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SMITH'S BLUE BUTTERFLY

RECOVERY PLAN

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SMITH'S BLUE BUTTERFLY
RECOVERY PLAN

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Joseph R. Blum
Acting Regional Director, U.S. Fish and Wildlife Service

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Date



Executive Summary

1. At what point or condition can the species be considered recovered?
When the 10 sites in Table 2 and the 8 sites in Table 3, or an equivalent number of comparable alternative sites, are protected, managed, and secured. If, after 10 consecutive years, these 18 sites appear to be permanently protected and the butterfly colonies that occupy them no longer appear to be threatened, then the Smith's blue butterfly would qualify for delisting.
2. What must be done to reach recovery?
Preserve and protect known Smith's blue butterfly colonies, develop and implement management strategies, develop public awareness of Smith's blue butterfly and habitat, and enforce laws to protect Smith's blue butterfly and habitat.
3. What specifically must be done to meet the needs of #2?
 - A. Preserve publicly owned habitat sites.
 - B. Increase law enforcement activity.
 - C. Control off-road vehicle use of habitat.
 - D. Revegetate dune areas.
 - E. Control foot traffic.
 - F. Remove exotic plants and replace with native plants.
 - G. Provide for caretaker at dune sites.
 - H. Secure known habitat sites.
 - I. Develop restoration techniques for native vegetation.

- J. Determine ecological needs of the Smith's blue butterfly.
 - K. Determine ecotypic status of butterfly populations.
 - L. Monitor and coordinate agency compliance with the recovery plan and Section 7 consultations.
 - M. Coordinate agency recovery efforts.
 - N. Develop public awareness through meetings, signs, tours, etc.
4. What management/maintenance needs have been identified to keep the species recovered?

Proper management and protection should be continued, and yearly monitoring of key sites should take place. Public education and law enforcement efforts should be continued.

THIS IS THE COMPLETED SMITH'S BLUE BUTTERFLY RECOVERY PLAN. IT HAS BEEN APPROVED BY THE U.S. FISH AND WILDLIFE SERVICE. IT DOES NOT NECESSARILY REPRESENT OFFICIAL POSITIONS OR APPROVALS OF COOPERATING AGENCIES AND IT DOES NOT NECESSARILY REPRESENT THE VIEWS OF ALL INDIVIDUALS WHO PLAYED KEY ROLES IN PREPARING THIS PLAN. IT HAS BEEN PREPARED IN COOPERATION WITH MR. JOHN LANE AND IS INTENDED TO DELINEATE THE ACTIONS NEEDED TO ACCOMPLISH RECOVERY. THIS PLAN IS SUBJECT TO MODIFICATION AS DICTATED BY NEW FINDINGS, CHANGES IN THE SPECIES' STATUS, AND COMPLETION OF THE TASKS DESCRIBED IN THE PLAN. GOALS AND OBJECTIVES WILL BE ATTAINED AND FUNDS EXPENDED CONTINGENT UPON APPROPRIATIONS, PRIORITIES, AND OTHER BUDGETING CONSTRAINTS.

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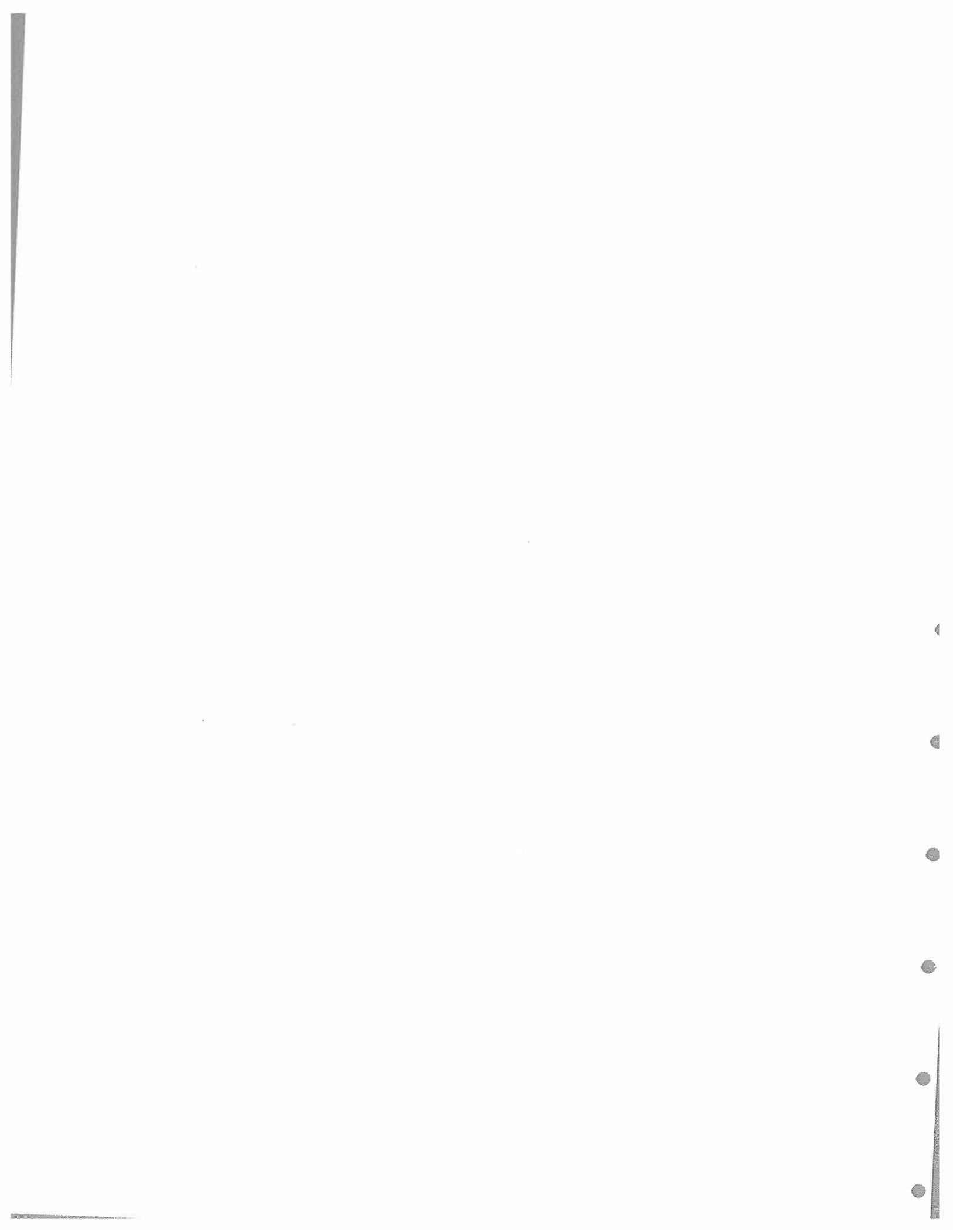
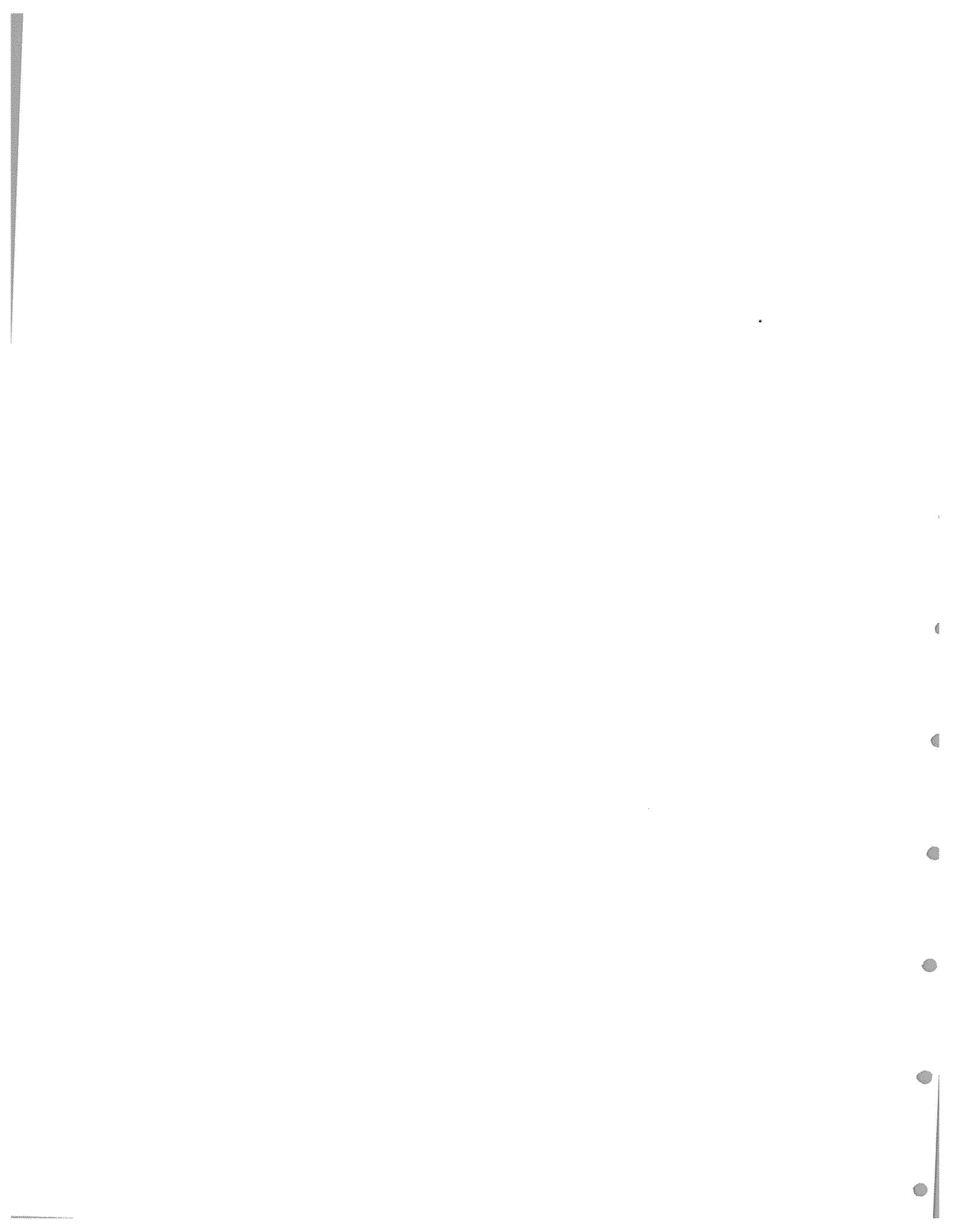


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PART I
INTRODUCTION

Brief Overview

The Smith's blue butterfly, Euphilotes enoptes smithi, is endemic to a number of inland and coastal sand dunes, serpentine grasslands, and cliffside chaparral communities along the central California coast in Monterey, Santa Cruz, and San Mateo Counties. When listed as endangered by the Department of Interior as Shijimiaeodes enoptes smithi on June 1, 1976 (41 Federal Register 22043-22044), the Smith's blue butterfly was known primarily from remnant, partially stabilized sand dunes around Monterey Bay.

Since it was listed, additional colonies of the butterfly have been discovered in other locations and habitat types, including the ancient beach sands at Zayante Sand Hills and a serpentine grassland in San Mateo County. On the basis of these recent discoveries, reclassification may now be appropriate. However, many of the known dune habitats are threatened with modification or destruction, and taxonomic questions have been raised concerning possible genetic differences between colonies in the different habitat types. Accordingly, studies are first needed to document the size and range of the recently discovered colonies, determine the current status of the other known populations, resolve taxonomic questions about the

colonies in the different habitat types, and identify the extent to which the existing habitats are threatened with destruction or modification.

The objective of this recovery plan is to prevent the extinction of the Smith's blue butterfly and to accomplish its recovery by conserving the ecosystems upon which it depends for survival. Accordingly, this plan considers not only the population dynamics and ecological requirements of the Smith's blue butterfly, but also addresses the protection, restoration, and maintenance of the dune, chaparral, and grassland habitats that are essential for its survival and recovery.

Taxonomy and Description

Several generic names have been attached to the group of butterflies to which the Smith's blue butterfly belongs. Mattoni (1954) originally described this subspecies as Philotes enoptes smithi. In 1975, Shields realigned several genera. Shijimiaeoides enoptes smithi was the resulting name of the Smith's blue butterfly and was the name used when the subspecies was listed in 1976. The group has most recently been revised by Mattoni (1977) with another rearrangement of genera. This resulted in the animal's name being changed to Euphilotes enoptes smithi. Despite the frequent generic name changes, the Smith's blue butterfly has always been accepted as a valid subspecies of the enoptes group, which is widespread in the western United States (Howe 1975).

Arnold (1980) identified two races or ecotypes of E. e. smithi in studies of the butterfly at Fort Ord and suggested that additional ecotypes may be found among the colonies that occupy other habitat types (Arnold 1983). Genetic studies are needed to determine whether any of these ecotypes warrant subspecific recognition (R. Arnold, pers. comm.*).

The Smith's blue butterfly is a relatively small butterfly -- slightly less than one inch across with wings fully spread. The undersides are whitish-gray, speckled with black dots, and have a band of red-orange marks crossing the hind-wings near the outer edge. Sexual differences are seen on the upper wing surface. Males are bright lustrous blue, whereas females are brown above with a band of red-orange marks across the hind-wings. Above, both sexes have prominently checkered fringes on both fore-wings and hind-wings, while males have wide black borders, and a very hairy appearance of the body and adjacent wings (Mattoni 1954). The Smith's blue butterfly is separated from other subspecies of E. enoptes by the light undersurface ground color with prominent overlying black markings together with a faint black terminal line.

Accounts of Smith's blue butterfly include the original description (Mattoni 1954), a non-technical overview of the genus Euphilotes by Pyle (1981), a treatment and illustration by Howe (1975), and papers

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by Langston (1963, 1965, 1969, 1975), Shields (1975, 1977), and Arnold (1982, 1983).

Life History

The Smith's blue butterfly, and the other members of the genus Euphilotes, are intimately dependent on their larval buckwheat host plants. The seacliff buckwheat, Eriogonum parvifolium, the coast buckwheat, E. latifolium, and an undescribed ecotype of E. latifolium are used by the females of E. e. smithi for oviposition and provide food for the larvae. For the coastal sand dune and cliff colonies of the butterfly, Eriogonum parvifolium (an evergreen shrub) and E. latifolium (an herbaceous and acaulescent perennial) are used for pupation. In addition, the surrounding soil and litter is sometimes used for this purpose. No information is available concerning the life histories of the inland dune, chaparral, and serpentine grassland colonies.

Adult butterflies of both sexes use the same plants as their primary nectar source and also as sites for resting, sunning, mate location, and copulation. The adult flight period corresponds with the blooming period of the host Eriogonum species and colonies are separated by the species utilized. The colonies utilizing E. parvifolium have a different flight season than those colonies which feed on E. latifolium because of the differential blooming times of the plants (Arnold 1982). Because of its close association with these two plants, the long-term survival of the Smith's blue butterfly depends

on continuous recruitment of vigorous individuals into the buckwheat populations.

Arnold (1978, 1982, 1983) has made the major contribution to knowledge of the biology and population dynamics of Smith's blue butterfly through his work on sand dune populations at the Fort Ord Army Base. Additional information comes from Donahue (1975), Langston (1975), and Walsh (1975a, b). Little is known of the population dynamics and ecological requirements of the colonies that occur in inland sand dune and serpentine grassland habitats.

Adult Smith's blue butterflies are univoltine (a single generation per year) and emerge from their pupal cases in a single extended flight season from mid-June to early September, which is synchronized with the peak flowering period of the buckwheats. Individual adults live for only about one week. However, individual emergences are staggered over the long summer flight period. This long flight period is partially the result of microclimatic differences among the habitats and differences in the flowering time of the host plants. Flowering can be significantly affected by annual climatic variations. The buckwheats are utilized as larval and adult foodplants. The larvae eat the flowerheads and the adults obtain nectar from the flowers.

Males emerge first, with females following about a week later. The overall sex ratio in a given season is probably 1:1 (Shields 1975). Soon after the emergence of females, courtship and copulation occur on and around buckwheat flower heads. Females explore and oviposit

individually on the flower heads. Males characteristically perch or sit on the flowers, sometimes returning to the same perch the following day to watch for approaching females to court. Both sexes visit the flowers to rest, sun, sleep, and obtain nectar.

Neither sex moves a significant distance away from the host plants. Capture-recapture studies by Arnold (1978) indicate that only about 3 percent of the males and 10 percent of the females were recaptured more than about 200 feet away from their original capture site.

Within its range, the distribution of the butterfly appears to be determined primarily by the occurrence, distribution, and age class patterns of the host buckwheat plants, although not all suitable-looking habitat is colonized. Because the plants often occur in high density patches, the density of flying adults is sometimes high in the individual colonies. Arnold (1978) estimated densities of 287 males/ha and 343 females/ha at the preserve on the southern end of the sand dunes at Fort Ord. Colonies occur as discrete, scattered islands in the dune habitat, primarily in response to the distribution of Eriogonum. However, because of low vagility, Smith's blue butterfly colonies can become isolated from one another if suitable habitat is not available nearby for dispersal and gene exchange.

Larvae hatch from eggs 4 to 8 days after oviposition and immediately begin feeding on the buckwheat flowers (in which they remain well concealed). As they grow, they molt 4 times and go through 5 larval instars before they pupate. Pupation occurs in both flower heads and

the sand and litter at the base of the host plants. Pupae are formed between mid-August and early September and remain in place until the adult butterflies emerge for the summer flight season in the following year. It is not known if survival is significantly different for butterflies that pupate in the litter than for those that pupate in flower heads.

Arnold (1980) recently identified two ecotypes of E. e. smithi at two coastal dune habitats on Fort Ord (Monterey County). The ecotype on the northern part of the Base utilizes Eriogonum latifolium as a food plant, while the one on the southern preserve utilizes E. parvifolium. The peak flowering period for these two host plants differs by nearly one month. The development of the larval butterflies and the emergence of adults is synchronized with the flowering periods of the two host plant species. Thus, the life stages of Smith's blue butterflies at the two sites on Fort Ord are partially asynchronous. Consequently, in spite of the geographic proximity of the two colonies, a potential isolating mechanism exists that may inhibit gene flow between the populations. This phenomenon is discussed by Arnold (1983), who noted that Bush (1974) and Tauber and Tauber (1978) have demonstrated that other insects have undergone sympatric speciation in similar circumstances.

Host race differentiation is common in other species of Euphilotes (O. Shields, pers. comm.*), and also in the more thoroughly studied genus

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Euphydryas. In Euphydryas editha, genetic differences often accompany host plant differences even between nearby colonies (Ehrlich et al. 1975). This may also be true of the Smith's blue butterfly, but further studies are needed to assess the significance of this potential isolating mechanism. No life history studies have yet been conducted on Smith's blue butterflies to determine if there are significant differences in life history patterns among the colonies that inhabit inland and coastal sand dunes, serpentine grasslands, and cliffside chaparral communities (J. Lane, pers. comm.*).

Little is known of predation or parasitism of the adult Smith's blue butterfly. Two genera of spiders, Clubonia sp. and Theridion sp., are known to prey on roosting butterflies. Spiders may be the most frequent Smith's blue butterfly predators (Arnold 1978). Smith's blue butterfly larvae have been observed to be heavily parasitized by a tachinid fly. In a collection of larvae, 42 percent proved to have this parasite (Arnold 1978). It is not known whether this level of parasitism is normal over time, or represents an excessively high peak of infestation.

The role of ant associations (myrmecophily) with the Smith's blue butterfly is unclear, but they may be important in the management and conservation of the animal. Larvae are known to be tended by ants during their third through fifth instars. The larvae produce a

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secretion of sugar from abdominal skin glands that provides food for the tending ants. In return, the larvae are thought to derive some benefit from the ants, possibly protection from predation or parasitism. The loss of an obligate mutualistic relationship with an ant played a crucial role in the extinction of Britain's large blue butterfly (Pyle et al. 1981). Hence, understanding this biological relationship may be very important to managing and preserving the Smith's blue butterfly.

Historic and Current Distribution

Euphilotes enoptes is a widely distributed species that is known from the West Coast to the Rocky Mountains (Howe 1975). It is generally found in isolated colonies associated with several species of Eriogonum, the larval and adult foodplant. The Smith's blue butterfly is an endemic California subspecies. At the time of its listing, it was known primarily from coastal sand dunes that extend from the mouth of the Salinas River to Del Rey Creek (see Figure 1). The known distribution of the Smith's blue butterfly now includes portions of Monterey, San Mateo, and Santa Cruz Counties (see Figure 2). These areas are all subject to coastal weather influences (Arnold 1978; Langston 1963; J. Lane, pers. comm.). Throughout this range, Smith's blue butterfly colonies are found within coastal sand dunes, inland sand dunes, serpentine grasslands, and coastal cliffside chaparral communities.

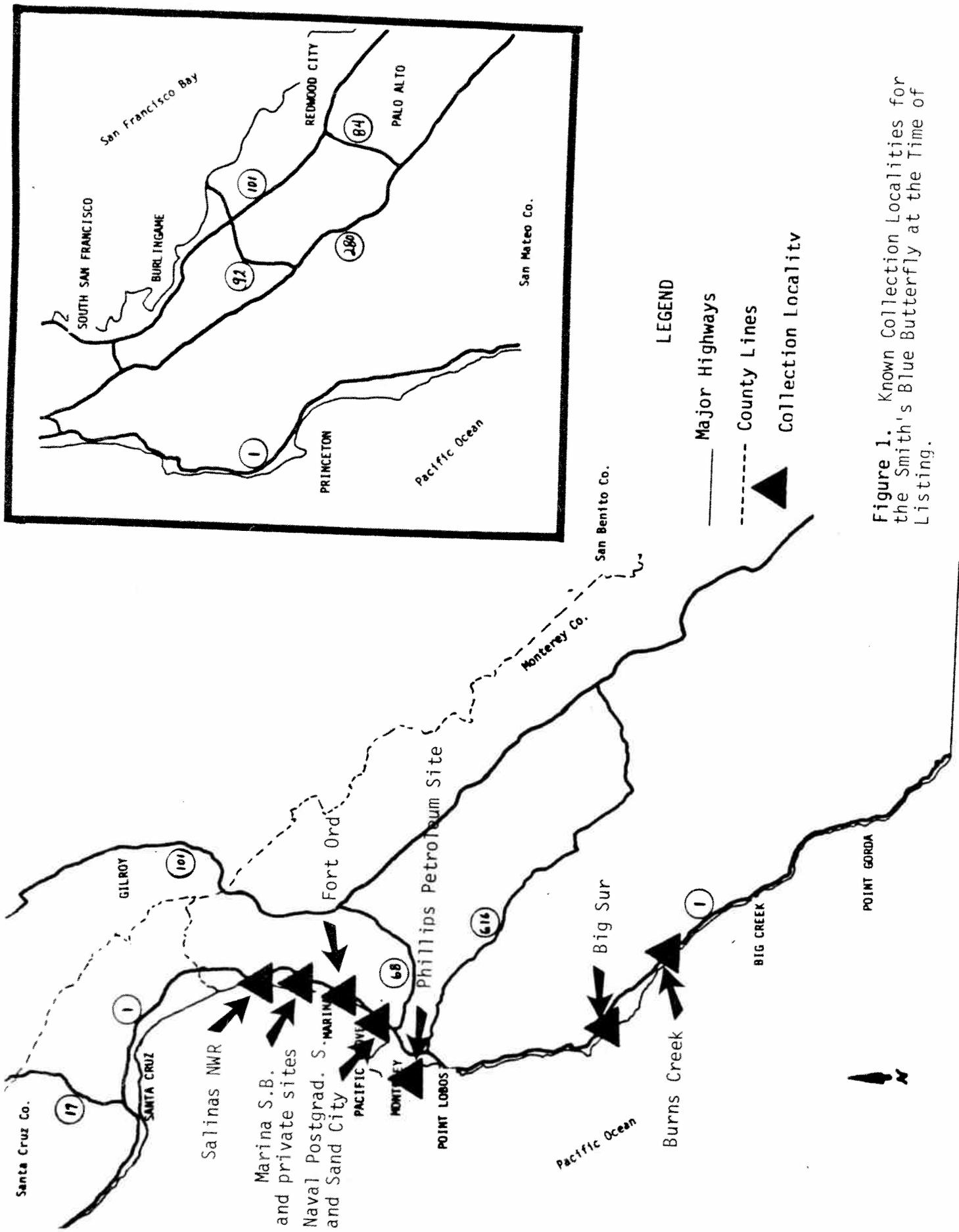


Figure 1. Known Collection Localities for the Smith's Blue Butterfly at the Time of Listing.

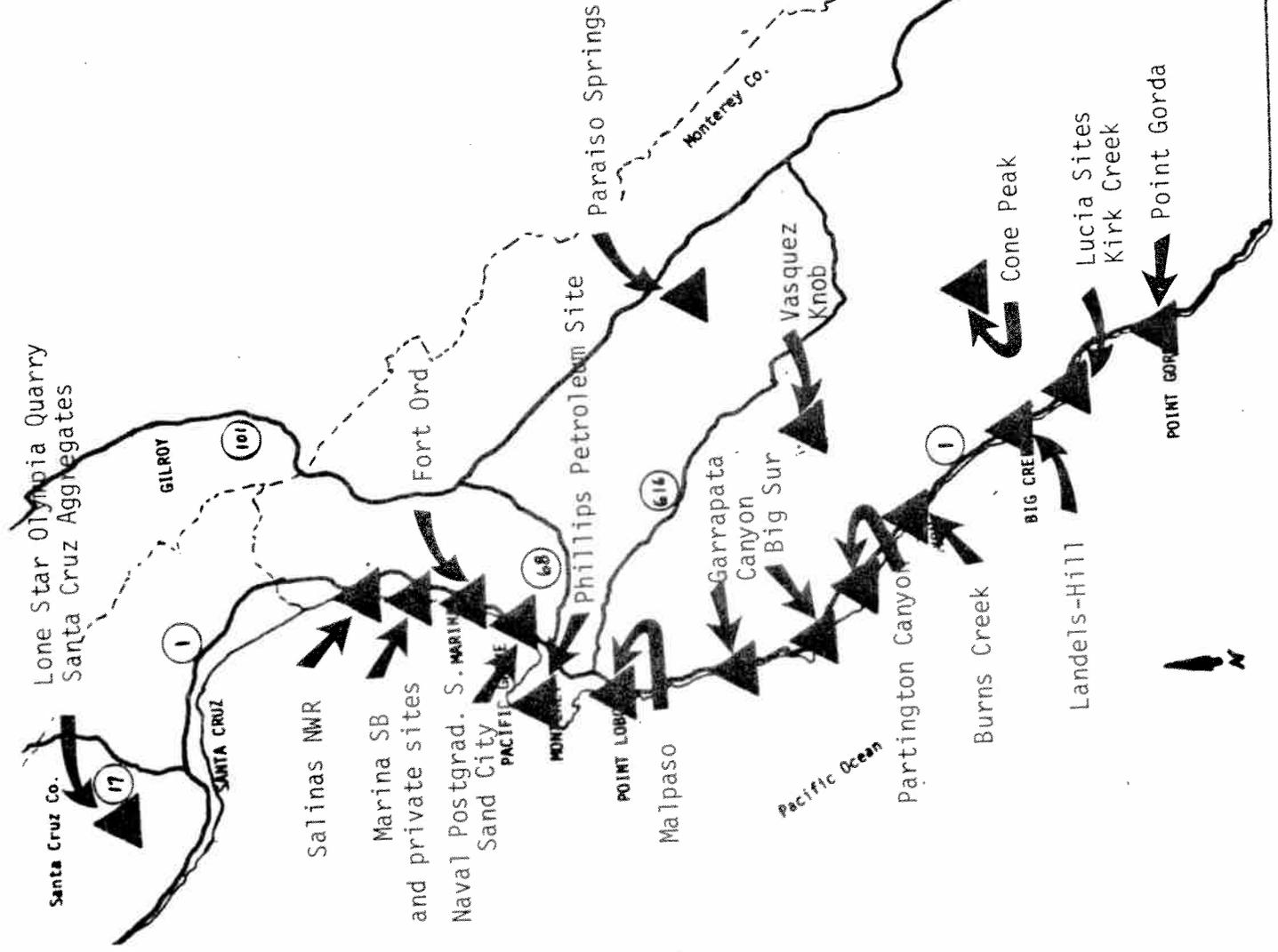
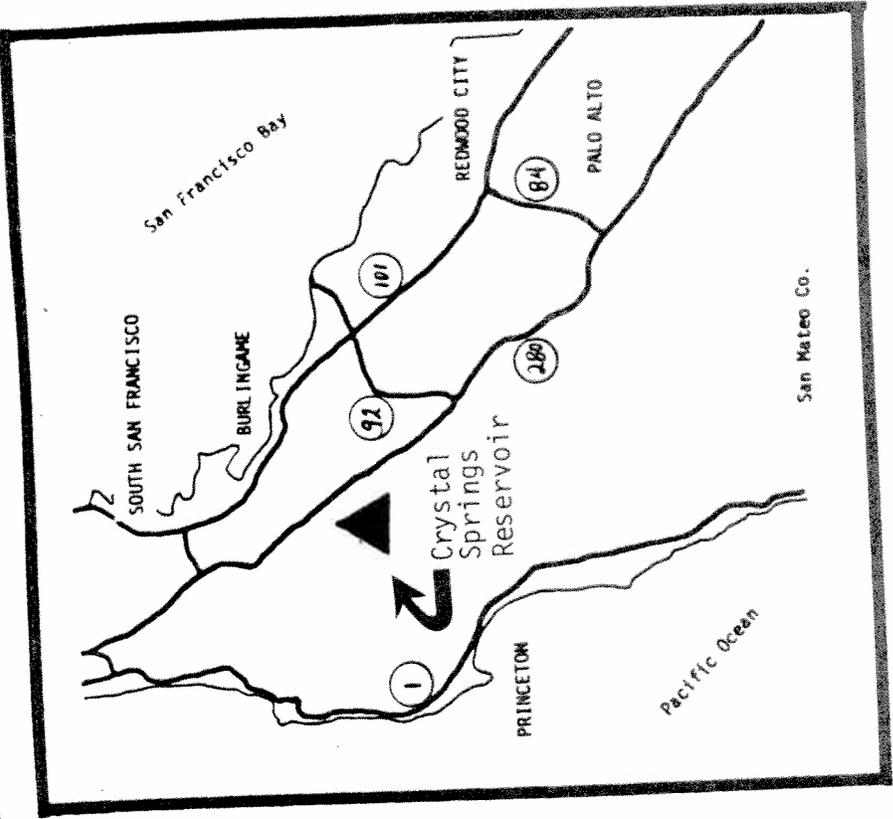


Figure 2. Known Collection Localities for the Smith's Blue Butterfly (Through 1983)

Since the Smith's blue butterfly was listed, extensive surveys by Dr. Richard Arnold, Mr. John Lane and others have located the animal in more abundance and more diverse habitats than were previously known. Table 1 contains a list of all recent collection localities.

Limiting Factors and Threats

The primary factor that limits populations of the Smith's blue butterfly is the occurrence of its host plants, seacliff buckwheat and coast buckwheat. The occurrence of the host plant does not always indicate that the butterfly will be present in an area, however. The occurrence of these plants is much more extensive than the distribution of the butterfly. Age-class distribution and the density of the host plant patches are believed to play important roles in the establishment and maintenance of Smith's blue butterfly colonies.

Coastal Sand Dunes

The Seaside-Marina dune complex contains patches of suitable habitat for the Smith's blue butterfly. Even though this dune system has been drastically altered in recent historic times, it is still the largest and best preserved of any of the historic dune systems in central California, except for the Oso Flaco Dunes near San Luis Obispo. The other major historic dune system along the central California coast, located in what is now the City of San Francisco, has been almost totally destroyed (Powell 1981).

Table 1
Smith's Blue Butterfly Collection Localities and Threats to SBB Habitat.

<u>Collection Locality</u> ^{2/}	<u>Owner/Manager</u> ^{1/}	<u>Habitat Type</u>	<u>Threats</u>
Salinas River National Wildlife Refuge.	USFWS/CDFG	Coastal Sand Dunes	Off-road vehicles iceplant and Holland dunegrass.
Marina State Beach.	State of California/ CDPR	Coastal Sand Dunes	Hang-glider use, foot traffic and invasion of iceplant.
Fort Ord Military Reservation.	Department of Defense/ U.S. Army	Coastal Sand Dunes	Invasion by iceplant is a problem, occasional off-road vehicle traffic.
Naval Postgraduate School.	Department of Defense/ U.S. Navy	Coastal Sand Dunes	Invasion by iceplant, unrestricted foot traffic.
Phillips Petroleum Site.	Private	Coastal Sand Dunes	Invasion by iceplant, unrestricted foot traffic, proposed housing development.
Sand City.	Private and Caltrans Highway right-of-way	Coastal Sand Dunes	Invasion by iceplant, unrestricted foot traffic.
City of Marina.	Private	Coastal Sand Dunes	Invasion by iceplant, proposed development, unrestricted foot traffic.

Table 1 (continued)

<u>Collection Locality</u> ^{2/}	<u>Owner/Manager</u> ^{1/}	<u>Habitat Type</u>	<u>Threats</u>
Vasquez Knob, 3 mi. east of Carmel Village.	Assumed Private	Cliff/Chaparral	No known threats. ^{3/}
Big Sur.	Unknown	Cliff/Chaparral	No known threats.
Partington Canyon.	CDPR	Cliff/Chaparral	No known threats.
Burns Creek at Highway 1.	Highway right-of-way CDPR	Cliff/Chaparral	No known threats.
Dolan Creek 0.5 mi. North on Highway 1.	Highway right-of-way CDPR	Cliff/Chaparral	No known threats.
6.4 and 4.8 mi. S.E. of Lucia.	Unknown	Cliff/Chaparral	Possible threats from exotic plants, landslide.
Paraiso Springs.	Unknown	Cliff/Chaparral	No known threats.
Carmel Valley.	Unknown	Cliff/Chaparral	Landslide.
Landels-Hill Big Creek Preserve.	UCNRS	Cliff/Chaparral	No known threats.
6.4 km North of Pt. Gorda.	USFS	Cliff/Chaparral	Possible threat from exotic plants.
Coastal Canyons between Malpaso and Garrapata Creeks.	CDPR	Cliff/Chaparral	Landslide.
Cone Peak Road.	USFS	Cliff/Chaparral	No known threats.
Kirk Creek.	USFS	Cliff/Chaparral	No known threats.

Table 1 (continued)

<u>Collection Locality</u> ^{2/}	<u>Owner/Manager</u> ^{1/}	<u>Habitat Type</u>	<u>Threats</u>
Coastal Mountains of Monterey Co.	Unknown	Cliff/Chaparral	Landslide.
Zayante Sand Hills (Lone Star Olympia Quarry).	Lone Star, Inc.	Inland Dune Parkland	Sand mining.
Zayante Sand Hills (Santa Cruz Aggregates).	Santa Cruz Aggregates, Co.	Inland Dune Parkland	Sand mining and off-road bicycles.
Crystal Springs Reservoir.	City of San Francisco Watershed	Serpentine Grassland	No known threats.
Loma Prieta Mountain.	Unknown	Chaparral	Habitat alteration.

^{1/} Abbreviations: USFWS = U.S. Fish and Wildlife Service
 CDFG = California Department of Fish and Game
 CDPR = California Department of Parks and Recreation
 Caltrans = California Department of Transportation
 UCNRS = University of California Natural Reserve System

^{2/} Table 1 includes all known recent (since 1954) collection localities for the Smith's blue butterfly. The current status of many of these colonies is unknown, and some may no longer be extant.

^{3/} Many of the sites for which there are "no known threats" have not been surveyed recently and only limited information is available concerning probable future land uses. Any significant changes in existing land uses could adversely affect habitat conditions and threaten the survival of the butterfly colonies.

The Seaside-Marina dune complex has been severely affected by housing developments, highway construction, off-road vehicle use, foot traffic, urbanization, sand mining, military activities, and the introduction of exotic plants (Cooper 1967). More than fifty percent of the dunes within this system have been destroyed or significantly altered.

The long-term survival of the Smith's blue butterfly colonies in coastal dune habitats depends on continuous recruitment of the native plants produced by dynamic sand dune succession. In a natural situation, the successional pattern of the dominant plants in an inland dune system follows the sequence shown in Figure 3, after disturbance (Barbour and Johnson 1977, McBride and Stone 1976, Cooper 1967).

This natural successional sequence has been altered in many of the dunes in the Seaside-Marina system by the introduction of Holland dune grass (Ammophila arenaria) and iceplant (Carpobrotus spp.) for sand dune stabilization (Barry 1973, Clark 1977). These two plants disrupt the natural successional process. They also tend to out-compete many of the native plants in this system. The reduction in native plants that has resulted from the invasion of Holland dune grass and iceplant has also affected the associated animal community by reducing the numbers of food plants and the amount of habitat available for native arthropods (Slobodchikoff and Doyen 1977).

The native plants in coastal dune systems have adapted to the physical processes that cause gradual sand movements. The seedlings of many of the woody perennial plants characteristic of dunes in fact must have

DUNE CHAPARRAL

- Adenostoma fasciculatum
- Arctostaphylos pumila
- A. vestita
- Ceanothus rigidus
- C. dentatus

PINE CLIMAX FOREST

- Pinus radiata

DEFLATION AREA

- Carex pansa
- Baccharis pilularis

PINE OR OAK
OR
PINE-OAK SCRUB

- Baccharis pilularis
- Eriogonum latifolium
- E. parvifolium
- Eriophyllum staechadifolium
- Lupinus chamissonis
- Haplopappus ericoides
- Rhamnus californica
- Rhus diversiloba

BARE SAND

OAK CLIMAX DUNE FOREST

OPEN DUNE PIONEER COMMUNITY

- Quercus agrifolia

- Abronia latifolia
- A. umbellata
- Artemisia pycnocephala
- Calystegia soldanella
- Camissonia cheiranthifolia
- Croton californica
- Eriogonum latifolium
- Poa douglasii

Figure 3. Successional sequences for sand dunes in the area of Monterey, California.

secondary deposits of aeolian sand to become established and grow (Arnold 1983). The interaction that occurs between the native vegetation and the abiotic forces produces a balance between sand movement and sand dune stability (Arnold 1983).

Relatively large areas are needed for a dune system to undergo the natural successional changes that favor the native vegetation (Pavlik 1979). Small dune remnants frequently lack nearby sand reservoirs and often become stabilized by weedy plants that out-compete or prevent the establishment of endemic perennial plants. Opportunities for pioneer species to colonize new areas and for dune scrub plants to become established are reduced when dune habitats are truncated. The Smith's blue butterfly is dependent on host plants whose distribution is patchy and changes over time. Therefore, relatively large areas of natural dune habitat will need to be maintained to insure the survival of the butterfly in this habitat type.

Recreational activities, even seemingly innocuous pursuits such as hiking and hang-gliding, are often destructive to sand dune vegetation. Foot traffic on the dunes contributes to substrate compaction and can lead to massive sand dune blow-outs. The use of dunes by hang-gliders is also a destabilizing influence and disturbs both plants and seeds. The construction of parking lots for dune users destroys habitat directly by covering dune habitat with pavement, and indirectly by increasing the foot traffic in nearby areas.

Another major threat to the butterfly colonies in coastal dune habitats is off-road vehicle (ORV) traffic. The destructive effects of ORV use are well-documented at Marina State Beach and on dune systems throughout the west coast (Barry 1973, Powell 1981).

Urbanization has also played a major role in reducing habitat quantity and quality in coastal sand dunes. Highway and housing construction destroys habitat directly by paving over the sand, and indirectly by fragmenting the remaining habitats and increasing the accessibility of dune areas to off-road vehicle and foot traffic.

The sand dunes at Fort Ord have been heavily affected by military activities. Urbanization and the siting of shooting ranges in the dunes have been the most significant factors causing the destruction of Smith's blue butterfly habitat. Other activities, such as highway and pipeline construction and the planting of exotic plants for dune stabilization, have also eliminated much native dune vegetation. Fort Ord does maintain a preserve for the protection of Smith's blue butterfly, however.

Large tracts of dunes in the Seaside-Marina dune system have been destroyed and removed by sand mining. This activity continues at several sites in Sand City and Marina and has occurred in the past at the dunes in the Del Monte Forest. Sand mining is a significant contributor to the direct destruction of Smith's blue butterfly habitat, and secondarily adds to off-road vehicle and dune blow-out problems.

Inland Dune Parkland

In 1983, Smith's blue butterflies were discovered at two locations in the Zayante Sand Hills of Santa Cruz County (R. Morgan, pers. comm.*). The host plant for these colonies is a sand dune ecotype of Eriogonum latifolium, a type with affinities to E. parvifolium (Munz 1968). Associates of the buckwheat in this habitat include Ben Lomond wall-flower (Erysimum teretifolium), California poppy (Eschscholzia californica), bicolor lupine (Lupinus bicolor), and ponderosa pine (Pinus ponderosa). One of these inland dune parklands -- Lone Star Olympia Quarry -- is an active quarry. The amount of natural dune habitat remaining at this site has been significantly reduced by sand mining operations (Harvey and Stanley Associates 1983). The size and extent of the distribution of the butterfly colony at this site is not known. The other known inland dune habitat -- Santa Cruz Aggregates -- has experienced some surface disturbance but a much greater proportion of the native vegetation is still intact.

Cliff/Chaparral

Smith's blue butterfly colonies are also found in sites not associated with sand dunes (Arnold 1978). The host plant in the cliffside chaparral habitat type, Eriogonum parvifolium, grows on steep coastal cliffs in the Big Sur region, in woodlands somewhat inland at Vasquez Knob, and in road cuts along Cone Peak Road.

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Many of these sites appear relatively secure because they are inaccessible and unsuitable for human development. However, in unseasonably wet years, such as 1982, some of these sites experienced slope failure and slumping. Road maintenance and rebuilding threatens the integrity of some of these habitats.

The amount of suitable Smith's blue butterfly habitat in coastal cliffside chaparral communities has undoubtedly declined from historic levels because of fire suppression activities. Prescribed burns on a 30 to 50 year rotation would help re-establish a size and age-class mosaic of host plants that is more suitable for the butterfly.

Serpentine Grassland

The Smith's blue butterfly has also been collected recently from near Crystal Springs Reservoir in San Mateo County (R. Morgan, pers. comm.). This habitat is located on water company lands within the San Francisco Bay watershed. The dominant plants on these serpentine soils are annual and perennial grasses, intermixed with Eriogonum and other forbs. (For want of a better term, this habitat type is referred to as serpentine grassland throughout this recovery plan.) There are no known threats to the butterfly colony at Crystal Springs Reservoir. However, most of the other serpentine grasslands in the San Francisco Bay area have been developed, or are vulnerable to development (T. Lindenmeyer, pers. comm.*). Thus, if any more Smith's

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blue butterfly colonies are discovered in serpentine grasslands, they will probably be vulnerable.

Associated Species

In California, sand dune ecosystems are generally vulnerable to modification by man. There are many plants and animals that occur with the Smith's blue butterfly that are also subject to the threats that endanger the butterfly. These include the California legless lizard (Anniella nigra nigra), the globose dune beetle (Coelus globosus), sandmat manzanita (Arctostaphylos pumila), Menzies' wallflower (Erysimum menziesii) and Monterey ceanothus (Ceanothus rigidus).

Many listed and candidate species are associated with serpentine grasslands. These include: San Mateo thornmint (Acanthomintha obovata subsp. duttonii), bay checkerspot butterfly (Euphydryas editha bayensis), fragrant fritillary (Fritillaria liliacea), white flowered pentachaeta (Pentachaeta bellidiflora), fountain thistle (Cirsium fontinale) and the San Francisco garter snake (Thamnophis sirtalis tetrataenia).

The inland dune parklands also support several candidate species, including the silver-leaved manzanita (Arctostaphylos silvicola) and the Ben Lomond wallflower (Erysimum teretifolium).

Previous Conservation Efforts

Relatively few agency actions have been taken specifically to promote the conservation of the Smith's blue butterfly. Among the conservation actions that have been taken are (1) the Army has established a butterfly preserve at one of the coastal sand dune areas at Fort Ord, (2) the Youth Conservation Corps has removed exotic plants from some of the dunes at Fort Ord and attempted to reestablish native plants, (3) the California Department of Parks and Recreation has instituted improved control measures over unauthorized off-road vehicle traffic at Marina State Beach, (4) Federal, State, and local law enforcement personnel have maintained patrols at some of the coastal sand dune habitats and thereby reduced the amount of degradation to Smith's blue butterfly habitat that otherwise would have occurred, and (5) the Coastal Commission and affected local agencies have developed Local Coastal Plans that provide some degree of protection for the biological resources, including endangered species, that occur in sensitive habitats within the coastal zone. Local Coastal Plans are now in preparation for other reaches of the coastal zone that contain Smith's blue butterfly habitat.

Current Status

The status of the Smith's blue butterfly is today less precarious than it was in 1976 when it was listed as endangered. At that time, little was known of the populations in non-dune habitats, and the known dune habitats were rapidly being modified or destroyed. Since it was

listed, additional Smith's blue butterfly colonies have been found in chaparral, inland dune, and serpentine grassland habitats in Monterey, Santa Cruz, and San Mateo Counties. Several of these recently discovered habitats are also vulnerable to modification or destruction, however, and the fate of the butterfly colonies in the coastal sand dunes, inland dune parklands, and serpentine grasslands is uncertain. Before the Smith's blue butterfly can be considered for reclassification or delisting, studies are needed to document the size, distribution, and genetic status of all known colonies, and the degree to which the remaining habitats are threatened.

PART II
RECOVERY

Objectives

The primary objective of this recovery plan is to prevent the extinction of the Smith's blue butterfly and to improve and maintain its status at a point where it can be safely delisted. This objective will be achieved when either of the following conditions have been met.

- A. The Smith's blue butterfly colonies at the 10 sites identified in Table 2 and the 8 sites identified in Table 3 have been made secure. A colony will be considered secure when viable, self-sustaining populations have been maintained for a period of ten consecutive years and no foreseeable threats to the future survival of the colony exist. If, after 10 consecutive years, these sites appear to be permanently protected and the butterfly colonies that occupy these sites no longer appear to be threatened, then the Smith's blue butterfly would qualify for delisting.

- B. An equivalent number of Smith's blue butterfly colonies have been made secure at comparable alternative sites to insure the continued existence of E. e. smithi. The determination that a colony is secure and is comparable to (i.e., interchangeable

with) one of the ones listed in Table 2 or Table 3 is to be based on the following criteria.

1. Status surveys are conducted that indicate the alternative colony is comparable in size and distribution to the colony listed in Table 2 or Table 3 (see Recovery Task #71 below);
2. Status surveys are conducted that indicate the alternative colony has, relative to one of the colonies listed in Table 2 or Table 3, comparable opportunities for genetic exchange with other Smith's blue butterfly colonies (see Recovery Task #73 below);
3. Genetic studies are performed that indicate there are no taxonomic differences between the alternative colony and the colony listed in Table 2 or Table 3 (see Recovery Task #63 below); and
4. Status surveys are conducted to document that a viable, self-sustaining population has been maintained at the alternative site for a period of 10 consecutive years and no foreseeable threats to the future survival of the colony exist (see Recovery Task #74 below).

If, after 10 consecutive years, a total of 18 sites (either qualifying alternative sites or sites listed in Table 2 or Table 3, or some combination thereof) appear to be permanently protected and the butterfly colonies that occupy these sites no longer appear to be threatened, then the Smith's blue butterfly would qualify for delisting.

As an interim measure, the Smith's blue butterfly will qualify for reclassification from endangered to threatened when either of the following conditions have been met.

- a. The Smith's blue butterfly colonies at the 10 sites listed in Table 2 have been made secure. For the purposes of reclassification from endangered to threatened, a colony will be considered secure when a viable, self-sustaining population has been maintained at the site for a period of 5 consecutive years and no foreseeable threats to the future survival of the colony exist.
- b. An equivalent number of Smith's blue butterfly colonies have been made secure at comparable alternative sites to insure the continued existence of E. e. smithi. (See paragraph B above, items 1, 2, and 3, for the criteria to be used in determining whether a colony is comparable to one of the ones listed in Table 2. See paragraph (a) above for the criteria to be used in determining whether a colony is secure.)

Table 2

Habitats to be Secured Prior to Reclassification from Endangered
to Threatened

Coastal Sand Dunes

Marina State Beach Site
Salinas River National Wildlife Refuge Site
Naval Post-graduate School Site
Fort Ord Military Reservation Site

Serpentine Grassland

Crystal Springs Reservoir Site

Inland Dune Parkland

Santa Cruz Aggregate Quarry Site

Cliff/Chaparral

Big Creek Preserve Site
Burns Creek Site
Vasquez Knob Site
Cone Peak Road Site

These sites support known populations of the Smith's blue butterfly. Most are in public ownership. Note that comparable alternative sites, as defined in paragraph B above, may be substituted for the sites listed in this table on a one-to-one basis.

Table 3

Additional^{1/} Habitats to be Secured Prior to Delisting

Coastal Sand Dune

Phillips Petroleum Site
Sand City Site
City of Marina Sites

Inland Dune Parkland

Lone Star Olympia Quarry Site

Cliff/Chaparral

Partington Canyon Site
Point Gorda Site
Dolan Creek Site
Kirk Creek Site

These sites support known populations of the Smith's blue butterfly. Many are in private ownership. Note that comparable alternative sites, as defined in paragraph B above, may be substituted for the sites listed in this table on a one-to-one basis.

^{1/}Additional means in addition to those listed in Table 2.

Unless action is taken in the near future to alleviate the threats identified in the section on Limiting Factors and Threats, some extant colonies are likely to disappear. Rigorous enforcement of existing laws, regulations, and policies, as well as positive action to stabilize blown-out sand dunes and road-cut areas and replace exotic plants with native species, is needed to protect the Smith's blue butterfly and its habitat. After these threats have been alleviated, other important, but lower-priority tasks, such as monitoring the size and distribution of the butterfly colonies and increasing public awareness, can be implemented to meet the criteria for delisting.

Step-down Outline

The primary objective of this recovery plan is to prevent the extinction of the Smith's blue butterfly and to improve and maintain its status at a point where it can be safely delisted. This objective will be achieved when a sufficient number of sites have been secured to insure the continued existence of E. e. smithi (see criteria for reclassification and delisting outlined in the Objectives section).

1. Enforce existing laws and regulations, and implement applicable policies to promote the conservation and recovery of the Smith's blue butterfly.
 11. Actively enforce existing laws and regulations.
 12. Evaluate success of law enforcement efforts.
 13. Propose new regulations or revisions of existing codes as necessary.
 14. Monitor agency compliance with Section 7 consultations and implementation of recovery plan tasks.
 15. Monitor agency designation of Smith's blue butterfly habitat in land use plans.
 16. Coordinate agency recovery efforts for the Smith's blue butterfly and its habitat.

2. Manage, protect, and secure coastal sand dune and inland dune-parkland colonies required for reclassification to threatened status.

21. Develop and implement management plan for Marina State Beach.
 211. Identify colonies and area necessary for maintenance of Smith's blue butterfly.
 212. Control hang-glider use of dunes.
 213. Control off-road vehicle use of dunes.
 214. Revegetate existing blow-out areas with native plants.
 215. Control foot traffic on dunes by constructing boardwalks for beach access.
 216. Remove exotic plants and replace with native plants.
22. Develop and implement management plan for Salinas River National Wildlife Refuge.
 221. Identify colonies and area necessary for maintenance of colonies.
 222. Control off-road vehicle use of dunes.
 223. Provide for caretaker.
 224. Revegetate existing blow-out areas with native plants.
 225. Remove exotic plants and replace with native plants.
23. Develop and implement management plan for the Naval Postgraduate School.
 231. Identify colonies and area to be rehabilitated.
 232. Control foot traffic access through dunes.
 233. Remove exotic plants and replace with native plants.
24. Develop and implement management plan for Fort Ord Military Reservation.
 241. Identify area to be rehabilitated.

- 242. Control off-road vehicle use of dunes.
- 243. Remove exotic plants and replace with native plants.
- 244. Revegetate existing blow-out areas with native plants.
- 25. Develop and implement land protection and management plans for the Santa Cruz Aggregate site.
 - 251. Identify colonies and area necessary for their maintenance.
 - 252. Control off-road vehicle use of dunes.
 - 253. Secure the site as a Smith's blue butterfly reserve.
- 26. Develop and implement management and land protection plans for comparable alternative sites if appropriate.

- 3. Manage, protect, and secure the serpentine grassland and cliff/chaparral colonies required for reclassification to threatened status.
 - 31. Implement management plan for Crystal Springs Reservoir site.
 - 32. Implement management plan for Landels-Hill Big Creek Preserve.
 - 321. Identify colonies and area necessary for their maintenance.
 - 322. Test vegetation management practices to determine those that lead to greater host plant recovery or reinvasion.
 - 33. Develop and implement management plan for Cone Peak Road colonies.

34. Develop and implement management plan for Burns Creek.
 341. Determine ownership status.
 342. Identify colonies and area necessary for their maintenance.
 343. Secure necessary conservation easements if appropriate.
 35. Develop and implement management and land protection plan for Vasquez Knob.
 351. Determine ownership status.
 352. Identify colonies and areas necessary for their maintenance.
 353. Secure necessary conservation easements if appropriate.
 36. Develop and implement management and land protection plans for comparable alternative sites if appropriate.
4. Secure, manage, and protect the Smith's blue butterfly colony sites needed for delisting.
 41. Develop and implement management and land protection plans for the Phillips Petroleum, Sand City, and Marina sites.
 411. Identify colonies and area necessary for their maintenance.
 412. Control off-road vehicle use of dunes.
 413. Revegetate existing blow-out areas with native plants.
 414. Control foot traffic on dunes by constructing boardwalks for beach access.

415. Remove exotic plants and replace with native plants.
42. Develop and implement management and land protection plans for the Lone Star Olympia Quarry Site.
 421. Identify colonies and area necessary for their maintenance.
 422. Coordinate recovery needs with restoration efforts on inland-dune parkland.
 423. Control off-road vehicle use of dunes.
43. Develop and implement management plans for Kirk Creek, Dolan Creek, Partington Canyon, and Point Gorda sites.
 431. Identify colonies and area necessary for their maintenance.
 432. Carry out prescribed burns if appropriate.
 433. Coordinate recovery needs with other agency activities.
44. Develop and implement management and land protection plans for comparable alternative sites if appropriate.
5. Determine ecological needs and apply results to management of Smith's blue butterfly.
 51. Determine effect of clump size, plant size, and host plant species on oviposition behavior of the Smith's blue butterfly for use in vegetation management.
 52. Examine interactions of ants associated with Smith's blue butterflies and apply to vegetation management.
 521. Determine whether Smith's blue butterfly survival is dependent on presence of ants.
 522. Identify species of ants involved, if ants are

- important.
523. Determine ecological requirements of ants, if ants are important.
53. Determine effects of vegetation management on predators and parasites.
6. Determine taxonomic and/or ecotypic variation among colonies found in each type of habitat and apply results to management of Smith's blue butterfly.
61. Examine ecotypes of Eriogonum latifolium and determine taxonomic relationship to other host plants.
62. Determine life history variation among colonies in different habitats.
63. Determine if the different ecotypes differ genetically.
7. Determine current population status of Smith's blue butterfly colonies, identify potential threats to habitats, and determine priorities for securing habitats.
71. Survey recent collection sites to document extent of distribution and population size.
72. Survey old collection sites to document status of habitat and current distribution and size of colonies.
73. Survey other potential habitats to determine if the Smith's blue butterfly is more widespread and abundant than now believed.
74. Examine proposed land uses to find out if any Smith's blue

butterfly habitats are likely to be destroyed or modified in the foreseeable future.

75. Establish priorities for securing the different sites.
8. Investigate and implement restoration techniques for native vegetation.
 81. Establish techniques for eradication of iceplant and Holland dune grass.
 82. Evaluate available techniques for planting native dune species.
 83. Use information to modify management plans accordingly at designated sites.
 9. Develop public awareness of the Smith's blue butterfly.
 91. Provide audio-visual programs for public display.
 92. Conduct informational meetings.
 93. Conduct interpretive tours of appropriate areas.
 94. Erect interpretive signs on Smith's blue butterfly reserve lands.
 95. Provide revegetation information for interested persons and agencies.

Narrative

1. Enforce existing laws and regulations, and implement applicable policies to promote the conservation and recovery of the Smith's blue butterfly.

To accomplish the primary objective of this recovery plan it is important that appropriate Federal and State agencies vigorously enforce all laws and regulations that may affect the survival of the Smith's blue butterfly. Foremost among these laws and regulations is the Endangered Species Act of 1973, and its associated regulations. Other relevant laws include the California Coastal Zone Protection Act, Federal Coastal Zone Management Act, National Environmental Policy Act, California Environmental Quality Act, and Harbors and Navigation Act.

11. Actively enforce existing laws and regulations.

Effective law enforcement is needed to reduce unauthorized off-road vehicle traffic on coastal sand dunes and inland dune parklands. Enforcement actions are also needed for activities that result in the "take" of the butterfly. Several proposed sand mining, grading, and development projects in coastal and inland sand dunes have the potential to result in the take of the butterfly.

12. Evaluate success of law enforcement efforts.

One potential means of increasing the effectiveness of available enforcement personnel is formation of a "dune watch" committee. Expanding the number of observers in sensitive dune habitats would be particularly effective if coordinated closely with area police and sheriff's departments, the military police at Ford Ord, State Park Rangers, and Service law enforcement personnel. Periodic evaluations should be made concerning the amount of law enforcement effort needed and the areas where that effort should be concentrated.

13. Propose new regulations or revisions of existing codes as necessary.

Periodic evaluations should be made of the existing regulations and statutes, and revisions proposed as needed to promote the recovery of this endangered species.

14. Monitor agency compliance with Section 7 consultations and implementation of recovery plan tasks.

The recommendations and stipulations in interagency consultations are important mechanisms for protecting Smith's blue butterfly habitats. The actions of Federal agencies should be monitored to ensure compliance with the Endangered Species Act. To accomplish recovery, it will be necessary to implement the recovery tasks identified in this

plan. The assigned tasks should be regularly monitored to ensure that they are being completed by the responsible agencies.

15. Monitor agency designation of Smith's blue butterfly habitat in land use plans.

The Local Plans and General Plans of counties and cities provide a good indication of how endangered species are to be treated in future land use decisions. State and Federal agencies should review those plans and advise local agencies of the measures needed to protect the Smith's blue butterfly if the indicated amount of protection is not adequate.

16. Coordinate agency recovery efforts for the Smith's blue butterfly and its habitat.

State and Federal agencies should take an active role in providing guidance on proposed recovery projects because many are sensitive in nature and require a good deal of technical expertise.

2. Manage, protect, and secure coastal sand dune and inland dune-parkland colonies required for reclassification to threatened status.

Many of the colonies that must be protected to meet the criteria for delisting are subject to threats. Positive action is needed to secure the habitats that support these colonies.

21. Develop and implement management plan for Marina State Beach.

The populations at Marina State Beach are extremely vulnerable. Unrestricted foot traffic, hang-gliding, and occasional off-road vehicle traffic on the dunes threaten the survival of these colonies. A management plan is needed to give direction to State Park staff for managing these habitats.

211. Identify colonies and area necessary for maintenance of Smith's blue butterfly.

There are two large colonies known from the dunes at Marina State Beach. These are not now protected. Reserves should be set up to protect these colonies. The reserves should include the areas where the colonies now occur and reasonable buffer strips.

212. Control hang-glider use of dunes.

The foot traffic associated with hang-gliding destroys dune vegetation and causes substrate compaction. This type of disturbance can cause sand dune blow-outs. A moving sand dune generally destroys all of the vegetation in its path. Thus, a major sand dune blow-out could eliminate one or more of the butterfly colonies at Marina State Beach. Restricting hang-glider activity to other areas of the State Beach would reduce the likelihood of this occurring.

213. Control off-road vehicle use of dunes.

Previous use of the dunes by off-road vehicles has caused a large blow-out to become active at Marina State Beach. Park Rangers have now reduced off-road vehicle use in this area. This restriction should be continued to allow the native vegetation to recover and the dune to stabilize.

214. Revegetate existing blow-out areas with native plants.

The active blow-out at Marina State Beach threatens to move across Highway 1. If that occurs, sand would be removed to maintain the road and that sand would be lost to the dune system. Stabilizing this blow-out is a high priority recovery task that needs to be implemented to protect butterfly colonies near the blow-out. Native plants should be used to stabilize the blow-out and increase host plant availability.

215. Control foot traffic on dunes by constructing board walks for beach access.

Much of the destruction to vegetation comes from foot traffic crossing the dunes to reach the beach. This could be alleviated by constructing boardwalks from the beach to the parking lot. This would allow direct beach access and reduce foot traffic in the adjacent dunes.

216. Remove exotic plants and replace with native plants.

Iceplant and Holland dune grass have been widely used in California to stabilize sand dunes and highway rights-of-way. These plants are highly invasive and, once established, tend to exclude the native flora. Replacing these exotic plants with native dune species would provide additional habitat for the Smith's blue butterfly and help to secure the colonies at Marina State Beach.

22. Develop and implement management plan for Salinas River National Wildlife Refuge.

The Salinas River NWR is cooperatively managed by the Service and the California Department of Fish and Game. Some colonies of Smith's blue butterflies occur in the sand dunes on the refuge. However, exotic plants have invaded this habitat and the area has been degraded by off-road vehicle use.

221. Identify colonies and area necessary for maintenance of colonies.

The present distribution of butterflies on the refuge needs to be documented so that all essential habitats are protected.

222. Control off-road vehicle use of dunes.

The previous uncontrolled use of the dunes by off-road vehicles has caused road cuts and sand dune blow-outs. Effective law enforcement is needed to reduce the amount of destruction caused by ORV users.

223. Provide for caretaker.

A part-time caretaker is needed to monitor activities on the Salinas River NWR and other nearby dunes. Having a care-taker on site would improve the effectiveness of the law enforcement personnel assigned to this area, and facilitate better refuge maintenance.

224. Revegetate existing blow-out areas with native plants.

The existing sand dune blow-outs and road cuts are remnants of the period when ORV use was uncontrolled. The sand movement generated by these blow-outs threatens to eliminate the Smith's blue butterfly and its host plant. These areas should be stabilized with native dune vegetation.

225. Remove exotic plants and replace with native plants.

See narrative for task 216.

23. Develop and implement a management plan for the Naval Postgraduate School.

A small butterfly colony exists on one of the dunes at the Naval Postgraduate School. The remnant native vegetation on this dune should be protected from uncontrolled foot traffic.

231. Identify colonies and area to be rehabilitated.

A study is needed to determine the distribution of the butterfly in the one remnant dune colony and the extent to which nearby areas can be readily rehabilitated.

232. Control foot traffic access through dunes.

Foot traffic from Del Monte Avenue to the beach traverses the one sand dune that still supports the Smith's blue butterfly. To protect this colony, the foot traffic should be rerouted to one of the adjacent dunes.

233. Remove exotic plants and replace with native plants.

See narrative for task 216.

24. Develop and implement management plan for Fort Ord Military Reservation.

The Army has designated one of the sand dune areas at Fort Ord as a preserve for the Smith's blue butterfly. Patrols are needed at both the north and south dune areas to control

off-road vehicle use. Iceplant is a problem on these sites despite recent attempts by the Youth Conservation Corps to remove this exotic plant. The effort to remove exotic plants should be continued, and a management plan prepared for the butterfly preserve to give direction and continuity to military activities in adjacent areas.

241. Identify area to be rehabilitated.

The use by Fort Ord of large dune areas for shooting ranges precludes their rehabilitation as Smith's blue butterfly habitat. The dune areas for which rehabilitation is possible should be identified and included in the management plan for the Base.

242. Control off-road vehicle use of dunes.

The management plan for Fort Ord should consider methods for excluding off-road vehicles from dune preserve areas. Some recommended means for improving the effectiveness of current patrol efforts are (1) educating military police on the measures needed to protect butterfly habitat, and (2) notifying military personnel of the areas that are closed to vehicular traffic and the reasons for such closures. Continued periodic patrols will be required to insure that unauthorized civilian and military vehicles are kept out of preserve areas.

243. Remove exotic plants and replace with native plants.

All exotic plants should be removed from designated preserve areas, and areas that are designated as preserves in the future. If and when cost-effective methods become available for revegetating dunes with native plants, efforts should be made to remove exotic plants from the dunes that lie outside designated preserve areas.

244. Revegetate existing blow-out areas with native plants.

See narrative for task 224.

25. Develop and implement land protection and management plans for the Santa Cruz Aggregate site.

A Smith's blue butterfly colony was recently discovered in the Zayante Sand Hills at the Santa Cruz Aggregate site. This property is owned by the Granite Rock Construction Company and is leased to the Santa Cruz Aggregate Company. It is being held in reserve for future sand mining activities. The areas that support Smith's blue butterfly colonies may lose their habitat value unless they are protected. A land protection plan should be developed to identify an effective means for protecting this colony. Such a management plan would also provide County and company personnel with guidance on recommended measures for protecting the butterfly.

251. Identify colonies and area necessary for their maintenance.

A thorough study of this site should be undertaken to determine how much habitat is needed to maintain the butterfly colony.

252. Control off-road vehicle use of dunes.

The use of the dunes by bicycles has recently created a large roadway of blowing sand. Continued use of the roadway by bicycles or off-road vehicles will destroy the protective vegetation and may cause severe erosion problems.

253. Secure the site as a Smith's blue butterfly reserve.

This site is one of two known inland dune habitats for the Smith's blue butterfly. The butterfly occurs there in association with a number of other rare dune plants and animals. Most of the other native inland dune parklands in this area have been mined out of existence. This habitat is relatively undisturbed and may support a genetically and taxonomically distinct butterfly colony. Efforts should thus be made to secure this habitat.

26. Develop and implement management and land protection plans for comparable alternative sites if appropriate.

If comparable alternative sites are selected to replace any of the ones listed in Table 2, appropriate measures should be taken to secure those habitats. Genetic studies and status surveys should be conducted to insure that they meet the criteria outlined in the Objectives section, and management and land protection plans should be developed to insure that the habitats remain secure after reclassification or delisting.

3. Manage, protect, and secure the serpentine grassland and cliff/chaparral colonies required for reclassification to threatened status.

Smith's blue butterfly colonies occur in several cliffside chaparral communities and at least one serpentine grassland. The ones that need to be secured to meet the criteria for downlisting are found at the Crystal Springs Reservoir, Big Creek Preserve, Burns Creek, Vasquez Knob, and Cone Peak Road.

31. Develop and implement management plans for Crystal Springs Reservoir site.

A management plan is now being prepared for the San Francisco Watershed. Crystal Springs Reservoir is within that watershed. The portion of the plan that deals with Crystal Springs Reservoir should include adequate protective measures to secure the integrity of this habitat.

32. Implement management plan for Landels-Hill Big Creek Preserve.

The University of California Natural Reserve System (UC/NRS) manages the Landels-Hill Big Creek Preserve. The Santa Cruz Campus of the University is responsible for managing this preserve. A management plan is now being developed for the area. This preserve, and surrounding lands administered by the U.S. Forest Service, have been designated as a Biosphere Reserve by UNESCO.

321. Identify colonies and area necessary for their maintenance.

The distribution of the Smith's blue butterfly at the preserve should be documented so that the management and research activities carried out at the preserve do not inadvertently eliminate the butterfly.

322. Test vegetation management practices to determine those that lead to greatest host plant recovery or reinvasion.

Several vegetation management techniques have been explored for improving the quantity and quality of habitat available for Smith's blue butterflies. These methods include prescribed burning and hand brush clearing. Experiments should be carried out to determine which methods are most effective in stimulating host plant recovery.

33. Develop and implement management plan for Cone Peak Road colonies.

The habitats occupied by Smiths' blue butterflies along Cone Peak Road are proposed for designation as a Research Natural Area (RNA) by the U.S. Forest Service. A major goal of the management plan to be developed for this area should be protection and enhancement of Smith's blue butterfly habitat.

34. Develop and implement management plan for Burns Creek.

Burns Creek is the type locality for the Smith's blue butterfly. Management and land protection plans should be developed for this area.

341. Determine ownership status.

These sites are thought to be privately owned or highway rights-of-way. However, the ownership pattern needs to be documented so that appropriate measures can be implemented to secure any threatened habitats.

342. Identify colonies and area necessary for their maintenance.

Surveys of the site are needed to determine the distribution of the butterfly in this habitat and determine how large an area is needed to maintain the colonies.

343. Secure necessary conservation easements if appropriate.

Efforts should be made to secure conservation easements, if status surveys indicate that significant amounts of privately owned habitat are threatened by development.

35. Develop and implement management and land protection plan for Vasquez Knob.

Vasquez Knob supports a large colony of Smith's blue butterflies and, because of its location, may be an important source of butterflies for recolonizing other nearby cliff/chaparral areas when localized extinctions occur.

351. Determine ownership status.

See narrative for task 341.

352. Identify colonies and areas necessary for their maintenance.

See narrative for task 342.

353. Secure necessary conservation easements if appropriate.

See narrative for task 343.

36. Develop and implement management and land protection plans for comparable alternative sites if appropriate.

See narrative for task 26.

4. Secure, manage, and protect the Smith's blue butterfly colony sites needed for delisting.

The additional sites needed for delisting may be more difficult to secure and manage because many of them are on private property and some have been proposed for future development. These areas include the Phillips Petroleum site in Del Monte Beach (City of Monterey), privately owned sites in Sand City and Marina, and the Lone Star Olympia Quarry in the Zayante Sand Hills. The habitats at Kirk Creek and Point Gorda are publicly owned and administered by the U.S. Forest Service. The habitats at Partington Canyon and Dolan Creek sites are managed by the California Department of Parks and Recreation.

41. Develop and implement management and land protection plans for the Phillips Petroleum, Sand City, and Marina sites.

Small remnant colonies exist at the Phillips Petroleum site in Monterey and privately owned sites in Sand City and Marina. These sites may be critical for maintaining dispersal corridors among the coastal sand dune populations to permit genetic interchange. Because most of the historic coastal dune habitat in this area has already been modified or destroyed, the small remaining parcels are very important for the survival and recovery of the butterfly.

411. Identify colonies and area necessary for their maintenance.

See narrative for task 251.

412. Control off-road vehicle use of dunes.

See narrative for task 213.

413. Revegetate existing blow-out areas with native plants.

See narrative for task 214.

414. Control foot traffic on dunes by constructing boardwalks for beach access.

See narrative for task 215.

415. Remove exotic plants and replace with native plants.

See narrative for task 216.

42. Develop and implement management and land protection plans for the Lone Star Olympia Quarry Site.

The Lone Star Olympia Quarry is still an active sand quarry. The colony that remains at this site is one of only two known populations from an inland dune parkland. A significant amount of natural habitat has already been mined from this dune system and another area was recently graded. Management and land protection plans are needed to protect the remaining habitat.

421. Identify colonies and area necessary for their maintenance.

The size of the butterfly colony at the Lone Star Olympia Quarry site and the extent of its distribution is not known. This information is needed before an effective land protection plan can be developed.

422. Coordinate recovery needs with restoration efforts on inland dune parkland.

Affected state and local agencies should be advised of the habitat requirements of the Smith's blue butterfly so that the surface reclamation and resource protection requirements in existing state laws and local ordinances can be tailored to meet the needs of the butterfly.

423. Control off-road vehicle use of dunes.

See narrative for task 213.

43. Develop and implement management plans for Kirk Creek, Dolan Creek, Partington Canyon, and Point Gorda sites.

These cliffside chaparral habitats all occur along the central California coast. Little is known about the size of the colonies and the extent of their distribution. This information should be obtained so that effective management programs can be developed to maintain these habitats.

431. Identify colonies and area necessary for their maintenance.

See narrative for task 251.

432. Carry out prescribed burns as appropriate.

Fire was formerly a natural component of chaparral ecosystems. Fire suppression activities by man have altered the successional stage of chaparral vegetation to the detriment of the Smith's blue butterfly. Prescribed burning, where practical, would stimulate the growth of Eriogonum and increase host plant availability.

433. Coordinate recovery needs with other agency activities.

Current and proposed agency activities for these sites should be reviewed, and appropriate changes made when there are conflicts that would jeopardize the survival of the Smith's blue butterfly.

44. Develop and implement management and land protection plans for comparable alternative sites if appropriate.

See narrative for task 26.

5. Determine ecological needs and apply results to management of Smith's blue butterfly.

Many important ecological requirements of the Smith's blue butterfly are not well understood. This is especially true of the recent collection sites. The butterfly's interactions with host plants, predators, parasites, and ants should be investigated because of their direct application to butterfly and host plant management.

51. Determine effect of clump size, plant size, and host plant species on oviposition behavior of the Smith's blue butterfly for use in vegetation management.

It is important to know what triggers oviposition so that the plant species used in revegetation programs do not elicit inappropriate oviposition behavior.

52. Examine interactions of ant associated with Smith's blue butterflies and apply to vegetation management.

It is common for blue butterflies as a group to be dependent on ants for protection from predators. Actions that would negatively affect the ants could result in local extirpations of the Smith's blue butterfly.

521. Determine whether Smith's blue butterfly survival is dependent on presence of ants.

The ants that tend the last 3 larval instars may be crucial to the development of the butterfly. Studies should be conducted to determine if the butterfly can survive when the ants are not present.

522. Identify species of ants involved, if ants are important.

If the butterfly is dependent upon ants to complete its life cycle, surveys should be made to determine the species of ants involved.

523. Determine ecological requirements of ants, if ants are important.

If the butterfly is dependent upon ants to complete its life cycle, studies should be conducted to determine the ecological requirements of the ants.

53. Determine effects of vegetation management on predators and parasites.

The identity and effects of predators and parasites on the Smith's blue butterfly are generally unknown. Current vegetation management practices may have important effects on predators and parasites and thus indirectly affect Smith's blue butterfly survival.

6. Determine taxonomic and/or ecotypic variation among colonies found in each type of habitat and apply results to management of Smith's blue butterfly.

The occurrence of the Smith's blue butterfly in vastly different habitat types may mean that the populations in coastal sand dunes, inland sand dunes, serpentine grasslands, and sandstone cliffs are evolutionarily distinct and should be elevated to

subspecific status. Studies are needed to determine the taxonomy of the colonies in the different habitat types. Information is also needed on the ecological requirements of the different ecotypes so that effective management programs can be developed.

61. Examine ecotypes of *Eriogonum latifolium* and determine taxonomic relationship to other host plants.

The host plants in the inland dune and serpentine grassland habitats appear to be ecotypes of *E. latifolium*. Dr. James Reveal (in Munz 1968) has noted that these ecotypes possess characters of *E. parvifolium*, the host plant for the coastal sand dune and cliffside colonies. Differences between the host plants in the various habitat types should be investigated because of the significance this may have on the life cycle of the butterfly.

62. Determine life history variation among colonies in different habitats.

The butterfly colonies that use different species of buckwheat may be evolutionarily distinct because of the temporal separation of emergence and flight season. Management of the different butterfly colonies should be based on the natural genetic units that have evolved to utilize the available food resources.

63. Determine if the different ecotypes differ genetically.
If significant taxonomic differences are identified among the different ecotypes of E. e. smithi, appropriate name changes should be proposed and management programs revised to protect each of the distinct taxonomic units. Appropriate morphological, meristic, electrophoretic, and statistical studies should be performed to resolve the taxonomic questions.

7. Determine population status of the different Smith's blue butterfly colonies, identify potential threats to habitats, and determine priorities for securing habitats.
Information about the current status of the Smith's blue butterfly and its habitat is needed to determine whether it now qualifies for reclassification or delisting.

71. Survey recent collection sites to document extent of distribution and population size.

Little is known about most of the recent collection sites other than that Smith's blue butterflies have been collected from those areas. Surveys are needed to document the size, range, and patchiness of those colonies.

72. Survey old collection sites to document status of habitat and current size and distribution of colonies.

Many of the old collection sites have not been surveyed recently. Surveys are needed to document that those colonies still exist and that the habitats are still intact.

73. Survey other potential habitats to determine if the Smith's blue butterfly is more widespread and abundant than now believed.

The recent discovery of the Smith's blue butterfly in inland dune and serpentine grassland habitats suggests that it may be more widespread than once believed. The butterfly's host plant occurs on the High Flandrian dunes and the lower Flandrain dunes west of Highway 1. These areas are largely in private ownership, but are in an undeveloped condition and represent some of the best remaining examples of coastal dune habitat. Other potential habitats that should be surveyed include the inland marine sands at the Bonny Doon Treatment Plant in Santa Cruz County. Documentation of an extended range could hasten qualification for reclassification or delisting.

74. Examine proposed land uses to find out if any Smith's blue butterfly habitats are likely to be destroyed or modified in the foreseeable future.

Information about potential threats to the various Smith's blue butterfly habitats is needed to determine whether or not it qualifies for reclassification or delisting.

75. Establish priorities for securing the different sites.

Priorities for securing the different sites should be established on the basis of colony size, location relative to other Smith's blue butterfly colonies, taxonomic distinctness, and potential threats to the habitat.

8. Investigate and implement restoration techniques for native vegetation.

Part of the problem in developing a recovery program for the Smith's blue butterfly is that a cost-effective method for revegetating sand dunes with native plants has not yet been developed. As a consequence, it is much more economical to stabilize shifting sand dunes and road cuts with Holland dune grass. New methods and techniques for producing and transplanting native dune plants are needed to gain public acceptance. When such methods are developed they should be distributed widely to the public.

81. Establish techniques for eradication of iceplant and Holland dune grass.

Iceplant and Holland dune grass have been widely used in California for for stabilizing sand dune and highway rights-of-way. They are highly invasive and tend to exclude the native flora, as well as native insect and arthropod populations. Converting the areas dominated by exotic plants to native dune vegetation would significantly increase the amount of Smith's blue butterfly habitat available.

82. Evaluate available techniques for planting native dune species.

Revegetation techniques utilizing plants native to the Seaside-Marina dune system have not been perfected. In

attempts to establish native plants for dune stabilization, problems with slow growth and shock-mortality of the plants have not yet been overcome. Additional work is needed to develop successful revegetation techniques.

83. Use information to modify management plans accordingly at designated sites.

Effective implementation of the management plans developed for the sites listed in Table 2 and Table 3 will require current technical information regarding the restoration of sand dunes with native vegetation.

9. Develop public awareness of the Smith's blue butterfly.

Greater public acceptance and support for recovery activities will be generated if the recovery program is explained to the public and property owners are kept informed of agency activities within their neighborhoods.

91. Provide audio-visual programs for public display.

Audio-visual programs are popular in local schools and may be of interest to some civic organizations. This may be an effective method for developing support within communities for programs that protect their own unique resources.

92. Conduct informational meetings.

Public meetings can be an effective method for disseminating information about recovery tasks that are of concern to the public.

93. Conduct interpretive tours of appropriate areas.

Interpretive tours of the dunes could be coordinated through local conservation groups such as the California Native Plant Society, Audubon Society, and local natural history museums, colleges, and universities.

94. Erect interpretive signs on Smith's blue butterfly reserve lands.

Interpretive signs should be placed at trailheads to beach access points to increase public cooperation in protecting sensitive dune habitats. Boardwalks and fencing should also be used, where practical, to protect sensitive habitats.

95. Provide revegetation information for interested persons and agencies.

Private property owners and development agencies can often be enlisted to support recovery activities if proper guidance is given. Revegetation techniques and suggestions are needed by these groups to help restore natural habitats for the Smith's blue butterfly.

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PART III
IMPLEMENTATION SCHEDULE

The table that follows is a summary of scheduled actions and costs for the Smith's blue butterfly recovery program. It is a guide to meet the objectives of the Smith's Blue Butterfly Recovery Plan as discussed in Part II, the recovery plan Narrative section. This table indicates the general category of the recovery plan tasks, the corresponding stepdown-outline numbers, the priority and estimated duration of the tasks, the estimated costs of implementation, and the agency or agencies responsible for performing the tasks. Implementing Part III is the action of the recovery plan, that when accomplished, will bring about recovery of the Smith's blue butterfly.

GENERAL CATEGORIES FOR IMPLEMENTATION SCHEDULES

Information Gathering - I or R (research)

1. Population status
2. Habitat status
3. Habitat requirements
4. Management techniques
5. Taxonomic studies
6. Demographic studies
7. Propagation
8. Migration
9. Predation
10. Competition
11. Disease
12. Environmental contaminant
13. Reintroduction
14. Other information

Acquisition - A

1. Lease
2. Easement
3. Management agreement
4. Exchange
5. Withdrawal
6. Fee title
7. Other

Management - M

1. Propagation
2. Reintroduction
3. Habitat maintenance and manipulation
4. Predator and competitor control
5. Depredation control
6. Disease control
7. Other management

Other - O

1. Information and education
2. Law enforcement
3. Regulations
4. Administration

RECOVERY ACTION PRIORITIES

- 1 = An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.
- 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.
- 3 = All other actions necessary to provide for full recovery of the species.

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					Region	FWS Program		FY1	FY2	FY3	
02	Actively enforce existing laws and regulations.	11	2	Ongoing	1	LE*	CDFG CDPR	5	5	5	Included in FY 85 LE Program Advice Objective 1-451.
02	Evaluate success of law enforcement efforts.	12	2	As Needed	1	SE* LE	CDFG	To be determined			
03	Propose new regulations or revisions of existing codes as necessary.	13	3	As Needed	1	SE* LE	CDFG Mon. Co.	To be determined			
03	Monitor agency compliance with Section 7 consultations and implementation of recovery plan tasks.	14	2	Continuous	1	SE*	CDFG	To be determined			
03	Monitor agency designation of Smiths' blue butterfly (SBB) habitat in land use plans.	15	2	Continuous	1	SE	CDFG* CaCC	To be determined			
M3	Coordinate agency recovery efforts for the SBB	16	3	Continuous	1	SE*	CDFG	To be determined			

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IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS	Region		FY1	FY2	FY3	
I3	Identify colonies and area necessary for maintenance of SBB [Marina State Beach].	211	2	1	1	SE					
M7	Control hang-glider use of dunes [Marina State Beach].	212	2	Ongoing			CDPR*	2			
M3	Control off-road vehicle use of dunes [Marina State Beach].	213	2	Ongoing			CDPR*	10	10	10	
M3	Revegetate existing blowout areas with native plants [Marina State Park].	214	2	10			CDPR* CCC	To be determined			
M3	Control foot traffic on dunes by constructing boardwalk for beach access [Marina State Park].	215	2	2			CDPR* CCC	2		2	
M3	Remove exotic plants and replace with native plants [Marina State Park].	216	2	10			CDPR*	To be determined			

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS	Region		FY1	FY2	FY3	
I3	Identify colonies and area necessary for maintenance of colonies [Salinas River NWR].	221	2	1	1	SE Refuge*	CDFG	1	1		
M3	Control off-road vehicle use of dunes [Salinas River NWR].	222	2	Contin-uous	1	LE Refuge	CDFG*	5	5	5	
M3	Provide for caretaker [Salinas River NWR].	223	2	Contin-uous	1	SE Refuge*	CDFG	5	5	5	This should be coordinated with CDPR and TNC.
M3	Revegetate existing blowout areas with native plants [Salinas River NWR].	224	2	10	1	SE Refuge*	CDFG CCC	5	5	5	
M3	Remove exotic plants and replace with native plants [Salinas River NWR].	225	2	Contin-uous	1	Refuge*	CDFG CCC	5	5	5	

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS	Region		Program	FY1	FY2	
I3	Identify colonies and area to be rehabilitated [Naval Postgraduate School].	231	2	1	1		SE				
M3	Control foot traffic access through dunes [Naval Postgraduate School].	232	2	Continuous			NAVY*	0.5			
M3	Remove exotic plants and replace with native plants [Naval Postgraduate School].	233	2	10			NAVY*	3	3	3	
M3	Identify area to be rehabilitated [Fort Ord].	241	2	1	1		NAVY*	2	2	2	
M3	Control off-road vehicle use of dunes [Fort Ord].	242	2	Continuous			ARMY*		0.5		
M3	Remove exotic plants and replace with native plants [Fort Ord].	243	2	5			ARMY*		To be determined		
							ARMY*	5	5	5	

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS	Region		FY1	FY2	FY3	
M3	Revegetate existing blowout areas with native plants [Fort Ord].	244	2	10			ARMY*	To be determined			
I3	Identify colonies and area necessary for their maintenance [Santa Cruz Aggregates].	251	2	1		SE*	CDFG	2	2		
M3	Control off-road vehicle use of dunes [Santa Cruz Aggregates].	252	2	Continuous			CDFG S.C. Sheriff*	To be determined			
A2	Secure the site as a Smith's blue butterfly reserve [Santa Cruz Aggregates].	253	2	5		SE ACQ	CDFG*	To be determined			

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					Region	FWS		FY1	FY2	FY3	
M7	Develop and implement management and land protection plans for comparable alternative sites.	26	2	5	1	SE ACQ	CDFG TNC CaCC CDPR COM SCI CMO	To be determined			Lead varies depending on site.
M7	Implement management plan for Crystal Springs Reservoir site.	31	2	3			SFWD*	To be determined			In progress
I3	Identify colonies and area necessary for their maintenance [Big Creek Reserve].	321	2	1	1	SE	UCNRS*	1 1			
M3	Test vegetation management practices to determine those that lead to greater host plant recovery or reinvasion [Big Creek Reserve].	322	2	5	1	SE	UCNRS*	2 2	2 2		To be completed in FY 6

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					Region	FWS		FY1	FY2	FY3	
M7	Develop and implement management plan for colonies at Cone Peak Road.	33	2	3	1		CDFG USFS*	To be determined			
I14	Determine ownership status [Burns Creek].	341	2	1	1	SE	CDPR* CDFG	0.5			
I3	Identify colonies and area necessary for their maintenance [Burns Creek].	342	2	1	1	SE*	CDPR	0.5 0.5			
A2	Secure necessary conservation easements [Burns Creek].	343	2	3	1	ACQ*	CDFG	To be determined			
M7	Determine ownership status [Vasquez Knob].	351	2	1	1	SE ACQ	CDFG*	0.5			

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS	Region		FY1	FY2	FY3	
I3	Identify colonies and area necessary for their maintenance [Vasquez Knob]	352	2	1	1	SE*	CDFG		0.5	0.5	
A2	Secure necessary conservation easements [Vasquez Knob]	353	2	3	1	ACQ*	CDFG		To be determined		
M7	Develop and implement management and land protection plans for comparable alternative sites.	36	2	5	1	SE ACQ	CDFG TNC CaCC CDPR COM SCI CMO		To be determined		Lead varies depending on site.
I3	Identify colonies and area necessary for their maintenance [Phillips Petroleum, Sand City, and Marina]	411	2	2	1	SE*	CDFG CaCC		1	1	1

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS Region	Program		FY1	FY2	FY3	
M3	Control off-road vehicle use of dunes [Phillips Petroleum, Sand City, and Marina].	412	2	Continuous	1	LE*	CDFG M.Co.Sheriff	To be determined			
M3	Revegetate existing blowout areas with native plants [Phillips Petroleum, Sand City, and Marina].	413	2	10			CaCC* CMO SCI COM	To be determined			Lead varies depending on site.
M3	Control foot traffic on dunes by constructing boardwalks for beach access [Phillips Petroleum, Sand City, and Marina].	414	2	As needed			CDFG CDPR M.Co.Sheriff COM	To be determined			Lead varies depending on site.
M3	Remove exotic plants and replace with native plants [Phillips Petroleum, Sand City, and Marina].	415	2	As needed			CMO CDPR COM	To be determined			Lead varies depending on site.
I3	Identify colonies and area necessary for their maintenance [Olympia Quarry].	421	2	1	1	SE*	CDFG		1	1	

PART III
 IMPLEMENTATION SCHEDULE
 SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Estimated Costs ² (\$1,000)	Comments and Notes
					Region	Program		
M1	Coordinate recovery needs with restoration efforts on inland dune parkland [Olympia Quarry].	422	2	Continuous	1	SE	To be determined	
M3	Control off-road vehicle use of site [Olympia Quarry].	423	2	Continuous			To be determined	S.C. Co.* CDFG
I3	Identify colonies and area necessary for their maintenance.	431	2	3	1	SE	To be determined	CDFG S.C. Sheriff* LoneStar
M3	Carry out prescribed burns if appropriate.	432	2	As needed			To be determined	CDFG USFS
M1	Coordinate recovery needs with other agency activities.	433	2	Continuous	1	SE*	To be determined	CDFG USFS*
							To be determined	CDFG CaCC USFS

Lead varies depending on site.

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IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)		Comments and Notes
					FWS	Region		FY1	FY2 FY3	
M7	Develop and implement management and land protection plans for comparable alternative sites.	44	2	5	1	SE ACQ	CDFG TNC CaCC CDPR COM SCI CMO	To be determined		Lead varies depending on site.
R7	Determine effect of clump size, plant size, and host plant species on oviposition of SBB for use in vegetation management.	51	2	3	1	SE*	CDFG	2 2		To be completed in FY 4.
R14	Determine whether SBB survival is dependent on ants.	521	2	2	1	SE*	CDFG	1 1		
R5	Identify species of ants involved.	522	2	2	1	SE*	CDFG	1 1		
R3	Determine ecological requirements of ants	523	2	2	1	SE*	CDFG	1 1		

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS	Region		FY1	FY2	FY3	
R9	Determine effects of vegetation management on predators and parasites.	53	3	2	1	SE*	CDFG	2	2	2	
R5	Examine ecotypes of <i>Eriogonum latifolium</i> and determine taxonomic relationship to other host plants.	61	3	2	1	SE*	CDFG	2	2	2	
R5	Determine life history variation among colonies in different habitats.	62	3	3	1	SE*	CDFG	2	2	2	To be completed in FY 5.
R5	Determine if different ecotypes of SBB warrant taxonomic recognition.	63	2	3	1	SE*	CDFG	2	2	2	To be completed in FY 4.
R1	Survey recent collection sites to document population size and distribution.	71	2	2	1	SE*	CDFG	1	1	1	

PART III
 IMPLEMENTATION SCHEDULE
 SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FWS Region	Program		FY1	FY2	FY3	
R2	Survey old collection sites to document current population size and habitat status.	72	2	2	1	SE*	CDFG	1	1	1	
R1	Survey other potential SBB habitats.	73	2	2	1	SE*	CDFG	1	1	1	
R2	Examine proposed land uses in SBB habitats to identify potential threats.	74	2	2	1	SE*	CDFG	1	1	1	
M3	Establish priorities for securing different sites.	75	2	2	1	SE*	CDFG CaCC USFS CDPR	2	2	2	
R4	Establish techniques for eradication of iceplant and Holland dune grass.	81	2	4	1	SE*	CNPS TNC	1	1	1	To be completed in FY 5.

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					Region	Program		FY1	FY2	FY3	
R4	Evaluate available techniques for planting native dune species.	82	2	4	1	SE*	CNPS TNC	1 1 1	1 1 1	1	To be completed in FY 5.
M4	Incorporate restoration techniques into management plans at designated sites.	83	2	As needed	1	Refuge	CDFG CDPR USFS UCNRS ARMY NAVY CaCC	To be determined	To be determined		Lead varies depending on site.
01	Provide audio-visual programs for public display.	91	3	Continuous	1	SE*	CDFG	To be determined	To be determined		
01	Conduct informational meetings.	92	3	As needed	1	SE*	CDFG TNC	To be determined	To be determined		
01	Conduct interpretive tours of appropriate areas.	93	3	Continuous	1	SE	CDFG CDPR* CNPS AUD TNC	To be determined	To be determined		This will be generally a volunteer effort.

PART III
IMPLEMENTATION SCHEDULE
SMITH'S BLUE BUTTERFLY RECOVERY PLAN

General Category	Task Plan	Task Number	Priority Number	Duration ¹ of Task (yrs.)	Responsible Agency		Other Agency	Estimated Costs ² (\$1,000)			Comments and Notes
					FMS	Region		Program	FY1	FY2	
01	Erect interpretive signs on Smith's blue butterfly reserve lands.	94	3	1	1	Refuge	CDFG CDPR ARMY NAVY	To be determined	To be determined	To be determined	Lead varies depending on site.
01	Provide revegetation information for interested persons and agencies.	95	2	Continuous	1	SE*	CNPS AUD	To be determined	To be determined	To be determined	To begin in FY 5.

* Lead agency = The action is now being implemented and will continue on an annual basis.
 1 Ongoing = The action will be implemented on an annual basis once the action is begun.
 2 FY1 = 1985

Abbreviations

- SE = USFWS (Endangered species)
- LE = USFWS (Law Enforcement)
- Refuge = USFWS (Wildlife Resources)
- ACQ = USFWS (Acquisition)
- CDFG = California Department of Fish and Game
- CDPR = California Department of Parks and Recreation
- CCC = California Conservation Corps
- CaCC = California Coastal Commission
- NAVY = United States Navy
- ARMY = United States Army
- TNC = The Nature Conservancy
- S.C.Sheriff = Santa Cruz County Sheriff

- SFWD = San Francisco Water District
- UCNRS = University of California Natural Reserve System
- COM = City of Marina
- SCI = Sand City
- CMO = City of Monterey
- M.Co.Sheriff = Monterey County Sheriff
- Lone Star = Lone Star Sand Mining Operations
- S.C.Co. = Santa Cruz County
- USFS = U.S. Forest Service
- CNPS = California Native Plant Society
- AUD = Audubon Society
- Mon. Co. = Monterey County

APPENDIX A.

Glossary of Technical Terms.

- Acaulescent - stemless or apparently stemless.
- Aeolian - borne, deposited, produced, or eroded by the wind.
- Asynchronous - occurring at different times; not simultaneous.
- Ecotype - A group of individuals which are interfertile with each other and with members of other ecotypes of the same species, but which maintain their individuality as a distinct group through environmental selection or isolation.
- Endemic - restricted to or native to a particular area or region.
- Myrmecophily - the practice by another organism (insect) of habitually sharing the nest of a species of ant.
- Oviposit - to deposit eggs in a position suitable for development.
- Pupation - the process of passing through the pupal state to become a pupa.
- Sympatric - occupying or taking place in the same area; capable of occupying the same range without loss of identity due to interbreeding.
- Univoltine - producing one brood in a season; especially a single brood of eggs capable of hibernating.
- Vagility - the capacity for an organism to move freely about.

APPENDIX B.

List of Organizations and Individuals Asked to Provide Agency Review Comments.

California Coastal Commission, San Francisco, California
California Conservation Corps, Sacramento, California
California Department of Fish and Game, Sacramento, California
California Department of Parks and Recreation, Sacramento, California
California Native Plant Society, Carmel Valley, California
Lone Star Industries, San Mateo, California
Marina City Planning Department, Marina, California
Monterey City Planning Department, Monterey, California
Monterey County Planning Department, Salinas, California
Naval Postgraduate School, Monterey, California
Sand City Planning Department, Sand City, California
San Francisco Water District, Millbrae, California
Santa Cruz County Planning Department, Santa Cruz, California
Santa Cruz Museum of Natural History, Santa Cruz, California
The Nature Conservancy, San Francisco, California
U.S. Army Corps of Engineers, Director of Engineering and Housing,
Fort Ord, California
U.S. Fish and Wildlife Service, Office of Endangered Species,
Washington, D.C.
U.S. Fish and Wildlife Service, Region One, Portland, Oregon
U.S. Forest Service, Pacific Southwest Region, San Francisco, California
University of California, Natural Reserve System, Berkeley, California
Dr. Richard Arnold, Pleasant Hill, California
Ms. Alice Howard, Berkeley, California
Mr. David Shonman, Pacific Grove, California



