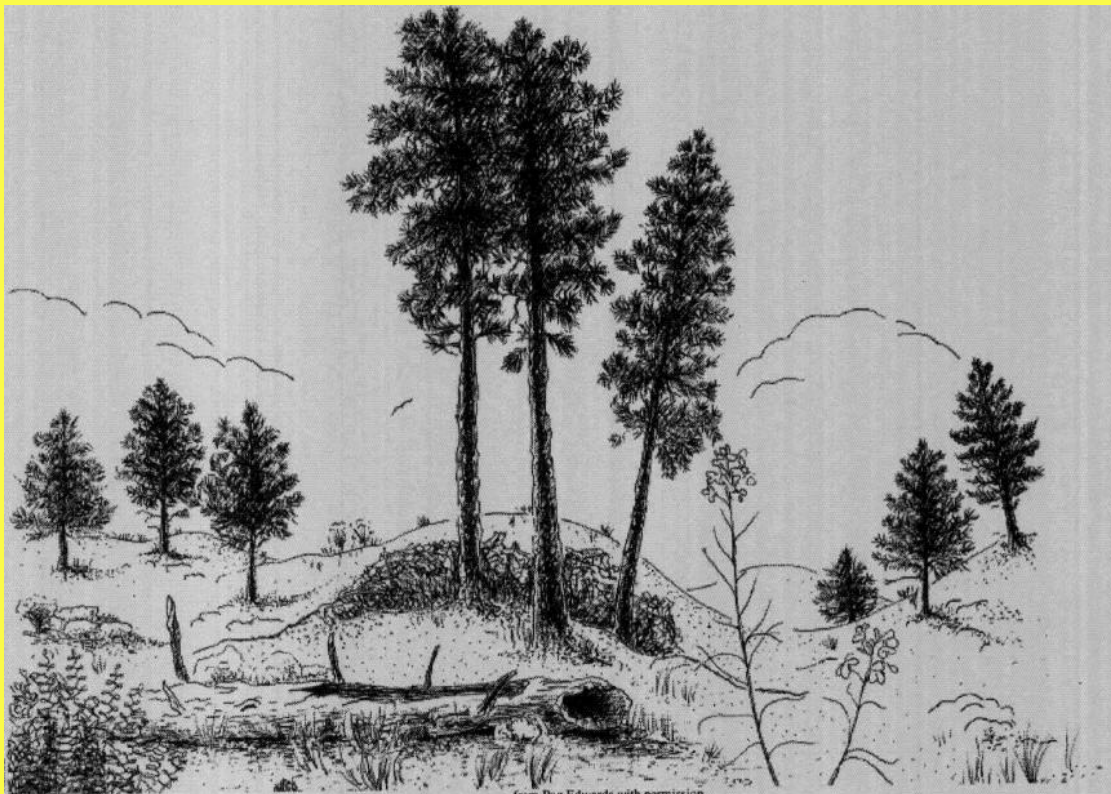


# Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California



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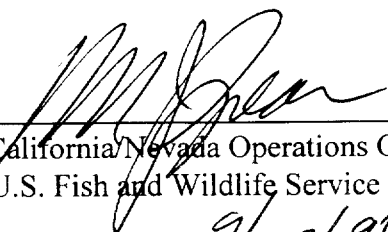
**RECOVERY PLAN**  
**FOR**  
**INSECT AND PLANT TAXA**  
**from the**  
**SANTA CRUZ MOUNTAINS**  
**in**  
**CALIFORNIA**

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Date: \_\_\_\_\_

9/28/98

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### **Literature citations should read:**

U.S. Fish and Wildlife Service. 1998. Recovery Plan for Insect and Plant Taxa from the Santa Cruz Mountains in California. Portland, Oregon. 83 pp.

### Additional copies may be purchased from:

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5430 Grosvenor Lane, Suite 110  
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Deborah Hillyard, plant ecologist, California Department of Fish and Game and  
Suzanne Smith, resource planner, County of Santa Cruz.

## EXECUTIVE SUMMARY

**Current Status:** The Mount Hermon June beetle (*Polyphylla barbata*), Zayante band-winged grasshopper (*Trimerotropis infantilis*), Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*), and Ben Lomond wallflower (*Erysimum teretifolium*) are listed as endangered. Conservation recommendations are included for Scotts Valley polygonum (*Polygonum hickmanii*) and Ohlone tiger beetle (*Cicindela ohlone*), species of concern in the same area. One or more populations of five of these species are found on public lands, including Quail Hollow Ranch County Park, Bonny Doon Ecological Reserve, Big Basin State Park, Henry Cowell Redwoods State Park, and Gray Whale Ranch State Park, and on private land. Populations of the Ohlone tiger beetle and Scotts Valley spineflower are located only on private land.

**Habitat Requirements and Limiting Factors:** These species are restricted to sandy soils in the Santa Cruz Mountains in Santa Cruz County, California. Sand parkland communities on Zayante soils support the two insects, Ben Lomond spineflower, and Ben Lomond wallflower. The Scotts Valley spineflower, Scotts Valley polygonum, and Ohlone tiger beetle are restricted to small patches of grasslands underlain by mudstones and/or Purisima sandstones.

These species are threatened by sand mining, urban development, agricultural conversion, equestrian use, recreational activities, alteration in natural fire regimes, and/or competition with nonnative vegetation. Overcollection and pesticide use are potential threats to the insect species. Very low numbers of individuals and populations of some of these species put them at great risk of extinction due to random naturally occurring events.

**Recovery Objectives:** Delisting is feasible for four listed species (Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spine flower, and Ben Lomond wallflower) with habitat protection and appropriate management actions.

**Interim Objective for Scotts Valley Spineflower and Scotts Valley**

**Polygonum:** Avert extinction of the Spineflower and the need to list Polygonum by establishing conservation easements or acquiring all parcels of private land supporting these species, especially in areas of encroaching development pressure.

**Interim Downlisting Criteria:**

**Mount Hermon June beetle**

- The 28 currently known sites have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans

including HCP's for Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, County of Santa Cruz, and the City of Scotts Valley. Conservation easements should be negotiated with private landowners not included in Habitat Conservation Plans for high-priority and medium-priority parcels in sandhills habitat.

- Management plan for Quail Hollow Ranch County Park has been developed and is being implemented.
- Population numbers are stable or increasing.

**Zayante band-winged grasshopper**

- The 7 discrete areas of sand parkland containing the 10 currently known collection sites have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans including HCP's for Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz.
- Management plan for Quail Hollow Ranch County Park developed and being implemented.
- Population numbers are stable or increasing.

**Ben Lomond spineflower**

- The 21 currently known populations have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans.
- Conservation measures for this species are included in Habitat Conservation Plans (Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz) that have been developed and implemented for the listed insect species.
- Management plans for populations on Quail Hollow Ranch County Park and the adjacent State-owned parcel, Bonny Doon Ecological Reserve, Henry Cowell Redwoods State Park, Big Basin State Park, and Gray Whale Ranch State Park are developed and being implemented.
- Population numbers are stable or increasing.

**Ben Lomond wallflower**

- The 17 currently known populations have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans.
- Management plans for populations on Quail Hollow Ranch County Park and Bonny Doon Ecological Reserve are developed and being implemented.
- Conservation measures for this species are included in Habitat Conservation Plans (Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz) that have been developed and implemented for the listed insect species.
- Population numbers are stable or increasing.

### **Scotts Valley spineflower**

- All four parcels of private land that support the Scotts Valley spineflower have permanent conservation easements or have been acquired.
- Conservation measures for the Scotts Valley spineflower are included in a Habitat Conservation Plan with the City of Scotts Valley
- Population numbers are stable or increasing.

### **Interim Delisting Criteria:**

#### **Mount Hermon June beetle, Zayante-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower**

Definitive delisting criteria will be developed for each species as more information becomes available on biology, range, and distribution through research and surveys. When the downlisting criteria have been met for a species the species can be considered for delisting if :

- Threats are reduced or eliminated so that populations are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species.

#### **Scotts Valley spineflower**

- Delisting of this species may not be feasible due to limited range and limited conservation opportunities.

**Long-term conservation actions for the Scotts Valley polygonum:** Long-term conservation actions are necessary for the Scotts Valley polygonum, which is being considered for Federal listing. These conservation actions would become recovery actions should this species be listed (1) establishing permanent conservation easements or acquisition of the two sites in Scotts Valley and (2) additional conservation measures for this species in Habitat Conservation Plans with the City of Scotts Valley for the listed insect species.

### **Actions needed:**

1. Protect species habitats through acquisition, conservation easements, and Habitat Conservation Plans.
2. Manage species habitats.
3. Conduct research on the ecology and biology of the species.
4. Develop and implement a public outreach program.
5. Locate additional populations.
6. Review and revise management and recovery guidelines.

**Recovery Costs:** Total cost for the first 5 years is \$583,000.

**Date of Recovery:** To be determined



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## I. INTRODUCTION

### A. Brief Overview

The final rule determining federally endangered status for three plant species, Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*), Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*), and Ben Lomond wallflower (*Erysimum teretifolium*), was published February 4, 1994 (U.S. Fish and Wildlife Service 1994). The final rule determining federally endangered status for two insects, Mount Hermon June beetle (*Polyphylla barbata*) and Zayante band-winged grasshopper (*Trimerotropis infantilis*), was published January 24, 1997 (U.S. Fish and Wildlife Service 1997a). The Ben Lomond wallflower is also listed as endangered by the State of California (Skinner and Pavlik 1994). The Scotts Valley polygonum (*Polygonum hickmanii*) and the Ohlone tiger beetle (*Cicindela ohlone*), occur in the same area as the listed species and are species of concern to the Service. The Santa Cruz cypress (*Cupressus abramsiana*), which is found in the same area, is listed as endangered (U.S. Fish and Wildlife Service 1987). This species is the subject of another recovery plan (U.S. Fish and Wildlife Service 1997b) to be finalized in 1998, which outlines recovery actions for this taxon. The Santa Cruz cypress population at Bonny Doon is the only population that overlaps the range of the species included in this recovery plan.

These plant and insect species are restricted in distribution to sandy soils derived from ancient marine terraces that occur in a small portion of the Santa Cruz Mountains in Santa Cruz County, California (Figure 1). The species and their habitats (Figure 2) have been variously affected and are threatened by one or more of the following: sand mining, urban development, agricultural land conversion, equestrian use, and encroachment by nonnative plants; collection and pesticide use are potential threats to the two insect species. The Scotts Valley spineflower, Scotts Valley polygonum, and the two insects have small populations and restricted distributions that make them vulnerable to extinction from random naturally occurring events. Recovery actions should benefit multiple species, including listed species and species of concern, within identified recovery areas because of the similarity in habitat and threats facing these species.

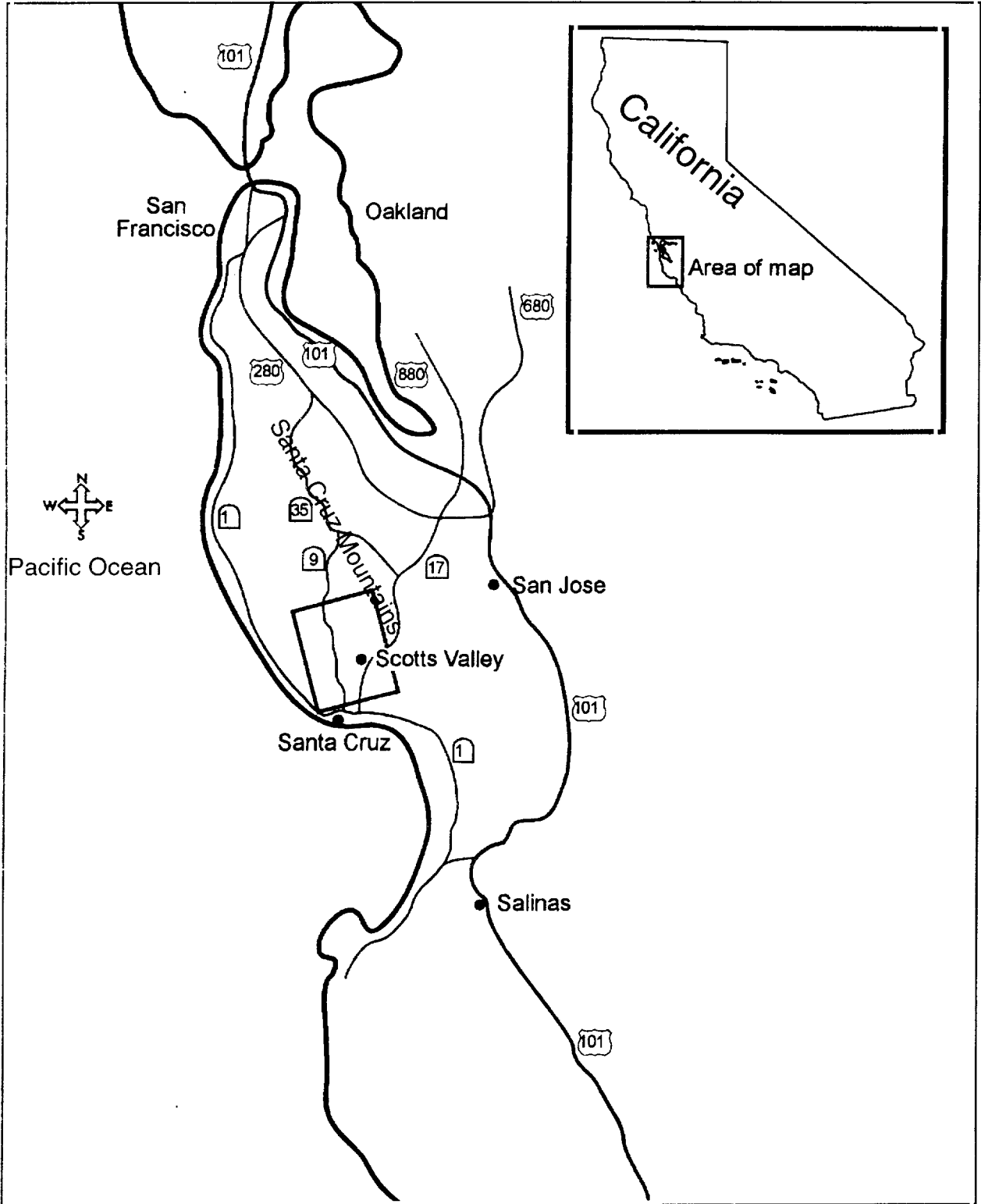


Figure 1.

Map of general area

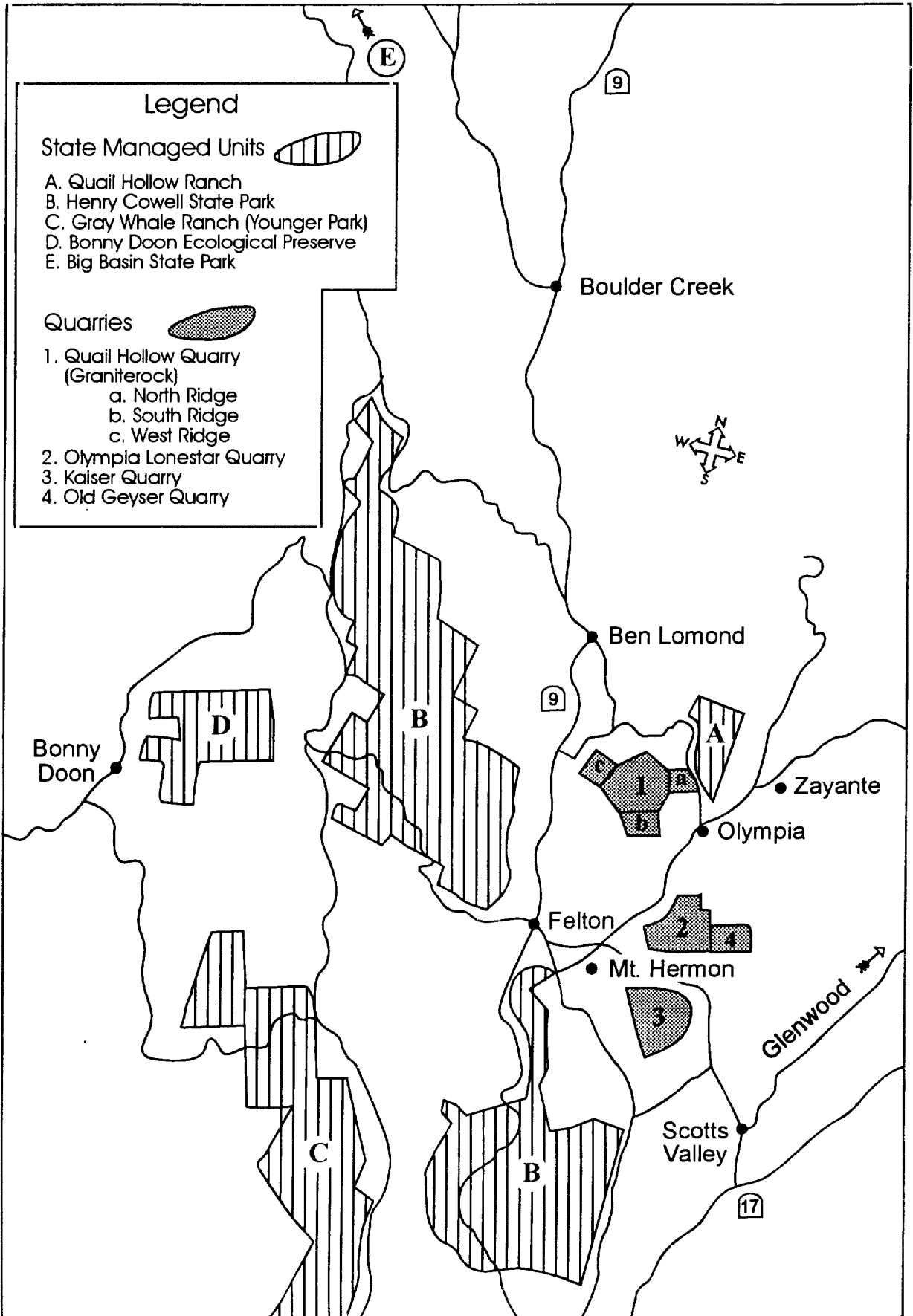


Figure 2. Map of the areas in which plan taxa occur (USFWS).

## **B. General Habitat Descriptions**

The Santa Cruz Mountains (Figure 1) are a geologically young range composed of igneous and metamorphic rocks overlaid by thick layers of sedimentary material uplifted from the ocean floor and ancient shoreline zone (Caughman and Ginsberg 1987). These Miocene marine terraces, called the Santa Margarita formation (Clark 1981, Marangio 1985), persist as pockets of sandstones and limestones geologically distinct from the volcanic origins of the Santa Cruz Mountains. Soils that formed from these sandstone deposits occur in scattered pockets covering approximately 3,400 hectares (8,400 acres) and are called the Zayante soil series (USDA Soil Conservation Service 1980). Zayante soils are endemic (restricted to, or native) to Santa Cruz County and occur in three primary clusters. The largest cluster is in the vicinity of the communities of Ben Lomond, Felton, Mount Hermon, Olympia, and Scotts Valley. A second cluster is located in the Bonny Doon area. The third, and smallest, cluster is found near the community of Corralitos. Zayante soils are deep, coarse-textured, poorly developed, and well-drained (USDA Soil Conservation Service 1980).

Predominant vegetation of the Santa Cruz Mountains consists of coast redwood forest (Zinke 1988) and mixed evergreen forest (Sawyer *et al.* 1988); however, the coarse, sandy, Zayante soils create a warmer and drier microclimate that supports a uniquely adapted flora distinctly different from the surrounding forest and chaparral communities (Marangio 1985, Davilla 1990). The Zayante soils in the Ben Lomond-Mount Hermon-Scotts Valley and Bonny Doon regions harbor a complex vegetation mosaic dominated by maritime coast range ponderosa pine forest and northern maritime chaparral (Griffin 1964, Holland 1986). The Zayante soils in the Ben Lomond-Mount Hermon-Scotts Valley and Bonny Doon regions harbor a complex vegetation mosaic dominated by maritime coast range ponderosa pine forest and northern maritime chaparral (Griffin 1964, Holland 1986). The distributions of northern maritime chaparral and maritime coast range ponderosa pine forest overlap to form a complex and intergrading mosaic of communities variously referred to as “ponderosa sand parkland,” “ponderosa pine sandhills,” and “silver-leafed manzanita mixed chaparral.” These habitats will be collectively referred to as “Zayante sandhills habitat” or the “Zayante sandhills

ecosystem.” The Corralitos cluster of Zayante soils are distant and do not support similar vegetation; therefore, that cluster is not included in the Zayante sandhills ecosystem.

Ponderosa pine (*Pinus ponderosa*) in this region represents a disjunct (separated from other populations) remnant population of the species in the Santa Cruz Mountains reflective of the unique edaphic (soil) conditions on Zayante soils. Here, the maritime coast range ponderosa pine forest occurs as open, park-like stands with an herbaceous understory or as an overstory to maritime chaparral. Ponderosa pine are occasionally interspersed with knobcone pines (*Pinus attenuata*) and, at some sites, the federally endangered Santa Cruz cypress. The presence of knobcone pines and Santa Cruz cypress, which require periodic fires for reproduction (Vogl *et al.* 1988), suggests that fire may play an important role in the maintenance of the Zayante sandhills habitat mosaic (Griffin 1964, Marangio 1985, Holland 1986).

Northern maritime chaparral on Zayante soils is dominated by silver-leafed manzanita (*Arctostaphylos silvicola*), a species of concern endemic to the region, which may occur as monotypic stands or be mixed with California-lilac (*Ceanothus* sp.), *Adenostoma* sp., yerba santa (*Eriodictyon* sp.), and other shrub species. Knobcone pine may occasionally be present (Morgan 1983, Marangio 1985, Lee 1994).

The Zayante sandhills ecosystem harbors a diversity of rare and endemic plant species and disjunct populations (Thomas 1961, Griffin 1964, Morgan 1983). In addition to silver-leafed manzanita and the disjunct population of ponderosa pine, Zayante soils support Ben Lomond wallflower and Ben Lomond spineflower. Because of their unique flora, the Zayante sandhills are considered “biological islands” (Marangio 1985).

An especially unique habitat within the Zayante sandhills ecosystem is Sand parkland. This habitat is characterized by sparsely vegetated, sandstone-dominated ridges and saddles that support a wide array of annual and perennial herbs and grasses. Scattered ponderosa pine trees are often, but not

always, present. Although overall vegetation cover is generally less than 20 percent, sand parkland supports over 90 specifically adapted plant species (Morgan 1983, Davilla 1990).

Another unique habitat found in the Santa Cruz Mountains and scattered at several other locations throughout Santa Cruz County consists of small pockets of winter-saturated/summer-dry grassland. These unique grasslands formed as some of the raised marine terraces of Purisima sandstone and Santa Cruz mudstone were buried beneath layers of alluvial materials during the uplifting of the Santa Cruz Mountains. In the Scotts Valley area, fine-textured shallow soils overlay these outcrops and support annual grasses and herbaceous species, including the Scotts Valley spineflower and Scotts Valley polygonum. Associated species include showy goldfields (*Lasthenia californica*) and other species restricted to grasslands, such as nest straw (*Stylocline amphibola*), Gray's clover (*Trifolium grayi*), and San Francisco popcorn flower (*Plagiobothrys diffusus*).

### **C. Reasons for Decline and Current Threats (Table 1)**

#### **Sand Mining**

Sand mining and urban development are the most significant causes of habitat loss in the Ben Lomond-Mount Hermon-Scotts Valley region. Sand deposits within the Zayante sandhills habitat have been actively mined for construction purposes for at least five decades (Storie *et al.* 1944 in Griffin 1964). Three sand mines in the area are in operation and have permits to mine areas of sand parkland and Zayante sandhills habitat that are currently undisturbed (Suzanne Smith, County of Santa Cruz Planning Department, pers. comm. 1994). A fourth mine is closed at this time, but may reopen if funds become available (Smith, pers. comm. 1994). Seventeen of the 28 Mount Hermon June beetle collection locations and 9 of the 10 Zayante band-winged grasshopper collection sites are adjacent to areas used for sand mining and may be threatened by future mining activities.



Table 1. Summary of threats to the taxa included in this plan. Large "X" indicates primary threat. Small "x" indicates minor threat.

Species	Sand Mining	Urban Development	Agricultural Conversion	Recreational Use*	Competition With Nonnative Plants	Altered Fire Cycles	Forest or Chaparral Succession	Other
Mount Hermon June beetle	X	X	x	X		X	x	Pesticides Overcollection x
Zayante band-winged grasshopper	X	X	x	X		X	x	Pesticides Overcollection x
Ben Lomond spineflower	X	X	x	X	X	X	X	
Scotts Valley spineflower		X						Herbicides Pesticides Fertilizers Altered hydrologic regimes
Ben Lomond wallflower	X	X	x	X		X	X	
Scotts Valley polygonum		X						
Ohlone tiger beetle		X	x	x	X			Overcollection Pesticides x
Santa Cruz cypress		x	x			x		logging

\* Recreational use includes a variety of activities, including hiking, equestrian use, off-road vehicles, bicycling, and camping. Each of these activities varies in the type and intensity of impacts caused.

Mining of sand from undisturbed areas would result in the destruction of habitat for the Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower. Permits held by the mining companies require revegetation efforts in mined areas as part of reclamation plans. Revegetation plans are considered inadequate, however, to successfully restore the biological integrity of sand parkland and Zayante sandhills habitats. The technical feasibility of restoration is questionable because of the diversity of the ecosystem's flora and fauna and the complexity of the soil facies (composition) and edaphic conditions on which they depend (Davilla 1990, John Gilchrist and Associate 1990, Murphy 1990).

### **Urban Development**

Urban development has also resulted in significant alteration and loss of habitat for the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower. Construction of private homes, roads, and businesses has removed vegetation and modified soils through excavation, compaction, and disruption of soil horizons. More than 480 hectares (1200 acres) of Zayante sandhills habitat have been lost to residential developments. Recent expansion of juvenile hall facilities near Mount Hermon eliminated portions of an area known to support Mount Hermon June beetles (William Hazeltine, private consultant, pers. comm. 1994). One site where Zayante band-winged grasshoppers had previously been collected has been converted to a parking lot (David Weissman, California Academy of Sciences, pers. comm. 1993). Fourteen collection sites for Mount Hermon June beetles and two locations of Zayante band-winged grasshoppers are adjacent to residential, commercial, and public developments. The County of Santa Cruz and the City of Scotts Valley have existing plans, zoning designations, and approved permits indicating development will continue in these areas (Marangio 1985, Lee 1994), thereby further reducing and fragmenting Zayante sandhills habitat.

Urban development also affects the grassland habitat for the Scotts Valley spineflower, Scotts Valley polygonum, and two sites where Ohlone tiger beetle burrows have been observed. Past development has already removed habitat for

the Scotts Valley spineflower. Several housing developments proposed for Scotts Valley spineflower sites at the time of listing did not proceed, but other developments are currently proposed for the same sites. At one site (referred to as the Glenwood site) the construction of Scotts Valley High School destroyed one portion and fragmented the remaining portion of habitat for Scotts Valley spineflower; a colony of Scotts Valley polygonum was set aside in a small grassland preserve. Adjacent housing proposed by Glenwood Homes will also affect Scotts Valley spineflower. A distribution system for recycled water, comprising water tanks, pipelines, and access roads, will come within less than 100 feet of colonies of Scotts Valley spineflower and Scotts Valley polygonum on adjacent Salvation Army property. At a second site (referred to as the Polo Ranch site) a parcel supporting both of these species was recently sold to Greystone Homes for development. The long-term viability of Scotts Valley spineflower and Scotts Valley polygonum will be jeopardized if all four projects are completed without significant conservation measures for the plants.

### **Agricultural Land Conversion**

Limited agricultural activities have also contributed to habitat fragmentation and degradation in the Zayante sandhills ecosystem. While the Zayante soils are generally of little agricultural value, Zayante sandhills habitat has been, and may continue to be, used for agricultural purposes. Currently, portions of two sand parkland areas are zoned for timber harvest (Lee 1994). Other areas of Zayante sandhills habitat have been proposed for conversion to vineyards (Davilla 1980). One population of Ben Lomond wallflower was destroyed in preparation for conversion to a vineyard; however, the parcel was acquired by the California Department of Fish and Game (Bonny Doon Ecological Reserve), and the wallflower was naturally reestablished on that site.

Currently, the threat from agricultural conversion is considered minor. It is uncertain how these activities may affect the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower.

## **Recreational Use**

Recreational uses of Zayante sandhills habitats may adversely affect the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower through habitat disturbance and degradation. Recreational uses include off-road vehicles (ORVs), equestrian activities, hiking, bicycling, and camping; the degree of impact varies for each recreational activity. These activities crush and remove vegetation, cause compaction of soils, promote soil erosion, and/or occasionally result in oil and gasoline spills. Off-road motorcycle events (200+ people) occur on sand parkland (Al Haynes, San Lorenzo Water District, pers. comm. 1993). Off-road vehicle damage is also noted at the Geyer Quarry and on the South Ridge of the Quail Hollow Quarry, a site considered to be the highest quality patch of intact sand parkland habitat (Lee 1994). Disturbance from equestrian use is reported from five sand parkland areas (Lee 1994, Stephan McCabe, California Native Plant Society, *in litt.* 1998). A campground encompasses approximately half of the sand parkland habitat within Henry Cowell Redwoods State Park (Deborah Hillyard, California Department of Fish and Game, pers. comm. 1993; S. Steinmetz, Henry Cowell Redwoods State Park, pers. comm. 1993), and horse, ORV, and foot traffic are recognized as causes of erosion damage at the Quail Hollow Ranch County Park (County of Santa Cruz 1990).

## **Competition with Nonnative Plants**

One of the secondary effects of destruction and fragmentation of habitat by urban development is the introduction, either intentionally or inadvertently, of nonnative plants to adjacent remaining habitat. Competition with nonnative plants poses the greatest threat to Ben Lomond spineflower. At the Bonny Doon Ecological Reserve, the presence of the nonnative annual grass *Vulpia myuros* was shown to significantly inhibit the growth and reproductive success of Ben Lomond spineflower where they occur together (Pollock 1995). Controlled burns or other controlled disturbance methods (e.g., mowing) could be used at some sites to reduce the abundance of the grass.

## **Recreational Use**

Recreational uses of Zayante sandhills habitats may adversely affect the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower through habitat disturbance and degradation. Recreational uses include off-road vehicles (ORVs), equestrian activities, hiking, bicycling, and camping; the degree of impact varies for each recreational activity. These activities crush and remove vegetation, cause compaction of soils, promote soil erosion, and/or occasionally result in oil and gasoline spills. Off-road motorcycle events (200+ people) occur on sand parkland (Al Haynes, San Lorenzo Water District, pers. comm. 1993). Off-road vehicle damage is also noted at the Geyer Quarry and on the South Ridge of the Quail Hollow Quarry, a site considered to be the highest quality patch of intact sand parkland habitat (Lee 1994). Disturbance from equestrian use is reported from five sand parkland areas (Lee 1994, Stephan McCabe, California Native Plant Society, *in litt.* 1998). A campground encompasses approximately half of the sand parkland habitat within Henry Cowell Redwoods State Park (Deborah Hillyard, California Department of Fish and Game, pers. comm. 1993; S. Steinmetz, Henry Cowell Redwoods State Park, pers. comm. 1993), and horse, ORV, and foot traffic are recognized as causes of erosion damage at the Quail Hollow Ranch County Park (County of Santa Cruz 1990).

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## **Altered Fire Cycles/Forest Succession**

Since the European settlement of the Santa Cruz Mountains, the suppression of wildfires has become a common practice and has resulted in longer intervals between fire events. In the sand parkland and northern maritime chaparral communities, this has resulted in the increase in vegetation cover over time. Because of increased litter and understory vegetation layers, a fire event may be more detrimental to the survival of the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower. Increased shading due to increased vegetation cover also may reduce the quality of the habitat for these species. For those sites where nonnative grasses are abundant, fires may be useful in reducing the competition between nonnative grasses and Ben Lomond spineflower.

### **D. Overall Conservation Efforts**

#### **Federal**

The Endangered Species Act of 1973, as amended, requires the Service to develop a recovery plan that describes “site-specific management actions” necessary for the conservation and survival of these species. The plan must have “objective, measurable criteria which, when met” will allow them to be removed from the Federal list. The plan must estimate the time needed and the cost to carry out the conservation measures. After a species is removed from the list, the Fish and Wildlife Service must “effectively monitor for not less than five years” the species’ status in cooperation with the State of California. The Service must be prepared to restore the species to the list, if necessary. The Act also authorizes the Department of the Interior to acquire habitat essential to preserving listed endangered species. None of the species included in this plan are found on Federal land.

Habitat Conservation Plans are developed as a requirement for obtaining a section 10(a)(1)(B) permit to incidentally “take” listed animal species for activities without Federal involvement. The prohibitions against incidental take do not

apply to federally listed plant species. The Endangered Species Act prohibits the removal of listed plants or malicious damage of these plants on lands under Federal jurisdiction or on non-Federal lands if the action is in violation of State law or regulation, but it generally does not prohibit take of listed plant species by private landowners on their own property. If only federally listed plant species occurred within an area to be covered by a Habitat Conservation Plan, a section 10(a)(1)(B) incidental take permit is not needed. Before issuing a 10(a)(1)(B) incidental take permit for any listed animal species, however, the Service is required to determine if the existence of any listed plant species would be jeopardized by issuing the permit. The Service could not issue the permit if this jeopardy determination is made. To avoid this outcome, the Service recommends that an applicant consider any listed plant species that occur a project area in the Habitat Conservation Plan and develop appropriate minimization and mitigation measures.

The Service is developing two Habitat Conservation Plans with mining companies in the County of Santa Cruz to allow “take” of the insect species while providing conservation measures for those species. The Service has begun development of a regional Habitat Conservation Plan with the County of Santa Cruz.

## **State**

State-listed species are protected by the Native Plant Protection Act and the California Endangered Species Act. The Native Plant Protection Act requires permits for collecting, transporting or selling state-listed plants. Under the California Endangered Species Act, State-designated endangered plants are protected from taking, except for scientific and management purposes, which require a permit or agreement from the California Department of Fish and Game. In addition, State agencies are required to consult formally with the California Department of Fish and Game on State projects that may affect listed endangered species. The California Environmental Quality Act (CEQA) provides some level of protection for endangered species through the environmental review process. Initially, a public agency reviews a project to determine if it would create negative impacts to the species. If the impacts are not considered significant, a formal

environmental impact report (EIR) is not required, and the project is granted a Negative Declaration with measures/recommendations to reduce environmental impacts. If the project's impacts are considered significant, an environmental impact report is required; an environmental impact report consists of a description of existing project site conditions, impact analysis, and detailed mitigation measures that would reduce project impacts to a less-than-significant level. Mitigation measures, such as avoidance, fencing, or landowner education programs, must be incorporated into the approved project and may provide long-term species protection; however, if there are no feasible mitigation measures, and if the lead agency believes the benefits of the project outweigh the environmental risks, it may approve a project by making a statement of overriding considerations. More specific information on mining projects that are subject to CEQA review is found under "Private" below.

Other State laws and regulations that apply to these species include the California Forest Practices Act, which applies to timber harvesting on sites greater than 1.2 hectares (3.0 acres); the State of California Surface Mining and Reclamation Act of 1975; California Department of Fish and Game policies, as they relate to management of reserves; and California Department of Parks and Recreation (CDPR) policies.

State-owned and managed parcels of land and the species occurring within those units (in parentheses) include:

Quail Hollow Ranch County Park, jointly owned with Santa Cruz County  
(Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower)

Bonny Doon Ecological Reserve (Ben Lomond spineflower, Ben Lomond wallflower, and Santa Cruz cypress)

Henry Cowell Redwoods State Park (Ben Lomond spineflower)

Big Basin State Park (Ben Lomond spineflower)

Gray Whale Ranch State Park (Ben Lomond spineflower)



California Department of Fish and Game is currently developing a final management plan for the Bonny Doon Ecological Reserve. None of the other units have management plans that specifically provide protection for the subject species or their habitats. Equestrian and recreational use on Quail Hollow Ranch County Park have been identified as management issues. No management issues pertaining to the Ben Lomond spineflower have been identified for Henry Cowell Redwoods State Park, Big Basin State Park, or Gray Whale Ranch State Park. Currently only the Ben Lomond wallflower, has been State-listed as endangered in 1981 (Skinner and Pavlik 1994).

### **County**

The Santa Cruz County General Plan/Local Coastal Program (LCP) 1994 update (Santa Cruz County 1994) recognizes “indigenous ponderosa pine” and “sand parkland” as sensitive botanical resources to be protected. The County Sensitive Habitat Protection Ordinance (chapter 16.32 of the County Code) was established to protect these habitats from development. Such habitats are protected against significant destruction of their habitat values, and only uses that depend on these sensitive botanical resources (i.e., nature observation, educational instruction, and specific residential uses) are allowed within the sensitive habitat area.

Conditions required by the County Sensitive Habitat Protection Ordinance include clustering of structures and/or locating a structure near any existing structure and use of native species, preferably grown from local gene pool stock, for landscaping. A “Declaration of Restrictions” is required to limit activities outside of the development zones, and for residential development, site disturbance cannot exceed 0.25 acre per unit or 25 percent of the parcel, whichever is less.

Quail Hollow Ranch County Park, which was discussed above, is jointly owned and managed by California Department of Fish and Game and the County of Santa Cruz.

## **Private**

Three parcels of sand parkland and Zayante sandhills habitat supporting the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower were preserved in a settlement agreement between local conservation groups, the County of Santa Cruz, and Graniterock Company, owners of Quail Hollow Quarry. Under the settlement agreement, preservation of the North Ridge, West Ridge, and South Ridge parcels would be contingent upon Graniterock's receiving approval to expand mining into their 33.6-hectare (83-acre) "future mining area" at the Quail Hollow Quarry. Graniterock prepared a Habitat Conservation Plan for both current and future mining operations at Quail Hollow Quarry (Thomas Reid Associates 1997) and received 3-year 10(a)(1)(B) incidental take permit from the Service for the "current mining area." Graniterock has granted a conservation easement in perpetuity to the County of Santa Cruz for the 4.5-hectare (11.1-acre) North Ridge habitat to mitigate the effects to listed species of mining in the 7.7-hectare (19-acre) "current mining area." When Graniterock receives its future mining approval from the County of Santa Cruz and an amended incidental take permit from the Service, it will grant a conservation easement in perpetuity to the County of Santa Cruz for the 8.3-hectare (20.6-acre) West Ridge habitat and sell the 13.2-hectare (32.6-acre) South Ridge habitat to the County of Santa Cruz.

A revised draft Habitat Conservation Plan for the Kaiser Sand and Gravel Company's Felton Plant is currently being reviewed by the Service (Habitat Restoration Group 1997); it addresses the Mount Hermon June beetle and the Zayante band-winged grasshopper.

### **E. Species Accounts**

#### **Mount Hermon June beetle (*Polyphylla barbata*) (Figure 3)**

**Recovery Priority 8**—indicates a species having a moderate degree of threat and a high recovery potential (Appendix C).

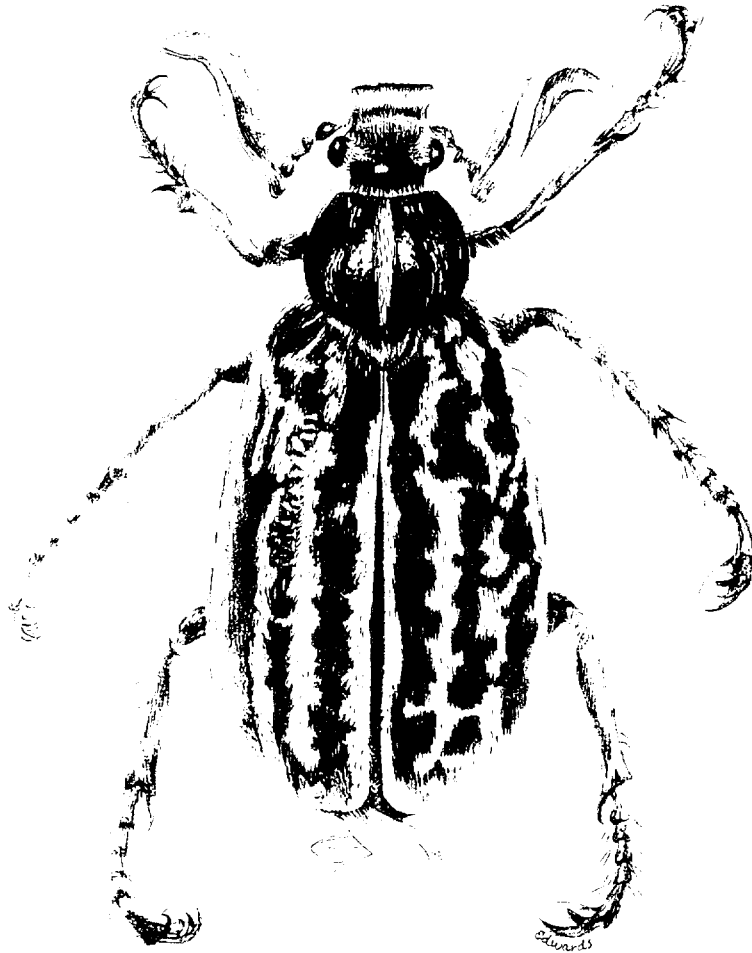


Figure 3. Illustration of *Polyphylla barbata* (Mount Hermon June beetle) by Peg Edwards (with permission).

**Description and Taxonomy.** The Mount Hermon June beetle (*Polyphylla barbata*) was first described by Cazier (1938) from Mount Hermon, Santa Cruz County, California. The status of *P. barbata* as a full species was supported by Cazier (1940) and again by Young (1988), who recently made several nomenclature adjustments to the genus *Polyphylla*, but retained *P. barbata*. The Mount Hermon June beetle belongs in the Order Coleoptera and Family Scarabaeidae.

The adult male is a small, cryptic scarab beetle with a black head, dark blackish-brown color on thick elytra (leathery wing covers) clothed with scattered long brown hair, and a striped body. Stripes on the elytra (wing covers) are broken, often reduced to discontinuous clumps of scales, but still form identifiable lines (Cazier 1938, Young 1988). Females are larger and have a black head with a clypeus (plate) on the lower part of the face and chestnut-colored forewings. Females have golden hairs on the head, thorax, and legs (Young 1988). The single adult female described was 22 by 11 millimeters (0.87 by 0.43 inch), while the holotype male (specimen used to describe the species) was 20 by 9.7 millimeters (0.79 by 0.39 inch) (Young 1988).

Three other wide-ranging species of *Polyphylla* (*P. crinita*, *P. nigra*, and *P. decemlineata*), occur in the Ben Lomond-Mount Hermon-Scotts Valley area. The Mount Hermon June beetle is distinguished from other species of *Polyphylla* by the presence of relatively dense, long erect hairs scattered randomly over the elytra and short erect hairs on the pygidium (abdominal segment) (Young 1988).

**Life History.** Like other *Polyphylla* species, the Mount Hermon June beetle is believed to require about 2–3 years to mature from an egg through the adult form. The rate of growth of laboratory-reared larvae, however, suggests that the Mount Hermon June beetle may complete its life cycle within one year (Hazeltine, *in litt.* 1994). Most of the life cycle is spent in larval stages. The subterranean larvae feed on plant roots. While *Polyphylla* larvae are generally considered to be grass and pine root feeders (Fred Andrews, California Department of Food and Agriculture, pers. comm. 1993; Art Evans, Los Angeles Museum of Natural History, pers. comm. 1993), the Mount Hermon June beetle may also feed on the

roots of monkeyflower, oak, fern, and other plants found in the Zayante sandhills ecosystem (Hazeltine, *in litt.* 1993). Based on laboratory observations, larvae may be susceptible to fungal infestations if soil conditions are too moist (Hazeltine, *in litt.* 1993); however, the significance of the mortality sources is unknown.

For 1 to 2 months during summer, Mount Hermon June beetles emerge as imagos (adult forms) to reproduce. Males are strong fliers, emerging from their burrows to fly low to the ground in search of females (Hazeltine, *in litt.* 1994). Females are thought to be fossorial, remaining just below the surface in burrows. Females may not fly due to their large body size (Evans, pers. comm. 1993; Alan Hardy, California Department of Food and Agriculture, pers. comm. 1993). Like other *Polyphylla* species, males are believed to locate females by tracking female pheromone signals (Fowler and Whitford 1981, Hazeltine 1993); such a mechanism would ensure reproductive success within the limited time period for mating (Lilly and Shorthouse 1971). The flight season generally extends from mid-June to late July. The adult males are crepuscular (active at twilight) and will generally fly for 60–90 minutes, depending on the timing of sunset (Frank Hovore, entomologist, Frank Hovore and Assoc., *in litt.* 1998). The flight time of males appears restricted to evening, being observed only between 8:45 and 9:30 p.m.; flights may occur later during the latter part of the flight season (Hazeltine 1993).

The small mouthparts and limited flight period of Mount Hermon June beetles suggest that adults of this species do not feed (Hazeltine, *in litt.* 1993). Adults of the related *Polyphylla decemlineata* feed on the leaves of trees (Johnson 1954). At the end of the flight period each evening, males burrow back into the soil, emerging repeatedly on subsequent evenings to search for mates until their nutrient reserves expire (Hazeltine 1993). Females are believed to lay eggs at the bottom of their burrows and die a short time later. The life cycle continues as newly hatched larvae tunnel from the burrow in search of roots.

**Habitat Description.** Habitat of the Mount Hermon June beetle includes ponderosa pine-chaparral habitat with sandy soil and open, sparsely vegetated

areas (Hazeltine 1993; W. Hazeltine, pers. comm. 1994; J. M. Hoekstra, U.S. Fish and Wildlife Service, pers. obs. 1994). Beetles may also occur in more vegetated areas of chaparral (David Russell, Miami University, Ohio, pers. comm. 1994). Common vegetation found in these open areas includes bracken fern (*Pteridium aquilinum*), monkeyflowers (*Diplacus* sp.; *Mimulus* sp.), grasses, and small annual herbs (Hoekstra, pers. obs. 1994). While not always present, silver-leaved manzanita seems to be a good indicator of suitable habitat (Hazeltine 1993; J.M. Hoekstra, pers. obs. 1994). All of these characteristics are consistent with descriptions of Zayante sandhills habitat.

**Range and Distribution.** Most *Polyphylla* species have very narrow distributions. Of the 28 North American species, 20 have restricted ranges; 15 of these are endemic to isolated sand deposits (Young 1988). The restricted distributions of these species are likely due to various factors including substrate and food preferences, edaphic tolerances, and the low mobility of fossorial larvae and females. Most *Polyphylla* species seem to prefer sand and grass or sand, grass, and conifer associations similar to those found in the Zayante sandhills ecosystem (Borror *et al.* 1976; Young 1988; Hardy, pers. comm. 1993).

The range of the Mount Hermon June beetle is restricted to the Zayante sandhills habitat of the Ben Lomond-Mount Hermon-Scotts Valley area. Historically, specimens were known only from “sandhills” at the type locality of Mount Hermon in Santa Cruz County, California (Cazier 1938, 1940; Young 1988).

**Population Status.** Between 1989 and 1994, Mount Hermon June beetles were collected at 28 of 43 sites surveyed. Records include results of a regional survey and incidental collections (McCabe, *in litt.* 1991; Hazeltine 1993; Hazeltine, pers. comm. 1994; Russell, pers. comm. 1994). Twenty-six of the twenty-eight collection locations were on mapped Zayante soils in the primary cluster of the Ben Lomond-Mount Hermon-Scotts Valley area. The other two collection records were within the same area, in close proximity to mapped Zayante soils (Hoekstra 1994a). All sites were similarly characterized by sparsely vegetated sandy substrate with Scotts Valley polygonum or ponderosa pine (Hazeltine 1993; Hoekstra, pers. obs. 1994). Mount Hermon June beetles were not found in

surveys of suitable Zayante sandhills habitat outside the Ben Lomond-Mount Hermon-Scotts Valley area, and they were not found at locations with habitat not characteristic of the Zayante sandhills ecosystem (Hoekstra 1994a).

**Current Threats.** Over 40 percent of Zayante sandhills habitat is estimated to have been lost to, or altered by, human activities including sand mining, urban development, recreational activities, and agriculture. Historically, Zayante sandhills habitat was estimated to have covered 2,533 hectares (6,265 acres) (Lee 1994). Currently, 1,459 hectares (3,608 acres) remain in a natural state (Lee 1994). Suppression of the periodic wildfires, which are probably critical to the maintenance of Zayante sand hills habitat, has resulted in increased litter and understory vegetation such that a fire may be detrimental to the survival of the Mount Herman June beetle. Fire suppression has also resulted in increased vegetation over time, possibly reducing the quality of the habitat for this species, which may prefer open, sparsely vegetated areas (Hazeltine 1993; W. Hazeltine, pers. comm. 1994; Hoekstra, pers. obs. 1994) but also may occur in more vegetated areas of chaparral (Russell, pers. comm. 1994). Pesticides and overcollection are recognized as potential threats.

**Conservation Efforts.** Portions of the Zayante sandhills ecosystem are protected under county/state ownership in only three locations: the Quail Hollow Ranch County Park, owned by the County of Santa Cruz and the California Department of Fish and Game; Bonny Doon Ecological Reserve; and Henry Cowell Redwoods State Park (Marangio 1985, Lee 1994). The Mount Hermon June beetle, however, does not occur in either the Bonny Doon Ecological Reserve or Henry Cowell Redwoods State Park. The majority of Zayante sandhills habitat is on privately owned properties and is susceptible to continued sand mining and urban development. No Federal land is located in the region.

**Needed Recovery Actions.** The Mount Hermon June Beetle would benefit from the following recovery actions:

- Habitat Conservation Plans with quarry owners that minimize the loss of habitat from sand mining,

- Habitat Conservation Plan with County of Santa Cruz that minimizes the loss of habitat from sand mining and urban development,
- Habitat Conservation Plan with the City of Scotts Valley that minimizes loss of habitat from urban development,
- Development and implementation of management plan for Quail Hollow Ranch County Park,
- Protection of habitat through acquisition or establishment of conservation easements, and
- Conduct research focusing on habitat requirements for long-term survival (e.g., feeding behavior; requirements for larval and adult stages).

**Zayante band-winged grasshopper (*Trimerotropis infantilis*) (Figure 4)**

**Recovery Priority 8**—indicates a species having a moderate degree of threat and a high recovery potential (Appendix C).

**Description and Taxonomy.** The Zayante band-winged grasshopper (*Trimerotropis infantilis*) was first described from a sand parkland area near Mount Hermon in the Santa Cruz Mountains, Santa Cruz County, California (Rentz and Weissman 1984). The Zayante band-winged grasshopper is in the Order Orthoptera and Family Acrididae.

The body and forewings are pale gray to light brown with dark crossbands on the forewings. The basal area of the hindwings is pale yellow with a faint thin band. The lower hind tibiae (leg) are blue-gray, and the eye is banded. Males range in length from 13.7 to 17.2 millimeters (0.54 to 0.68 inch); females are larger, ranging in length from 19.7 to 21.6 millimeters (0.78 to 0.85 inch) (Otte 1984, Rentz and Weissman 1984). This species is similar in appearance to *Trimerotropis occulans* and *T. koebelei*; neither of these species is known from the Zayante sandhills region (Otte 1984, Rentz and Weissman 1984). *Trimerotropis thalassica* and *T. pallidipennis pallidipennis* have been caught nearby, but are not considered sympatric (i.e. they do not occupy the same or overlapping ranges) and are morphologically distinct from the Zayante band-winged grasshopper (Rentz and Weissman 1984).





Figure 4. Photograph of *Trimerotropis infantilis* (Zayante band-winged grasshopper) by David Weissman (with permission).

**Life History.** The flight season of the Zayante band-winged grasshopper extends from late May through August with peak activity during July and August (Raymond White, Harvey and Associates, *in litt.* 1993; Randal Morgan, private consultant, *in litt.* 1994). Specimens have been collected as late as November 1 (White, *in litt.* 1993).

Band-winged grasshoppers are conspicuous in flight because of the color of the hind wings and the crackling sound made by the wings (Borror *et al.* 1976). Individuals generally fly 1–2 meters (3–7 feet) when flushed, producing a crepitating (buzzing sound) in flight (Rentz and Weissman 1984), and often alighting on bare ground.

One Zayante band-winged grasshopper specimen was observed to be parasitized, most likely by a tachinid fly (White, *in litt.* 1993); however, the significance of parasitization on populations of this species is unknown. No additional information on the life cycle of this species is available.

**Habitat Description.** Habitat of the Zayante band-winged grasshopper was originally described as “sandy substrate sparsely covered with *Lotus* and grasses at the base of pines” (Rentz and Weissman 1984). Subsequent reports describe habitat as open sandy areas with sparse, low annual and perennial herbs on high ridges with sparse ponderosa pine. These descriptions are consistent with sand parkland. Surveys also report that the Zayante band-winged grasshopper occurs with Ben Lomond wallflower (White, *in litt.* 1993; Morgan, *in litt.* 1994). The significance of this association is unknown.

**Range and Distribution.** The Zayante band-winged grasshopper is narrowly restricted to sand parkland habitat found on ridges and hills within the Zayante sandhills ecosystem in Santa Cruz County. Approximately 200–240 hectares (500–600 acres) of sand parkland existed historically (Marangio and Morgan 1987). By 1986, only 100 hectares (250 acres) of sand parkland remained intact (Marangio and Morgan 1987). By 1992 sand parkland was reportedly reduced to only 40 hectares (100 acres) (Morgan, pers. comm. 1992). A more recent assessment revised that estimate up to 78 hectares (193 acres) because of

identification and inclusion of additional lower quality sand parkland (Lee 1994). Evaluation of sand parkland quality was based on vegetation structure and species composition.

**Population Status.** Between 1989 and 1994, Zayante band-winged grasshoppers were found at 10 of 39 sites sampled during two independent regional surveys (White, *in litt.* 1993; Morgan, *in litt.* 1994). All 10 collection locations were on Zayante series soils (Hoekstra 1994b). The habitat at these sites was consistently described as a sparsely vegetated sandy substrate or sand parkland (White, *in litt.* 1993; Morgan, *in litt.* 1994). The association and restriction of the Zayante band-winged grasshopper to sand parkland was further corroborated by an overlay of collection locations on maps delineating sand parkland habitat (Marangio 1985; Morgan, *in litt.* 1994; Lee 1994). All 10 collection locations fell within 7 discrete areas of sand parkland habitat (Hoekstra 1994b).

**Current Threats.** Over 60 percent of sand parkland is estimated to have been lost to, or altered by, human activities including sand mining, urban development, recreation, and agriculture (Marangio and Morgan 1987; Morgan, pers. comm. 1992; Lee 1994). Periodic wildfires, important for resetting vegetation succession and maintaining the open characteristics of sand parkland, have been suppressed. Pesticides and overcollection are recognized as potential threats.

**Conservation Efforts.** Only 20 hectares (49 acres) of sand parkland habitat are publicly owned: 1.2 hectares (3 acres) of high-quality and 2.4 hectares (6 acres) of low-quality habitat are protected within Quail Hollow Ranch County Park; 8 hectares (20 acres) of low-quality sand parkland are protected in the Bonny Doon Ecological Reserve, owned and managed by the California Department of Fish and Game (Lee 1994); and approximately 8 hectares (20 acres) of low-quality habitat occur in Henry Cowell Redwoods State Park (Steinmetz, pers. comm. 1993). The Zayante band-winged grasshopper does not occur in the Bonny Doon Ecological Reserve or Henry Cowell Redwoods State Park. The remaining 58 hectares (143 acres) of sand parkland are privately owned and at risk of loss to sand mining and urban development (Hillyard, pers. comm. 1993; Lee 1994).

**Needed Recovery Actions.** Specific recovery actions for the Zayante band-winged grasshopper include:

- Habitat Conservation Plans with quarry owners that minimize the loss of habitat from sand mining,
- Habitat Conservation Plan with County of Santa Cruz that minimizes the loss of habitat from sand mining and urban development,
- Development and implementation of management plan for State- and County-owned unit (Quail Hollow Ranch County Park),
- Protection of habitat through acquisition or establishment of conservation easements, and
- Conduct research focusing on habitat requirements for long-term survival.

#### **A Note on the Taxonomy of the genus *Chorizanthe***

Because of the sheer number of spineflower species in California and the character used to distinguish them, even experienced botanists may have difficulty with their taxonomy. The two spineflowers in this plan are varieties of closely related species that are both included in the *Pungentes* section (subdivision) of the genus *Chorizanthe*.

The Service listed the entire species of *Chorizanthe robusta* at the same time (U.S. Fish and Wildlife Service 1994), including the Santa Cruz Mountain variety covered in this recovery plan, the Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*). *Chorizanthe robusta* var. *robusta* (robust spineflower) occurs along the coastal and near-coastal areas of Santa Cruz and northern Monterey Counties and will be covered in a separate recovery plan.

The Service listed the varieties of *Chorizanthe pungens* separately (U.S. Fish and Wildlife Service 1992,1994). The Santa Cruz Mountains variety *Chorizanthe pungens* var. *hartwegiana* (Ben Lomond spineflower) is included in this recovery plan. *Chorizanthe pungens* var. *pungens* (Monterey spineflower), which occurs along the coastal areas of Santa Cruz and northern Monterey Counties, was listed

as threatened and is treated in a recovery plan with six other plant species and the Myrtle's silverspot butterfly (U.S. Fish and Wildlife Service 1997c).

**Ben Lomond spineflower (*Chorizanthe pungens* var. *hartwegiana*)**

**Recovery Priority 9** -- indicates a subspecies having a moderate degree of threat and a high recovery potential (Appendix C).

**Description and Taxonomy.** *Chorizanthe pungens* was first described by George Bentham in 1836 based on a specimen collected in Monterey. This taxon was recognized by George Goodman in 1934 as the type species in describing the *Pungentes* section of the genus. *Chorizanthe pungens* var. *hartwegiana* was distinguished from *C. pungens* var. *pungens* by James Reveal and Clare Hardham (1989) based on a distinction between the coastal form and an inland form "in the Ben Lomond sandhills area."

Ben Lomond spineflower is a small annual herb in the buckwheat family (Polygonaceae). The plants grow up to 2.5 decimeters (10 inches) high. Whorls of bracts (involucre) below the flowers are 1.5–2.5 millimeters (0.6–1.0 inch) long and have pink scarious (thin and dry) margins. The tepals (undifferentiated petals and sepals) are irregularly toothed at the tips. Compared to other species in the *pungens-robusta* complex, Ben Lomond spineflower is more erect and the flower clusters and associated structures (inflorescences) are pink with small distinct heads (Ertter 1996).

**Life History.** Ben Lomond spineflower is a short-lived annual species. Seeds germinate in late fall after the first substantial rains. The plants mature through the winter and then bolt and produce branches, flower in April and May, and die soon after seed production in June (McGraw and Levin 1994). The life span of the plant ranges from 15 to 21 weeks, with most of the variability coming during the adult stage. It is pollinated by a variety of insects, including wasps, bees, flies, and butterflies (Morgan, pers. comm. 1997).

Several studies carried out by students at the University of California at Santa Cruz have contributed to our knowledge of the species (Pollock 1995, Kluse 1994, Hames *et al.* 1993, McGraw and Levin 1994). Biomass and seed set varied with site conditions in a controlled experiment with plants transplanted into grass, manzanita, and pine sites. Seed set varied from none to about 60 seeds per plant, with an overall average of 8 seeds. Higher performance was closely tied to the lack of shading; the highest seed sets and survivals were in unshaded or open pine forests and the lowest under silver-leafed manzanita canopies (Kluse 1994). In another controlled experiment, potted seedlings were subjected to various soil and shade treatments. Plants grown in full sun flowered earlier than those in low shade or high shade; however, plants in low shade produced more flowers than either those in full sun or high shade (McGraw and Levin 1994).

**Habitat Description.** Ben Lomond spineflower is found on sandy Zayante soils that are the basis for the Ben Lomond sandhill communities in the Santa Cruz Mountains. This species is frequently found in association with Ben Lomond wallflower and other species restricted to the sandhills habitat. McGraw and Levin (1994) found that survivorship of potted individuals was more strongly tied to shade treatment (with highest survivorship under low shade, and lowest survivorship under high shade) than to soil treatment. Of the five soil treatments (sand, manzanita, pine, redwood, oak), all measures of performance were highest for plants grown in the four soils where spineflowers do not naturally occur. These results indicate the Ben Lomond spineflower is not restricted to sandy soils due to any chemical, physical, or biological requirement, but is intolerant of shade and unable to compete for light with other species that commonly occur on the nonsandy soils.

**Range and Distribution.** Most occurrences of Ben Lomond spineflower are found in the area generally bounded by the communities of Ben Lomond, Glenwood, Scotts Valley, and Felton. Outlying populations are located near Bonny Doon, Boulder Creek, Big Basin State Park, and Gray Whale Ranch State Park.

**Population Status and Current Threats.** Sand quarrying has resulted in the direct removal of the plant's habitat, and a currently proposed expansion of operations at Quail Hollow Quarry will eliminate additional populations (Thomas Reid Associates 1997). Residential development on smaller parcels of privately owned lands has also contributed to the elimination of Ben Lomond spineflower and the fragmentation of the remaining habitat.

**Conservation Efforts.** Protective management for sandhill parkland communities will be developed for one parcel that was recently acquired by the State of California adjacent to Quail Hollow Ranch County Park. Management plans for Quail Hollow Ranch County Park are being developed by the County of Santa Cruz; proposed recreational facilities may affect populations of both the Ben Lomond spineflower and Ben Lomond wallflower (County of Santa Cruz 1990). A few small populations also occur within Big Basin and Henry Cowell Redwoods State Parks, but there are no specific management prescriptions for this species at this time (George Gray, Ecologist, CDPR, pers. comm. 1997). The Quail Hollow Quarry Habitat Conservation Plan includes conservation of North Ridge, which supports this species and other sandhills species.

**Needed Recovery Actions.** Specific recovery actions for the Ben Lomond spineflower include:

- Habitat Conservation Plan with the County of Santa Cruz that minimizes the loss of habitat from sand mining and urban development,
- Develop and implement appropriate management actions for State-owned units (Big Basin State Park, Henry Cowell Redwoods State Park, and Gray Whale Ranch State Park). (A management plan for Quail Hollow Ranch County Park is under development and California Department of Fish and Game is currently developing a final management plan for Bonny Doon Ecologic Reserve.)
- Research focusing on habitat requirements for long-term survival, and
- Manage for reduction of competition from nonnative annual grasses and to minimize or prevent invasion of native woody species into open habitats.

**Scotts Valley spineflower (*Chorizanthe robusta* var. *hartwegii*)**

**Recovery Priority 3C**—indicates a species having a high degree of threat, a high recovery potential, and is, or may be, in conflict with construction or other development projects (Appendix C).

**Description and Taxonomy.** Hartweg originally collected this taxon in 1847. James Reveal and Randall Morgan published the combination *Chorizanthe robusta* var. *hartwegii* (Reveal and Morgan 1989). Scotts Valley spineflower is an annual species in the buckwheat family. The plant grows to 3 decimeters (12 inches) high and has an erect rather than prostrate habit. The rose-pink color on the margins of the bracts below the flowers is confined to the basal portion of the teeth. The medium-sized heads (1.0–1.5 centimeters [0.4–0.6 inch] in diameter) are distinctly clustered.

**Life History.** Scotts Valley spineflower is a short-lived annual species. This plant has not been the subject of specific studies other than population monitoring.

**Habitat Description.** Scotts Valley spineflower is endemic to Purisima sandstone and Santa Cruz mudstone in Scotts Valley in the Santa Cruz Mountains. Where Scotts Valley spineflower occurs on Purisima sandstone, the bedrock is overlain with a thin soil layer that supports a meadow community that includes herbs and low-growing grasses. The presence of certain associate species, such as toad rush (*Juncus bufonis*), sand pigmyweed (*Crassula erecta*), mosses, and lichens suggest a high seasonal moisture content. Where the plant occurs on Santa Cruz mudstone, the bedrock is variously mixed with scree (small stones or rock debris) or a thin soil layer supporting a meadow community of herbs and grasses, though of somewhat different composition than those on Purisima sandstone and with a lesser frequency of toad rush, pigmyweed, and lichens (Habitat Restoration Group 1992). Scotts Valley polygonum occurs in close proximity to Scotts Valley spineflower at several sites.



**Range and Distribution.** Virtually the entire range of the Scotts Valley spineflower occurs on four parcels, all in private ownership, and covers a range of 1.5 miles in northern Scotts Valley.

**Population Status and Current Threats.** In 1990, the total population of Scotts Valley spineflower was estimated to be about 300,000 individuals, but recent estimates have been much lower (CNDDDB 1998, Denise Duffy and Associates 1997). These fluctuations in numbers of this short-lived annual most likely have been tied to changes in climatic conditions.

Over the last 5 years, a variety of housing proposals have been considered for three of the parcels, and a fourth parcel was recently sold by Borland International to Greystone Homes for development. Scotts Valley spineflower is threatened by the destruction of a portion of currently occupied habitat associated with the proposed construction of a high school and two proposed residential developments and by secondary impacts, including alteration of the remaining habitat by trampling, introduction of nonnative species, the application of herbicides, pesticides and fertilizers, and alteration of the surrounding hydrologic regime.

**Conservation Efforts.** Each of the proposals for development has included plans for setting aside preserve areas primarily for Scotts Valley spineflower and, to some extent, for Scotts Valley polygonum (City of Scotts Valley 1991, Harding Lawson Associates 1991); however, the Service believes that preserve designs have been inadequate to maintain the long-term viability of the populations of either the spineflower or the polygonum (U.S. Fish and Wildlife Service, *in litt.* 1992, 1993).

**Needed Recovery Actions.** Specific recovery actions for Scotts Valley spineflower include:

- Protection through acquisition of habitat or establishment of conservation easements,

- Habitat Conservation Plan with the City of Scotts Valley that minimizes disturbance from urban development, and
- Conduct research focusing on habitat requirements for long-term survival.

**Ben Lomond wallflower (*Erysimum teretifolium*) (Figure 5)**

**Recovery Priority 9**--indicates a subspecies having a moderate degree of threat and a high recovery potential (Appendix C).

**Description and Taxonomy.** *Erysimum teretifolium* was first collected at Glenwood, Santa Cruz County by Horace Davis in 1914. This plant was described by Alice Eastwood in 1938 as *Erysimum filifolium*, not realizing that this combination had already been applied to another plant (Eastwood 1938). Therefore, it was renamed *Erysimum teretifolium* the following year (Eastwood 1939).

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 a raceme (flowers clustered in a terminal spike). The flowers are a deep yellow with petals 1.3–2.5 centimeters (0.5–1.0 inch) long. The fruit, a slender capsule, reaches 10 centimeters (4.0 inches) in length and is 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.

**Life History.** First-year and, frequently, second-year plants consist of a basal rosette. In subsequent years, the basal rosette withers as the main flowering stem develops. In *Erysimum* species, flowering may be postponed due to unproductive habitat; therefore, some adults may be older than two years old. Successful reproduction most likely depends on habitat characteristics and climatic conditions (Berg 1986).



Figure 5. Illustration of *Erysimum teretifolium* (Ben Lomond Wallflower) by Peg Edwards (with permission).

Brunette (1997) observed population structure and sampled seedbanks of Ben Lomond wallflower. He found that populations on South Ridge (Quail Hollow Quarry) exhibited a healthy population structure consisting of 63 percent seedlings, 21 percent subadults, 7 percent adults and 9 percent reproductive individuals; seedbanks ranged from 38 to 731 seeds per square meter. In contrast, the population at Bonny Doon Ecological Reserve supported 0 percent seedlings, 29 percent subadults, 57 percent adults, 14 percent reproductive individuals, and no seedbank.

**Habitat Description.** Ben Lomond wallflower is endemic to pockets of sandstone soils in the Santa Cruz Mountains. It is found in open areas within northern maritime chaparral and within the scattered ponderosa pine in the sand parkland. The best populations are found on ridgelines where underlying fossilized sand dollar beds inhibit the growth of all but herbaceous perennials and annuals.

**Range and Distribution.** Seventeen populations occur within the area generally bounded by the communities of Ben Lomond, Glenwood, Scotts Valley, and Felton, with one outlying population occurring in the Bonny Doon area, five miles west of Felton (Greening Associates 1996). 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 Reserve owned by California Department of Fish and Game. The ownership of two recently reported populations is unconfirmed. One population located near Olympia Quarry (operated by RMC Lonestar) may be on California Department of Fish and Game property. The other population, on a roadcut along Highway 17 near Scotts Valley, is most likely within a California Department of Transportation (Caltrans) right-of-way. All other populations are on privately owned lands.

**Population Status and Current Threats.** Historical and continuing threats to the Ben Lomond wallflower include the direct removal of habitat by sand quarrying and residential development. Alteration of habitat may also be

occurring in the form of increased canopy density within the Ben Lomond sandhills as a result of fire suppression.

Only a few of the Ben Lomond wallflower populations have been monitored sufficiently to provide trend information. The largest population is located south of Quail Hollow Road and comprises approximately 6,000 plants, about 75 percent of all Ben Lomond wallflowers. This population has already been reduced in size by sand quarrying. The next largest population comprises about 700 plants and is near Ben Lomond in a residential-zoned area that is fragmented by private homes. Three populations support 200–400 individuals: Olympia Quarry, Quail Hollow Ranch County Park, and Scotts Valley. Eleven populations comprise fewer than 200 individuals each, and one population had no individuals the last time it was checked in 1986.

The population at Bonny Doon Ecological Reserve has fluctuated in size over the last 16 years. In 1982, there were “fewer than 1000” plants, and in 1986 there were “about 25.” The population was “thriving” in 1994, but in 1997 there were only 28 individuals remaining (CNDDDB 1997, Brunette 1997, Hames *et al.* 1993).

**Conservation Efforts.** The Ben Lomond wallflower is afforded protection by the State of California; in 1981, *Erysimum teretifolium* was State-listed as endangered (Skinner and Pavlik 1994). Three populations of Ben Lomond wallflower occur on sites that are afforded some protection. One population is on the recently acquired Quail Hollow Ranch County Park site; however, development of recreational facilities is being proposed for a portion of the ranch (County of Santa Cruz 1990). The other population occurs within the Bonny Doon Ecological Reserve; a draft management plan has recently been released for public review. A third site, at North Ridge, is protected through the 1997 Habitat Conservation Plan with Graniterock for Quail Hollow Quarry’s “current mining area.”

**Needed Recovery Actions.** Specific recovery actions for Ben Lomond wallflower include:

- Habitat Conservation Plan with the County of Santa Cruz that minimizes disturbance from sand mining and residential development,
- Development and implementation of management plans for State-owned units (Quail Hollow Ranch County Park and Bonny Doon Ecological Reserve),
- Conduct research focusing on causes of reproductive failure and how to increase reproductive success, and
- Manage for reduction of succession of woody species into occupied habitat.

### **Species of Concern**

The Scotts Valley polygonum and the Ohlone tiger beetle are species of concern to the U.S. Fish and Wildlife Service and are being considered for Federal listing. The range of the Scotts Valley polygonum completely overlaps the ranges of the other taxa included in this recovery plan. Therefore, conservation recommendations for the Scotts Valley polygonum are similar to recovery recommendations for the listed species, particularly the Scotts Valley spineflower, and would serve as recovery recommendations for this species if it is listed.

Only one of the five Ohlone tiger beetle populations occurs within the ranges of the other species included in this recovery plan in the vicinity of the Glenwood area in Scotts Valley. Two of the five populations occur on California State and county land that is not included in the area covered by this recovery plan.

### **Scotts Valley polygonum (*Polygonum hickmanii*)**

**Description and Taxonomy.** *Polygonum hickmanii* is a recently described endemic species from Scotts Valley, Santa Cruz County, California (Hinds and Morgan 1995). Randy Morgan first noted the distinctness of this taxon in 1990 and made the type collection in 1993. The plant is a small, erect, taprooted annual in the buckwheat family (Polygonaceae). It grows from 2 to 5 centimeters (1 to 2 inches) tall and can be either single stemmed or profusely branching near the base. The single white flowers are found in the axils of the bracteal leaves. The nearest location of a closely related species, *Polygonum parryi*, is at Mount Hamilton about 50 miles inland. *Polygonum hickmanii* differs from *Polygonum parryi* in its

larger white flowers, longer leaves, larger anthers (pollen producing part of the flower) and achenes (type of fruit), and longer, straight stem sheath (Hinds and Morgan 1995).

**Habitat Description.** Scotts Valley polygonum occurs on gently sloping to nearly level, fine-textured shallow soils over outcrops of Santa Cruz mudstone and Purisima sandstone. It occurs with Scotts Valley spineflower and other small annual herbs in patches within isolated relict grasslands. Elevation of the sites is from 700 to 800 feet.

**Range and Distribution.** Clusters of colonies of Scotts Valley polygonum are known from two sites about one mile apart at the northern end of Scotts Valley. Total occupied habitat comprises less than one acre.

**Population Status and Current Threats.** The total population of Scotts Valley polygonum has varied between 200 to 1,000 individuals over the last few years. In 1998, the total number of individuals was estimated to be on the order of 5,000 (Kathy Lyons, *in litt.*). On the Glenwood site, colonies occur on two parcels previously proposed for a housing development, which was never initiated, by Glenwood Homes in the early 1990's. One of these colonies has recently been included in a 4.8-acre grassland preserve as part of mitigation for current construction of a high school by the Scotts Valley School District (Lyons, *in litt.* 1998, Denise Duffy and Associates 1997). Several other colonies occur on adjacent land owned by Salvation Army. The Scotts Valley Water District has recently approved a recycled water distribution system, part of which will service the Glenwood area (EMC Group). One of the pipelines and access roads will come within 100 feet or less of several of the colonies on the Salvation Army parcel.

At the Polo Ranch site, a cluster of colonies is on a parcel that was recently sold by Borland International to Greystone Homes, which plans to build 67 homes on the 84.5-acre parcel. Although much of the parcel will remain in open space, most of the Scotts Valley polygonum will occur within 100 feet of proposed housing or attendant roads (City of Scotts Valley 1998). Approval for the

development of Glenwood Homes and the Polo Ranch site falls under the purview of the City of Scotts Valley. Approvals for the high school and water distribution system were secured from the Scotts Valley Unified School District and the Scotts Valley Water District, respectively. Both of these agencies are exempt from local planning and zoning ordinances and regulations.

Scotts Valley polygonum is not listed by the State of California; therefore it receives no protection under the California Endangered Species Act. However, the species is given consideration during the environmental review process conducted under the California Environmental Quality Act. Although the Service is considering listing Scotts Valley polygonum, this plant is not federally listed.

**Conservation Efforts.** One colony occurs on a small grassland preserve on the Scotts Valley Unified School District property and will be subject to a monitoring and management plan (Biotic Resources Group 1998).

**Needed Conservation Measures.** Specific actions to protect Scotts Valley polygonum include:

- Protection through acquisition of or establishment of conservation easements on habitat in Scotts Valley,
- Include conservation measures for Scotts Valley polygonum in Habitat Conservation Plan for the two listed insect species and the Ohlone tiger beetle with the City of Scotts Valley that minimizes loss of habitat from urban development, and
- Conduct research focusing on habitat requirements for long-term survival of the species.

**Ohlone tiger beetle (*Cicindela ohlone*) (Figure not available)**

**Description and Taxonomy.** The Ohlone tiger beetle, *Cicindela ohlone*, is a member of the Coleopteran family Cicindelidae (tiger beetles). Tiger beetles are day-active, predatory insects that prey on small arthropods. Adult tiger beetles are medium-sized, elongate beetles characterized by their usually brilliant metallic



green, blue, red, and yellow coloration highlighted by stripes and spots. Adults are swift and agile predators that have strong dentate mandibles (mouthparts) for capturing prey. Tiger beetle larvae are also predatory. They live in small vertical burrows from which they lunge and seize passing invertebrate prey.

The Ohlone tiger beetle was first described in 1993 from specimens collected in Santa Cruz County, California (Freitag *et al.* 1993). The Ohlone tiger beetle has a relatively small adult body size compared to closely related *Cicindela purpurea* and other species in the *purpurea* group. Males range in length from 9.5 to 10.5 millimeters (0.37 to 0.40 inch); the females are slightly larger, ranging in length from 10.5 to 12.5 millimeters (0.40 to 0.49 inch). The adults have a bright light green dorsum with tints of bronze on the pronotal disc (hardened body wall plate on the prothorax) and elytra (leathery wing covers), particularly around the middle band. Other closely related species have a darker green or blue green dorsum (back) with indistinctive, or no brown highlight. The elytra maculations (spotted markings on the wing covers) of the Ohlone tiger beetle are broad; the closely related species have narrower markings. Females have a deep notch in the lateral portion of the gonapophysis (the process in the anal region of the beetle that serves in copulation or oviposition), and the male has sharply defined lacteroapical flanges on its median lobe (Freitag *et al.* 1993)

**Habitat Description.** The habitat of the Ohlone tiger beetle includes coastal terraces with remnant stands of open native grassland containing purple needlegrass (*Stipa pulchra*), California oat grass (*Danthonia californica*), Gairdner's yampa (*Perideridia gairdneri*), and/or Kellogg's yampa (*Perideridia kelloggii*) (Morgan, *in litt.* 1992; Freitag *et al.* 1993). Soils at these level or nearly level sites are shallow, poorly drained, pale clay or sandy clay soils over bedrock of Santa Cruz mudstone (Freitag *et al.* 1993). Adult tiger beetles generally occupy sun-exposed or open areas within their habitat to thermoregulate (control body temperature) or hunt (Knisley *et al.* 1990, Knisley and Hill 1992).

**Range and Distribution.** Surveys conducted in San Mateo, Santa Cruz, and Monterey Counties determined that the current range of the Ohlone tiger beetle extends from City of Scotts Valley to the eastern edge of the City of Santa Cruz.

The Ohlone tiger beetle is restricted to coastal terraces of clay or sandy soils. Based on soil maps, potentially suitable habitat is believed to have historically extended from southwestern San Mateo County to northwestern Monterey County, California (Freitag *et al.* 1993). Much of this habitat has been destroyed, degraded, and fragmented by urban development, agriculture, and invasion of nonnative vegetation.

**Population Status and Current Threats.** The Ohlone tiger beetle is limited to only five populations in the mid-county portion of coastal Santa Cruz County, California. Four are threatened by habitat fragmentation, degradation, and destruction due to proposed developments of residential housing, ballfields, parks, parking lots, and an entrance road. One population occurs within the range of the other taxa included in this plan, in the area of Scotts Valley.

Ohlone tiger beetle habitat sites are also threatened by invasion of nonnative vegetation (e.g., French broom [*Cytisus monspessulanus*], velvet grass [*Holcus* sp.], filaree [*Erodium* sp.] and *Eucalyptus* sp.) (Morgan, *in litt.* 1992). These nonnative plants convert sunny, open grassland habitat needed by Ohlone tiger beetles to habitat dominated by an overstory that shades the grasses and possibly eliminates areas necessary for thermoregulation, foraging, and oviposition (laying eggs). In addition to shading areas used by the beetle, nonnative vegetation will directly eliminate the open spaces by creating an unsuitable, densely vegetated habitat.

The species' restricted range and small population size increase its vulnerability to local extirpations resulting from random, naturally occurring events, such as erosion, disease, or predation. Recreational use of habitat (i.e., bicycling or off-road motor vehicle use), overcollection, and pesticides are recognized as potential threats.

The Ohlone tiger beetle is not State-listed and receives no protection under the California Endangered Species Act. However, the species is given consideration during the environmental review process conducted under the California

Environmental Quality Act. Although the Service is considering listing the Ohlone tiger beetle, this species is not federally listed.

**Needed Conservation Measures.** Specific actions that would provide protection for the Ohlone tiger beetle include:

- Habitat Conservation Plans with the County of Santa Cruz, City of Santa Cruz, and City of Scotts Valley that minimize loss of habitat from urban development,
- Protection of habitat through acquisition or conservation easements on habitat in the City of Santa Cruz and Scotts Valley, and
- Conduct research focusing on habitat requirements for long-term survival.

### **Overlapping Listed Species**

The Santa Cruz cypress is a Federally listed species that overlaps with other taxa in this plan in the vicinity of Bonny Doon. Information below on Santa Cruz cypress is taken from its Draft Recovery Plan prepared by the Service (U.S. Fish and Wildlife Service 1997).

### **Description and Taxonomy**

A member of the coniferous cypress family (Cupressaceae), Santa Cruz cypress (*Cupressus abramsiana*) is a tree 1 to 25 m (3 to 82 ft) in height. The grey bark is fibrous, thin, and broken into vertical strips or plates, and the scale-like leaves are bright green. The seed cones are spheric to widely elliptic and have 8 to 10 brown scales with a central projection. Cones are serotinous, but the species does recruit at sites that have not burned recently. Although some taxonomists have classified Santa Cruz cypress as a variety or subspecies of Gowen cypress (*Cupressus goveniana*) with recognized intermediate characteristics, the most recent taxonomic treatment by Bartel, as published in The Jepson Manual (Hickman 1993), recognizes Santa Cruz cypress as a distinct species. Bartel confirms the original description of the species by Wolf in 1948.

The Ohlone tiger beetle is restricted to coastal terraces of clay or sandy soils. Based on soil maps, potentially suitable habitat is believed to have historically extended from southwestern San Mateo County to northwestern Monterey County, California (Freitag *et al.* 1993). Much of this habitat has been destroyed, degraded, and fragmented by urban development, agriculture, and invasion of nonnative vegetation.

**Population Status and Current Threats.** The Ohlone tiger beetle is limited to only five populations in the mid-county portion of coastal Santa Cruz County, California. Four are threatened by habitat fragmentation, degradation, and destruction due to proposed developments of residential housing, ballfields, parks, parking lots, and an entrance road. One population occurs within the range of the other taxa included in this plan, in the area of Scotts Valley.

Ohlone tiger beetle habitat sites are also threatened by invasion of nonnative vegetation (e.g., French broom [*Cytisus monspessulanus*], velvet grass [*Holcus* sp.], filaree [*Erodium* sp.] and *Eucalyptus* sp.) (Morgan, *in litt.* 1992). These nonnative plants convert sunny, open grassland habitat needed by Ohlone tiger beetles to habitat dominated by an overstory that shades the grasses and possibly eliminates areas necessary for thermoregulation, foraging, and oviposition (laying eggs). In addition to shading areas used by the beetle, nonnative vegetation will directly eliminate the open spaces by creating an unsuitable, densely vegetated habitat.

The species' restricted range and small population size increase its vulnerability to local extirpations resulting from random, naturally occurring events, such as erosion, disease, or predation. Recreational use of habitat (i.e., bicycling or off-road motor vehicle use), overcollection, and pesticides are recognized as potential threats.

The Ohlone tiger beetle is not State-listed and receives no protection under the California Endangered Species Act. However, the species is given consideration during the environmental review process conducted under the California

Environmental Quality Act. Although the Service is considering listing the Ohlone tiger beetle, this species is not federally listed.

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- Habitat Conservation Plans with the County of Santa Cruz, City of Santa Cruz, and City of Scotts Valley that minimize loss of habitat from urban development,
- Protection of habitat through acquisition or conservation easements on habitat in the City of Santa Cruz and Scotts Valley, and
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### **Habitat Description**

Santa Cruz cypress occurs on dry ridges above the fog belt, in patches and within a mosaic of coastal chaparral and mixed evergreen forest vegetation, including knobcone pine, ponderosa pine, and redwood forests. Distribution of the cypress is restricted in part by the limited amount of suitable habitat, especially on soils that tend to be poorly developed, sandy or gravelly in texture, and well-drained.

### **Range and Distribution**

The species exists only in five populations. More than 5,100 total individuals cumulatively occupy approximately 142 hectares (356 acres) along a 24 kilometer (15 mile) range of the Santa Cruz Mountains in Santa Cruz and San Mateo Counties, California. The Bonny Doon population is the largest and supports over 3000 individuals; this is the only population that overlaps in range with other species in this plan.

### **Population Status and Current Threats**

When Santa Cruz cypress was federally listed as endangered, primary threats were alteration and destruction of habitat due to logging, agricultural conversion, and land development. Secondary threats to the cypress may be posed by alteration of natural fire cycles, genetic introgression, disease and insect infestation, and competition with alien plants; however, the extent to which these factors pose a threat has not yet been fully evaluated. The restricted range of the species may enable random events to extirpate one or more populations.

### **Conservation Efforts**

Santa Cruz cypress is both federally and state listed as an endangered plant species. 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, and three of the five 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. Moreover, some of the private landowners reportedly are interested

in conserving the species by selling their property to a local private land conservancy, but funding for this has not been available.

### **Needed Recovery Actions**

As outlined in the Santa Cruz Cypress Draft Recovery Plan, the following recovery actions are needed: (1) Secure habitat for those populations that occur on private lands; (2) Conduct research on life history, ecological requirements, and population demographics of the species to contribute toward development of management plans for each population; (3) Develop and implement management plans for each populations and its habitat; (4) Develop a public education program; and (5) Establish an *ex situ* seed bank. The total recovery cost is estimated at \$51, 500 over 5 years.

### **F. Overall Recovery Strategy**

The species addressed in this plan, which have overlapping ranges, are restricted both geographically and by the amount of available habitat. Because these species are naturally rare and habitat is naturally fragmented, minimizing habitat destruction and degradation is of more immediate importance than addressing habitat fragmentation and metapopulation dynamics. For these reasons, recovery efforts should be focused on conserving the sand parkland habitat and other appropriate habitat within the Santa Cruz Mountains. The priorities for achieving recovery are as follows:

**1. Protect habitat for Santa Cruz Mountains species.** Because the principal threat to these species is loss of habitat resulting primarily from sand mining and urban development, these activities should be curtailed or reduced significantly in appropriate habitat areas. Sand mining activities are under the purview of the County, and therefore the County should use its authorities to ensure that future sand mining activities do not impact habitat for these species. Approval of urban development, except within the city limits of Scotts Valley, also falls under the purview of the County. The County and the City of Scotts Valley should use their authorities, including the use of conservation easements and other tools, to ensure that future development does not impact habitat for these species.

In addition to regulating future activities, all interested parties, including the Service, California Department of Fish and Game, the County, the City of Scotts Valley, and other nongovernmental organizations, such as the California Native Plant Society and the Sempervirens Fund, should work together to acquire high priority parcels to add to current conservation areas or initiate new sites.

**2. Manage habitat for Santa Cruz Mountains species.** Protected habitat should be managed to ensure ecosystem processes vital to the long-term survival of the subject species are allowed to function. Such ecosystem processes include edaphic and hydrologic functioning, nutrient cycling, pollinator activity, and seed dispersal mechanisms. Management plans should be developed for specific sites that identify the most appropriate activities for maintaining ecosystem functioning, if needed. Management activities should include the use of controlled burning or other controlled disturbance methods and control of nonnative plant invasions, competing native vegetation (natural succession), recreational activities that would cause soil erosion or compaction, and pesticide applications.

**3. Conduct research.** Research that contributes to a greater understanding of what individual species require for long-term survival will contribute to the development and revision of more appropriate management goals. Research for each species should include, but not be limited to, distribution surveys, key species interactions, key life history stages and rates influencing population viability, population dynamics studies, population monitoring, habitat characterization, restoration methods, effects of alternative management strategies, and threat monitoring.

**4. Locate additional habitat/populations within species' historic range.** If additional populations of the insect or plant species in this plan are located as a result of future surveys, these populations should be evaluated to assess any appropriate conservation measures.



**5. Develop an implement a public outreach program.** A program should be developed to educate landowners and interested nongovernmental organizations about the significance of these taxa.

**6. Evaluate progress of effectiveness management and recovery actions and revise management plans and recovery criteria.** Based on the effectiveness of the efforts to preserve and manage habitat and the information resulting from research, recovery criteria for each of the species should be revised in the future, as necessary.

## II. RECOVERY

### A. Objectives and Criteria

**Recovery Objectives:** Delisting is feasible for four listed species (Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower) with habitat protection and appropriate management actions.

**Interim Objective for Scotts Valley Spineflower and Scotts Valley Polygonum:**

Avert extinction by establishing conservation easements, restricting activities to those compatible land uses with the plant or acquiring all parcels of private land supporting these species.

**Interim Downlisting Criteria:**

**Mount Hermon June beetle**

- The 28 currently known sites have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans including HCP's for Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, County of Santa Cruz, and the City of Scotts Valley. Conservation easements should be negotiated with private landowners not included in Habitat Conservation Plans for high-priority and medium-priority parcels in sandhills habitat .
- Management plan for Quail Hollow Ranch County Park has been developed and is being implemented.
- Population numbers are stable or increasing.

**Zayante band-winged grasshopper**

- The 7 discrete areas of sand parkland containing the 10 currently known collection sites have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans including

HCP's for Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz.

- Management plan for Quail Hollow Ranch County Park developed and being implemented.
- Population numbers are stable or increasing.

#### **Ben Lomond spineflower**

- The 21 currently known populations have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans.
- Conservation measures for this species are included in Habitat Conservation Plans (Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz) that have been developed and implemented for the listed insect species.
- Management plans for populations on Quail Hollow Ranch County Park and the adjacent State-owned parcel, Bonny Doon Ecological Reserve, Henry Cowell Redwoods State Park, Big Basin State Park, and Gray Whale Ranch State Park are developed and being implemented.
- Population numbers are stable or increasing.

#### **Ben Lomond wallflower**

- The 17 currently known populations have been secured through fee-title acquisition, conservation easements, or Habitat Conservation Plans.
- Management plans for populations on Quail Hollow Ranch County Park and Bonny Doon Ecological Reserve are developed and being implemented.
- Conservation measures for this species are included in Habitat Conservation Plans (Graniterock Quarry, Kaiser Sand and Gravel Felton Plant, and the County of Santa Cruz) that have been developed and implemented for the listed insect species.
- Population numbers are stable or increasing.

### **Scotts Valley spineflower**

- All four parcels of private land that support the Scotts Valley spineflower have permanent conservation easements or have been acquired.
- Conservation measures for the Scotts Valley spineflower are included in a Habitat Conservation Plan with the City of Scotts Valley.
- Population numbers are stable or increasing.

### **Interim Delisting Criteria:**

#### **Mount Hermon June beetle, Zayante-winged grasshopper, Ben Lomond wallflower, and Ben Lomond spineflower**

Definitive delisting criteria will be developed for each species as more information becomes available on biology, range, and distribution through research and surveys. When the downlisting criteria have been met for a species the species can be considered for delisting if:

- Threats are reduced or eliminated so that populations are capable of persisting without significant human intervention or perpetual endowments are secured for management necessary to maintain the continued existence of the species.

#### **Scotts Valley spineflower**

- Delisting of this species may not be feasible due to limited range and limited conservation opportunities.

**Long-term conservation actions for the Scotts Valley polygonum:** Long-term conservation actions are necessary for the Scotts Valley polygonum, which is being considered for Federal listing. These conservation actions would become recovery actions should this species be listed.

Long-term conservation actions for the Scotts Valley polygonum include establishing permanent conservation easements or acquisition of the two sites in

Scotts Valley and addressing conservation measures for this species in Habitat Conservation Plans with the City of Scotts Valley for the listed insect species.

## **B. Narrative Outline for Recovery Actions**

### **1. Protect habitat for Santa Cruz Mountains species on private land through Habitat Conservation Plans and landowner agreements.**

Because of the extremely limited amount of habitat that exists, recovery cannot be achieved by the management of State and County lands alone (see task 2). Habitat Conservation Planning with local governments, quarry owners, and developers will provide additional protection. The long-term survival of these species will depend to a large extent on the protection that can be achieved on private lands.

#### **1.1 Reduce loss of sand parkland and northern maritime chaparral habitat due to sand mining and urban development.**

The loss of sand parkland and northern maritime chaparral habitat to sand mining and urban development are the major threats to the long-term survival of the Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower. Tools for reducing loss of these habitats include the development and implementation of Habitat Conservation Plans, conservation easements, and deed restrictions. Habitat Conservation Plans should address any threats identified for the species in the covered area, including competition from nonnative plants, encroachment of woody species into open sites, erosion and soil compaction, recreational impacts, and insecticide use. They should also identify opportunities for restoration and enhancement of any sites considered important for recovery of the species.

##### **1.1.1 Develop and implement Habitat Conservation Plans for quarry sites that support Mount Hermon June beetle and Zayante band-winged grasshopper.**

Habitat Conservation Plans developed to protect the two listed insect species, should also include measures to protect habitat for the Ben Lomond spineflower and the Ben Lomond wallflower as well.

1.1.1.1 Develop and implement a Habitat Conservation Plan with Graniterock for Quail Hollow Quarry.

Graniterock has developed a Habitat Conservation Plan to cover its short-term and long-term mining needs. The Service issued a 3-year 10(a)(1)(B) permit to Graniterock on August 1, 1997. The Habitat Conservation Plan establishes a conservation easement in perpetuity on North Ridge in exchange for approval of pending mining activity. Graniterock intends to apply for a long-term permit to cover expanded mining in other areas. If future mining activity is approved, South Ridge will be sold to the County, and the West Ridge will be put in a conservation easement.

1.1.1.2 Develop and implement a Habitat Conservation Plan with Kaiser Sand and Gravel for the Felton Plant.

A revised draft Habitat Conservation Plan, currently being reviewed by the Service, would include conservation measures for the Mount Hermon June beetle and the Zayante band-winged grasshopper.

1.1.2 Develop and implement a regional Habitat Conservation Plan with the County of Santa Cruz.

The Habitat Conservation Plan should include guidelines for allowing mining to proceed when sufficient protections for listed species and their habitats have been established. Although a Habitat Conservation Plan for Graniterock (Quail Hollow Quarry) has been developed, and a revised draft Habitat Conservation Plan for Kaiser Sand and Gravel (Felton Plant) is currently being reviewed by the Service, a regional Habitat

Conservation Plan would allow the Service and the County to establish guidelines to be followed for any future mining activity, eliminating the need to develop individual Habitat Conservation Plans.

1.1.3 Develop and implement a Habitat Conservation Plan with the City of Scotts Valley.

Scotts Valley spineflower, Scotts Valley polygonum, and the Ohlone tiger beetle are restricted to patches of grassland in northern Scotts Valley. If the Ohlone tiger beetle is federally listed, the Service and the City of Scotts Valley should develop a Habitat Conservation Plan to also include conservation measures for the two plants.

Suitable habitat that is populated by the Mount Hermon June Beetle exists in the Zayante sandhill habitats of the City of Scotts Valley. If future developments are proposed in this area, the Service and the City of Scotts Valley should pursue a Habitat Conservation Plan that addresses the Mount Hermon June beetle.

1.1.4 Negotiate conservation easements on suitable habitat that is not included in Habitat Conservation Plans.

Habitat for the seven species in this plan that are not included in Habitat Conservation Plans should be secured and protected through acquisition, conservation easements, or deed restrictions. Conservation easements should be negotiated with private landowners in areas with suitable habitat for the Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower that may not be included in Habitat Conservation Plans. Conservation easements will be especially important to protect habitat for the two listed plants where neither of the two listed insects is present. Conservation easements can also potentially provide long-term conservation for habitat that supports the two species of concern.

For the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower, priority parcels include South Ridge at the Graniterock Quarry and sites at Olympia Quarry.

1.1.5 Secure and protect high-priority parcels in collaboration with other State, County, local agencies and nongovernmental organizations.

The best habitat for these taxa is habitat that is intact, unfragmented, and not degraded.

1.1.5.1 Secure and protect portions of dry grassland habitat in northern Scotts Valley.

The Glenwood High School District, Salvation Army, and Greystone Homes properties support high priority habitat for Ohlone tiger beetle, Scotts Valley spineflower, and Scotts Valley polygonum. These sites should be secured and protected through acquisition, conservation easements, or deed restrictions.

1.5.1.2 Secure and protect portions of sandhill habitats and northern maritime chaparral.

Other properties that support habitat for the Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower should be secured.

A high priority area that should be secured and protected for the insects is the site located south of Mission Springs and north of Mt. Hermon Road, extending northeastward to Olympia. If future developments are proposed for this area, a Habitat Conservation Plan should be developed and implemented.



1.1.6 Secure and protect medium-priority parcels in collaboration with other State, county, local agencies and nongovernmental organizations.

Habitat for the species in this plan that are not included in Habitat Conservation Plans should be secured and protected through acquisition, conservation easements, or deed restrictions. Two medium-priority sites that should be secured and protected are sandhill habitats located (1) between Highway 17 and Henry Cowell Redwoods State Park (along Graham Hill Road) and (2) north of Lockhart Gulch Road and south of Gibbs Avenue.

2. Manage habitat for Santa Cruz Mountains species.

Management of the seven species included in this recovery plan and the habitats that support them will depend on data gathered from monitoring, threat analyses, and available conservation measures. Development and implementation of management programs should be specific to the species complex, ecological process, landowner, and particular threats to be managed.

2.1 Develop techniques and management guidelines to address specific threats.

Some of the threats to the species in this recovery plan can be minimized or eliminated through land management practices. Techniques for managing these threats need to be developed, and management guidelines for using these techniques should be provided to land managers and private landowners.

2.1.1 Control invasion of nonnative plants.

Techniques and management guidelines should be developed for controlling invasive nonnative plants where they compete with Ben Lomond spineflower. For areas with nonnative grasses, controlled burns may be the most effective tool for reducing competition. If controlled burns are to be conducted on Mount Hermon June beetle or Zayante

band-winged grasshopper habitat, burns should be timed during the wet season, between mid-November and January, to avoid the periods of activity for the adult insects.

2.1.2 Reduce encroachment of woody species (forest succession) into more open habitat that supports these species.

Techniques and management guidelines should be developed for controlling encroachment of woody species. Controlled burns may be the most effective tool for reducing cover by woody species. If controlled burns are to be conducted on Mount Hermon June beetle or Zayante band-winged grasshopper habitat, burns should be timed during the wet season between mid-November and January to avoid the periods of activity for the adult insects; however, other means, such as manual removal, may also be appropriate.

2.1.3 Reduce or control erosion and soil compaction caused by trails, roads, mining, and construction activities.

Techniques and management guidelines for reducing or controlling erosion and soil compaction should be developed. Activities that promote soil erosion, disturb soil integrity, or remove vegetation, such as sand mining, urban development, road construction, and off-trail recreational activities (i.e., off-road vehicles), should be minimized or prevented.

2.1.4 Reduce impacts from recreation (i.e., ORV, equestrian activities, hiking, bicycling, and camping) on these species.

Techniques and management guidelines should be developed to reduce impacts from recreation. Impacts can be reduced or eliminated through appropriate rerouting, revegetation, closure, or other means.

### 2.1.5 Limit use of insecticides in areas adjacent to occupied habitat.

Guidelines for use of insecticides should be developed for areas adjacent to habitat occupied by the plan species. Some habitat areas of the Mount Hermon June beetle and Zayante band-winged grasshopper are adjacent to residential, commercial, and public developments. Public awareness and appropriate limitations should be established to reduce the potential for unintentional adverse effects such as drift of aerially applied insecticides.

### 2.1.6 Restore and enhance selected sites.

Techniques and management guidelines for selecting, restoring and enhancing sites important to the recovery of the plan species should be developed. Selected sites with minimal ground disturbance may be appropriate for restoration activities. Sites that have been disturbed by trails or roads that are now closed, or areas that have been cleared but still maintain an intact soil profile, may respond well to restoration efforts.

## 2.2 Develop and implement management plans for sensitive species that occur on State-owned parcels.

State-owned and managed parks and reserves present some of the best options for managing these species due to their mandates to protect sensitive resources. Management plans should address any threats identified for the species in the covered area, including competition of nonnative plants (task 2.1.1), encroachment of woody species into open sites (task 2.1.2), erosion and soil compaction (task 2.1.3), recreational impacts (task 2.1.4), and insecticide use (task 2.1.5). Management plans should also identify opportunities for restoration and enhancement of any sites considered important for recovery of the species.

### 2.2.1 Develop and implement a management plan for Bonny Doon Ecological Reserve.

A final management plan is being developed by California Department of Fish and Game. This unit supports populations of Ben Lomond spineflower and Ben Lomond wallflower. Management of habitats to reduce competition from nonnative species (task 2.1.1) and from encroachment by surrounding forest communities (task 2.1.2) is a high priority.

2.2.2 Develop and implement a management plan for Quail Hollow Ranch County Park in conjunction with the County of Santa Cruz.

Quail Hollow Ranch County Park supports populations of Ben Lomond spineflower, Ben Lomond wallflower, Mount Hermon June beetle, and Zayante band-winged grasshopper. Management of recreational impacts on the species is a high priority (task 2.1.4). ORV traffic should be restricted or limited to prevent habitat disturbance and degradation.

2.2.3 Develop and implement a management plan for Henry Cowell Redwoods State Park.

The status of the population of Ben Lomond spineflower in this State park should be assessed, and management needs that are identified should be addressed in the management plan.

2.2.4 Develop and implement a management plan for Big Basin State Park.

The status of the population of Ben Lomond spineflower in this State park should be assessed, and management needs that are identified should be addressed in the management plan.

2.2.5 Develop and implement a management plan for Gray Whale Ranch State Park.

The status of the population of Ben Lomond spineflower in this State park should be assessed, and management needs that are identified should be addressed in the management plan.

### 2.3 Manage habitat for species that occur on private lands.

Management should be directed toward reducing threats to these species. Management plans, using techniques and guidelines developed in task 2.1, should be developed and implemented in coordination with landowners, appropriate agencies, and other interested parties.

#### 2.3.1 Establish a working group with private landowners to develop management practices for private lands.

Working groups should include interested private landowners, appropriate agencies (including the Service, the California Department of Fish and Game, the County of Santa Cruz, the California Department of Forestry), and other nongovernmental organizations (including the California Native Plant Society). The group would identify specific threats and implement specific management practices (task 2.1) to protect these species and their habitats on private lands.

### 3. Conduct research on the life history, ecology, and population dynamics of these species that will contribute to appropriate management strategies.

Research is needed to ensure that management actions that are undertaken are appropriate and will contribute to the long-term survival of these species and the habitats on which they depend.

#### 3.1 Conduct research on the life history of these species to identify factors influencing their long-term conservation.

Minimal information currently exists on the life history of these species. Research on their life histories should focus on identifying those

particular stages that are critical to maintaining viable reproductive populations. Additional studies on dispersal, recolonization, reproduction, and any interspecific interactions that may limit population numbers or densities (e.g., parasitism, herbivory, and competition) should be conducted to augment understanding of the species biology and ecology and to refine management efforts. Additional studies on the plants' seed bank sizes and dynamics should be conducted to better understand how populations will respond to disturbance regimes.

### 3.2 Conduct more distribution surveys for the insects.

Distribution surveys should be conducted to assess the location and detailed boundaries of the insects' populations within inhabited sandhill parkland. Available collection data are not sufficient to determine precise population ranges of the insects. Additional information on the life history of these insects (e.g., reproduction, larval biology, and dispersal capabilities), will be used to determine detailed ranges of populations, guide habitat protection efforts, and refine site-specific habitat recovery areas.

### 3.3 Conduct research on habitat requirements for the insects.

Studies should be conducted to characterize specific habitat requirements in sandhill parkland that are needed by the insects, including all life cycle stages. Research results should determine the associated vegetation structure, soil characteristics, and any other relevant physical parameters needed to meet the resource requirements of the insects.

### 3.4 Conduct habitat enhancement and restoration trials for sandhill and northern maritime chaparral habitats that support Mount Hermon June beetle, Zavante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower.

Potential habitat exists in disturbed areas. Recovery potential can be enhanced if these areas can be restored so that they support the needs of these species. Certain sites that have had minimal to moderate surface disturbance may be appropriate for restoration trials. For example, sites that have been subject to recreational use (camping, trails, equestrian use) or have been cleared but still maintain intact soil profiles are more likely to respond to restoration efforts than heavily disturbed sites. Other sites with little or no past disturbance may be enhanced by using controlled disturbance to maintain or improve habitat quality, particularly if woody plant encroachment or nonnative plant invasions are a problem.

3.5 Conduct regular population monitoring for all species.

Monitoring should focus on demographics, population trends, and threat monitoring. The information gathered from monitoring should be used to evaluate the status of the species and the success of any management actions that are being implemented. Management actions should then be modified accordingly.

4. Locate additional habitat/populations within the historic range of the species.

The status of any new populations of these species that are discovered in the future should be evaluated and an assessment made of appropriate management actions. The value to the recovery strategy for these species of any additional habitat that is located should be assessed.

Potential sandhill habitats that should be extensively resurveyed for the Mount Hermon June beetle and Zayante band-winged grasshopper are located (1) in the area northwest of Quail Hollow Road and southwest of Loch Lomond Reservoir, (2) southwest of Graham Hill Road, and (3) in Redwood Glen Camp.

5. Develop and implement a public outreach program.

An educational program should be established for the public, including private landowners whose property supports these taxa or suitable habitat, to encourage conservation and proper management of the taxa. Nongovernmental organizations such as the California Native Plant Society and the Santa Cruz Mountains Biodiversity Task Force should be approached about participating in this effort.

#### 5.1 Develop educational materials.

Educational brochures and other materials (such as video or slide presentation) should be prepared that include discussion of the importance of the taxa to the region (e.g., legal status), plant and insect identification, ecology, and related management issues (e.g., use of fire or mechanical methods for species regeneration, recommended landscape species compatible for adjacent development). Separate brochures could be developed to target youth in public schools and an adult audience.

#### 5.2 Implement educational program.

Distribute brochures and other educational materials through local public schools and directly to private landowners and other interested audiences in the local area.

### 6. Evaluate progress of recovery effectiveness of management and recovery actions and revise management plans.

#### 6.1 Refine downlisting criteria and/or delisting criteria.

The current criteria for downlisting of the Mount Hermon June beetle, Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower include maintaining the same number of populations as are currently known and ensuring that management actions have secured these populations from human-caused threats. The status of the populations and the result of management actions should be assessed as to their success in



contributing to the recovery of the species. The criteria should be refined based on this assessment. Based on information gathered from life history studies, monitoring, and management actions that have been taken, criteria for delisting should be developed for these species.

Information gathered from life history studies, monitoring, and management actions should be used to determine whether downlisting or delisting criteria for the Scotts Valley spineflower can be established, and whether recovery and management actions for the listed species are adequate to protect the Scotts Valley polygonum and the Ohlone tiger beetle.

## 6.2 Update management guidelines for all species.

Review of the relative success and failure of various management actions in attaining recovery goals should be used to update management guidelines. This includes management plans for county- and State-owned units as well as management actions that have been undertaken on private lands.

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## V. IMPLEMENTATION SCHEDULE

The table that follows is a summary of scheduled actions and costs for the Santa Cruz Mountains Recovery Plan. It is a guide for meeting the objectives discussed in Part II of this plan. The actions identified in the Implementation Schedule should bring about the recovery of the Mount Hermon June beetle, the Zayante band-winged grasshopper, Ben Lomond spineflower, and Ben Lomond wallflower, prevent extinction of Scotts Valley spineflower, and provide long-term conservation for Scotts Valley polygonum and Ohlone tiger beetle. The table indicates the task priority, which agencies are responsible to perform these tasks, a timetable for accomplishing these tasks, and the estimated costs. Initiation of these tasks is subject to the availability of funds.

**Priorities in the first column of the Implementation Schedule are assigned as follows:**

- Priority 1: An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
- Priority 2: An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.
- Priority 3: All other actions necessary to provide for full recovery of the species.

### **Terms used in the Implementation Schedule:**

Continuous Task = Task will be implemented on an annual basis once it is begun.

Total Cost = Projected cost of task from start to completion.

Responsible Parties (\* designates lead agency):

CDFG	= California of Fish and Game
CDF	= California Department of Forestry
CDPR	= California Department of Parks and Recreation
PVT	= Private parties
SCCO	= Santa Cruz County
UCSC	= University of California, Santa Cruz
USDA	= U.S. Department of Agriculture
USFWS	= U.S. Fish and Wildlife Service

Recovery Plan Implementation Schedule for Two Insects and Three Plants from the Santa Cruz Mountains.

Priority #	Task #	Task Description	Task Duration (yrs)	Responsible Party	Cost Estimates (\$1,000)					Comments
					Total Cost	FY1	FY2	FY3	FY4	
<b>Need 1: Protect habitat</b>										
1	1.1.5.1	Secure & protect dry grassland in Scotts Valley	5	PVT TBD	TBD					
1	1.1.5.2	Secure & protect high-priority sandhill parklands and northern maritime chaparral	5	TBD	TBD					
2	1.1.1.1	Develop HCP for Quail Hollow Quarry	done	USFWS* CDFG SCCO PVT						
2	1.1.1.2	Develop HCP for Kaiser Felton Plant	1	USFWS* CDFG SCCO PVT	10	10	0	0	0	0
2	1.1.2	Develop HCP with County of Santa Cruz	3	USFWS* CDFG SCCO	120	40	40	40	0	0
2	1.1.3	Develop HCP with City of Scotts Valley	2	USFWS* CDFG PVT	20	0	10	10	0	0
2	1.1.4	Establish conservation easements on other sites not covered by HCPs	5	USFWS CDFG* PVT	TBD					
2	1.1.6	Secure & protect medium-priority sandhill parklands and northern maritime chaparral	10	TBD	TBD					
<b>Need 1 Subtotal Cost:</b>					150	50	50	50		
					+TBD					

Recovery Plan Implementation Schedule for Two Insects and Three Plants from the Santa Cruz Mountains.

Priority #	Task #	Task Description	Task Duration (yrs)	Responsible Party	Cost Estimates (\$1,000)						Comments
					Total Cost	FY1	FY2	FY3	FY4	FY5	
<b>Need 2: Manage habitat</b>											
2	2.1.3	Reduce erosion and soil compaction	Continuous	CDFG* PVT	10	1	1	1	1	1	
2	2.1.4	Reduce impacts from recreation	Continuous	CDFG* PVT	10	1	1	1	1	1	
3	2.2.1	Develop & implement plan for Bonny Doon Ecological Preserve	Continuous	CDFG*	35	26	1	1	1	1	CDFG is currently developing a final management plan
3	2.2.2	Develop & implement plan for Quail Hollow Ranch County Park	Continuous	CDFG SCCO*	35	26	1	1	1	1	
3	2.2.3	Develop & implement plan for Henry Cowell Redwoods State Park	Continuous	CDPR*	35	26	1	1	1	1	
3	2.2.4	Develop & implement plan for Big Basin State Park	Continuous	CDPR*	35	26	1	1	1	1	
3	2.2.5	Develop & implement plan for Gray Whale Ranch State Park	Continuous	CDPR*	35	26	1	1	1	1	
3	2.1.1	Control invasion of nonnative plants	Continuous	CDFG* CDF PVT	50	5	5	5	5	5	
3	2.1.2	Reduce encroachment of woody taxa	Continuous	CDFG* CDF PVT	50	5	5	5	5	5	
3	2.1.5	Limit use of insecticides	Continuous	CDFG* USDA PVT	5	0.5	0.5	0.5	0.5	0.5	

Recovery Plan Implementation Schedule for Two Insects and Three Plants from the Santa Cruz Mountains.

Priority #	Task #	Task Description	Task Duration (yrs)	Responsible Party	Cost Estimates (\$1,000)					Comments	
					Total Cost	FY1	FY2	FY3	FY4		FY5
3	2.1.6	Restore selected sites	Continuous	CDFG* PVT	10	1	1	1	1	1	
3	2.3.1	Establish private landowner working group									
<b>Need 2 Subtotal Cost:</b>					290	141.5	16.5	16.5	16.5	16.5	
<b>Need 3: Conduct research</b>											
2	3.1	Conduct research on life histories	3	CDFG* USFWS UCSC	72	0	24	24	24	0	
2	3.2	Conduct distribution surveys for insects	3	CDFG* USFWS UCSC	24	8	8	8	0	0	
2	3.3	Conduct research on habitat requirements	3	CDFG* USFWS UCSC	36	12	12	12	0	0	
2	3.4	Conduct restoration trials	3	CDFG* USFWS UCSC	12	0	0	4	4	4	
2	3.5	Conduct population monitoring	Continuous	CDFG* USFWS UCSC	100	10	10	10	10	10	
<b>Need 3 Subtotal Cost:</b>					244	30	54	58	38	14	

Recovery Plan Implementation Schedule for Two Insects and Three Plants from the Santa Cruz Mountains.

Priority #	Task #	Task Description	Task Duration (yrs)	Responsible Party	Cost Estimates (\$1,000)						Comments
					Total Cost	FY1	FY2	FY3	FY4	FY5	
<b>Need 4: Locate additional habitat/populations</b>											
2	4	Locate additional habitat/populations	2	CDFG* USFWS	10	0	0	5	5	0	
<b>Need 4 Subtotal Cost:</b>					10	0	0	5	5	0	
<b>Need 5: Develop and implement a public outreach program</b>											
3	5.1	Develop educational materials			6	3	2	1	0	0	
3	5.2	Implement education program			6	0	2	2	2	0	
<b>Need 5 Subtotal Cost:</b>					12	3	4	3	2	0	
<b>Need 6: Review &amp; revise recovery criteria</b>											
3	6.1	Refine recovery criteria	1	USFWS*	2	0	0	0	2	0	
3	6.2	Update management guidelines	1	USFWS*	5	0	0	0	0	5	
<b>Need 6 Subtotal Cost:</b>					7	0	0	0	2	5	
<b>TOTAL COST:</b>					583	224.5	124.5	127.5	65.5	35.5	



**APPENDIX A: Summary of the Agency and Public Comments on the Draft Recovery Plan for Two Insects and Four Plants from the Santa Cruz Mountains**

On September 30, 1997, the Service released the Draft Recovery Plan for Two Insects and Four Plants from the Santa Cruz Mountains for a 90-day comment period that ended on December 29, 1997, for Federal agencies, State and local governments, and members of the public (62 Federal Register 51122).

Twenty-two letters were received, each containing varying numbers of comments. Local jurisdictions that responded included the County of Santa Cruz and the City of Scotts Valley. Copies of the draft recovery plan were sent to a total of 160 interested parties. Of these, seven individuals were asked to peer review the document; all seven peer reviewers responded. Peer reviewers were selected on their familiarity with either a taxonomic group, a geographic area, and/or jurisdictional issues.

**The number of letters received, by affiliation:**

State agencies	1
Local governments	2
Environmental/conservation organizations	1
Equestrian users	7
Other recreational users	2
Academia/professionals	8

**Summary of Significant Comments and Service Responses**

The Service reviewed all of the comments received during the comment period, as well as several received after the comment period closed. Comments that were either technical in nature, or were updating the information in the draft recovery plan have been incorporated into the appropriate section of the recovery plan. Summarized below are comments that were more substantive in nature, along

with the Service's response to each, and an indication as to what modifications were made to the plan, if any:

Comment 1: Local governments do not have funding available to implement recovery efforts. Have specific funds been allocated, and what are the sources of private funding?

Response: The plan does not commit funding on the part of the Service, or any other interested parties. By identifying specific recommended actions, estimated costs, and responsible parties in the recovery plan, the Service hopes to guide recovery efforts as opportunities become available. In the case of local governments, funding for implementing specific recovery actions may be included in conditions for development or other permitted activities. Funds may also be available through section 6 of the Endangered Species Act (Federal Grants to States).

Comment 2: The general approach to recovery presented in the plan is not specific enough to be applied to pending development proposals.

Response: The recovery plan is intended to provide guidance and direction on the actions needed to protect and manage the seven species to achieve recovery. It is not intended to provide specific and rigid instructions for these activities. Differing situations will necessarily require that the appropriate activities be tailored for each situation.

Comment 3: Can you clarify what the Service's interest is in the acquisition of the Glenwood, Borland, and high school sites?

Response: Because a few of the species in this plan have extremely limited distributions, the best opportunity for long-term conservation is to ensure that development or certain other activities do not severely impact remaining habitat. This protection could be achieved in

several ways. While acquisition is one option, establishing long-term conservation easements or deed restrictions are also available methods. The appropriateness of pursuing acquisition needs to be evaluated on a case-by-case basis.

Comment 4: Why were the preparation of Habitat Conservation Plans not recommended for the plant species?

Response: Habitat Conservation Plans are developed as a requirement for obtaining a section 10(a)(1)(B) permit to incidentally “take” listed animal species for activities without Federal involvement. The prohibitions against incidental take do not apply to federally listed plant species. The ESA prohibits the removal of listed plants or malicious damage of these plants on lands under Federal jurisdiction or on non-Federal lands if the action is in violation of State law or regulation, but it generally does not prohibit take of listed plant species by private landowners on their own property. Therefore, if only federally listed plant species occurred within an area to be covered by a Habitat Conservation Plan, a section 10(a)(1)(B) incidental take permit is not needed. However, before issuing a 10(a)(1)(B) incidental take permit for any listed animal species, the Service is required to determine if the existence of any listed plant species would be jeopardized by issuing the permit. The Service could not issue the permit if this jeopardy determination is made. To avoid this outcome, the Service recommends that the applicant consider any listed plant species that occur in the project area in the Habitat Conservation Plan and develop appropriate minimization and mitigation measures.

Comment 5: The scientific background for downlisting criteria is lacking.

Response: Section 4(f)(1)(B) of the Endangered Species Act directs the Service to incorporate objective and measurable criteria for recovery, as well as to estimate the time required and the costs to

carry out measures that would achieve intermediate and final goals toward recovery. Although the criteria may appear to be arbitrary, the Service endeavors to make the best determination regarding threshold levels to be reached to trigger downlisting, and eventually delisting, based on the best information that is available at the time the recovery plan is prepared. The Service fully expects that these criteria may be revised in the future, depending on additional information gathered through monitoring, research, and recovery actions that have been implemented.

Comment 6: With regard to the need to maintain interconnectivity between different populations of each species to effect conservation, one commenter indicated that conservation of “islands” without corridors would be counter-productive to the species, while another commenter indicated that because these species are “naturally rare”, that Service “rightfully ignored” the issue of metapopulation dynamics.

Response: Because the distributions of most of these species are tied to specific habitats that in themselves are limited and patchy in distribution, the Service has placed an emphasis on maintaining currently known habitat for these species. Should research indicate that additional habitat beyond that occupied by the species is required to maintain populations, that information would be taken into consideration in revising recovery goals and criteria.

Comment 7: There is an “under-emphasis” on the positive role that disturbance may play in maintaining the sandhills community; other management tools besides fire should be considered in maintaining the open character of the habitat that is needed by the species.

Response: While it is true that other management tools besides fire could achieve the goals for maintaining an open character to the habitat, not as much is known about the potential success for using other

methods. One concern is that using other methods may also contribute to the spread of nonnative plant species. The effectiveness of using other methods could certainly be a point of research. If results of research indicate other methods are useful in achieving desired results, those methods should be employed through a process of adaptive management.

Comment 8: Although native wildlife species (deer, rabbits, fox, mountain lion, and snakes) have a significant impact on the sandhills habitat, they are not recognized in the plan as being a threat.

Response: Because native wildlife has evolved with the habitat their impacts are typically insignificant compared to human-caused impacts, including the introduction of nonnative animals such as horses. Of all the articles, papers, and reports used in the preparation of the rules to list five of the species and in the preparation of this recovery plan, there was only one reference to a potential impact from a native wildlife species (Kluse 1994).

Comment 9: Impacts to the sandhills habitat caused by horses are less than that caused by native wildlife, off-road vehicles (all-terrain vehicles, motorcycles, and quads), development, and sand-mining.

Response: Historically speaking, impacts from sand mining and development have certainly been greater than those caused by horses and other recreational uses. However, future sand mining will impact only a small fraction of the habitat that has already been altered or destroyed, and the County currently has guidelines that aim to minimize the impacts of future development. Therefore, with respect to current threats, recreational use is considered as significant as other threats. A note to the threats table on page 8 has been added to indicate that various activities included in the “recreation” category have varying types and levels of impact.

Comment 10: a) Horseback riding has been a traditional use occurring in the sandhills habitat for at least 50 years. Because impacts from horse use are so minimal, equestrian use should not be restricted by this plan. b) Equestrian users are willing to adjust riding trails, riding patterns, and certain restricted use areas in order to maintain use of the area.

Response: The plan in itself does not restrict use; no wholesale closures are being proposed. The plan recommends that a working group be formed with private landowners, appropriate agencies, and other nongovernmental organizations (such as equestrian groups) to develop plans for reducing impacts to the species in this plan. The Service welcomes participation by equestrian users to identify ways to eliminate or reduce impacts to the seven species addressed in this plan.

Comment 11: Restoration trials should focus on restoring habitat affected by sand mining rather than recreational trails, because the former activity has caused proportionately more damage; restoration efforts would be of more benefit than focusing on small trail areas.

Response: Since sand-mined areas are usually extremely degraded, the opportunity for restoration to succeed may be more limited. Low impact disturbance, such as recreational trails, actually have more potential for successfully being restored.

**APPENDIX B: Individuals and Agencies that provided comments on the Draft Recovery Plan for Two Insects and Four Plants from the Santa Cruz Mountains**

\* indicates designated peer reviewer

Jack and Chris Ashworth, residents Ben Lomond, California	E. Flyod Kvamme, resident Saratoga, California
Melba Caster and Jeanne Kendall, residents Santa Cruz, California	*David Lightfoot, professor Department of Biology University of New Mexico Albuquerque, New Mexico
*Dan Doak, professor Department of Environmental Studies University of California, Santa Cruz Santa Cruz, California	Stephan McCabe, conservation co- chair California Native Plant Society, Santa Cruz County Chapter Ben Lomond, California
Carol Eaton, resident Ben Lomond, California	Jodi McGraw, graduate student Department of Integrative Biology University of California, Berkeley Berkeley, California
Sarah Eaton, resident Ben Lomond, California	*Daniel Otte, curator of insects Academy of Natural Sciences Philadelphia, Pennsylvania
*Barbara Ertter, botanist University of California, Berkeley Berkeley, California	Guy and Michelle Peabody, residents Ben Lomond, California
*Deborah Hillyard, biologist California Department of Fish and Game Sacramento, California	Suzanne Schettler, principal Greening Associates Ben Lomond, California
*Frank Hovore, entomologist Frank Hovore and Associates Santa Clarita, California	Kevin Shaffer, biologist California Department of Fish and Game Sacramento, California
Flo and Dan Huston, residents Ben Lomond, California	Diane Shelander, resident Scotts Valley, California
Laura Kuhn, community development director City of Scotts Valley Scotts Valley, California	

\*Suzanne Smith, resource planner  
Planning Department  
County of Santa Cruz  
Santa Cruz, California

David Weissman, entomologist  
California Academy of Sciences  
San Francisco, California

Richard Whippo, resident  
Soquel, California



**APPENDIX C: Recovery Priority System<sup>1</sup>**

Degree of Threat	Recovery Potential	Taxonomy	Priority	Conflict <sup>2</sup>
<b>High</b>	High	Monotypic genus	1	1C 1
	High	Species	2	2C 2
	High	Subspecies	3	3C 3
	Low	Monotypic genus	4	4C 4
	Low	Species	5	5C 5
	Low	Subspecies	6	6C 6
<b>Moderate</b>	High	Monotypic genus	7	7C 7
	High	Species	8	8C 8
	High	Subspecies	9	9C 9
	Low	Monotypic genus	10	10C 10
	Low	Species	11	11C 11
	Low	Subspecies	12	12C 12
<b>Low</b>	High	Monotypic genus	13	13C 13
	High	Species	14	14C 14
	High	Subspecies	15	15C 15
	Low	Monotypic genus	16	16C 16
	Low	Species	17	17C 17
	Low	Subspecies	18	18C 18

<sup>1</sup> As published September 21, 1983 [43 FR 43098]

<sup>2</sup> C = conflict with human activities

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