during the fires. The impacts of the Otay fire were analyzed according to personal communications; areas around Proctor Valley and Otay Lakes had burned but that Otay Mesa and Marron Valley had not burned. Post-fire monitoring will be necessary to assess any long-term effects of the fire on willowy monardella.

The City of San Diego is currently soliciting proposals to develop a fire management plan for the Marron Valley MSCP Cornerstone Lands. Based on an assessment of resources and issues, the Marron Valley Fire Management Plan (FMP) will identify and prioritize measures to preserve biological resources during fire prevention and control activities onsite. The Fire Management Plan will be approval by the City of San Diego and the DFG and funded by

DFG. The FMP will outline methods for fire suppression while maintaining responsibility for species and habitat protection in the event of a fire.

**Few-flowered
navarretia**

*Navarretia
leucocephala
ssp. pauciflora*

State: Threatened 1990
Federal: Endangered 1997

General Habitat:

Few-flowered navarretia occurs in drying vernal pools on volcanic substrate, usually volcanic ash, in the north coast ranges of Lake and Napa counties. Volcanic ash vernal pools have always been a rare habitat in California.

Description:

Few-flowered navarretia is a small, annual herb in the phlox family (Polemoniaceae). This plant grows 1-4 inches in height, either unbranched or with a few short, spreading branches. Its stems are white with purple streaks. The tiny white or pale blue flowers occur in clusters and bloom in June.

Status:

Few-flowered navarretia is primarily threatened by degradation or loss of its vernal pool habitat. Damage or destruction of vernal pool habitat happens quickly and easily due to the extremely crumbly nature of the soil and the dependency of the pool upon an intact durapan or impermeable subsurface soil layer. Degradation of vernal pool habitat can lead to the invasion of non-native species such as star thistle, which compete with native species for water, sunlight, and space. Further information is needed on the effect of competition on few-flowered navarretia.

Few-flowered navarretia is known from six sites in Lake and Napa counties. Five of those sites are on private land, and several are threatened with habitat loss and degradation. The current status of few-flowered navarretia at these sites is unknown.

The sixth site occurs on the DFG's Loch Lomond Ecological Reserve. However, the plants at this location appear to be the result of hybridization with another state-listed species, many-flowered navarretia (*Navarretia leucocephala* ssp. *pliantha*). Further information is needed on the extent and effect of hybridization at this site.

This species is included in the USFWS Vernal Pool Recovery Plan.



Niall McCarten, DFG File Photo



Susan Cochran Levitsky, DFG File Photo

**Many-flowered
navarretia**

*Navarretia
leucocephala
ssp. plieantha*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Many-flowered navarretia is found in dry meadows, along the margins of volcanic ash vernal pools and lakes and in open wet ground in forest openings in Lake and Sonoma counties.

Description:

Many-flowered navarretia, a member of the phlox family (Polemoniaceae), is a prostrate, spiny annual herb with widely spaced, narrow leaves, forming mats that range from 2-8 inches wide. From May to June, heads of small white to blue flowers bloom at the ends of stems.



Status:

Many-flowered navarretia is known from only a few locations in Lake and Sonoma counties. Historically, about eight sites for many-flowered navarretia were known: two are now protected, four are on private land, and two have been extirpated. The status of the four occurrences on private land is unknown. The primary threat to this species is degradation or loss of vernal pool habitat. Damage or destruction of vernal pool habitat happens quickly and easily due to the extremely crumbly nature of the soil and the dependency of the pool upon an intact durapan or impermeable subsurface soil layer. Off-highway vehicle use has resulted in the destruction of plants and habitat at several sites in Lake County. Attempted drainage of a pool in Lake County containing many-flowered navarretia resulted in the invasion of two competitive weeds, yellow star-thistle (*Centaurea solstitialis*) and medusahead (*Taeniatherum caput-medusa*).

One occurrence is protected at the DFG's Loch Lomond Ecological Reserve in Lake County. DFG provided fencing at this site to prevent off-highway vehicle entry into the area. However, the plants at this location appear to be the result of hybridization with another state-listed species, few-flowered navarretia (*Navarretia leucocephala* ssp. *pauciflora*). Further information is needed on the extent and effect of hybridization at this site. TNC and DFG own another Lake County occurrence, at Boggs Lake. In 1997, surveys revealed a large population of many-flowered navarretia, perhaps because it was a good rainfall year.

This species is included in the Vernal Pool Species Recovery Plan currently being finalized by the USFWS.

**Twisselmann's
nemacladus**

*Nemacladus
twisselmannii*

State: Endangered 1979
Federal: Threatened 1997

General Habitat:

This member of the bellflower family (Campanulaceae) grows in small colonies on loose gravels and granitic soils amid sparse Jeffrey pine forests at the rim of the Kern Plateau in Kern and Tulare counties. It occurs on steep slopes with sulphur flower buckwheat, ivesia, lupine and monkeyflower.

Description:

Twisselmann's nemacladus is an inch-high, gray, hairy annual herb with basal leaves in rosettes, and small, short stemmed, white flowers.



Status:

Twisselman's nemacladus is known from two occurrences on Sequoia National Forest lands. The populations are relatively inaccessible with no visible threats. One occurrence is within the Domeland Wilderness Area. DFG has no recent information on the status of this plant.

Colusa grass *Neostapfia colusana*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

This grass occurs only on the mud of large or deep vernal pools in Merced, Stanislaus, Solano, and Yolo counties. Associated species in some locations include State and federally listed hairy Orcutt grass and San Joaquin Valley Orcutt grass. Other associated species include dove weed, coyote thistle, blue-curly, popcornflower, and goldfields.



Description:

Colusa grass is a coarse, pale green, sticky, aromatic annual member of the grass family (Poaceae). Its loosely folded, clasping leaves, and thick, cylindrical terminal spikes of flowers are characteristic of the species.



Status:

Colusa grass has been extirpated at its type locality in Colusa County and at many other sites. Most of the remaining populations continue to be variously threatened by agricultural land conversion, herbicide contaminated runoff, and competition from introduced weedy species that tend to displace Colusa grass. Conversion of habitat to agricultural use eliminated the first-discovered population in Colusa County and at least 7 populations have been eliminated in Merced and Stanislaus counties. All populations exist on private lands, with the exception of one found on Castle Air Force Base in Merced County and one on McClellan Air Force Base in Yolo County. Two populations are currently protected at the Jepson Prairie Preserve in Solano County and at the Flying M Ranch in Merced County, where conservation easements protect some of the large vernal pools.

Heavy grazing and trampling, agricultural conversions, and competition from introduced weedy species are ongoing threats. Protection measures for this species are expected to be included in the FWS California vernal pool species recovery plan. Critical habitat has been proposed for Colusa grass and other vernal pool species. The proposal is still under review by FWS. Colusa grass is a covered species in the Habitat Conservation Plan for the Natomas Basin in Sacramento and Sutter Counties.

Amargosa nitrophila

*Nitrophila
mohavensis*

State: Endangered 1979
Federal: Endangered 1985

General Habitat:

Amargosa nitrophila is found in open alkali flats and deposits in the Amargosa River drainage of Inyo County, California, and Nye County, Nevada. This area includes the Carson Slough drainage near Tecopa, and Ash Meadows, a unique desert oasis. It is associated with salt grass, Tecopa bird's-beak, shadscale, and western nitrophila.

Description:

Amargosa nitrophila is a small, erect perennial in the goosefoot family (Chenopodiaceae). This compact plant has smooth, pinkish stems with rounded, opposite leaves which clasp the stems and minute rose-colored flowers at the base of the leaves. It flowers during the late spring. It is distinguished from western nitrophila by its shorter stature and smaller, overlapping leaves.



Status:

Amargosa nitrophila is known from two occurrences in California and one in Nevada. The species listed as Critically Endangered in Nevada and is listed as a Special Status Species by BLM. Maintenance of natural hydrological regimes is essential to this species' survival. Threats to this species include mining exploration, water pumping for mining activities, road maintenance, trash dumping, and development of adjacent property.

Personnel from the Soil Ecology and Restoration Group (SERG) at San Diego State University are conducting a study of the hydrologic and biologic parameters of Amargosa nitrophila and the threatened Ash Meadows gumplant in the Lower Carson Slough area of Death Valley. The study includes the determination of water usage by both plant species, i.e., ground water versus overland water flow; a survey of potential habitat for the species; mapping of the perimeters of each such occurrence using a Global Positioning System (GPS); developing a complete list of all vascular plants occupying the areas of occurrence; and an assessment of the physiological tolerance of the species to desiccation. SERG will develop guidelines for propagation and transplantation of nursery stock and long term management practices for the two species.

Dehesa nolina

Nolina interrata

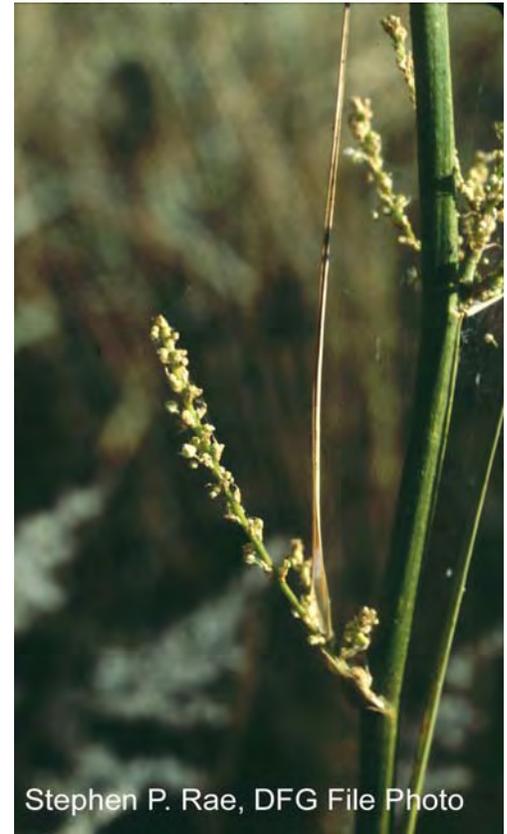
State: Endangered 1979
Federal: None

General Habitat:

Dehesa nolina occurs in open mixed chaparral and chamise chaparral in a limited area of southwestern San Diego County and adjacent Baja California, Mexico. Most populations occur on ultramafic soils derived from gabbro and metavolcanic rocks. Associate species include chamise, manzanita, and Parry's tetracoccus. When found on clay soils derived from gabbro, it is often associated with other rare plants such as Gander's butterweed (State - Rare), chocolate lily, felt-leaved monardella, and San Diego thornmint (State - Rare; Federal -Threatened).

Description:

Dehesa nolina is a large, yucca-like perennial with rosettes of long, flat leaves and tall, much-branched flower stalks to approximately five feet in height. The white male and female flowers occur on separate plants. Dehesa nolina does not flower every year and may require fire or other disturbance to induce flowering.



Stephen P. Rae, DFG File Photo



Edward S. Ayensu
Courtesy of the Smithsonian Institution

Status:

Dehesa nolina is known from five occurrences in San Diego County and three small occurrences in Baja California Norte. In Baja California, the species ranges as far south as Ensenada (Rancho de la Cruz). One population is about 16 km (10 mi) northeast of La Mision. Both of these disjunct Mexican populations have fewer than 25 individuals each. Another population has recently been discovered in Mexico closer to the United States border, and it appears to be of comparable size to the other Mexico population.

About two-thirds of all populations, and 90-100 percent of all major populations, are protected on reserve lands owned and managed by The Nature Conservancy (TNC) at McGinty Mountain and by the California Department of Fish and Game (CDFG) at Sycuan Peak. The protection afforded by the establishment of the Sycuan Ecological Preserve occurred subsequent to the proposal to federally list the species. This proposal was subsequently dropped due to the protection afforded the species at McGinty Mountain and Sycuan Peak. The few remaining populations are small and are on private lands. Populations on private lands are protected under provisions of the San Diego County MSCP that require avoidance of narrow endemic species to the maximum extent possible. The County's Biological Mitigation Ordinance requires encroachment to be limited to 20 percent of the population on site for impacts that cannot be avoided. *Dehesa nolina* is covered by the MSCP based on conservation of 100 percent of the McGinty Mountain population, 90-100 percent of the Sycuan Peak, and 80-100 percent of the Dehesa Peak population under this plan. At least 1,000 individuals, associated with mafic chaparral were recorded on McGinty Mountain, with a large population to the southwest of the saddle of the mountain. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

The habitat in which it occurs is adapted to fire and *Dehesa nolina* sprouts vigorously following fire. Near the Dehesa School, a series of fires have left stands of this *Nolina* in disturbed annual grassland. This species reproduces primarily asexually and form large clones. For example, one of the Dehesa Valley populations is considered to be a single female clone that has an extent of one-quarter acre or more. Consequently, the exact number of individual plants is not known and would be difficult to determine without genetic analysis.

Studies are needed to determine the role of wildfire management and/or prescribed burning with respect to reproduction in populations of *Dehesa nolina* and the sexual demography of the major populations. Wildfire has been noted to induce mass flowering in populations of *Dehesa nolina* and related species, but fire frequency and its role in establishment and perpetuation of the species has not been studied. Fire suppression and alteration of natural fire periodicity, season, and intensity may have various adverse effects on this species. Fire suppression measures are intensified in undeveloped areas near population centers. The natural period between fires in these areas may be altered. Fire suppression activities may also affect the vegetation. High fire frequencies prevent young plants from reaching reproductive maturity and will result in population declines or extirpation once the underground seed bank has been depleted. In other cases, the reduced frequency of fire due to fire suppression programs can adversely affect the viability of plant populations by reducing genetic diversity.

In 2003, the huge Otay Fire burned a large area of south-central San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 25% of suitable habitat in the foothills east of El Cajon and north of Alpine burned during the fire. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of *Dehesa nolina*.

Dehesa nolina is threatened by development and collecting for the nursery trade. The species is considered Vulnerable by IUCN and has been listed on Appendix I of CITES since 1983.

**Eureka Dunes
evening-primrose**

*Oenothera
californica ssp.
eurekensis*

State: Rare 1978
Federal: Endangered 1978

General Habitat:

Eureka Dunes evening-primrose is endemic to the Eureka Valley in Inyo County. It grows in flat to gently sloping sand areas bordering larger desert sand dunes, at 2860-3840 ft elevation.

Description:

Eureka Dunes evening-primrose is a perennial herb in the evening primrose family (Onagraceae). During wet years, the plants develop from the roots, forming dense rosettes of leaves. When a leafy flower shoot is covered by windblown sand, roots sprout from the sides and a new rosette of leaves forms at the tip. The large, showy flowers, blooming from April to July, are white and fade to red with age, producing abundant, long-lived seeds. After setting seed, the stems break off and the plants grow from the roots again during the next wet year.

Eureka Dunes evening-primrose is associated with two other plant species endemic to the Eureka Dunes, Eureka Valley dunegrass (*Swallenia alexandrae*), although the grass generally grows much higher on the dunes, and Eureka milkvetch (*Astragalus lentiginosus* var. *micans*).

Status:

Eureka Dunes evening-primrose is known from several occurrences, all confined to the southern portion of Eureka Valley within Death Valley National Park. The populations vary tremendously based upon rainfall: in 1997, only 20 individuals were observed around the main dunes; in 1998, a high rainfall year, extensive fields of evening-primrose were observed around the entire main dune system.

The closure of the dunes to OHVs in 1976 greatly reduced the primary threat to the species, sand disturbance and destruction of plants by OHVs. However, occasional illegal OHV activity still occurs, and a new, legal recreational activity, sandboarding, now poses similar threats. Expansion of Russian thistle, a non-native invasive species that became established on the dunes during the period of intense disturbance by OHVs prior to closure to such vehicles, also threatens the habitat. The plant populations currently appear to be stable; however, increased recreational use of the dunes could quickly degrade the habitat.

Eureka Dunes evening-primrose is covered under the 1982 USFWS Eureka Valley Dunes Recovery Plan.



Objectives of the plan include protecting the species from human threats, and conducting adequate monitoring of remaining populations. Implementation of the first objective has been quite successful through the closure of the dunes to OHVs. The second objective is not currently being implemented.

In 1998, the USFWS withdrew the proposed rule to list *Astragalus lentiginosus* var. *micans* (shining milk-vetch) as threatened, based on the *de facto* protection it already receives because of the overlap of its habitat with Eureka Dunes evening-primrose and Eureka Valley dune grass, making the protection of these State- and Federally-listed dune species and their habitat essential also to the protection of this rare milk-vetch.

**Antioch Dunes
evening-primrose**

*Oenothera
deltoides ssp.
howellii*

State: Endangered 1978
Federal: Endangered 1978

General Habitat:

Antioch Dunes evening-primrose occurs in loose sand in semi-stabilized dunes along the San Joaquin River near Antioch in Contra Costa County and at Brannan Island State Recreation Area. Its habitat at the Antioch Dunes is unique and constitutes a remnant of a unique dune system. Vegetation consists of scattered native herbaceous plants and grasses on the dunes. Common native plants in the dunes include elegant clarkia, California poppy, California croton, gumplant, deerweed, California matchweed, and silver bush lupine. The Contra Costa wallflower, a federally-listed endangered species, occurs here as well. Many of the plants that comprise the unique stand have desert affinities.

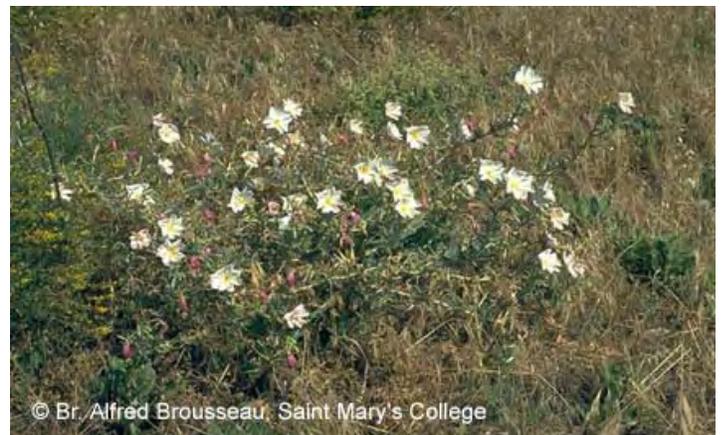
Description:

Antioch Dunes evening-primrose is a short-lived perennial plant in the Evening-primrose Family (Onagraceae). It forms large, highly-branched clumps with drooping stems and grayish toothed or divided leaves. The leaves have numerous short hairs. The white flowers bloom from March to September. Petals are about one inch long, and the stamens are yellow. This species can be confused with *Oenothera deltoides ssp. cognata*, which grows in the Oakley area southeast of the Antioch Dunes. Leaves in the latter species are rarely toothed.

Status:

The Antioch Dunes evening-primrose is restricted to two areas, the Antioch Dunes National Wildlife Refuge (Refuge), the native site, and Brannan Island State Recreation Area where seed were introduced in 1969. The historic range of the species is not known. The Refuge, which consists of 55 acres of stabilized sand dunes, was established in 1980. Along with the adjacent 12 acres of Pacific Gas and Electric Company (PG&E) land, the site is a relict of what was once a larger dune system that hosted a unique assemblage of plants, insects, and reptiles. The Refuge provides protection and critical habitat for three endangered species: Lange's metalmark butterfly (*Apodemia mormo langei*), Contra Costa wallflower (*Erysimum capitatum ssp. angustatum*), and Antioch Dunes evening-primrose (*Oenothera deltoides var. howellii*). The Final Comprehensive Conservation Plan for the Antioch Dunes National Wildlife Refuge was released by the USFWS in 2002.

The evening-primrose has been continuously monitored at the Refuge since the 1980s. From 1984 to 1991, the



total evening-primrose population was estimated to range from 4,300-5,800 individuals. In 1992, the USFWS observed a dramatic decline to 1,200 individuals and began outplanting evening-primrose seedlings. In 1997, the evening-primrose population reached a low of 455 individuals. This marked the 11th year of general decline in the number of evening-primrose at the Refuge since 1986. In 1998, the downward trend in the evening-primrose population ended and increased to 785 individuals. Evening-primrose plantings in December 1997 were probably a bigger factor in this increase than natural reproduction. The evening-primrose is still declining, and outplanting continues today.

A number of management strategies for the evening-primrose are presented in the Refuge Conservation Plan. These include 1) propagation and outplanting on the Refuge to prevent extinction until the populations are self-sustaining; 2) hand weeding or raking a 1½ foot radius around each outplanted evening-primrose to improve germination rates; 3) continuing research to determine the best means to optimize seed production, viability, germination, seedling survival, and reproduction; and 4) outplanting evening-primrose grown from the seed of plants at the Brannan Island SRA or the Regional Parks Botanic Garden at Tilden Regional Park to encourage genetic diversity.

Antioch Dunes evening-primrose was transplanted to Brannan Island State Recreation Area in 1969. Brannan Island is located about 16 miles north of the Refuge along the Sacramento River, Jackson Slough, and Three Mile Slough. The evening-primrose was planted on dredge spoils on the southern part of Brannan Island. This site now supports a self-sustaining population of the evening-primrose. The area surrounding the original planted evening-primrose has been fenced although plants have established outside of the fenced area. Plants are now seen at the edges of pathways and along the beach. The new locations are not aligned with the existing population and prevailing winds on the island; seeds, therefore, were not likely to have been distributed by wind. DPR staff believe that rabbits have spread the seed through their digestive tracts. Park personnel have noted that the evening-primrose seem to do better in these areas of disturbance. Antioch Dunes evening-primrose has also been grown at the East Bay Regional Parks Botanic Garden at Tilden Regional Park in Berkeley since 1970, and introduced to Point Reyes National Seashore, and Brown's Island in the Delta. Of these sites, the evening-primrose persists only at Tilden Regional Park.

The principal threats to the Antioch Dunes evening-primrose include loss of ecosystem function, loss of habitat, habitat fragmentation, and decreased genetic diversity. Although considerable evidence indicates that the dunes were stabilized in historic times with the "blowout areas" supporting the evening-primrose, the major threat to the evening-primrose is the invasion of nonnative vegetation such as yellow starthistle and ripgut brome. A reservoir of moving sand is essential to maintain the dynamic ecology of the dunes, as moving sand opens areas for the establishment of seedling plants.

Nonnative vegetation leads to lower germination and seedling survival rates and has been identified as the leading problem for the endangered species and the dune ecosystem habitat at Antioch Dunes. Because the evening-primrose prefers disturbed sites with nearly pure sand, it is vulnerable to encroachment from nonnative weedy species. No evening-primrose seedlings were found around mature plants that were surrounded by weed species. However, seedlings were found near about 40 percent of mature plants that were not surrounded by weed species. Nonnatives compete with the evening-primrose seedlings for water and light, resulting in reduced seedling germination and survival. Removal of nonnative weeds around adult evening-primrose plants enhanced germination rates. Weeds also have a negative impact on seedling germination success because they stabilize the dunes.

The positive relationship between disturbance and seedling survivorship has been demonstrated for plants grown under cultivation. Evening-primrose seedlings germinated more readily in sand when the sand was disturbed and turned over. Strategies to introduce a disturbance regime to the Antioch Dunes, while limiting weed invasion, are essential to the survivorship of the evening-primrose and other similarly-adapted plants.

Weed control activities have been somewhat successful at controlling non-native grasses and starthistle. The Refuge then conducted its first prescribed burn in 1997 and burned about 12 acres total. The goal was to burn this acreage for three consecutive years to kill the nonnative weeds and reduce their seed bank. Persistent starthistle was spot treated with Round-up®. As of 1999, the treated areas had been burned for three consecutive years and were recently replanted with native vegetation. The burned areas showed promising though mixed results. Although the evening-primrose and other native plants responded positively. Non-native weeds such as filaree and vetch quickly reestablished in the burned areas. Vetch is now being controlled with herbicide. Starthistle has been effectively controlled through three years of prescribed burning. During firebreak construction, Refuge staff found that the native plants, including the evening-primrose, responding more favorably to open space created by scraping (by bulldozer) than by burning.

Mammals are known to eat evening-primrose. Although the specific animal has not yet been identified, it is presumed to be a subterranean animal, probably a rodent. The animal eats roots, leaving evening-primrose severed at the tap root, effectively killing the plant. There has also been evidence of mammals eating the above ground portions of the plant. Three insect predators have been identified for the evening-primrose. One is a moth that feeds on growing tips but does not seem to limit the evening-primrose's ability to be self-sustaining. Another moth grazes in the interior of evening-primrose stems, but also does not have a major effect. However, a leaf eating beetle, reduces plants to skeletons in early summer, and does present a potential threat to the sustainability of the evening-primrose population.

Ongoing research is examining pollinators of the Antioch Dunes evening-primrose and pollination ecology as possible factors relating to low seed production. Although not known from the Antioch Dunes until 1983, hawk moths have been observed visiting the evening-primrose. Hawk moths are reported as pollinators of other species of evening-primrose, but their role in pollinator of the Antioch Dunes evening-primrose has not been documented. Researchers believe that bees are the actual pollinators of this species. Studies are needed to determine the phenology and pollinators of this evening-primrose.

Researchers have examined the seed bank of this species and found it to be lower than that of other endemic species in the Antioch Dunes. The absence of a large seed reservoir potentially makes the evening-primrose highly susceptible to random extinction events. Potential factors that may limit evening-primrose reproduction include low genetic variation and limited pollinators. Seed production was not considered a limiting factor for evening-primrose reproduction. Researchers also studied the seed bank dynamics, seed production, and seedling demography to assess the limitations on evening-primrose growth. They found that more than half the ovules produced failed to become seeds because effective pollinators were not available. Their work also indicated that substrate makeup and exposure were not critical to evening-primrose seed germination, though competition with riggut brome for light and moisture was. Although substrate makeup was not critical for seedlings to germinate, they found that evening-primrose only reached reproductive maturity on sandy soils. Evening-primrose produced many viable seeds, but seed output production over two years ranged from 26 percent to 37 percent of the maximum. Other factors, such as weather and pre-dispersal seed predation, also contributed to lowered seed production, but lack of pollinators was believed to play a prominent role.

The USFWS is continuing to propagate the evening-primrose. During seed collection, no more than five percent of the seeds are collected from Refuge plants for propagation. These seeds are grown in a nursery during the fall for planting on the Refuge in the winter. In the 1999-2000 season, the USFWS propagated and planted 835 evening-primrose to augment the wild population. In 2000, the USFWS completed construction of an additional greenhouse at the San Francisco Bay National Wildlife Refuge Complex to accommodate an increased quantity of endangered plant propagation. The new greenhouse is dedicated to the propagation of endangered plants of Refuge. With its increased capacity, the Refuge will be able to meet its endangered plant restoration needs in-house.

Bakersfield cactus *Opuntia basilaris*
var. *treleasei*

State: Endangered 1990
Federal: Endangered 1990

General Habitat:

This species grows on coarse, cobbly, well-drained granitic sand on bluffs, low hills, and flats in the valley and foothills of Kern County. It is a characteristic species of the Sierra-Tehachapi Saltbush Scrub plant community, but populations near Caliente are in Blue Oak Woodland and the Cottonwood Creek population is in riparian woodland. Many sites for Bakersfield cactus support a dense growth of red brome and other non-native annual grasses. Sand Ridge is characterized by sparse vegetation and a preponderance of native species such as California filago and yellow pincushion.

Description:

Bakersfield cactus is a succulent member of the cactus family (Cactaceae) with large, showy magenta flowers that bloom from March through June. It is perennial fleshy flattened with gray-green pads. The pads of Bakersfield cactus vary in outline from rounded, heart-shaped, or diamond-shaped to nearly cylindrical. A single plant may consist of hundreds of pads, which originate both at ground level and from the tips of other pads. The pads and fruits are dotted with eye-spots, which are rounded structures that contain barbed bristles. Tiny leaves are produced on the youngest pads of beavertail cacti, but are quickly shed. The dry fruits are the size and shape of small eggs and may contain grayish-white seeds. Seed production is not common.

Status:

Bakersfield cactus once formed extensive colonies in the area around Bakersfield, extending up the Kern River Canyon to the northeast, through the Caliente Creek drainage to the southeast, and to the Tejon Hills, about 20 miles to the south. Much of the historical habitat for the species has been destroyed by impacts associated with human activities. Of the more than 40 occurrences of this species, over 14 are extirpated.

This variety grows in dense patches with many of its leaves overlapping with those of adjacent plants, making accurate individual counts difficult. This plant is measured as collections of pads that all appear to root at the same location or clusters to deal with this difficulty.

The rapidly accelerating urbanization of this area poses a severe threat to the species today. Agricultural



conversion of land, oil field development, overgrazing by sheep and cattle, OHV activity, dumping, and sand mining have contributed to the decline of this species and destruction of its habitat throughout its range. Dense stands of non-native grasses compete with Bakersfield cactus. In wet years, these invasive grasses cover the cactus, and when dry, greatly increase the likelihood and destructiveness of wildfires. The grasses may reduce vegetative reproduction of the cactus by preventing broken pads from contacting and rooting in the soil. In 1995, extensive die-back in some populations was discovered, perhaps caused by high rainfall during the winter of 1994-1995.

In 1997, three important areas of Bakersfield cactus habitat were acquired as mitigation under the Metropolitan Bakersfield HCP. These parcels are being managed for Bakersfield cactus. Protection measures for Bakersfield cactus are included in the USFWS *Draft Recovery Plan for Upland Species of the San Joaquin Valley, California*, completed 1998. Bakersfield cactus will be covered under the proposed Kern County Valley Floor Habitat Conservation Plan. It is also addressed in the Bureau of Reclamation Central Valley Project endangered species conservation program.

California Orcutt grass *Orcuttia californica*

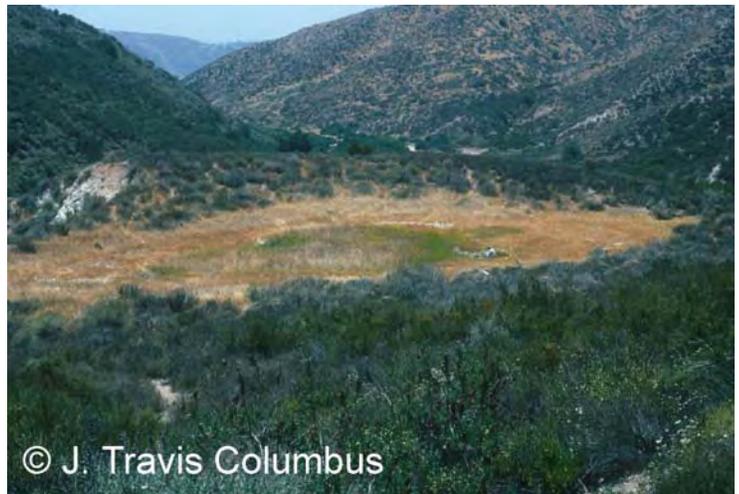
State: Endangered 1979
Federal: Endangered 1993

General Habitat:

California Orcutt grass occurs in volcanic terrace and vernal pool systems from Ventura County south to Baja California, Mexico. California Orcutt grass is restricted to deep pools in the vernal pool system in association with woolly marbles, navarretia, and mouse-tail.

Description:

California Orcutt grass is a bright green, aromatic, and densely tufted annual grass in the Grass Family (Poaceae). During the wet season, California Orcutt grass produces a set of aquatic leaves that float on the pool surface. After the pools dry in the summer, a new set of foliage emerges and lasts for one or two months until flowering and fruiting are complete. California Orcutt grass blooms from April through June and appears to be strongly adapted to wind pollination. After dying, California Orcutt grass remains intact and upright until falling apart in heavy rains. Seeds formed the previous summer are then released. Seeds can remain dormant for at least three to four years, germinating in the spring only after flooding of the vernal pools.



Status:

California Orcutt grass is declining throughout its range. Vernal pools supporting California Orcutt grass are threatened by destruction and fragmentation from urban and agricultural development, pipeline construction, alteration of hydrology and flood plain dynamics, excessive flooding, off road vehicle activity, trampling by cattle and sheep, weed abatement, fire suppression practices (including discing and plowing), and competition from alien plant species. Maintaining adequate vernal pool diversity to allow for population dynamics is critical to this species. California Orcutt grass was once found in the volcanic terrace and vernal pool system in Ventura, Los Angeles, Riverside, and San Diego Counties in southern California. Of the 30 known locations for this species, at least half represent historic or extirpated sites.

The number of individual California Orcutt grass plants varies annually in response to the timing and amount of rainfall and temperature. It is found in deeper portions of vernal pools and less frequently on pool margins. Pools that have prolonged flooding appear to support larger colonies of California Orcutt grass than do shallower pools.

Studies of other *Orcuttia* species indicate that the number of seeds produced per plant is highly variable within a population and variation in seed production between seasons can vary by two- or three-fold. Researchers have found that optimal seed germination occurs when seed are covered by fungus and under conditions of low oxygen (anaerobic conditions).

California Orcutt grass is found in southwestern California from eastern Ventura County east through Los Angeles County to Riverside County, and south to San Diego County from near sea level over 2000 feet. California Orcutt grass is known from a single vernal pool complex in Ventura County, a vernal pool complex at Cruzan Mesa and in Plum Canyon in Los Angeles County, and several vernal pool complexes in San Diego County. Four of these populations in San Diego County are on Otay Mesa. An additional two populations on Otay Mesa have been extirpated and at least four additional populations in the Los Angeles basin have also been extirpated. A report of California Orcutt grass from the vicinity of Newhall, Los Angeles County, has not been verified.

California Orcutt grass is also known from three vernal pool sites in Riverside County: Upper Salt Creek west of Hemet, Skunk Hollow, and the Santa Rosa Plateau. On the Santa Rosa Plateau, this species is found in two of the five vernal pools on Mesa de Colorado and in four of the six vernal pools on Mesa de Burro. This species is also known to occur in Murrieta and near Menifee. Historic sites were mapped at Salt Creek west of Menifee and at Murrieta Hot Springs. A mapped locality west of the Santa Rosa Plateau, possibly in Tenaja Canyon and a recently mapped population at the intersection of Borel Road and Benton Road require verification. California Orcutt grass has been recorded from several locations in northwestern Baja California, Mexico, primarily in the vicinity of Cabo Colnett and at Valle de las Palmas.

Protection measures for California Orcutt grass are provided in the USFWS *Recovery Plan for Vernal Pools of Southern California*, released in 1998. This species is covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border, the San Diego Multiple Habitat Conservation Program NCCP, and in the Western Riverside MSHCP. In 1998, San Diego was awarded \$43,000 for the restoration of degraded vernal pools in Otay Mesa. A vernal pool restoration plan was completed and approved, and work began to restore over 17,000 square feet of vernal pool surface area on a 2.5 acre parcel.

California Orcutt grass conservation objectives are included in the 2003 Western Riverside MSHCP. The objectives require inclusion of at 6600 acres of suitable habitat in a minimum of three known locations of California Orcutt grass within the conservation planning area and annual surveys in areas of suitable habitat. In addition, watersheds at three vernal pool complexes would be protected. At the current time, Core Areas for California Orcutt grass in the Western Riverside Plan Area are located within the upper Salt Creek drainage west of Hemet and on the Santa Rosa Plateau. A Core Area is a block of habitat of sufficient size and configuration to support a sensitive species. This species can be difficult to detect as the vernal pools it inhabits may receive enough water to germinate and grow the plants only two or three times a decade. Therefore, surveys conducted during years of rainfall inadequate to germinate the species may not result in detection. Competition with other vernal pool species may also be a significant factor in the distribution of California Orcutt grass.

The Skunk Hollow vernal pools in Riverside County receive protection by inclusion in a reserve established within an approved mitigation bank in the Rancho Bella Vista Habitat Conservation Plan Area. Management actions undertaken in the Skunk Hollow watershed benefit the endangered Riverside fairy shrimp, threatened spreading navarretia, and California Orcutt grass, all of which are included as protected species under the HCP.

Additional protection for California Orcutt grass in Los Angeles County came with the proposal to designate the Cruzan Mesa vernal pools as a Significant Ecological Area (SEA). The proposed SEA is at the southeastern end of the Liebre Mountains, north of the Santa Clara River, and southeast of Bouquet Canyon. The proposed SEA boundaries encompass the watershed and drainages of the Cruzan Mesa and the Plum Canyon vernal pools as a single ecosystem within the SEA. The Cruzan Mesa vernal pools lie within an elevated, closed basin atop an

eroded foothill between Mint and Bouquet canyons while the Plum Canyon vernal pool is situated in a basin formed by a landslide. The proposed SEA supports a number of sensitive plant and animal species in addition to California Orcutt grass, including the federally threatened prostrate navarretia, federally endangered Riverside fairy shrimp, western spadefoot toad, and possibly also the federally threatened California gnatcatcher.

Specific management practices are recommended for the proposed Cruzan Mesa Vernal Pools SEA. These include a prohibition on development that alters the ground surface within the watershed of the pools; limiting development to areas in which the pools are not located; maintaining viable populations of the sensitive species found in the SEA; retaining connectivity between Cruzan Mesa and Plum Canyon vernal pools; and, establishing buffers around the sensitive habitats.

San Joaquin Valley *Orcuttia inaequalis* Orcutt grass

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

San Joaquin Valley Orcutt grass is found in naturally occurring, widely scattered vernal pool complexes in Fresno, Madera, Merced, Tulare, and Stanislaus counties in the northeastern San Joaquin Valley. It is primarily endemic to larger vernal pools that range in area from 1,500 sq ft to 12.1 ac in size and 12 in to 22 in deep. These pools form on acidic soils that vary in texture from clay to sandy loam on a variety of geological surfaces. The impermeable layer at historical or extant pools includes iron-silica cemented hardpan, basalt from ancient volcanic flows, and alluvium derived from volcanic tuff. San Joaquin Valley Orcutt grass is associated with Colusa grass, Boggs Lake hedge-hyssop, and succulent owl's-clover, all of which are State listed as endangered.

Description:

San Joaquin Valley Orcutt grass is a small, aromatic, tufted annual in the grass family (Poaceae). The plant has several stems 2 to 6 inches tall, ending in a spike-like inflorescence. The foliage is grayish, with soft, straight hairs. At maturity, the spikelets of the plant are aggregated into a dense, hat-shaped cluster. This feature separates San Joaquin Valley Orcutt grass from other members of the genus *Orcuttia*. Although San Joaquin Valley Orcutt grass is geographically isolated from all other members of the genus, it closely resembles the endangered Sacramento Orcutt grass (*Orcuttia viscida*).



USFWS File Photo



© Justin Boldt



Marc Hoshovsky, DFG File Photo

Status:

San Joaquin Valley Orcutt grass is known primarily from a 36-mile-long strip in Fresno, Merced, and Madera counties where the species has declined due to agricultural conversion, such as to vineyards, and urban development. The species has declined mainly due to severe habitat loss caused by agricultural and urban development. Because the human population of the Central Valley is growing rapidly, numerous populations of Orcutt grasses, including San Joaquin Valley Orcutt grass, have been extirpated and continue to be threatened by

urban development projects. It is the only Orcutt grass restricted to the San Joaquin Valley. Of the 50 occurrences of San Joaquin Valley Orcutt grass currently reported in CNDDDB, 30 occurrences are presumed extant; 17 are considered extirpated; and three others are possibly extirpated because the habitat has been lost. Of the occurrences that are presumed to still be extant, two are in Fresno County, seven are in Madera County, 23 are in Merced County, and one is in Tulare County. This species has been extirpated from Stanislaus County where it was once known from seven occurrences. Two populations of San Joaquin Valley Orcutt grass occur on federal land: a natural population managed by BLM and a translocated population on BLM land. Of the known populations on private land, five are protected through conservation easements with The Nature Conservancy (TNC) on the Flying M Ranch in Merced County. In Fresno County, TNC also protects the Table Mountain site.

The regional study area for the U.C. Merced campus harbors 23 (77 percent) of the 30 extant occurrences of San Joaquin Valley Orcutt grass. These 23 occurrences are located exclusively on rangelands and are concentrated in the central eastern portion of the study area, primarily at the Flying M and I chord Ranches and the Smith Trust lands. The three newly discovered occurrences at the I chord Ranch were found in three large vernal pools in widely separated locations. Numerous large vernal pools were identified during the 2001 surveys of the study area as providing potentially suitable habitat for San Joaquin Valley Orcutt grass. Most of these sites are located in the central and southern portions of the survey area (from the Flying M Ranch south) rather than the hilly terrain in the northern portion of the study area. The hilly terrain generally precludes the development of large vernal pools. Only three pools at one ranch (I chord) were, however, found to support the species. Poor hydrologic conditions during the survey period may have limited detection of San Joaquin Valley Orcutt grass and additional surveys should be undertaken during a season with higher rainfall.

The specific vernal pool features that determine the suitability for San Joaquin Valley Orcutt grass germination, growth, and successful reproduction are unknown. Conserving a broad distribution San Joaquin Valley Orcutt grass across its geographical and elevational distribution would protect a mosaic of habitat types both between and among vernal pools that is essential to long-term survivorship of the species. The Critical Habitat document provides specific habitat components that constitute critical habitat for San Joaquin Valley Orcutt grass. These elements include: 1) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths; and 2) The associated watershed(s) and hydrologic features, including the pool basin, swales, and surrounding uplands that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool inundation, water quality, and soil moisture for germination, growth and reproduction, and dispersal. Although critical habitat units were designated in Butte, Tehama, Solano, Sacramento, Merced, Mariposa, Madera, Fresno, and Tulare Counties in the proposed Critical Habitat document, Butte, Sacramento, Solano, Merced, and Madera Counties were excluded from the final designation (August 2003) due to economic considerations.

Protection measures for this species are expected to be included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*.

Hairy Orcutt grass *Orcuttia pilosa*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Hairy Orcutt grass occurs in vernal pools formed on alluvial fans, high and low stream terraces, and tabletop lava flows in Butte, Glenn, and Tehama counties in the Sacramento Valley and Stanislaus and Madera counties in the San Joaquin Valley. Occupied pools range in surface area from 0.05 to 12.1 acre, with a median area of 1.54 acre. Hairy Orcutt grass is found on both acidic and saline-alkaline soils, in pools with an iron-silica cemented hardpan or claypan. Associated species include coyote thistle, wooly marbles, and two other State-listed grasses: Colusa grass and Greene's tuctoria.

Description:

Hairy Orcutt grass is a small, tufted annual in the grass family (Poaceae). The plant has several stems 2-8 inches tall, each stem ending in a long, spike-like inflorescence. Foliage is grayish, with soft, straight hairs. Hairy Orcutt grass flowers from May through September. This species and slender Orcutt grass (*Orcuttia tenuis*) grow together over a portion of their respective ranges but are readily distinguished. Slender Orcutt grass has fairly slender stems that often branch from their upper nodes. Spikelets are evenly spaced, not densely crowded. Hairy Orcutt grass stems branch only from lower nodes. Upper spikelets are densely crowded.



Status:

Hairy Orcutt grass inhabits vernal pools in rolling topography on remnant alluvial fans and stream terraces in the Central Valley. The historical range includes the eastern margins of Sacramento and San Joaquin Valleys from Tehama County south to Stanislaus County and through Merced and Madera counties at an elevation range of 180 ft to 405 ft. Only 27 of the 40 known populations exist, including a new population in Merced County which was found in 2001 and a transplant population. More than one third of the remaining populations occur in Tehama County. Others are in Butte, Glenn, Madera and Stanislaus counties. Conversion of vernal pool habitat to irrigated agriculture, vineyards, or orchards, or to urban uses has been the primary factor leading to decline in this species. Urbanization, agricultural land conversion, a highway expansion projects, discing, off-highway vehicle use, and

competition from nonnative weeds continue to threaten most of the remaining populations. Populations at the Nature Conservancy's Vina Plains Preserve and the various State and federal locations are partially protected.

Conserving a broad distribution of hairy Orcutt grass across its geographic and elevation distribution provides a mosaic of habitat types both between and among vernal pool species occurrences across the full extent of its range and is essential to conservation of the species. For example, the vernal pool types and soils associated with the six areas of concentration of hairy Orcutt grass differ greatly across the geographic range of the species; this variability leads to differences in species composition and environmental conditions among hairy Orcutt grass occurrences.

The USFWS Critical Habitat document includes specific habitat components that constitute critical habitat for hairy Orcutt grass. These elements include: 1) Vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths; and 2) The associated watershed(s) and hydrologic features, including the pool basin, swales, and surrounding uplands that contribute to the filling and drying of the vernal pool or ephemeral wetland, and that maintain suitable periods of pool inundation, water quality, and soil moisture for germination, growth and reproduction, and dispersal. Although critical habitat units were designated in Butte, Tehama, Solano, Sacramento, Merced, Mariposa, Madera, Fresno, and Tulare Counties in the proposed Critical Habitat designation, Butte, Sacramento, Solano, Merced, and Madera Counties were excluded from the final designation (August 2003) due to economic considerations. One exception to this rule is the Vina Plains, which occurs partly in Butte County, was included in the critical habitat designation.

The Vina Plains Unit in Tehama and Butte Counties supports over 25 of the known occurrences of hairy Orcutt grass on approximately 19,300 acres. This area represents only one of two sites that have been placed in protected status under ownership or stewardship by TNC or conservation agreements. The second unit, the Turlock Unit encompasses approximately 48,600 acres in Stanislaus and Merced Counties. Fewer than 60 acres in this unit are owned by BLM or DPR; the remainder is in private ownership. A portion of habitat within Merced County is included within the University of California, Merced Campus study area and proposed NCCP. Although no new populations of hairy Orcutt grass were found during 2001 field surveys, a new occurrence was reported during the season from a large vernal pool at a proposed mitigation bank site in the southern portion of the study area. Because field surveys did not cover the entire study area and because of poor hydrologic conditions, it is possible there are additional occurrences of the species in the study area. Occurrences would most likely be found in the central and southern ranchland portions of the study area where most large vernal pools are concentrated. Additional targeted surveys are warranted during a season with higher rainfall. Surveys should target the large pools mapped with GPS and aerial photo interpretation during the 2001 surveys as well as sites identified through other sources.

Protection measures for this species are expected to be included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*.

Slender Orcutt *Orcuttia tenuis*
grass

State: Endangered 1979
Federal: Threatened 1997

General Habitat:

Slender Orcutt grass occurs in vernal pools at 3,000 to 3,600 feet in blue oak woodland, oak-juniper woodland, and Jeffrey pine forests of northern California. Vernal pools in which it grows are classified as Northern Volcanic Ashflow and Northern Volcanic Mudflow vernal pools.

Impervious layers range from iron-silica hardpan to bedrock. It is reported from Butte, Lake, Lassen, Modoc, Plumas, Shasta, Siskiyou, Tehama, and Sacramento counties. Associated species include wooly marbles, coyote thistle, popcorn flower, and downingia, as well as listed species such as Boggs lake hedge-hyssop, many-flowered navarretia, and Greene's tuctoria.

Description:

Slender Orcutt grass is a weakly-tufted and sparsely-hairy annual grass in the Grass Family (Poaceae). It grows to about two to six inches in height and branches only from the upper half of the stem. The flower stem comprises more than half of the plant's height, and the spikelets are more or less evenly spaced along the inflorescence. The flowering period is from May to July. Slender Orcutt grass and hairy Orcutt grass can be found growing together in some vernal pools, but are readily distinguished from each other.

Status:

Slender Orcutt grass is restricted to northern California and has the largest geographic range of any of the Orcutt grasses. Seeds germinate under water and the plant matures as water evaporates. Optimal germination of slender Orcutt grass is achieved through stratification followed by warm days and mild nights. Peak flowering of this species typically occurs in May in the Central Valley but not until June or July on the Modoc Plateau. Unlike hairy Orcutt grass (*Orcuttia pilosa*) and Greene's tuctoria (*Tuctoria greenei*), slender Orcutt grass is not likely to die when pools are flooded by late spring or summer rains. Conversely, drought has been known to cause 100



percent mortality. The main habitat requirement for slender Orcutt grass is standing water of sufficient quantity and duration to drown out most competition and supply its physiological requirements for prolonged inundation, followed by a period of gradual (becoming total) desiccation. Seeds germinate in the spring while under water, and plants send up long, floating leaves. As the pool dries, plants put out shorter terrestrial leaves, and then flowering stalks. Slender Orcutt grass plants generally mature later than other vernal pool annuals, so often they are the only vegetation still green by mid-summer on the vernal pool bed. As an annual, it depends on seed set to replenish the seed bank for continued survival.

Similar to other vernal pool annuals, slender Orcutt grass populations can vary greatly in size from year to year. Fluctuations of up to four orders of magnitude have been documented in Lake and Shasta counties. At the Vina Plains Preserve, the single population ranged in size from 1,000 to 147,700 individuals during the five times it was reported over a 13 year period. However, slender Orcutt grass populations do not always fluctuate in size. Among five populations of slender Orcutt grass studied from 1973 to 1979, two in the Dales area remained at the same order of magnitude for the entire period. None of the other five species of Orcutt grass included in the study remained stable for the duration of the research.

In the mid 1980s, slender Orcutt grass was known from only 18 localities in Lake, Sacramento, Shasta, and Tehama counties. An additional 34 occurrences were discovered in the 1980s, and 27 new occurrences were found in the 1990s as a result of intensive surveys. Slender Orcutt grass is currently found in five general areas of concentration from south Sacramento County to the Modoc Plateau and west to Lake County with an elevation range from near 90 feet to 3500 feet. The wide ranging distribution of slender Orcutt grass has led to a large diversity of vernal pool habitat types for the species.

A variety of factors have contributed to the continued decline of slender Orcutt grass including off-road vehicle use, intensive livestock grazing, altered hydrology, and competition from other plants. Off-road vehicle use in vernal pools is a particular problem near Redding and in forested areas of the Modoc Plateau. Although moderate levels of livestock grazing in spring are compatible with slender Orcutt grass, overstocking, summer grazing, and trampling pose threats to several occurrences. However, grazing may be necessary to control aggressive non-native species. Altered hydrology contributes to the decline of slender Orcutt grass by creating conditions unsuitable for its germination, growth, or reproduction, and by promoting the growth of competing plant species.

Protection measures for slender Orcutt grass are included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan* although critical habitat has not been designated for this species throughout its range. Critical habitat is proposed to encompass the range of vernal pool types inhabited by the species, as well as its geographic range. Orcutt grass is found in five general areas and the vernal pool types and soils associated with the areas of concentration differ greatly across the range of the species and leads to different species compositions and environmental conditions among slender Orcutt grass occurrences.

Critical habitat includes acreage in Lake, Plumas, Lassen, Shasta, Modoc, and Siskiyou Counties. All occurrences, except those in Lake County, are within the volcanic plateau of northeastern California and are located at higher elevations and experience colder climatic conditions than in any other area throughout the species range. Lassen National Forest has 18 known occurrences of slender Orcutt grass; occurrences are known from all three ranger districts. Under the Sierra Nevada Forest Plan, vernal pools containing slender Orcutt grass are managed according to the "Orcuttia tenuis Species Management Guide." Under this guidance, all populations will be protected from direct disturbance by Forest Service and BLM management activities. Disturbance is identified as excessive grazing, vehicle traffic within vernal pools, and hydrologic manipulation within the pools. When necessary, fencing will be the primary method of protection. Specific protocols pertain to all earth moving projects within the drainage area to allow unchanged drainage into the vernal pools. All populations are monitored and unoccupied vernal pools are inventoried to detect new populations.

Bogg's Lake in the Clear Lake Area of Lake County encompasses about 4,200 acres and represents the western extent of the range of slender Orcutt grass and some of the last remaining vernal pool habitats in Lake County. Isolated and peripheral populations such as this may have genetic characteristics essential to the overall long-term conservation of the species. The unit is over 84 miles from the nearest units to the north and west. Critical habitat was not designated in the southeast portion of the Sacramento Valley. This area supports the southern extent of the species and is over 100 miles from the nearest occurrence. It includes the rapidly developing urban areas near Mather Field along Laguna Creek and Dry Creek, as well as areas near Galt and Elk Grove.

Sacramento Orcutt grass *Orcuttia viscida*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Sacramento Orcutt grass has been found in Northern Hardpan and Northern Volcanic Mudflow vernal pools where it occurs on high terrace sites at elevations of 150 to 270 ft. This grass is restricted to several vernal pool complexes in either blue oak woodland or valley grassland communities in Sacramento County. Sacramento Orcutt grass grows in relatively large, deep vernal pools.

Description:

Sacramento Orcutt grass is a blue-green, tufted, sticky aromatic annual plant in the grass family (Poaceae) with flowers crowded into bristly heads. The stems are erect or spreading, 1 to 4 in long and do not branch. The inflorescence occupies the upper part of the stem and consists of between 5 and 15 spikelets (groups of individual flowers). Sacramento Orcutt grass is particularly sticky even when young. Although Sacramento Orcutt grass is geographically isolated from all other members of the genus, it most closely resembles the threatened San Joaquin Valley Orcutt grass (*Orcuttia inaequalis*). Sacramento Orcutt grass flowers in May and June.



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Susan Cochrane Levitsky, DFG File Photo



F. Thomas Griggs, DFG File Photo

Status:

Sacramento Orcutt grass is restricted to Sacramento County and is known only from eight extant occurrences, one of them an introduction. Five occurrences are concentrated into a single small area east of Mather Field. Two other occurrences are adjacent to each other: Phoenix Field Ecological Reserve and the introduced occurrence at Phoenix Park Vernal Pool Preserve. The majority of these occurrences are unprotected.

The species has declined mainly due to severe habitat loss caused by agricultural and urban development. Because the human population of the Central Valley is growing rapidly, numerous populations of Orcutt grasses, including Sacramento Orcutt grass, have been extirpated and continue to be threatened by urban development projects. Sacramento Orcutt grass was extirpated from its historic occurrence between Orangevale and Folsom by urban development. The species was extirpated from one pool near Grant Line Road by changes in hydrology - pool depth was increased artificially to provide a longer-lasting water source for livestock, which created conditions unsuitable for persistence of Sacramento Orcutt grass.

Extant occurrences at the Phoenix Field Ecological Reserve and the Phoenix Park Vernal Pool Preserve have been degraded by off-road vehicles and alterations to natural drainage patterns. The remaining pools where Sacramento Orcutt grass grows are subject to a wide variety of factors that threaten the species survival. Urban encroachment and the associated increase in human activities, is the primary factor. Competition from native plants such as spikerush (*Eleocharis* sp.) and manna grass (*Glyceria* sp.) could displace Sacramento Orcutt grass. Livestock grazing during the growing season, or overstocking during winter grazing, may degrade habitat for Sacramento Orcutt grass; however, grazing may be useful in providing control of competing plants if appropriate timing and stocking rates can be determined.

Protection measures for slender Orcutt grass are included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*. In 2003, the USFWS designated approximately 740,000 acres in 30 California counties and one Oregon county as critical habitat for 15 vernal pool animals and plants. However, all lands in Butte, Madera, Merced, Sacramento, and Solano counties were excluded due to the potential economic effect of critical habitat designation in those areas. No critical habitat was therefore designated for Sacramento Orcutt grass.

Primary constituent elements of critical habitat for Sacramento Orcutt grass were proposed in the Draft Critical Habitat document. These elements were 1) vernal pools, swales, and other ephemeral wetlands and depressions of appropriate sizes and depths that sustain germination, growth, and reproduction; and 2) the associated watersheds and hydrologic features that support the pools. Areas that currently support Sacramento Orcutt grass would have comprised the three units of critical habitat: Phoenix Field and Phoenix Park; southeast Sacramento County in the vicinity of Mather Field; and at Rancho Seco.

The Phoenix Field and Phoenix Park area is situated within the City of Fair Oaks and encompasses 72 acres. The pool complex is bounded by urban development except for the east side, which is adjacent to Folsom Lake State Recreation Area. It supports two of the eight remaining occurrences of the species and represents the northern extent of the species range. The Phoenix Field Ecological Reserve and Phoenix Park occurrences are affected by excess runoff from lawns, baseball fields, and roads; by herbicide and fertilizer applied in adjacent areas, and by dumping of landscape waste. Another threat at the Phoenix Field Ecological Reserve is invasion of garden plants. Recreational activities such as rollerblading, biking, and horseback riding also are damaging the Phoenix Park occurrence. A management plan for Phoenix Field Ecological Reserve is being prepared using Section 6 grant funding from the USFWS.

The Southeastern Sacramento Valley area is located south and east of Mather Airport and Regional Park in the urban areas of the Cities of Sacramento and Rosemont. This area is highly significant to the long-term survivorship of Sacramento Orcutt grass because the vernal pool system is relatively undisturbed, maintains a hydrologic regime, and includes interconnected vernal pools, swales, and uplands. The majority of the lands included within this unit are privately owned, including the Sunrise Douglas mitigation area, where several occurrences of Sacramento Orcutt grass are known to occur. Other vernal pool habitats in this area have been identified by the Sacramento Valley Open Space Conservancy, the CNPS, and TNC as excellent examples of vernal pool grasslands, supporting a rich and diverse community of vernal pool endemic plants and animals within Sacramento County. Vernal pool habitats in this unit are threatened by urbanization from the expanding cities of Sacramento and Elk Grove. Conversion to intensive agriculture, particularly vineyards, is also a significant threat

to Sacramento Orcutt grass habitat in this area. Other sensitive vernal pool species located within this area include vernal pool tadpole shrimp, vernal pool fairy shrimp, California linderiella, slender Orcutt grass (*Orcuttia tenuis*), legenere (*Legenere limosa*), Bogg's Lake hedge-hyssop (*Gratiola heterosepala*), and western spadefoot toad.

The area centered on Rancho Seco and represents the southern range of Sacramento Orcutt grass. This unit includes relatively undisturbed, hydrologically intact vernal pool habitats. The majority of land within this unit is privately owned. Some vernal pool areas are protected in this unit on The Nature Conservancy's Howard Ranch Preserve and Schneider property near Meiss Road. The Clay Station Mitigation Bank and the Borden Ranch mitigation site are located within this unit, as well as a number of smaller conservation areas including the Rancho Seco Preserve and the L.V. Island Preserve. Approximately 600 acres in this area are owned by the DFG, and 7,736 acres by TNC. An additional 11 acres of private land are protected by easements or agreements. Urban expansion and conversion to vineyards threaten existing vernal pool habitats throughout the Rancho Seco area. Vernal pools in this area also provide habitat for the vernal pool tadpole shrimp and the vernal pool fairy shrimp. Other sensitive species found within this unit include Bogg's Lake hedge-hyssop, Henderson's bent grass, legenere, Sanford's arrowhead, pincushion navarretia, dwarf downingia, California tiger salamander, western spadefoot toad, and California linderiella.

Sacramento Orcutt grass is targeted for protection in the developing Sacramento County HCP, which should result in protection of the remaining populations in the County.

**Baja California
birdbush**

*Ornithostaphylos
oppositifolia*

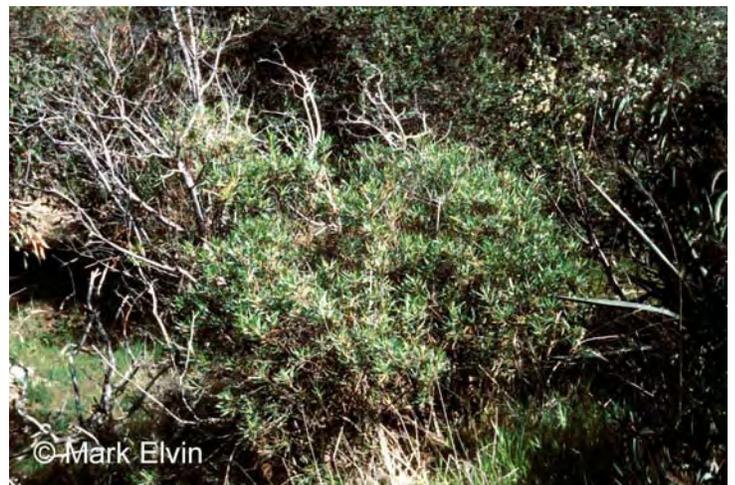
State: Endangered 2001
Federal: None

General Habitat:

In California, Baja California birdbush occurs on a mesa and adjacent slopes, which support a mixture of coastal sage scrub and chaparral species and can be characterized as maritime chaparral. The plants grow in cobbly loam soil. Associate species include coast white lilac, black sage, chamise, flat-topped buckwheat, California sagebrush, and bush mallow.

Description:

Baja California birdbush is a rigidly-branched, erect shrub in the Heath family (Ericaceae) with leathery, narrow leaves and reddish-brown bark that peels to expose white or gray-green stems. The small greenish-white flowers bloom in clusters from January to April, and small red fruits are generally present from May to August. The species is long-lived, has low reproductive rates, and grows slowly, reaching a height of up to 6 feet.



Status:

Baja California birdbush is known from only one location in the United States, just north of the U.S. - Mexico border on a mesa and adjacent slopes in the Tijuana Hills in San Diego County. The species is also known from northwestern Baja California Norte, Mexico.

A total of 103 Baja California birdbush shrubs have been documented at the sole U.S. population. No seedlings have been observed. Threats include fragmentation of habitat by dirt roads and trails, brush clearing and cutting and soil compaction associated with illegal border crossings and U.S. Border Patrol activities, and, possibly, a fire frequency that is too high. This population occurs within an area proposed for construction of the U.S. Border Patrol's Border Fence project, which is still in the planning stages, and may include cutting the mesa to fill an adjacent gulch. It is likely that some of the birdbush plants will be destroyed during construction. DFG is working with the federal agencies involved to determine appropriate mitigation and conservation measures. Baja California birdbush is in cultivation at several locations in California. Attempts to propagate new plants from seeds and cuttings have met with little success.

Lake County stonecrop *Parvisedum
leiocarpum*

State: Endangered 1990
Federal: Endangered 1997

General Habitat:

Lake County stonecrop grows in shallow soils of vernal pools or on rock outcrops that are seasonally wet and dry out in late spring. Lake County stonecrop has always been rare and occurs only in a few sites in Lake County. The populations range in elevation from 1,300 to 2,600 feet. It is associated with goldfields, few-flowered navarretia, popcorn flower and downingia.

Description:

Lake County stonecrop is a diminutive, succulent annual in the stonecrop family (Crassulaceae). The plant has reddish stems 1-2 in. tall, small and narrow fleshy leaves. The leaves fall off before the plant flowers. Pale yellow flowers bloom in April and May. Two rows of tiny, bell-shaped flowers are crowded on a curving flowering stem. Each flower has five small petals. The species is now known as *Sedella leiocarpa*.

Status:

Lake County stonecrop is currently known from three sites on private property. None of these sites have been visited since the 1980s and the status of the plant is not known. The three populations of this plant are found in Lake County within a 10 mile radius from Seigler Springs near Lower Lake. The existing sites have been impacted by OHV use, alteration of hydrology, trampling, and cattle grazing. Conversion of private lands to vineyards is an immediate threat. Information about vernal pool hydrology, as well as ecological and biological information regarding germination and growth requirements for this plant is lacking.



Dudley's lousewort

*Pedicularis
dudleyi*

State: Rare 1979

Federal: None

General Habitat:

This member of the figwort family (Scrophulariaceae) grows in shaded conditions in maritime chaparral, coastal redwood, and mixed evergreen forest communities of San Luis Obispo, Monterey, and San Mateo counties. It had been reported from Santa Cruz County based on a collection from the 1800s. It is associated with star flower, snowberry, iris, clintonia, and violet.

Description:

Dudley's lousewort is a low-growing, perennial herb with mostly compound, basal leaves. It produces a head of pink, irregular-shaped flowers.



Status:

There are 11 known occurrences of Dudley's lousewort. The majority of these are within Los Padres National Forest or on DPR land. Two occurrences are located on the Hearst Ranch. A collection of *Pedicularis* from Fort Hunter-Liggett, tentatively identified as this species, was determined to be a collection of a pale red-flowered *Pedicularis densiflora*.

Dudley's lousewort is a Forest Service Sensitive Species and it is a riparian species of concern on the Los Padres National Forest. The species is vulnerable to trampling and trail maintenance activities. There is potential for occurrences to be affected by logging, road building, and development projects. Invasive species could also constitute a threat to Dudley's lousewort.

Permanent management programs for this species are needed. DFG has no recent information on the status of this plant.

White-rayed pentachaeta

*Pentachaeta
bellidiflora*

State: Endangered 1992
Federal: Endangered 1995

General Habitat:

Historically, white-rayed pentachaeta was known from serpentine bunchgrass and native prairie habitat from Marin to Santa Cruz counties. Serpentine soils provide a harsh environment for plant growth due to their low calcium-magnesium ratio; lack of essential nutrients such as nitrogen, potassium, and phosphorous; and high concentrations of heavy metals. However, species such as white-rayed pentachaeta have adapted to serpentine soils and require them to survive.

Description:

White-rayed pentachaeta is a small annual plant in the sunflower family (Asteraceae) that grows from three to seven inches tall. It has few erect, unbranched stems, which grow from a slender taproot, and narrow, alternate leaves. Each flower head has many yellow disk flowers surrounded by five to 16 white to purple ray flowers. The flowers bloom from March to May.

Status:

Most historical occurrences of white-rayed pentachaeta within Marin, San Mateo, and Santa Cruz counties are believed to have been extirpated by urbanization and off-road vehicle use. Suitable habitat remains at two San Mateo County locations, but the species has not been seen at either site in many years. The species is now known from only one confirmed location in San Mateo County. This population was bisected by the construction of California Interstate 280 in the late 1960s. The largest portion of the population occurs on land administered by the San Francisco Water District. A small remnant remains to the east of Interstate 280, in Edgewood County Park.

Population sizes vary from year to year due to local rainfall and competition from non-native plants. The species is also threatened by proposed trail construction. Due to the small size of the population and limited occupied area, it is also extremely vulnerable to random natural events such as a disease outbreak or increased insect predation.

In 1997, this species was the subject of a recovery workshop conducted by the DFG in cooperation with USFWS. Participants discussed the need for permanently protecting and managing the existing populations, as well as attempting to reintroduce populations into suitable protected habitat. Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.



Lyon's pentachaeta

Pentachaeta lyonii

State:	Endangered	1990
Federal:	Endangered	1997

General Habitat:

Habitat for Lyon's pentachaeta consists of sparsely vegetated openings in grassland, coastal sage scrub, and chaparral on red clays often of volcanic origin. It typically occupies pocket grassland sites at the ecotone with scrublands, and the edges of roads and trails. Soils on which Lyon's pentachaeta occurs often have a cryptobiotic crust on the surface. Lyons' pentachaeta is associated with Turkish rugging, Catalina mariposa lily, purple needlegrass and annual members of the Phlox Family. Lyon's pentachaeta is found only in Los Angeles and Ventura Counties.

Description:

Lyon's pentachaeta is an herbaceous, annual plant in the sunflower family (Asteraceae). It has yellow ray and disk flowers arranged in heads that bloom in late spring from April to June. It is distinguished from other species of *Pentachaeta* by pubescent phyllaries (flower head bracts), the number of bristles on the seed, and reddish branches originating from the upper portion of the plant. The ray flowers are typically curled, and the leaves are narrow and linear with long hairs on the leaf margins. There are no other members of the genus in the region.

Status:

Lyon's pentachaeta is known only from the coastal mountain region of northern Los Angeles County and southern Ventura County in the Santa Monica Mountains and in the Simi Valley. It occurs in a highly fragmented landscape where the majority of occurrences have been extirpated. According to the USFWS, Lyon's pentachaeta is known from five population areas in the Santa Monica Mountains and the western Simi Hills. The East unit consists of one occurrence; the Mulholland crest unit has three occurrences; the Central unit has seven occurrences; the Conejo Ridge unit has seven occurrences; and the North unit has four occurrences. Five occurrences are known to exist on public agency lands managed by the NPS, the Las Virgenes Municipal Water District, and the Conejo Open Space Conservation Agency. Population numbers vary greatly with seasonal precipitation. Since the publication of the Proposed Rule (to list the species), three occurrences on public lands (Stunt Ranch, Malibu Creek State Park, and Arroyo Sequit) appear to have become extirpated, although the status of the population at the Stunt Ranch following a wildfire is not known. The remaining locations are privately owned. Populations on the Palos Verdes Peninsula and on Santa Catalina Island have not been seen for many years and focused searches in areas of suitable habitat in the general area of the original population by the Catalina Island Conservancy failed to locate the plant in 2001. Lyon's pentachaeta had last been seen on Santa Catalina Island in the 1930s. Lack of adequate land buffers, increases in invasive plant species such as wild oats and yellow star thistle, fuel clearance, loss of suitable habitat for population expansion, fragmentation of habitat connectivity, and lack of management of competing vegetation threaten most of these populations. Several populations have been severely damaged in recent years by geotechnical trenching, vegetation fuel clearance, and bulldozing.



A detailed study of the ecological requirements of Lyon's pentachaeta was funded by three Federal Section 6 grants in the 1990s. In studying the ecology and distribution of Lyon's pentachaeta, researchers hypothesized that the species maintain populations on undisturbed "safe sites," such as on ridgetops or in areas of shallow soils where there is little competition from invasive plants. It is from these refugia that Lyon's pentachaeta expands into disturbed sites following removal of the shrub canopy. Intensive field studies at two large populations focused on documenting the density and cover of Lyon's pentachaeta; pollinator identification and observation of behavior; quantification of pollen on observed insect visitors; and the effect of pollen exclusion on flower development and seed set. In addition, the responses of plants to different substrates, levels of soil moisture, and shading were studied.

At both study sites, Lyon's pentachaeta occurred in areas where bare ground made up more than 60% of the plots. There was also significant correlation with soil depth and pentachaeta density at both study sites. Although Lyon's pentachaeta can grow on shallow soils, higher densities were recorded on deeper soils. Deeper soils also extended the growing season. Nine species of insects were observed visiting flowers. Digger bees were the most common visitors and likely were important pollinators. Lyon's pentachaeta pollen was collected from six of the seven bees captured and in one case comprised 90% of the pollen load. There was a highly significant difference in seed development between bagged and unbagged flowers. Viable seed were not produced on plants with bagged flowers indicating that Lyon's pentachaeta requires cross-pollination with another plant (self-incompatible). Soil moisture had a minimal effect on survivorship of Lyon's pentachaeta, although soil type (alkaline limestone vs. acidic soils derived from volcanics) and shading had significant effects on the plants. Lyon's pentachaeta is incapable of establishing on limestone soils and grows poorly if shaded by overstory plants.

Lyon's pentachaeta is shade-intolerant and often found on disturbed sites where overtopping vegetation has been removed or reduced. Lyon's pentachaeta is able to maintain populations for extended periods of time without disturbance through soil storage of seeds (seed bank). Although the species does not tolerate most forms of intensive disturbance, selective shrub removal coupled with control of invasive plants and minimal soil disturbance may expand its populations. Germination experiments indicate that Lyon's pentachaeta does not produce deeply dormant seed stimulated by fire and that it is not a "fire follower" or fire-dependent species.

A 2000 Master's thesis project at the University of California, Santa Barbara examined predictive modeling of endangered plant species in the Santa Monica Mountains. In collaboration with Santa Monica Mountain National Recreation Area scientists, the researcher developed a knowledge base that represented a predictive model of the habitat for Lyon's pentachaeta. A habitat classification tree was used as the predictive tool. The results of analysis of the *Pentachaeta* model identified 26 out of 41 known sites and identified 526 possible "Habitat Assessment Units" of species habitat. The classification tree models identified 2,044 sites that belong to the "very suitable set of solutions" for *Pentachaeta lyonii*. This type of analysis will allow NPS staff to focus surveys, as well as prioritize management in potentially suitable habitat for Lyon's pentachaeta.

Protection measures for Lyon's pentachaeta are provided in the USFWS *Draft Recovery Plan for Six Plants from the Mountains Surrounding the Los Angeles Basin, California*, released in 1999.

Yreka phlox

Phlox hirsuta

State: Endangered 1987
Federal: Endangered 1998

General Habitat:

Yreka phlox is an endemic serpentine plant whose distribution is limited to four populations located near Yreka in Siskiyou County. It occurs at elevations from 2,800 to 4,400 feet in association with incense cedar, Jeffrey pine, juniper, rabbitbrush, and in the general vicinity of Yreka, Siskiyou County.

Description:

Yreka phlox is a low perennial subshrub in the Phlox Family (Polemoniaceae). The species grows from a woody base to about two to six inches high and is hairy throughout. Leaves have glands on the margins and are crowded on short stems. The pink to purple flowers appear from April to June. Several other species of phlox may occur within the range of Yreka phlox. Of these, showy phlox has notched petal lobes and grows taller than Yreka phlox. Northern phlox is also larger than Yreka phlox and blooms later, from June to August. The stems of spreading phlox lay on the ground and lack glands on the leaves.

Status:

Yreka phlox is a narrow endemic known only from the vicinity of Yreka, California. It is currently known to occur at four locations, which are generally referred to as the "China Hill," "Soap Creek Ridge," "Cracker Gulch," and "Jackson Street." In addition, the locality information from a single 1930 collection indicates a possible historical location in the vicinity of Etna or in the vicinity of Echo Mill, near Soap Creek Ridge. Intensive surveys have been conducted in potential habitat (defined as the presence of suitable soils) on Klamath National Forest and Bureau of Land Management lands within the Redding Resource Area. No new populations of Yreka phlox have been discovered.

The China Hill occurrence is located on an open ridge and adjacent slopes approximately one mile northeast of downtown Yreka. Yreka phlox occurs on the main ridge and its adjacent slopes. Slopes vary from approximately 20-50%, and aspects are variable. Important components of the vegetation include rabbitbrush, several species of buckwheat, and native perennial grasses such as Idaho fescue and wildrye. Other plants commonly observed at the site include woolly sunflower, bitter root, silverleaf phacelia, small onion, and spring gold. The shallow soils support scattered western junipers and buckbrush. An estimated 1,000 to 3,000 plants are scattered over approximately 47 acres based on a spring 2001 survey and mapping effort by DFG and Timber Products Company staff, who employed very accurate Global Positioning System (GPS) technology. Approximately 55 to 60 percent of this occurrence is on parcels owned by the City of Yreka, while the remainder is situated on several privately held parcels that are currently zoned for residential development.



The threat of development at the China Hill site was a primary factor in the decision by the USFWS to list the phlox as Endangered in 2000. Securing protection for the China Hill occurrence is essential to the conservation and recovery of this species, according to the draft Yreka Phlox Recovery Plan currently in preparation. In the 1990s, three parcels on China Hill that supported the phlox were donated to the City of Yreka. Recent collaboration between the City, the DFG, and the WCB led to the purchase of two additional properties supporting Yreka phlox in 2002. Purchase of another property is pending. These properties are now owned by the City and are managed for the conservation of the phlox. Two important properties that support the phlox remain in private ownership and remain subject to development. Although not known to support the phlox, an additional parcel is also important to site conservation and management because it is adjacent to the phlox occurrence and is accessed by a road that bisects the occurrence.

The Soap Creek Ridge occurrence includes at least 14 discrete clusters of plants and is located approximately five to six miles southwest of Yreka. The entire occurrence has been estimated to contain as many as 5,000 to 10,000 plants over 584 acres. The phlox occurs on lands owned and managed by private landowners, industrial timber companies, and the USFS. The predominant plant community is Jeffrey pine woodland, with incense cedar, Douglas-fir, and sometimes Garry oak present in the overstory. The shrub layer is much more developed than the China Hill site, and includes buckbrush, birch-leaf mountain mahogany, and Fremont's silk tassel.

The Cracker Gulch is located on the south side of State Highway 3 in the Yreka Creek drainage. Vegetation is similar to that of Soap Creek Ridge. Cracker Gulch is estimated to contain 200 to 300 Yreka phlox plants. Land ownership at this site includes a small ranch and timberland owner and an industrial timber company. The Highway 3 occurrence is partially on U.S. Forest Service lands on the Klamath National Forest, partially within a State highway right-of-way, and partially privately owned. The occurrence along Highway 3 has been disturbed in the past by logging and road construction. Although selective logging has resulted in roads and bulldozer trails through the site, logging activities are not currently considered to be a significant threat to considered to Yreka phlox because of site-specific protection measures included in timber harvesting plans. The USFS has no activities planned that may pose a threat in this area. The realignment of Highway 3 over 30 years ago impacted part of this occurrence. The area has since been designated by Caltrans as an Environmentally Sensitive Area, which provides limited protection in that it requires consideration of a sensitive species occurrence in project planning and maintenance activities. The area within the right-of-way consists of five small subpopulations with approximately 100 plants, occupying less than two acres along 2.5 miles of the highway.

The Jackson Street occurrence is located on a privately-owned parcel near the west-central edge of Yreka, in the Little Humbug Gulch drainage. A professional botanist, who visited the site in 1997 or 1998, indicated the presence of Yreka phlox at that time. However, no verified collections have been made from the site. Because access is restricted by the landowner, the current extent and condition of the occurrence is unknown.

Federal Section 6 Recovery Land Acquisition funds, along with State matching funds, are being used to purchase these three properties at China Hill from willing sellers. Public acquisition of these parcels will preclude future residential development on these properties; prevent indirect impacts to phlox plants that occur on parcels already owned by the City from potential development; provide a small buffer on the western edge of the occurrence; permit the City to effectively manage vehicle and other use within the area; and provide the public an opportunity to observe and enjoy a locally endemic species in perpetuity.

The City of Yreka has made a commitment to manage the site for Yreka phlox, which will effectively ensure the conservation of the China Hill occurrence. Because the properties are relatively undisturbed, little or no active restoration is necessary. The City generally practices a "hands off" or passive management approach to the Yreka phlox on the China Hill parcels that it currently owns. This approach has been effective in conserving and protecting the phlox because there are few substantial threats to the plant at this occurrence. Proposed public uses of the site will include passive natural resource related activities such as nature study, photography, and

hiking. The City will also encourage scientific and educational use. Long-term management of the site may include the addition of fencing and other improvements along the private access road to the properties. Because it is not gated or locked, unrestricted access has resulted in unauthorized use of the properties, including City-owned parcels, by off-road vehicles. In addition, specific management recommendations may be developed and implemented pursuant to the Yreka Phlox Recovery Plan.

Yreka phlox pollination ecology is currently being studied with Section 6 funding. A minimal number of scientific studies have been conducted on this plant species and no studies have been completed on any aspect of its pollination biology. An understanding of the pollination biology of an endangered flowering plant species can greatly assist efforts directed toward its successful recovery or preservation. Information from this study will contribute to the draft recovery plan being prepared for this species. Principal objectives of this study are to 1) determine the importance of insect pollinators in the reproduction of Yreka phlox; 2) identify which insects serve as important pollinators for this phlox species; and 3) compare fruit set between phlox flowers exposed to pollinators and those from which pollinators have been excluded.

San Francisco *Plagiobothrys diffusus*
popcornflower

State: Endangered 1979
Federal: None

General Habitat:

San Francisco popcorn flower is restricted to vernal-moist areas in the coastal prairie of San Mateo, Santa Cruz, and Alameda Counties. The grassland is largely composed of non-native grasses such as wild oats, wild barley, rattlesnake grass, and bromes. Native grasses include California oat grass and purple needlegrass. It is associated with other listed species including the Santa Cruz tarplant and Scotts Valley spineflower.



Description:

San Francisco popcornflower is a member of the Borage Family. It is a low, herbaceous annual, with narrow leaves and a branched flower stalk of white flowers. Some collections of this plant appear to be very similar to *Plagiobothrys reticulata*.



Status:

San Francisco popcornflower is restricted to coastal grasslands in San Mateo, Santa Cruz, and Alameda Counties. It is first described from a locality near Mountain Lake in the Presidio of San Francisco. The type locality was altered during the construction of Highway 1 and is now a popular neighborhood park. San Francisco popcornflower has not been seen at the type locality since the 1930s. It is currently known from 11 occurrences. Proposed development, non-native plant invasion, and recreational use of its grassland habitat are the principal threats to the species.

One population of San Francisco popcornflower is in joint public ownership under the University of California Natural Reserve System and DPR. This population is vulnerable to disturbance by recreational activities such as horseback riding and biking. A portion of a population on Moore Creek Uplands was purchased by the City of Santa Cruz and WCB in 1998. A management plan for that property will be developed by the DFG, City of Santa Cruz, and the Land Trust of Santa Cruz County. The remaining portion of that population is on private land. The City of Santa Cruz is also developing a management plan for Pogonip, a city park and the location of another population. A prominent feature within Pogonip, the Main Meadow consists of a remnant of coastal terrace

prairie. Although it is dominated by non-native grassland species, areas of native coastal prairie support San Francisco popcornflower, as well as the rare Santa Cruz clover and the federally-listed Ohlone tiger beetle. A population in the City of Scotts Valley is included in a grassland preserve, established by the Scotts Valley Unified School District to protect the listed Scotts Valley spineflower and Scotts Valley polygonum. Non-native grasses dominate this site which was established following construction of the adjacent high school. A population has been reported in Redwood Regional Park in the East Bay Regional Park District, but has not been confirmed.

**Calistoga
popcornflower**

*Plagiobothrys
strictus*

State: Threatened 1990
Federal: Endangered 1997

General Habitat:

This species grows in swales adjacent to active geysers and hot springs. These seasonal wetlands are underlain by a gravelly loam intermixed with clay, and water tables are close to the surface. Concentrations of boron, arsenic, and sulphates are high in these soils and a unique flora has evolved in them. Calistoga popcorn flower is associated Brewer's milkvetch, goldfields, and Napa blue grass, a state and federally listed species.

Description:

Calistoga popcornflower is a small, erect annual herb in the borage family (Boraginaceae). It has slender stems with narrow leaves. Small white flowers appear in March to April in a slender, unbranched inflorescence. The fruit is a minute, egg-shaped nutlet with wart-like projections on the back and no prickles. The ranges of several other species of popcornflower overlap that of Calistoga popcornflower and occur in similar habitats, but do not resemble Calistoga popcornflower.

Status:

Calistoga popcornflower is restricted to two sites near the town of Calistoga. Only two of the three known occurrences of Calistoga popcornflower ever known still remain. These are near the town of Calistoga in Napa County. Both remaining occurrences are on privately owned land and are not protected. Historically, the range of this plant has been diminished by the development of recreational hot springs and the growth of the town of Calistoga. Alteration of the hot springs hydrology, early season mowing prior to flowering or setting of seed, airport maintenance, and residential and commercial development continue to threaten this species. Although both occurrences were still extant in 1997, they are small and at risk of extirpation by random events such as a severe disease outbreak or other natural or human-caused events.



**North Coast
semaphore grass**

*Pleuropogon
hooverianus*

State: Threatened 2002
Federal: None

General Habitat:

North Coast semaphore grass is found in partial shade in seeps, springs, and marshy ground in meadow openings within mixed evergreen-hardwood forest or woodland. Canopy species include coast live oak, redwood, douglas-fir, and madrone. Associated species include sedges, rushes, and blue wild-rye. North Coast semaphore grass is endemic to northwestern California and is known only from Marin, Sonoma, and Mendocino counties.

Description:

North Coast semaphore grass is a tall perennial bunchgrass, with flowering stems greater than 36 inches in height. The flower spike is 8 to 9 inches long, bearing 7 to 9 widely-spaced linear clusters of flowers (spikelets). The spikelet stems are erect to ascending although they bend downwards occasionally.



Status:

Historically, this grass was reported from 23 locations (occurrences) in Marin, Sonoma, and Mendocino Counties. Several of those occurrences were found to be a closely-related species or found to be duplicate reports of an already known site. Six locations date from the early 1900s to 1940s, have not been observed since then, and are believed to be extirpated. Another occurrence was last seen in 1981 and is also believed to be extirpated. North Coast semaphore grass is currently known from eight disjunct sites in these counties. Estimates of total occupied habitat are 14 to 18 acres.

Existing populations are all on privately-owned lands. All are threatened by one or more types of land management activity, including invasion by non-native plants, alteration of hydrologic conditions, routine ditch maintenance, or herbicide spraying. Populations could also be lost through large-scale conversion of habitat to vineyard or other intensive land use, or due to random natural and anthropogenic events, for example wildfire and fire suppression activities.

The Department is working with five landowners to implement conservation measures for North Coast semaphore

grass. In Marin County, management activities will include weed removal and conservation seed collection. A portion of the population along a county road will be protected by modifying road maintenance activities and through an education program for road maintenance staff.

Several populations of plants occur in Mendocino County. One population is located within a vineyard. Herbicide application and mowing to create a firebreak were the two principal threats to North Coast semaphore grass at this site. Department staff met with the property owner in February 2002. As a result of that meeting, the owner agreed to suspend herbicide application and to delay mowing until plants flowered and set seed. At the request of the landowner, the Department conducted subsequent surveys at the vineyard and found that North Coast semaphore grass was quite extensive at this site and was not in immediate jeopardy. Seed has been collected from this site and placed in conservation storage.

Three new populations were discovered on Mendocino Redwood Company land during pre-harvest rare plant surveys. Timber harvest, under approved Timber Harvest Plans, will occur in the next few years. Mendocino Redwood Company has flagged the major colonies of plants and created a buffer around each of the sites. In addition, staging areas, timber piles, and haul roads will be located away from the populations. North Coast semaphore grass will be one of the species covered under a NCCP currently in preparation. Department staff also met with the owner of the third major population in Mendocino County. The landowner is interested in long-term conservation of the species at this site.

The Sonoma County population is still in jeopardy. A small portion of this population occurs along a public road where it is mowed for roadside maintenance. A portion of this population near the road was sprayed with herbicide in 2002 although damage to the grass appeared to be minimal. The Department is continuing to work with county road maintenance staff to minimize impacts. The majority of the site, however, is in a meadow that is mowed by the property owners for fire suppression.

A number of management activities could benefit North Coast semaphore grass, and could be formalized in voluntary conservation agreements and strategies with willing landowners. These activities could include selective control of aggressive weeds; removal of native trees and shrubs invading meadows where the grass grows; and prescriptive grazing to remove thatch and reduce competition from non-native grasses. Other management activities include systematic surveys of potential habitat for additional populations, research to quantify ecological requirements of this plant, research to determine the number of genotypes found in native populations, annual monitoring and maintenance of existing populations, and seed collection of all populations for long-term storage in a seed germplasm bank. A public education program could also be implemented so that landowners are aware of the significance and potential value of this grass.

Napa blue grass *Poa napensis*

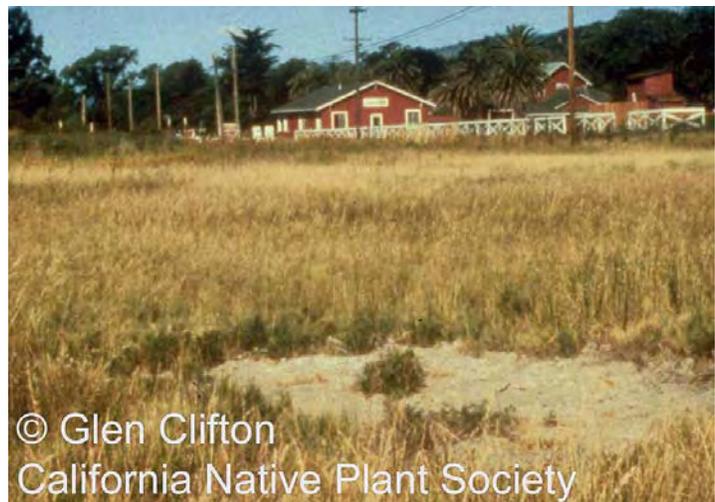
State: Endangered 1979
Federal: Endangered 1997

General Habitat:

This rare grass is known from just two sites near Calistoga in Napa County where it is found in grasslands and moist, alkaline meadows fed by hot springs. It is associated with Brewer's milkvetch, Parry's tarplant, and Calistoga popcornflower, a State-listed Threatened species.

Description:

Napa blue grass is a tufted, perennial bunchgrass in the grass family (Poaceae). Its leaves are very narrow, folded and stiffly erect. Basal leaves reach eight inches long while flowering stems reach 27 inches in height. Flower clusters are pale green to purple and appear in May. Napa blue grass most resembles ocean bluff bluegrass but differs in leaf and flower form and habitat.



Status:

Napa blue grass is only known from two populations in the vicinity of Calistoga. Both are on private land and are not protected. Historically, the range of this plant has been diminished by the development of recreational hot springs and the growth of the town of Calistoga. Alteration of the hot springs hydrology, early season mowing prior to flowering or setting of seed, airport maintenance, and residential and commercial development continue to threaten this species. Although both occurrences were still extant in 1997, they are small and at risk of extirpation by random events such as a severe disease outbreak or other natural or human-caused events.

San Diego mesa mint

*Pogogyne
abramsii*

State: Endangered 1979
Federal: Endangered 1978

General Habitat:

San Diego mesa mint is restricted to vernal pools within grasslands, chamise chaparral, and coastal sage scrub on the mesas of western San Diego County. It is often associated with toothed downingia and the state- and federally-endangered San Diego button-celery.

Description:

San Diego mesa mint, a member of the mint family (Lamiaceae), is a small, aromatic, herbaceous annual with opposite leaves, reaching one foot in height. As the plant matures and flowers, the vegetation develops a reddish tinge. The two-lipped, violet to reddish-purple flowers have white or yellow throats. Following inundation of the pools, this mint often blooms profusely, sometimes blanketing pool basins with flowers. Typical bloom time is May to July.



Status:

Most of the approximately 35 known, extant occurrences are on DOD lands. Protection measures for San Diego mesa mint are provided in the USFWS *Recovery Plan for Vernal Pools of Southern California*, released in 1998. The San Diego National Wildlife Refuge Vernal Pools Unit provides habitat for several listed species including the San Diego mesa mint, San Diego button celery, and California Orcutt grass, as well as two species of vernal pool fairy shrimp.

The pools at the Marine Corps Air Station Miramar, California, which represent 80% of the remaining pools in San Diego County, support San Diego mesa mint, San Diego button celery, and the San Diego fairy shrimp. While under Navy ownership, Navy resource managers and local scientists used aerial photographs and field inspections to identify sites at Miramar where vernal pools once existed but had been damaged before the Navy bought the

land. Thirty-three of the pools were then restored, by carefully excavating fill material without damaging the hard clay underneath. Seeds, soil, and other fill material were then added to the restored pools. The soils, which had been collected from vernal pools in an off-base area that was about to be developed, held seeds from the mesa mint and button celery, as well as eggs from the fairy shrimp. Both seeds and eggs often lie dormant for months or even years awaiting the next rainfall. This successful project added significant vernal pool habitat without impacting the military mission.

San Diego mesa mint receives protection under the Multiple Species Conservation Program (MSCP) of southern San Diego County. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. San Diego mesa mint is considered to be a narrow endemic species under the MSCP. The City of San Diego prepared a Subarea Plan under the MSCP to meet the requirements of the California Natural Communities Conservation Planning (NCCP) Act of 1992. Management directives for this species require specific measures to maintain and increase populations, reduce or eliminate threats to the species, and address ecological relationships of the species.

San Diego mesa mint is one of several vernal pool species targeted for conservation on Del Mar Mesa. Numerous vernal pools occur on Del Mar mesa. Del Mar Mesa has been the subject of biological study for many years, particularly the unique type of vernal pools that are found there. Unlike other vernal pools in San Diego County, those on Del Mar Mesa Preserve are almost exclusively found within chaparral habitats, versus other pools that may occur in coastal sage scrub or grasslands. Vernal pools located away from existing roads and trails in the chaparral vegetation are the least disturbed and weedy. A portion of the vernal pools on Del Mar mesa have been damaged by road grading, off-road vehicle traffic, and creation of new trails by mountain bikes. Levels of damage to the pools range from pools that are undisturbed relatively to pools that have been nearly eliminated by past road grading and associated vehicle traffic. Pools that have been the most severely impacted are located in and adjacent to roads and unauthorized trails through the DFG vernal pool preserve area and along the graded access roads west of the preserve. In some cases vernal pools along the graded roads have been bisected and formerly contiguous sections of pools are now divided by the access road. The DFG owns 81 acres within the Preserve.

The Del Mar Mesa Preserve was established to protect the sensitive biological resources in the area. A management plan was developed for the Preserve in accordance with the MSCP and the Subarea Plan. Protection will include directing all activities to less sensitive areas when possible. A detailed vernal pool restoration and enhancement plan is outlined in the Subarea Plan. Enhancement would involve restoring the natural hydrology to disturbed pools, removal of exotic plants, and the reintroduction of plant propagules for San Diego mesa mint, San Diego button celery, and spreading navarretia. If restored pools have the hydrologic conditions suitable for the San Diego fairy shrimp, seed for vernal pool plants could also be introduced.

In 2003, the huge Cedar Fire burned a large area of central San Diego County. The fire burned through valleys that contain major stream courses and down onto sedimentary mesas at the Miramar Marine Corps Air Station. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 34% of habitat suitable for San Diego mesa mint, including eleven vernal pool complexes, burned during the fire. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on the Miramar Marine Corps Air Station, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on San Diego mesa mint.

This species is also included in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Santa Lucia mint

Pogogyne clareana

State: Endangered 1979
Federal:

General Habitat:

Santa Lucia mint is known only from the tributaries of the Nacimiento River on the Hunter-Liggett Military Reservation in the Santa Lucia Mountains, Monterey County. It grows in sandy to gravelly banks of winter-wet, summer-dry stream banks and vernal pools, often in mixed oak woodland. Associate species include deer grass, rush, spikerush, dense flower willowherb, meadow barley, and other riparian herbs.

Description:

This member of the mint family (Lamiaceae) is a delicate, strong-scented, herbaceous annual, with low-spreading branches, reaching 16 inches in height. It has dense, narrow, head-like clusters of deep pink flowers that bloom from May to July.

Status:

All populations of Santa Lucia mint are on Hunter-Liggett Military Reservation, which is owned and managed by the Department of Defense. Access to areas with suitable habitat for the species is restricted to security patrols, for purposes of fire management and occasional recreational activities. Recent surveys conducted by the Santa Barbara Botanic Garden raised the number of known occurrences to over 50, of which 20 supported colonies with 10 to 1000 individuals, 20 supported colonies of 1000 to 10,000 plants, and 9 sites supported over 10,000 plants. The newly discovered occurrences greatly increase the number of plants known, but do not increase the range for the species.

Several of the populations occur near dirt roads, and are vulnerable to dust during the flowering season, as well as erosion and compaction from vehicles. Disruption of drainage systems also represents a potential threat to some populations. All occurrences may be vulnerable to livestock grazing, feral pigs, military activities, road maintenance, frequent wildfires, trampling, and OHVs, although all known sites currently seem to be doing well.

A management plan should be developed and implemented to help protect the populations of Santa Lucia mint. Emphasis should be placed on working cooperatively with the Army to secure known occurrences and prevent their accidental destruction by military activities or by lack of management.

Santa Lucia mint is currently included in the Santa Barbara Botanic Garden's Conservation Collection.



Otay Mesa mint

Pogogyne nudiuscula

State: Endangered 1987
Federal: Endangered 1993

General Habitat:

Otay mesa mint is restricted to vernal pools on Otay Mesa, located in southwestern San Diego County and extending into Baja California Norte, Mexico. It generally grows on gravelly clay loam soils in association with Orcutt's brodiaea, San Diego goldenstar, and the state- and federally-endangered San Diego button-celery. While some colonies are associated with chamise chaparral, most occur in open grasslands with mima mound topography.

Description:

A member of the mint family (Lamiaceae), this small, aromatic, annual herb has a branched and somewhat spreading habit. Its two-lipped, lavender flowers bloom after the rainy season when pools begin to dry down, from May through early July.



Status:

Otay mesa mint is highly endangered. Although once considered widespread near Balboa Park, Mission Valley, and University Heights, urbanization has destroyed those occurrences. Approximately six occurrences of Otay Mesa mint remain in California. Most of these are privately owned and highly threatened by urbanization, including expansion of airports, landfills, road construction (I-905), and residential and commercial building; livestock grazing; agricultural conversion; and activities around the second International Border crossing with Mexico. Additional threats to remaining habitat include off-road vehicular activities, trash dumping, and invasion of non-native species.

The USFWS provided a management strategy in their 1998 *Recovery Plan for Vernal Pools of Southern California*. Their plan includes stabilization of populations through habitat management and expansion of existing populations. Monitoring and restoring populations are critical plan elements. Restoration efforts need to address the reestablishment of abiotic and biotic characteristics such as soil and water quality, hydrology, nutrient cycling, species diversity, reproductive mechanisms and species and interactions.

This species is covered in the San Diego Multiple Species Conservation Plan (MSCP). The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. Otay Mesa mint is considered to be a narrow endemic species under the MSCP; 91 percent of its major populations will be conserved. The Otay River Special Area Management Plan (SAMP) is currently being prepared. When completed, the comprehensive plan will be used to guide permitting and protection of aquatic resources while protecting that provides for natural resource protection and reasonable economic growth within geographic areas

of special sensitivity. This comprehensive planning effort is to be used to assist the federal, state and local regulatory agencies with their decision making and permitting authority to protect aquatic resources. Preserves established under the Otoy River Watershed Management Plan will also protect California Orcutt grass.

In 2003, the huge Otoy Fire burned a large area of south-central San Diego County. Two vernal pool complexes along the Otoy River and in Proctor Valley burned during the fire. Few of the grasslands supporting vernal pools burned with great intensity, so alteration of the soils' physical properties should not result in the loss of vernal pool species. Where vernal pools occur within chaparral, such as on Marine Corps Air Station Miramar, soils may have been altered, which may negatively affect water quality and create sites favorable to weed invasion. Post-fire monitoring will be necessary to assess the long-term effects of the fire on Otoy mesa mint.

Otoy mesa mint is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Scotts Valley polygonum

Polygonum hickmanii

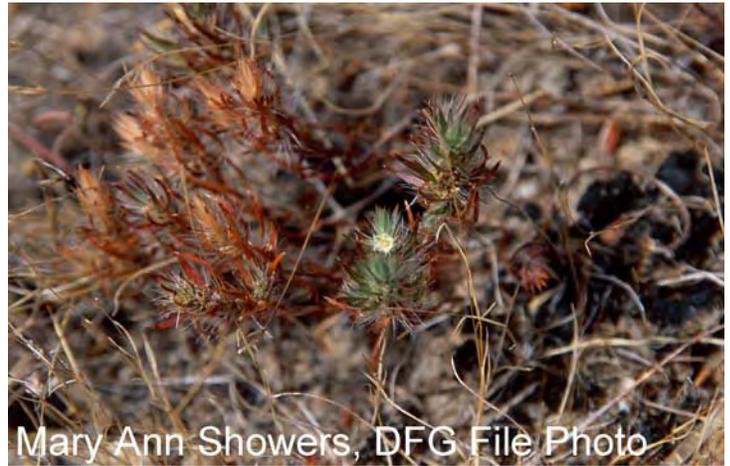
State	Endangered	2004
Federal	Endangered	2003

General Habitat:

Scotts Valley polygonum occurs is endemic to Scotts Valley, Santa Cruz County, California, approximately seven miles from the coast, at an elevation of 700-800 feet. It is found in grassland habitat of gently sloping to nearly level, fine-textured, shallow sandy loam soils, underlain by outcrops of Santa Cruz mudstone and Purisima sandstone. Pockets of these shallow, well-draining soils are often referred to as "rock outcrops." Scotts Valley polygonum occurs with several sensitive species, including the federally-listed Scotts Valley spineflower, the State-listed, Endangered San Francisco popcorn flower, the federally-listed endangered Ohlone tiger beetle.

Description:

Scotts Valley polygonum is a small, erect, taprooted annual plant in the buckwheat family (Polygonaceae), growing 1-2 inches tall. The linear leaves are 0.04-0.06 inch wide, 0.2-1.4 inch long, and sharply pointed at the tip. The single white flowers, with bright orange or pink anthers, bloom from late May to August.



Status:

Scotts Valley polygonum is known from only two occurrences, less than one mile apart and occupying a total area of less than one acre. Thorough surveys of potentially suitable habitat throughout Scotts Valley and surrounding areas have not located any additional populations. This species was first discovered in 1990 and little is known about its historical range and distribution. The two occurrences of Scotts Valley polygonum are located on three privately-

owned parcels. At each occurrence the Scotts Valley polygonum plants are grouped in one or more discrete patches located within distinct areas of thin-soiled habitat. Each patch of plants ranges in size from 25 ft² to 1500 ft². Since its discovery, the total number of plants observed in any given year has ranged from 200-400 plants to almost 3500 plants.

Scotts Valley polygonum is threatened by direct and indirect impacts due to development, including the destruction of plants and/or their habitat, habitat fragmentation, changes in surface hydrology, and soil siltation. Illegal OHV use has created trails through polygonum habitat, resulting in furrows and erosion of the outcrops on which the polygonum grows. In addition, non-native plants have invaded and now dominate habitat areas that once may have supported Scotts Valley polygonum.

A housing development is currently being planned for one of the sites. The project configuration has not yet been finalized. It would eliminate one patch of plants although the remaining six patches would be set aside as open space. One patch of Scotts Valley polygonum plants is located adjacent to playing fields at Scotts Valley high school. Although it is located in the high school "preserve area", which is currently fenced to protect the rare species that occur there, the long-term conservation of this habitat area is not guaranteed. Road construction for a recycled wastewater facility also removed habitat for the polygonum, and provides access for OHV users.

Scotts Valley polygonum is highly vulnerable to any modification or destruction of habitat due to the limited size of the populations and small number of plants. Long-term survivorship of the species will depend on preservation of a matrix of occupied and potentially suitable habitat so that the species would survive random natural disturbance and respond to varying levels of environmental perturbation.

Hickman's cinquefoil

*Potentilla
hickmanii*

State: Endangered 1979
Federal: Endangered 1998

General Habitat:

Hickman's cinquefoil is known from seepage areas and other wet sites in coastal prairies or open forested areas in San Mateo and Monterey Counties. Associate species include the native grassland species California oatgrass and needlegrass, while non-native grasses appear to be competitors.

Description:

Hickman's cinquefoil is an herbaceous, slender-stemmed perennial member of the rose family (Rosaceae) that dies back to a woody taproot every year. Its leaves are divided into many leaflets, and numerous yellow flowers bloom from April to August.



Status:

Historically, there were four occurrences of Hickman's cinquefoil, one in coastal San Mateo County and three sites on the Monterey Peninsula. In 1995, a population of Hickman's cinquefoil was discovered in San Mateo County. This population, a portion of which is located within a proposed construction zone of the State Highway 1 Devil's Slide Bypass, was estimated to consist of 2,000 to 3,000 individuals. In 1997 a decision was made to route Highway 1 through a tunnel, thus avoiding the population, which remains on private land. No other measures have been implemented to protect this population.

Currently, only one of the Monterey peninsula populations, at Indian Village in Pebble Beach, is extant. It has been reduced to as few as 14 individuals, and most recent surveys in 1999 found fewer than 40 individuals. In 1995, the Del Monte Forest Foundation, owners of the property, relocated volleyball and horseshoe areas to reduce impact to the population. Surveys were conducted in 1995 to identify suitable sites in the area for establishment of additional populations. Clones and seedlings were planted in several locations in the vicinity of Indian Village in 1998; at one site there was no survival, and at the other 64% were surviving in 2000. Related research showed that competition from other plants strongly suppresses the survival and reproductive performance of Hickman's cinquefoil. Further research is needed on habitat preferences and tolerances, effects of competition and herbivory, limits on pollinators and seed dispersal, and genetic analysis.

In 2002 the USFWS released a draft recovery plan for Hickman's cinquefoil and four other Monterey County plants.

Hartweg's golden sunburst

Pseudobahia bahiifolia

State: Endangered 1981
Federal: Endangered 1997

General Habitat:

Hartweg's golden sunburst is a very rare species that inhabits upland sites in valley and foothill annual grasslands, typically in association with undulating mima mound topography formed on acidic soils. The species usually grows most densely on the upper third of the mounds, mostly on their north and northeast aspects. North aspects of larger knolls and shaded creek banks however, are also inhabited. Population sizes fluctuate significantly with the season's precipitation. Annual grassland with which it is typically associated is dominated by annual fescues, filaree, smooth cat's ear, upland popcorn-flower, and California plantain. It occurs in Fresno, Madera, Merced and Stanislaus counties, with historic, now-extirpated locations in Sutter and Yuba counties.

Description:

Hartweg's golden sunburst is a diminutive annual member of the sunflower family (Asteraceae). This species possesses mostly unbranched stems that reach two to eight inches in height. It possesses tiny, alternately arranged, narrowly elongate, woolly leaves. Single, small yellow-rayed sunflower heads are produced from March through April. The genus *Pseudobahia* is most easily distinguished in the field from the widespread and common goldfields (*Lasthenia*) by its woolliness and alternately arranged leaves.

Status:

Historically, Hartweg's golden sunburst was scattered but locally abundant in valley and foothill grasslands of the Central Valley from Yuba County south to Fresno County. Only 15 extant occurrences are now known. Five of the historical occurrences of Hartweg's golden sunburst have been extirpated, including the type-locality in Yuba County. This species is now only known from a two general areas, including a concentration of occurrences near the Fresno-Madera county line, and from an aggregation of occurrences in northeastern Merced and southeastern Stanislaus counties. All occurrences are situated at approximately 500 feet elevation. Nearly all the occurrences in southeastern Stanislaus County are found on acidic Amador soils of the Valley Springs Formation developed from weathered rhyolitic tuff. Little else is known about the ecology of this species. Development of habitat is the most significant threat to the species. Additional threats include competition from non-native grasses, incompatible grazing practices, mining, and conversion of habitat to agriculture.

The species occurs within the proposed footprint of the University of California Merced campus. As part of the planning process for the proposed campus and related, *Eastern Merced County Natural Community Conservation*



Plan Habitat Conservation Plan, focused upland surveys were conducted between April 5 and May 5, 2001. These surveys concentrated primarily rock outcrops, sandy slopes and weathered clay deposits in the Lone and Valley Springs Formations with which Hartweg's golden sunburst is known to be associated. Four occurrences (16 populations) were discovered during the 2001 surveys.

Hartweg's golden sunburst was previously known within the U.C. Merced regional study area from one occurrence recorded in the CNDDDB at the Kelsey Ranch, east of Snelling. This occurrence, representing two small separate colonies, was first discovered in 2000 during preliminary ranchland surveys. Both colonies were found on the north and northeast slopes on the uppermost portions of closely spaced mima mounds. These colonies are associated with acidic Amador and Hornitos clay soils of the Valley Springs and Lone formations. Interestingly, both colonies were found just below the contact zone for these two formations (on Lone Formation) and this zone might apparently provide some unique qualities in terms of hydrology or soil composition. During the 2001 surveys, two additional occurrences were found at the Kelsey Ranch, one consisting of a single colony and the second consisting of four colonies. Also, two occurrences comprising a total of nine colonies were discovered at the adjacent Richards Ranch. Given the overall rarity of the species, this represents a significant portion of its known occurrence. The regional study area is therefore very important in terms of the statewide conservation of the species.

San Joaquin adobe sunburst

Pseudobahia peirsonii

State:	Endangered	1987
Federal:	Threatened	1997

General Habitat:

San Joaquin adobe sunburst is restricted to heavy adobe clay soils on the grassy valley floor and rolling foothills of the eastern San Joaquin Valley. It is concentrated in three major locations: east of Fresno in Fresno County, west of Lake Success in Tulare County, and northeast of Bakersfield in Kern County. Its habitat is dominated by non-native annual grasses. Native species that occur with San Joaquin adobe sunburst include blue dicks, blow wives, fiddleneck, and bird's-eye gilia.

Description:

San Joaquin adobe sunburst is a small annual herb in the sunflower family (Asteraceae). It grows 4 to 18 inches tall and is loosely covered with white, wooly hairs. Its alternate leaves are twice divided into smaller divisions. Flower heads, which appear in March or April, are solitary at the ends of the branches.

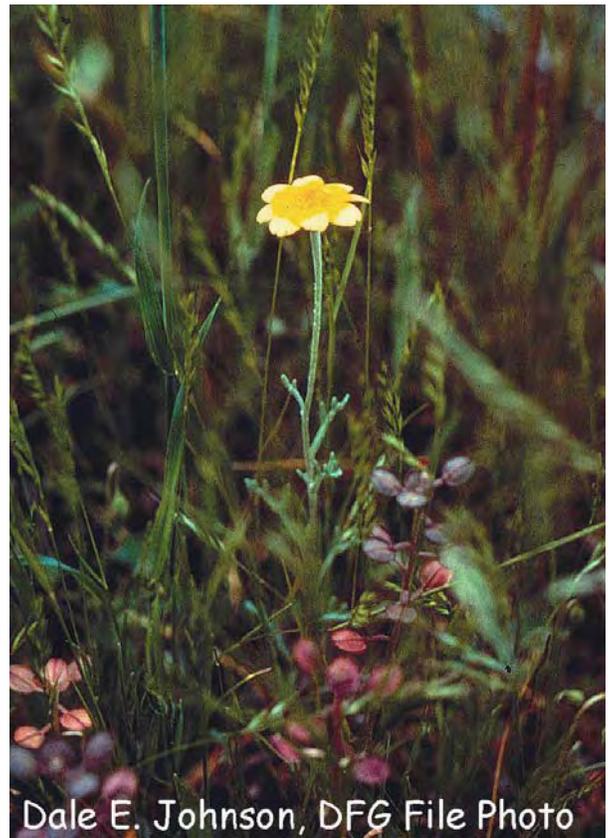
Status:

San Joaquin adobe sunburst is known from approximately 30 occurrences. Conversion of natural habitat to residential development is the major current threat to the species. Other threats include flood control, competition from non-native grasses, incompatible grazing practices, road maintenance activities, conversion of habitat to agriculture, transmission line maintenance, and recreational activities.

The largest historically known population of San Joaquin adobe sunburst has been reduced by a residential development in Fresno County east of Clovis. The species occurred as four subpopulations at the site. Mitigation for the project included protection of the two subpopulations with the highest density of plants, and an attempt was made to create a new subpopulation in 1993 from seeds and topsoil salvaged from a high density subpopulation that was destroyed. In 1994 and 1995, a few plants of San Joaquin adobe sunburst were seen at both the preserved and transplanted subpopulations, but no plants were seen in 1996 and 1997. The status of this population is unknown.

The second-largest historically known population of San Joaquin adobe sunburst occurs within the Redbank-Fancher Creek Flood Control Project area, in Fresno County east of Clovis. Redbank Reservoir was constructed several years ago by the Fresno Metropolitan Flood Control District to temporarily detain water during floods. This project was predicted to impact approximately 40 percent of this population of San Joaquin adobe sunburst. The current status of this population is unknown. A population in Tulare County east of Porterville is threatened by a proposal to raise the water level of Lake Success.

Sierra Los Tulares Land Trust, a non-profit land conservation organization, has protected a population of San



Joaquin adobe sunburst at its Lewis Hill Preserve, just north of Porterville. The preserve also contains a population of fragrant fritillary (*Fritillaria liliacea*), a sensitive species. Grazing is used as a management tool at the preserve.

Species such as San Joaquin adobe sunburst that have very small populations are vulnerable to decline and extinction due to the increase of deleterious genes in the population or to random catastrophic events such as floods, attack by insects, disease outbreaks, or extended droughts.

Gambel's watercress

*Rorippa
gambellii*

State: Threatened 1990

Federal: Endangered 1993

General Habitat:

Gambel's watercress is found in freshwater or brackish marsh habitats at the margins of lakes and along slow-flowing streams. It grows in or just above the water level and requires a permanent source of water. It is found in San Luis Obispo and Santa Barbara Counties.

Associate species include cattail, willow, bur-reed, and sedge. It is also associated with marsh sandwort, a listed species.

Description:

Gambel's watercress is an herbaceous perennial in the mustard family (Brassicaceae). This species characteristically roots from the stem, which bears scattered compound leaves and dense clusters of white flowers.

Status:

Historically, Gambel's watercress occurred in interior wetland areas of San Diego, San Bernardino, and Los Angeles counties, as well as coastal wetland areas of San Luis Obispo and Santa Barbara counties. A population known from Mexico is thought to have been extirpated. Of the eight known locations of Gambel's watercress in California, only five small populations remain in San Luis Obispo and Santa Barbara Counties. The San Luis Obispo populations occur at Little Oso Flaco Lake and Oso Flaco Lake and are reported from Black Lake Canyon. There is also a population on Vandenberg Air Force Base in northern Santa Barbara County. Encroachment of willows and non-native plants, such as German ivy, into wetland areas threaten the marsh habitat of this species. Eucalyptus trees and drilling of water wells in the immediate watershed are serious threats to the habitat of this species in Black Lake Canyon. Oso Flaco Lake is within the Oceano Dunes State Vehicular Recreation Area (SVRA). OHV use in proximity to the lakes is a threat to vegetation of the dune and lake system.



The Land Conservancy of San Luis Obispo County has prepared a management plan for Black Lake Canyon that addresses Gambel's watercress. In addition, TNC recently purchased a conservation easement in the Nipomo Dunes that includes a large dune lakes complex. This area, which has not been surveyed by botanists for half a century, will be surveyed to determine if other populations exist and if potential habitat is available for establishment of experimental populations of this species. Beginning in 1993, research into demography, general ecology, and recovery options has been conducted by University of California, Santa Barbara researchers. During 1999, researchers recovered seeds from the known occupied locations for propagation and planting. A cooperative effort to establish more populations of this species at Vandenberg Air Force Base is in progress. Protection measures for Gambel's watercress are included in the USFWS *Recovery Plan for Marsh Sandwort (Arenaria paludicola) and Gambel's watercress (Rorippa gambellii)* completed in 1999.

Tahoe yellow cress

*Rorippa
subumbellata*

State: Endangered 1982
Federal: None

General Habitat:

Tahoe yellow cress is found only along the margins of Lake Tahoe in El Dorado and Placer counties and in Nevada's Douglas and Washoe counties. The plants have an extremely narrow elevation range of 6,222 to 6,230 ft., growing only within the eight foot band between the high and low water line. The plant has most frequently been observed growing on a sandy substrate. Some of the largest, most persistent, and vigorous Tahoe yellow cress populations are associated with sand beaches near the mouths of streams, suggesting a dependency upon mesic substrate conditions.

Description:

This member of the mustard family (Brassicaceae) is a profusely branching, somewhat fleshy, herbaceous perennial, usually less than 4 inches tall. Its low growing branches, reaching up to 8 inches in length, bear wavy or deeply lobed leaves, and sulfur yellow flowers are clustered together at the ends of short branches. Reproduction occurs sexually, with seeds transported via wind or water, and clonally, through creeping rootstocks. Small plants, often observed among the "bathtub" ring of beach wrack in late spring and early summer, could originate from floating rootstocks well as floating seeds or fruit.

Status:

Since it was first described in 1941, Tahoe yellow cress has been collected or observed at 51 locations around the lake. Not all known occurrences have been occupied at the same time; the locations of the plants and number of occurrences vary from year to year, with the greatest number of occupied sites observed in one year being 48, and the fewest being 7. The most recent survey, 2002, found 48 occupied sites. An estimated 20,301 "individuals" were counted, up from 6,136 in 2001. Stem counts per site ranged from a low of one (Kahle/Nevada Beach) to a high of 14,434 (Upper Truckee East). Over 1,100 plants were found at new or expanded sites, nearly eight times more plants than the 2001 survey (146 plants). This increase may be a function of lower lake elevation and the intensive nature of the survey.

Generally, suitable habitat is considered to be composed of at least 30 percent sand; however, based on 2002 survey results, it is apparent the species is adapted to a broader range of habitat conditions (e.g., such as cobbles and rock substrates) than previously thought. Composition of sandy substrate ranged from less than 5 percent to 100 percent. Nineteen percent of the Tahoe yellow cress occupied sites had less than 30 percent sandy



substrate; however, the majority of sites (70 percent) had greater than 50 percent sandy substrate.

Tahoe yellow cress presence appears to be cyclical and mostly related to lake level fluctuation. More populations are observed in dry years with low lake levels; existing populations appear to increase, and new populations are sometimes found in previously inundated areas as well. Conversely, in wet years with high lake levels, fewer populations are observed; there is less available habitat, and previously existing occurrences are sometimes inundated. Studies have also found that soil saturation during the spring and summer inhibits vegetative growth and delays the onset of flowering. In addition to being sensitive to changes in lake level, the populations are also vulnerable to threats due management of habitat. Land management and maintenance practices of private individuals and public agencies, including removal of organic matter and debris by raking, recreational activities, and even attempts at ecological restoration have impacted Tahoe yellow cress directly by uprooting seedlings and adult plants and indirectly by altering the sand, the natural community, and hydrology of its habitat.

The 2002 Conservation Strategy for Tahoe Yellow Cress found that the major contributors to the current status of Tahoe yellow cress are: 1) Alterations in lake level dynamics caused by construction and operation of the Truckee River outlet dam and reservoir; 2) destruction of actual and potentially suitable habitat by the construction of some types of structures; 3) high levels of recreational activity associated with beaches and dunes; 4) disturbance of the sand by public and private property maintenance activities; 5) and possibly random environmental events. The Conservation Strategy, a cooperative effort to be implemented by a task force made up of 14 federal, state, and local agencies and private interest groups, including DFG, outlines a number of management goals including: 1) Protect occupied habitat and potentially suitable habitat that does/could support natural populations; 2) improve Tahoe yellow cress populations; 3) promote conditions that favor a positive metapopulation dynamic; 4) conduct research that directly supports management and restoration; 5) Revise and continue the monitoring program for Tahoe yellow cress; and 6) implement an interagency adaptive management framework.

The population dynamic of Tahoe yellow cress, with fluctuations in population size, disappearance/extirpation, and reappearance/recolonization, is referred to as a "metapopulation dynamic." Recovery of Tahoe yellow cress will depend on restoration of its metapopulation dynamics at local and landscape levels. Such a program must increase the number and size of Tahoe yellow cress occurrences and work towards reestablishing the vital processes of dispersal, genetic exchange, population growth, and colonization so that the species will maintain itself into the indefinite future. At times, the persistence of populations depends on the availability of microhabitat refuges: less accessible areas, enclosures, or adjacent parcels that are often sub-optimal as habitat, but provide the only relief from anthropogenic disturbance such as recreational impacts. The optimum number of occupied sites necessary to ensure the survival of the species is unknown.

Currently, the Upper Truckee meadows population is protected by the California Tahoe Conservancy, and fencing around the area has been increased. Plants are being propagated for experimental reintroductions and research. An experimental introduction at three sites on U.S. Forest Service land in 1988 had a survival rate after 5 years of 12 to 43%. Researchers have found that the small seeds have very high germination rates and readily establish in the greenhouse. Studies conducted by the National Forest Genetics Electrophoresis Laboratory at the University of California, Davis have found that Tahoe yellow cress has very low levels of genetic variability. Further research and other conservation efforts are currently being pursued.

Small-leaved rose

*Rosa
minutifolia*

State: Endangered 1989

Federal: None

General Habitat:

Small-leaved rose grows in the maritime succulent scrub plant community of Southern California and Baja California, Mexico.

Description:

Small-leaved rose is a densely spiny, low-growing shrub in the rose family (Rosaceae). It has slender, gray shoots, small compound leaves, and showy rose-pink flowers.



Susan C. Levitsky, DFG File Photo



Susan Cochran Levitsky, DFG File Photo

Status:

In the United States, this species was known from a single population, discovered in 1985 on private property on Otay Mesa in southwestern San Diego County. The species is documented from Baja California, Mexico, where it has been reported from more than 20 sites. The current number of extant stands in Baja California is not known.

The Otay Mesa population of small-leaved rose was once a large, healthy thicket occupying an area of approximately 100 square yards. The population appeared to represent a large clone, or single genetic individual. A major residential and commercial subdivision approved by the City of San Diego resulted in the elimination of the existing population in 1997. Cuttings taken from the original population were translocated to adjacent habitat as mitigation for loss of the original population. The sole U.S. population of this species is included in the San Diego Multiple Species Conservation Plan (MSCP) and will be protected under agreement with the California Terraces residential development. The MSCP provides a framework for preserving and protecting natural resources in the San Diego region. The participating jurisdictions and special districts cooperatively designed a Multi-Habitat Planning Area (MHPA) in partnership with the USFWS and DFG, property owners, and development representatives, and environmental groups. The MSCP incorporated conditions of DFG 2081 permit ("take permit") issued as part of the California Terraces project. These conditions required conservation, propagation, and translocation of the rose to a preserve on Otay Mesa. A number of years following establishment of these replacement populations will be needed before a reasonable assessment of the translocation efforts can be made, although several hundred cuttings are surviving to date. Small-leaved rose is also covered in the San Diego Gas &

Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican Border.

Development of the coastal plain in western Baja California is rapidly converting much of the Mexican habitat for small-leaved rose to farmland and other commercial or residential uses. An effort is underway, however, to conserve the rich biological diversity of border region of California and Baja California. The Las Californias Binational Conservation Initiative proposes a binational conservation vision for the border region. Small-leaved rose and a suite of other sensitive species would be conserved under the preserve system envisioned by the Initiative project.

Adobe sanicle

Sanicula maritima

State: Rare 1981
Federal: None

General Habitat:

This member of the carrot family (Apiaceae) is found in wet to dry clay soils of coastal prairie and coastal sage scrub plant communities. Its distribution is centered in the coastal hills of San Luis Obispo and Monterey counties, with one historical record from the San Francisco area. Associated species include meadow barley, hedge nettle, buttercup, blue-eyed grass, and rush.

Description:

Adobe sanicle grows as a stout, aromatic, perennial herb with large basal leaves, smaller upper leaves, and yellow flowers in head-like clusters.

Status:

Adobe sanicle formerly occurred in coastal areas from the San Francisco Bay area south to San Luis Obispo County. Of the twelve historical occurrences of adobe sanicle, one is presumed extirpated, and eight are privately owned and have not been documented in twenty or more years. The three remaining occurrences are publicly owned: one in the Los Padres National Forest; one in Andrew Molera State Park; and one at Laguna Lake Park, owned by the City of San Luis Obispo. Until its discovery at Laguna Lake Park, adobe sanicle was known to exist only at two sites in southern Monterey County and from sites on the Hearst Ranch near Arroyo de la Cruz in northwestern San Luis Obispo County.

Adobe sanicle grows in moist soil on a gently sloping spring-fed swale in a grassland area. Prior to 1996, the area had been grazed and the sanicle plants were not observed due to trampling and cropping. With the cessation of grazing, adobe sanicle and other species grew back. The population was estimated at 100 individuals although an actual count was not possible since taller plants obscured the leaves of the adobe sanicle. Adobe sanicle grows in the same type of habitat as does Chorro Creek bog thistle (*Cirsium fontinale* var. *obispoense*), a listed species, also known from Laguna Lake Park. The species occurs in the Irish Hills Natural Reserve, owned and operated by the City of San Luis Obispo.



DFG has no recent information on the status of this plant. Adobe sanicle would benefit from protection of both the privately and publicly owned occurrences. Studies to determine its ecological requirements would also aid efforts to protect this plant.

Rock sanicle

Sanicula saxatilis

State: Rare 1982
Federal:

General Habitat:

Rock sanicle is endemic to Contra Costa and Santa Clara counties. It is found on rocky soil, rock outcrops, and talus slopes, usually within the chaparral plant community, often surrounded with oak and foothill pine. Associate species include sickle-leaf onion, common phacelia, violet, and Brewer's rock-cress.

Description:

Rock sanicle is a low, stout, perennial herb in the carrot family (Apiaceae) with numerous dissected basal leaves and small pale yellow flowers borne in round stalked clusters.



Status:

About 10 occurrences of rock sanicle are known, in Mount Diablo State Park in Contra Costa County, and in the vicinity of Mount Hamilton in Santa Clara County. Because the populations of this species are located largely on protected land, and occur in habitat areas that are generally remote and experience little disturbance, the status of this species appears to be stable.

Rock sanicle occurs on the main and north peaks in Mount Diablo State Park. Several populations are made up of a number of colonies along trails; these appear stable and receive few impacts from hikers. Primary threats include parking and radar station development.

In the vicinity of Mount Hamilton, rock sanicle is found both on privately owned land and on property of the University of California's Lick Observatory. These populations are located in remote areas and so receive little impacts.

Gander's butterweed

Senecio ganderi

State: Rare 1982
Federal: None

General Habitat:

Gander's butterweed usually grows in the understory of mature mixed chaparral, or in open areas of recently burned chaparral. It is found in the very southwestern part of Riverside County and the foothills of western San Diego County, and its habitat is limited to areas of gabbro soils on Lawson, Sycuan, and Tecate Peaks; Barber, Black, El Cajon, and McGinty Mountains; and Magee Ridge.

Description:

Gander's butterweed is a member of the sunflower family (Asteraceae). This basal-leaved, perennial herb has compact, yellow-orange flower heads and leaves suffused with purple.



Status:

Fewer than fifteen occurrences of Gander's butterweed have been reported. Some occurrences are in undisturbed, protected sites, while others exist in areas threatened by residential development. A cooperative preserve on McGinty Mountain managed by the DFG, The Nature Conservancy, San Diego County Department of Public Works, and the Environmental Trust protects the known population there. As of 1999, DFG and WCB had worked successfully with private landowners to acquire 1,270 acres of habitat to protect the population on Sycuan Peak. Cleveland National Forest manages the Barber Mountain, Black Mountain, El Cajon Mountain, and Lawson Peak populations. Recent efforts to protect the largest populations should help stabilize the population trend and greatly reduce further loss of habitat.

Studies are needed to determine the role of wildfire management and/or prescribed burning with respect to establishment and reproduction in populations of Gander's butterweed. Information from these studies will be crucial to the development of recovery strategies for Gander's butterweed and essential for management of the species in the actual and proposed reserves. This species is covered in the San Diego Multiple Species Conservation Plan (MSCP), which should ensure that 90 to 100 percent of the populations within the southwestern portion of San Diego County will be preserved. It is also covered in the San Diego Gas & Electric Company Subregional NCCP, a linear NCCP from Orange County to the Mexican border.

In 2003, the huge Otay Fire burned a large area of south-central San Diego County. Initial impacts to sensitive species were analyzed using the fire perimeter in October 2003. Based on this analysis, approximately 40% of habitat suitable for Gander's butterweed burned during the fire, with direct impacts to at least one population. However, the ability to precisely locate sensitive species locations within the fire perimeter was limited. Post-fire monitoring will be necessary to assess the effects of the fire on regeneration and survivorship of this species.

Layne's ragwort

Senecio layneae

State: Rare 1979
Federal: Threatened 1996

General Habitat:

Layne's ragwort occurs on gabbro- and serpentine-derived soils of chaparral and black oak and interior live oak woodlands in the vicinity of Pine Hill in western El Dorado County, in the Red Hills of Tuolumne County, and in Yuba County. Associated species in El Dorado County include four other State listed plants: Stebbins' morning glory, Pine Hill ceanothus, Pine Hill flannel-bush, and El Dorado bedstraw.

Description:

Layne's ragwort is a perennial herb with basal leaves and reduced stem leaves and yellow flowers in small heads. The flowers have five to 10 rays arranged in an irregular pattern around the central disk flowers. It is a member of the sunflower family (Asteraceae).

Status:

Layne's ragwort is currently known from approximately 43 occurrences. The majority of occurrences are in El Dorado County. Population size records vary from 10 to over 1,000 individuals. Observations suggest that Layne's ragwort is an early successional species that occupies temporary openings on gabbro or serpentine soils and is eliminated as vegetation grows up around it. More information is needed on the reproductive biology and demography of this species. Habitat loss, habitat fragmentation, alteration of natural fire regime, and suppression of disturbance (all mainly due to urbanization) are the major threats facing *Senecio layneae* in western El Dorado County. Proposed residential or commercial development within the Pine Hill formation threatens most of the remaining sites within the Pine Hill formation and adjacent serpentine in western El Dorado County, and either directly or indirectly will adversely affect most of the range of the gabbro soil plants. Although mitigation for impacts to habitat occurs when the El Dorado County approves discretionary projects, the forms of protection that can be conducted on relatively small individual parcels is unlikely to result in long-term viability of the colonies located on these sites. Rural property owners clear native understory vegetation, graze livestock, or build access roads and outbuildings under ministerial permits, resulting in unregulated losses of Layne's ragwort.

The USFWS released the Recovery Plan for Gabbro Soil Plants of the Central Sierra Nevada Foothills in August 30, 2002. The Recovery Plan provides guidance on how to protect and recover Stebbins' morning glory, Pine Hill ceanothus (*Ceanothus roderickii*), Layne's butterweed, and El Dorado bedstraw (*Galium californicum* ssp. *sierrae*). Pine Hill Preserve is being established through a combination of federal, State, and local funds. The target acreage is 5001 acres. The Preserve is being expanded around existing public lands, if private landowners are willing to sell or dedicate title or conservation easements, and if the program continues to receive support from local public agencies. The Recovery Land Acquisition Fund, provided to the Department by the USFWS to acquire land to protect listed species, has been used for several purchases. The goal will be difficult to achieve due to the fact that some of the land needed for recovery has already been developed. Prior to the Recovery Plan, El Dorado County established a fee ordinance to raise money to develop a preserve; however its target acreage is 3,500 acres. This preserve, when complete, will also include a large number species which are considered endemic to or characteristic of gabbroic and serpentine soils, including El Dorado mule ears (*Wyethia reticulata*),



which is only found in the gabbro soil in western El Dorado County. As of May 2003, 3079 areas have been preserved.

In the northern portion of the gabbro soil formation, approximately 2,079 acres have been purchased and transferred to the DFG, BLM, or El Dorado County. This area includes a population of Stebbins' morning glory. A prescribed fire on nearby property held by BLM appears to have rejuvenated a dwindling population on that site. In the southern portion of the gabbro soil formation, approximately 454 acres have been purchased and transferred to BLM or El Dorado County.

Recovery is defined in relation to natural fire cycles of approximately 30 years for most species covered in this recovery plan. Assuming recovery criteria are met, *Senecio layneae* could be delisted after 60 years.

Owens Valley checkerbloom

Sidalcea covillei

State: Endangered 1979
Federal: None

General Habitat:

This species is endemic to the Owens Valley in Inyo County. It occurs in moist, alkaline meadows with a high water table, and freshwater seeps. The meadows are often dominated by alkali sacaton and salt grass. Owens Valley checkerbloom is associated with Inyo star tulip, a sensitive species.

Description:

Owens Valley checkerbloom, a member of the mallow family (Malvaceae), is a several-stemmed, herbaceous perennial with mostly lobed basal leaves and pinkish-lavender flowers in an elongated flower stalk.



Status:

Owens Valley checkerbloom is known from approximately 40 occurrences. The majority of these occurrences are on land owned by the Los Angeles Department of Water and Power; others are owned by BLM, Bureau of Indian Affairs, and private landowners. Historically, the species declined due to loss of wetland habitat from groundwater pumping and water diversions, as well as intensive grazing. Many populations are located in areas of livestock grazing. Moderate levels of grazing appear to be compatible with maintaining populations, particularly where livestock graze down competing vegetation. Field studies have shown that plants in grazed areas produced fewer flowers and fruits than in ungrazed areas. In areas of very heavy grazing, plants appear stunted and sometimes fail to bloom. At certain sites, moist meadow habitat supporting this species is being overtaken by an invasive peppergrass.

The *Los Angeles Dept. of Water & Power and EPA Lower Owens River Project Draft EIR/EIS* was released in November 2002. Under this plan, the existing populations of Owens Valley checkerbloom would be protected by rare plant exclosures on the Blackrock and Thibaut grazing leases. Grazing will be prohibited in the exclosures during the flowering period of the species (April-June). These populations have been subjected to grazing for decades and have persisted, despite removal of plants by grazing and trampling. A seasonal timing change in grazing is expected to improve the reproductive success and long-term survival of the checkerbloom populations.

**Cuesta Pass
checkerbloom**

*Sidalcea
hickmanii ssp.
anomala*

State: Rare 1979
Federal: None

General Habitat:

Cuesta Pass checkerbloom is restricted to a small area of San Luis Obispo County on West Cuesta Ridge, in the vicinity of Sargent cypress forest. It grows on open, rocky serpentine slopes, sometimes near abandoned mine spoils and near roads, in chaparral and at the margins of cypress woodlands. This species is a typical "fire follower", with thousands of plants reported within the first two to three years following a fire, but relatively few plants remaining after five years. Common associates include leather oak, bishop manzanita, California-lilac, and Sargent cypress.

Description:

Cuesta Pass checkerbloom is a perennial herb in the mallow family (Malvaceae), with rounded basal leaves and deeply lobed stem leaves, and covered with grayish, star-shaped hairs. Its multiple, ascending stems reach three feet in length, and each stem bears numerous pinkish-lavender flowers above broad bracts from May to June.



Status:

Cuesta Pass checkerbloom is restricted Cuesta Ridge in San Luis Obispo County. This species is a typical "fire follower", with thousands of plants reported within the first two to three years following a fire, and the number of plants sharply declining thereafter. The population then lies dormant in a soil seedbank until germination is stimulated by the next fire event or other sufficient disturbance.

The Highway 41 wildfire of August 1994 burned tens of thousands of acres in Los Padres National Forest including the known population of the checkerbloom on West Cuesta Ridge. Prior to the fire, this population consisted of fewer than 50 individuals. Surveys after the fire in 1995 and 1996 revealed tens of thousands of checkerbloom plants extending throughout the Cuesta Ridge Botanical Area and beyond, including most of the serpentine soils on west Cuesta Ridge.

Some populations in the Los Padres National Forest are protected within the Cuesta Ridge Botanical Area. Populations on land managed by the California National Guard (Camp San Luis Obispo) are in restricted areas. Primary threats include potential mine reclamation activities, road and facility construction, and erosion at road cuts and adjacent trenches.

**Parish's
checkerbloom**

Sidalcea hickmanii
ssp. parishii

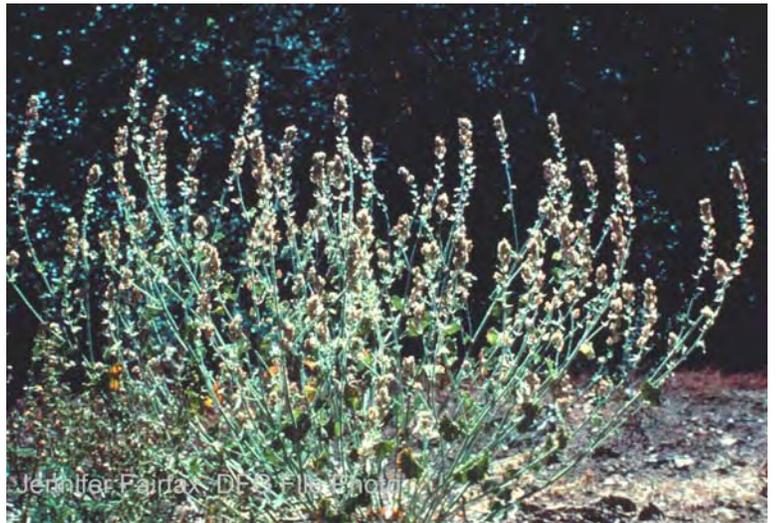
State: Rare 1979
Federal:

General Habitat:

Parish's checkerbloom occurs on dry, rocky slopes in chaparral and mixed coniferous forest at elevations between 3000 and 7000 feet San Bernardino, Santa Barbara, and San Luis Obispo counties. It appears most commonly in recently burned areas, and is also found in unvegetated openings such as along roads, trails, firebreaks, or small landslides.

Description:

Parish's checkerbloom is an herbaceous perennial in the mallow family (Malvaceae), with multiple stems emerging annually from a woody root crown. It is covered with coarse, gray hairs, and has rounded leaves with scalloped edges. Its elongated inflorescences of pinkish-lavender flowers bloom from June to August.



Flowers - Image of closely related species, Cuesta Pass checkerbloom (*Sidalcea hickmanii* ssp. *parishii*). Flower bracts distinguish the two subspecies.

Status:

Parish's checkerbloom is historically known from approximately fifteen locations in San Bernardino, Santa Barbara, and San Luis Obispo counties. The plant's emergence primarily following fire makes it difficult to accurately assess its distribution.

The earliest collections of this species are from San Bernardino County. Collections were made between the 1890's and 1924 at several locations in the San Bernardino Mountains. The species was not documented in this area again until 1981, when 20 plants were discovered near a historical collection location. A few years later these plants could not be relocated, but in 1995, two other small occurrences with a total of eight plants were found at the edge of a trail not far from the 1981 discovery. Despite focused surveys for this taxon in two small burns, and recent wide-ranging surveys conducted for a flora of the San Bernardino Mountains, no other occurrences have been located in San Bernardino County. Fire has been suppressed in most of the San Bernardino Mountains for over half a century, so it is possible a buried soil seedbank exists that is unexpressed.

In Santa Barbara County, Parish's checkerbloom is known from Big Pine Mountain, Sierra Madre Ridge, and McKinley Peak, all within the Los Padres National Forest. Collections in these areas were made in the 1930s, 1960s, and 1970s, in burned areas and along roads and fuel breaks. The Forest Service surveyed all known occurrences in 1993 and 1994. At that time, they located no plants at Big Pine Mountain, where historical collections were made after the last documented fire there in 1932. On Sierra Madre Ridge, four small

occurrences (between 13 and 25 plants) were found along roads and fuel breaks, corresponding to the general locations of past collections. Portions of Sierra Madre Ridge burned in 1921, 1932, and 1966. On McKinley Peak, about 600 individuals were located; this area burned in 1923 and 1966, and a controlled burn was conducted there in 1985.

In 1989, a small population of less than 20 Parish's checkerbloom plants, occupying less than one acre, was discovered in the Los Padres National Forest in San Luis Obispo County during a floristic survey. This area had last burned between 1921 and 1939. In 1996, the area burned in the "58" wildfire. In 1998, the Forest Service surveyed 315 acres of this burned area and mapped 3,000 to 5,000 Parish's checkerbloom plants occurring on approximately 80 acres in two locations. This discovery suggests that, while a few plants may continue to persist in openings and disturbed sites, a large persistent seedbank may remain viable in the surrounding soil for five or more decades.

Most known occurrences of the species are owned and managed by the USFS. Primary threats include livestock grazing and trampling, development or expansion of roads and facilities, recreational use, invasion of non-native species, and fire suppression or prescribed burns at the wrong time of year. In addition, road maintenance activities, such as pesticide spraying and mowing, and maintenance of an Air Force communication facility, impact the species. Parish's checkerbloom would benefit from a management plan and from studies designed to determine the effects of grazing and wildland fire suppression.

**Kenwood Marsh
checkerbloom**

Sidalcea oregana
ssp. valida

State: Endangered 1982
Federal: Endangered 1997

General Habitat:

Kenwood marsh checkerbloom, endemic to Sonoma County, occurs on the edges of freshwater marshes. It is known from only two occurrences, one in Kenwood Marsh and the other in Knights Valley. Associate species include willow, sedge, and rush.

Description:

Kenwood Marsh checkerbloom is a many-stemmed, perennial herb in the mallow family (Malvaceae), with rounded, deeply lobed stem leaves. Spike-like inflorescences of pink to mauve flowers bloom from late June through September.



Status:

Kenwood marsh checkerbloom is known from only two small occurrences in Sonoma County. Both sites are located on private land and have had the natural hydrology altered and habitat eliminated by nearby housing development, cattle grazing, and agricultural practices.

At the first site, located in Kenwood marsh, the quality of the habitat has been declining over the past several decades. Surveys in 1998 found 40 plants at this location. The fencing that once protected the site has been removed, and the marsh was partially bulldozed in 2002. The current status of the population is unknown. The second site is completely surrounded by vineyards. Surveys in 1998 found 50 plants at this location. The current status of this population is also unknown.

Primary threats to this species include trampling and reduced seed set resulting from cattle grazing, alteration of the hydrology due to water withdrawal related to adjacent urban development or vineyards, encroachment and competition with invading species such as Himalayan blackberry and yellow star-thistle, and potential conversion of habitat to urban development or vineyards. Due to the small number and size of the populations, the species is also susceptible to adverse impacts from random events.

There are currently no management agreements with the private landowners. Up-to-date information and conservation actions are needed to prevent further impacts to Kenwood marsh checkerbloom and its marsh habitat.

Bird-foot checkerbloom

Sidalcea pedata

State: Endangered 1982

Federal: Endangered 1984

General Habitat:

Bird-foot checkerbloom is restricted to moist meadows, sparsely vegetated drier meadow margins and forested areas in Big Bear Valley, San Bernardino County. A large number of endemic species occur in the area, including the State and federally endangered slender-petaled mustard.

Description:

Bird-foot checkerbloom is a slender, few-stemmed perennial in the mallow family (Malvaceae), with mostly basal leaves, growing to 16 inches tall. It has numerous pinkish-rose, dark-veined flowers that bloom along a spike-like raceme from May to July.



Status:

Bird-foot checkerbloom is a narrow endemic restricted to the Big Bear Valley in the San Bernardino Mountains of San Bernardino County in Southern California. It is estimated that 20 acres or less of wet meadow habitat now exists for the checkerbloom. Very little checkerbloom habitat is protected and its habitat is threatened by urban development. All of the unprotected habitat occurs on private property and most parcels have existing or proposed development plans. Bird-foot checkerbloom was historically known from approximately 13 occurrences. It was probably more widespread prior to construction of a dam in the 1890s that flooded much of its meadow habitat and created Big Bear Lake. The western portion of its range has been highly fragmented by urban development in the City of Big Bear Lake, while populations in the eastern portion around Baldwin Lake are in better condition. The chief threat to the species is loss of habitat from development, recreation, alterations in hydrology, intensive grazing, and excessive growth of competing vegetation. Although large fires burned in portions of San Bernardino County in 2003, the region around Big Bear and Baldwin Lakes, where the populations of bird-foot checkerbloom occur, were not affected.

Four of the 13 historical occurrences are believed extirpated. Most other occurrences are on privately owned land and have not been recently documented, although some privately owned occurrences are voluntarily protected through The Natural Conservancy's Registry of Natural Areas. Habitat protection is urgently needed for populations in the City of Big Bear Lake. Unmitigated losses of plants continue in this area.

Several occurrences are on property owned by the DFG (North Baldwin Lake Ecological Reserve), the City of Big Bear, and USFS. DFG carefully monitored protected populations from 1990 through 1994 and found that the numbers of adult plants and first year plants increased in years with more rainfall. In 1998, the USFWS released the recovery plan, which provides a strategy to address protection and recovery of the species. Additional habitat acquisition and protection is key to preventing further declines.

In 2002, the DFG funded a research project for bird-foot checkerbloom using federal Section 6 funding. The objective of this project is to develop a reserve design for the bird-foot checkerbloom. The principal task under this project examines the reproductive potential of this species in a fragmented environment. The breeding system, pollination biology, and recruitment success, were examined to answer critical questions about the biology and ecology of the checkerbloom so that the reserve design would be defensible. To elucidate the breeding system of the bird-foot checkerbloom, specific floral observations were made at four sites. All checkerbloom populations surveyed appeared to have a breeding system in which two forms of individual plants exist in the population: flowers with both male and female floral parts (hermaphrodite) and flowers in which the anthers are sterile (female only). The brief surveys of these populations suggest that male/female flowers are more common than females, but no quantitative data on frequency distributions were taken. This type of breeding system was not recognized in bird-foot checkerbloom prior to this project.

In general, the main kinds of insect visitors observed at all sites are bees, flies, butterflies, and beetles. At one, relatively undisturbed site, Bluff Lake, honey bees and bumblebees were the most common insect visitors to checkerbloom flowers. At the other sites, honey bees and bumble bees were rarely observed visiting the flowers. Counts of the relative abundance of floral visitors along transects at Bluff Lake suggest that individuals near the lower road that bisects the meadow receive fewer bumblebee visits than individuals away from the road in the interior of the meadow. Bird-foot checkerbloom occurs in larger, denser patches along the transects established within the interior of the meadow.

Experiments were conducted to determine if male/female flowers require insects for pollination or if self-pollination produces viable seed. An insect that is an effective pollinator of a species like bird-foot checkerbloom should visit both forms of flowers and frequently switch between male/female and female flowers. When male/female flowers were caged to prevent insect pollination, the findings suggested that insect pollinators are required for fruit and seed production in the male/female flowers. In assessing pollinator behavior, the study showed that about one-third of the pollinators moved between the two types of floral forms and over half of the moves were to consecutive male/female flowers.

This project is ongoing and will determine whether bird-foot checkerbloom is capable of self-pollination. In addition, flower longevity and the development of reproductive structures will be assessed. The results of this project will provide information needed to ensure survival of populations. The size of individual populations, the size of the meadow remnant, the presence of pollinators, the nature of the surrounding land use, and geographical location will be used to evaluate potential acquisitions and guide reserve design.

Scadden Flat *Sidalcea stipularis*
checkerbloom

State: Endangered 1982

Federal: None

General Habitat:

Scadden Flat checkerbloom is endemic to Nevada County, California. It grows in a wet montane freshwater marsh habitat fed by local springs, which also supports many plants normally found at higher elevations.

Associate species include broad-leaved cattail, rush, and fireweed.

Description:

Scadden Flat checkerbloom is a perennial herb in the mallow family (Malvaceae). It grows from elongated rhizomes and has basal leaves without lobes, and mauve flowers in densely branched inflorescences.



Status:

Scadden Flat checkerbloom is known from three small populations in Nevada County. The first population, in Scadden Flat near Grass Valley, occurs on private land and along the Caltrans right-of-way. A portion of the population was established through transplanting. The second population, in the vicinity of Peardale, occurs on private land directly next to the Caltrans right-of-way. The third population, located near Squirrel Creek, also occurs on private land. Primary threats to the species include highway widening, herbivory and trampling, and encroachment of Himalayan blackberry (*Rubus discolor*). Two of the three populations are thriving as of 2005; one could not be relocated. Himalaya blackberry remains the primary threat to plants along Squirrel Creek. The population at Scadden Flat is extensive, with 1000s of the stems visible.

Red Mountain catchfly *Silene campanulata* ssp.
campanulata

State: Endangered 1982
Federal: None

General Habitat:

Red Mountain catchfly occurs on rocky, dry serpentine soils within lower montane coniferous forest and montane chaparral communities on Red Mountain and Little Red Mountain in Mendocino County and in the vicinity of Cook Springs, Colusa County. Among its associates in Mendocino County is McDonald's rock cress, which is State and federally listed as endangered.

Description:

Red Mountain catchfly, a member of the pink family (Caryophyllaceae), is a short, much-branched, perennial herb with long, narrow leaves, short, glandular hairs and cream to greenish or pink flowers.

Status:

Originally Red Mountain catchfly was thought to be restricted to Red Mountain in Mendocino County, California, where subsurface and surface mining of nickel and cobalt threaten two populations. Since 1980, additional populations have been discovered. Beginning in 1993, as many as seven additional populations were documented. Examination of specimens from the entire range of *Silene campanulata* shows that there is overlap of taxonomic characteristics of *ssp. campanulata* (Red Mountain catchfly) and *ssp. glandulosa*. The presence of plants with intermediate traits warrants further study to determine if Red Mountain catchfly is a distinct species. The lack of documented threats to the newly discovered populations and the uncertain taxonomic status have led the USFWS to discontinue candidate status for this species.



Tiburon *Streptanthus niger*
Jewelflower

State: Endangered 1990
Federal: Endangered 1995

General Habitat:

Tiburon jewelflower is known from only two occurrences on the Tiburon Peninsula in Marin County. It grows on shallow, rocky, serpentine soils on south- or west-facing slopes within a native bunchgrass plant community. The serpentine soils provide a harsh environment for plant growth due to their low calcium-magnesium ratio; lack of essential nutrients such as nitrogen, potassium, and phosphorous; and high concentrations of heavy metals. However, species such as Tiburon jewelflower have adapted to serpentine soils and require them to survive. It is associated with Marin dwarf-flax, Tiburon Indian paintbrush, and wild onion.

Description:

Tiburon jewelflower is a simple to much branched, annual herb in the mustard family (Brassicaceae), and growing one to two feet tall. The flowers, which bloom in May and June, have dark purple sepals and narrow, white petals with light-purple centers. The long, narrow seed capsules open in late June, releasing seeds. Seedlings appear in March and April.

Status:

Tiburon jewelflower is an extremely narrowly-distributed species. Combined, the two occurrences cover approximately 12 acres of habitat. The two populations have fluctuated in size from 50 to 2,000 plants each over the past several years. Both occurrences are partially on private and publicly-owned lands. A portion of one population is within Marin County's Ring Mountain Preserve and Old St. Hilary's Open Space Preserve. The second population is within the Reed School District Open Space. This species was possibly once more widespread on the Peninsula; urban development has destroyed an estimated 40 percent of the potential habitat in the area. Pedestrian traffic, residential development, and road construction threaten both populations.

In 1997, DFG held two recovery workshops to address Tiburon jewelflower and 11 other plants known from serpentine habitats in the San Francisco Bay Area. Habitat loss to invasive species such as broom, pampas grass, and Himalaya berry, and loss of some habitat to a proposed residential development were identified as threats to



the two remaining populations. The workshop identified the development of habitat management methods to increase regeneration as a primary need. In 1998, plant numbers were up significantly from 1997, a very poor year for the species. Management and recovery actions for the species have been addressed in the USFWS *Recovery Plan for Serpentine Soil Species of the San Francisco Bay Area*, finalized in 1998.

Eureka Valley dune grass

*Swallenia
alexandrae*

State: Rare 1981
Federal: Endangered 1978

General Habitat:

Eureka Valley dune grass is endemic to Death Valley National Park. It occurs in sand dunes in the Eureka Valley and west of Eureka Valley at the foot of the Saline Range in eastern Inyo County. It is often the only plant found on the higher slopes of the dunes, occurring at 2950-4200 ft elevation. Associated plant species include the Eureka Dunes Evening Primrose (*Oenothera californica* ssp. *eurekensis*), a listed species, and shining milkvetch. In addition, the blue-green weevil, an insect endemic to the Eureka Dunes, relies on the shade provided by Eureka Valley dune grass for survival.

Description:

Eureka Valley dune grass, a member of the grass family (Poaceae), is a stiff, branched, perennial grass, often forming tufts more than a meter wide, with spiny leaf tips and a woody base. The species grows from a long, branched, scaly rhizome, which spreads through the sandy substrate. Its dense root system catches and holds drifting sand, forming hummocks on the unstable upper dune slopes. It grows rapidly from March to November. Flowering stalks are 6-40 inches tall and have stiff lance like blades. Narrow clusters of small flowers bloom from April to June.

Status:

Eureka Valley dune grass is restricted to four dunes in the Eureka Valley and one dune in the Saline Range to the west of Eureka Valley. Prior to 1976, OHV activity in the Eureka Valley sand dunes represented a critical threat to the species. With the closure of the dunes to OHVs in 1976, sand disturbance and destruction of plants were greatly reduced. However, occasional illegal OHV activity still occurs, and a new, legal recreational activity, sand boarding, now poses similar threats. Expansion of Russian thistle, a non-native invasive species that became established on the dunes during the period of intense disturbance by OHVs prior to closure, also threatens the habitat. The plant populations currently appear to be stable; however, population size varies widely depending on seasonal rainfall.

Prior to the administrative transfer to the National Park Service in 1994, the BLM established the Eureka Valley



© Rick York, California Native Plant Society



S. Harrison, DFG File Photo

Area of Critical Environmental Concern and in 1982, the USFWS adopted the Eureka Valley Dunes Recovery Plan. Stemming from these, a voluntary joint conservation strategy is being developed by the USFWS and Death Valley National Park. The agreement targets actions over entire dune ecosystems to benefit sensitive plants and other species of special consideration including endemic beetles.

Research done under contract with the DFG, using federal Section 6 grant funds, revealed that although seed production in Eureka Valley dune grass is low and variable, seeds and plants are long-lived. Current research indicates that there is very little genetic variation in the species.

Slender-petaled thelypodium

*Thelypodium
stenopetalum*

State: Endangered 1982
Federal: Endangered 1984

General Habitat:

Slender-petaled thelypodium is endemic to Big Bear Valley in San Bernardino County, growing in seasonally moist, alkaline clay soils associated with seeps, springs, and meadows. A large number of endemic species occur in the area, including the State and federally endangered pedate checkerbloom.

Description:

Slender-petaled thelypodium, a member of the mustard family (Brassicaceae), is a much-branched biennial herb with an open inflorescence. Stems spread from the base of the plant. Flowers are lavender, with narrow, linear petals.

Status:

Slender-petaled thelypodium occurs in the north, south and west end of Baldwin Lake, Eagle Point in the City of Big Bear Lake, and Upper Holcomb Valley. Populations at the North Baldwin Lake Ecological Reserve are protected by the DFG, and Upper Holcomb Valley is a USFS-designated Botanical Special Interest Area. The Big Bear Community Services District owns several populations around Pan Hot Springs (West Baldwin) and south Baldwin Lake and has cooperated with the DFG in providing protective management for some sites. The Eagle Point occurrence occupies a seven-acre meadow-pebble plain complex within a developing housing tract, and is partially protected through an open space designation. This site represents one of the few protected habitat areas for slender-petaled mustard, pedate checkerbloom, and other rare endemics on the west end of Big Bear Valley. The remaining occurrences are on private land and are not formally protected.

The USFWS released a recovery plan for this species in 1998.



Susan Cochrane Levitsky, DFG File Photo



Susan Cochrane Levitsky, DFG File Photo

Santa Ynez false-lupine

*Thermopsis
macrophylla* var.
agnina

State: Rare 1981
Federal: None

General Habitat:

Santa Ynez false-lupine is restricted to the Santa Ynez Mountains of Santa Barbara County. It occurs on gravelly to rocky substrates derived from sandstone in openings in the chaparral germinates well after fire.

Description:

Santa Ynez false-lupine, in the Pea Family (Fabaceae) is a large, herbaceous perennial with woolly stems and leaves and spikes of yellow flowers. It reaches a height of about six feet. Following fire, plants resprout from underground buds.



Status:

The eight known occurrences of Santa Ynez false-lupine are entirely within Los Padres National Forest. Four of the eight occurrences were last observed between 1955 and 1963, after a fire burned in the Los Padres National Forest in 1955. No plants have been located at these sites recently. In 1999, approximately 500 plants were observed at the type locality for the species; however, no seedlings were observed. The total number of plants is now estimated at 2,000 to 2,500 individuals. The majority of plants are dispersed primarily in a three-mile area, occurring as individuals or colonies of 3-150 plants. A small population of fewer than ten plants occurs approximately 15 miles away from the type locality. According to the Center for Plant Conservation, reports of other plants in the Santa Ynez Mountains have not been substantiated by recent surveys and reports of plants from other mountain ranges in California are based on misidentifications. Santa Ynez false-lupine is threatened by habitat disturbance and loss of plants along roads and mountain bicycle trails, as well as by illegal off-highway vehicle activity. Construction of fuel breaks also removes habitat. Since the species reproduces by seed following fire, alteration of natural fire cycles is another threat.

Research has shown that this species responds to fire by producing great numbers of seed and may depend on fire to maintain a sizable seed bank in the soil. However, researchers found low rates of recruitment and establishment from seed during the eight years following a controlled burn. Studies are being conducted by the Santa Barbara Botanic Garden on germination rates following short-term cold storage. Populations are monitored annually to estimate numbers, reproductive rates, and pollinator visitation. Research needs include genetic analysis within and among populations and an assessment of ecological factors that affect successful establishment from seed. Seeds have been collected for conservation storage.

Although recognized as a sensitive species by the USFS, Santa Ynez false-lupine lacks an active management program. A management plan that increases the number of plants and ensures a stable population structure is need.

Pacific Grove clover

Trifolium polyodon

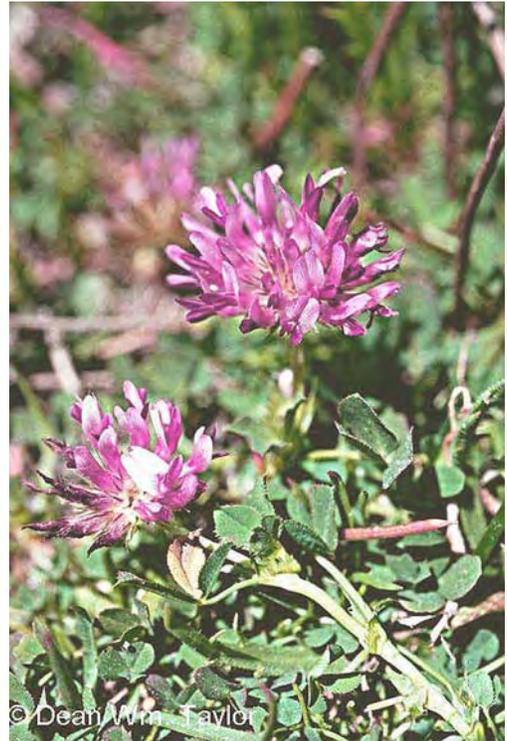
State: Rare 1979
Federal: None

General Habitat:

Pacific Grove clover occurs in moist grassland areas in the Monterey and Point Lobos area.

Description:

Pacific Grove clover is a low, annual herb in the pea family (Fabaceae). This small clover has muted purple flowers with lighter tips.



Status:

This species is known from 13 sites on the Monterey and Point Lobos Peninsulas, sites immediately inland from these areas, and from Fort Ord. The Fort Ord populations are owned and managed by the BLM. All of the remaining occurrences for Pacific Grove clover are in private ownership. In 1997, the DFG initiated recovery activities on the Monterey peninsula for the Pacific Grove clover, in cooperation with the landowners, the Del Monte Forest Foundation, and the Pebble Beach Company. Actions include mowing and weeding to reduce competition by weedy native and non-native plants.

Yearly monitoring of these populations, including a census of numbers of individuals and their seed production, is needed.

Monterey clover *Trifolium trichocalyx*

State: Endangered 1979
Federal: Endangered 1998

General Habitat:

This member of the pea family (Fabaceae) has an extremely limited distribution. It is confined to a small portion of the Monterey Peninsula in the Bishop pine/Monterey pine/pygmy cypress plant community. Nutrient-poor ancient podzol-like soils in this habitat are poorly drained and underlain with hardpan. This species is a classic "fire follower", appearing in large numbers only after fire burns through its habitat, removing the vegetative cover. Within a few years following the fire the number of plants rapidly declines to zero, and the population persists only as a seedbank awaiting the next fire.

Description:

Monterey clover is a small, low-growing, branched, herbaceous annual with three wedge-shaped leaflets per leaf. Plants can be rather inconspicuous, with branches less than two inches long, but with favorable conditions branches can reach 8 to 12 inches. Its small, pale purple flowers bloom from April to June.

Status:

Monterey clover is a "fire follower": it persists for long stretches of time only as an "invisible" soil seedbank, and plants appear in an area only for a few years following a fire that has burned through the habitat, clearing vegetation. Because of this it is difficult to quantify the numbers and distribution of this species; distribution maps are likely a product of recent fire history. Better means to determine the distribution of this species must be established. Fire suppression activities have likely limited the survival and reproduction of this species. It is unknown how long the soil seedbank can persist. In the absence of fire, or a reasonable habitat disturbance alternative, this species could become extirpated and potentially rendered extinct.

Before the 1987 fire at Huckleberry hill, Monterey clover was known only from small occurrences at the Morse Botanical Reserve and near Highway 68 in the central portion of the Monterey peninsula. In spring 1988, much larger populations were identified along Costanilla Way and Los Altos Road and in the Morse Botanical Reserve. A small number of plants were observed near Highway 68 following a fire in 1990. Surveys in 1995 identified two occurrences of Monterey clover with a total of 22 plants along Costanilla Way.

As recommended in a 1995 recovery workshop that the DFG held in cooperation with USFWS, the DFG used federal Section 6 grant funds to investigate the distribution and population ecology of Monterey clover. Various techniques were applied to determine how soil samples may be used to establish the presence of a seed bank, and to understand germination cues needed by the species. Of 32 soil samples taken from Huckleberry Hill, only one Monterey clover seedling germinated. This indicates that either the seeds require specific germination cues, or



the seeds are sparsely or patchily enough dispersed that even the large samples collected (0.5 m wide x 0.5 m long x 5-10 cm deep) were insufficient to obtain seeds. An additional clearing experiment was conducted on 1m x 1m plots on Huckleberry Hill where a seedbank was expected. All above-ground vegetation was removed from the plots, but no Monterey clover seedlings emerged. Further research is necessary to understand germination requirements and establish tests to determine the presence of a seedbank.

In 2002 the USFWS released a draft recovery plan for Monterey clover and four other Monterey County plants.

Greene's Orcutt grass *Tuctoria
greenei*

State: Endangered 1979
Federal: Endangered 1997

General Habitat:

Greene's Orcutt grass grows in the dried bottom of vernal pools of the Central Valley. It is currently found in Butte, Merced, Shasta, and Tehama counties and is believed to be extirpated from Fresno, Madera, San Joaquin, Stanislaus, and Tulare counties. Associated species in some locations include several listed species such as hairy Orcutt grass, slender Orcutt grass, San Joaquin Valley Orcutt grass, and Boggs Lake hedge-hyssop.

Description:

This unusual member of the grass family (Poaceae), known as Greene's Orcutt grass or Greene's tuctoria, is a small, pale green, hairy, tufted annual. It has several to many stems growing two to six inches tall, each ending in a spike-like inflorescence that may be partly enfolded in the upper leaf.



Status:

About half of the approximately 40 known occurrences of Greene's Orcutt grass have been extirpated through habitat conversion to irrigated agriculture and intensive cattle grazing. Of the remaining occurrences, five are at The Nature Conservancy (TNC) Vina Plains Preserve. Fifteen others are privately owned, and only four of those have been observed within the past fifteen years. In 2000, one of the privately owned populations was proposed to be included in a mitigation bank.

Greene's Orcutt grass continues to be threatened by destruction of vernal pools for agriculture and urban developments. Additional threats to Greene's Orcutt grass include competition from weeds and cattle grazing in winter pasture. The primary threat to the populations at the TNC Vina Plains Preserve is competition from aggressive weeds, including orchard morning-glory, common devil's claw, and cocklebur. Because it grows in the margins of vernal pools, and germinates as the pool water is receding, whereas many other vernal pool plants are already established at this phase, it is particularly susceptible to livestock trampling and competition from nonnative weeds. Research is currently being conducted on the effects of grazing. Research has also shown that

germination is almost entirely dependent on a combination of anaerobic (lacking oxygen) conditions and light. It is suggested that in nature, such cues would be relatively specific to the uppermost soil substrate overlain by water. There is also some indirect evidence that fungi may play an important role in stimulating germination of this species.

Protection measures for this species are included in the USFWS *Draft California Vernal Pool Ecosystem Recovery Plan*. The USFWS designated critical habitat for Greene's Orcutt grass in August, 2003.

Crampton's Orcutt grass

Tuctoria mucronata

State: Endangered 1979
Federal: Endangered 1978

General Habitat:

Crampton's Orcutt grass grows in the clay bottoms of vernal pools of the Central Valley grassland. It is known from only three locations in Yolo and Solano counties.

Description:

A member of the grass family (Poaceae), this sticky, aromatic annual plant produces a dense spike of overlapping flower spikelets that emerge from the upper leaves.



Status:

Crampton's Orcutt grass has been declining at all three known locations during the past two decades. At the site where Crampton's Orcutt grass was first discovered in 1958, only four plants have been observed during the past 17 years. In 1985, 553 plants were found at this site, and in 1986, 100 plants were observed. The species then disappeared from the site for seven years, until surveys in 1993 found four plants. These were the last plants seen at this location; no plants have been located in the past ten years, despite extensive surveys. The cause of the decline of this population is unknown; possible causes are overcollection, changes in hydrology, displacement by other species, or a combination of these or other factors. The second population occurs in Solano County on private land. This population has steadily declined over the past two decades, from 763 plants in 1985 to only 38 plants in 2000. The third population occurs at a communications facility in Yolo County owned by DOD. Although it is the largest population, it has also declined by more than 80% over the past decade. In 1993 there were 10,000 plants at this location; in 1996, 2,700 plants; and in 2001, 1,993 plants. Competition with non-native species appears to be a threat at this site.

Research on this species is currently underway at Rancho Santa Ana Botanic Garden, where it is hoped that information collected from germination trials will provide the basis for reintroduction and enhancement of this species.

California vervain

*Verbena
californica*

State: Threatened 1994
Federal: Threatened 1998

General Habitat:

California vervain, also known as Red Hills vervain, is restricted to moderately mesic areas along intermittent or small, perennial streams underlain by serpentine rocks within the Red Hills area of Tuolumne County.

Description:

A member of the vervain family (Verbenaceae), California vervain is a tall, perennial herb with spikes of one to five small, light purple flowers.



Melanie Gogol-Prokurat, DFG File Photo



Melanie Gogol-Prokurat, DFG File Photo

Status:

California vervain is restricted to intermittent or small, perennial streams underlain by serpentine rocks within the Red Hills area of Tuolumne County. Approximately ten populations of California vervain are known; all are located within a band approximately one-half mile wide and five miles long.

Historical placer mining activities appear to have reduced the size of several California vervain populations. Some existing populations are threatened by recreational gold mining and by livestock grazing and trampling. The primary threat to the survival of the species is residential development, including habitat destruction and fragmentation, groundwater depletion, and decline in groundwater quality from septic system leachate. A major concern is that residential wells on or adjacent to California vervain habitat could lower the water table and dry up the moist areas that support the species.

Over half of the California vervain populations are located on BLM land within the Red Hills Management Area,

which has been designated an Area of Critical Environmental Concern (ACEC). As of 1999, only three populations remained on private land; however, these comprised approximately 85 percent of the total known plants. The Tuolumne County Land Trust has been working to protect the remaining populations of California vervain on privately owned land. Over the past five years, the Land Trust has successfully worked to acquire the second largest population, at Andrews Creek, which had previously been proposed for development. This land, which lies directly adjacent to the BLM Red Hills Management Area, was transferred to BLM after the acquisition. Protection of this large population was an important step in securing the long-term survival of California vervain.

The Tuolumne County Land Trust is continuing their efforts to secure protection for the remaining populations of California vervain and other associated rare species in the Red Hills area.

Big-leaved crown-beard *Verbesina
dissita*

State: Threatened 1990
Federal: Threatened 1996

General Habitat:

Big-leaved crown-beard species occurs primarily on steep, rocky, north-facing slopes within 1.5 miles of the ocean in a maritime chaparral plant community. The densest populations are found on shaded slopes under a layer of shrubs. In California, big-leaved crown-beard is restricted to a few canyons in southern Laguna Beach, Orange County. Another native occurrence is found in Baja California Norte, Mexico, over 150 miles disjunct from the California occurrence.

Description:

Big-leaved crown-beard is a semi-woody, perennial shrub in the sunflower family (Asteraceae). It produces new stems each spring from rhizomes and grows up to three feet tall. Terminal clusters of bright yellow flowers appear in the late spring. After flowering and producing seed, the stems die down to the ground by mid-summer.



Meredith Osborne, DFG File Photo



Mary Ann Showers, DFG File Photo

Status:

In California, only two big-leaved crown-beard populations exist. Each population consists of numerous "stands" of plants. The population areas are located two miles from each other and cover between 20 and 25 acres. The status of big-leaved crown-beard in California has continued to decline over the last decade, due primarily to destruction and modification of habitat. Small-scale residential development continues to fragment and destroy this species' habitat. Other threats include grading, fire break maintenance, vegetation fuel clearance zones, and competition with non-native species.

Habitat at one occurrence was subdivided into single family residential lots containing big-leaved crown-beard and/or its habitat. Plans for homes on several of these lots are currently in progress, and others are expected in the near future, which will likely lead to further decline of the species. Even if precautionary steps are taken during construction to avoid or minimize negative impacts on big-leaved crown-beard, the plants will be threatened by trampling, erosion, landscaping activities, changes in water regime, garden pesticide and/or herbicide use, and habitat fragmentation.

Populations in coastal Baja have been impacted by resort and residential development, as well as slash and burn practices. The current status of the Baja populations is unknown.