ATTACHMENT G

PROFILES OF FEDERAL SPECIAL-STATUS WILDLIFE SPECIES

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GIANT KANGAROO RAT *(Dipodomys ingens)*

HISTORICAL AND CURRENT DISTRIBUTION

Historically, the giant kangaroo rat occurred in the Tulare Basin and in the adjacent Carrizo Basin and Cuyama and Panoche valleys. This distribution closely coincides with the distribution of marine sediment-derived soils on the southern and western edges of the San Joaquin Valley (Williams, 1992). Conversion of valley grasslands to agriculture and other land uses has resulted in a 98 percent loss of habitats suitable for the giant kangaroo rat (Williams, 1992). The species is found in less than 2 percent of its historical range, in small, widely scattered colonies in areas such as the Panoche and Cuyama valleys, Carrizo and Elkhorn plains, and the upper Buena Vista Valley in the Elk Hills. (Williams, 1980.)

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Giant kangaroo rats prefer sparsely vegetated grasslands that are characterized by good drainage, fine sandy-loam soils, and a gentle slope (284 Federal Register 52, January 5, 1987). Populations are limited to areas with less than 6 inches of rain and are generally found at elevations of less than 3,000 feet (Williams, 1992). Areas with halophytic vegetation, dense shrub cover, or excessively rocky or gravelly terrain are typically avoided (Williams, 1980). The species feeds almost exclusively on the seeds of annual plants, such as brome grasses and filarees. Individuals harvest, stack, and dry the grasses and forbs near the entrance of their burrows (California Department of Fish and Game, 1991). Historically, the colonies of giant kangaroo rat precincts were so dense as to exclude all other rodent species.

Loss of habitat to agriculture and other land-modifying actions is the primary reason for the decline in population of the giant kangaroo rat. This decline is apparently continuing, with habitat loss still the main threat to this species. Intensive livestock grazing and the use of rodenticides may contribute to the continued decline of this species (Williams, 1980).

RECOVERY EFFORTS

The giant kangaroo rat is federally and state listed as endangered. The Service is preparing a draft recovery plan for this and other arid upland and riparian species of the San Joaquin River and Tulare Lake regions.

FRESNO KANGAROO RAT *(Dipodomys nitratoides exilis)*

HISTORICAL AND CURRENT DISTRIBUTION

The Fresno kangaroo rat is a subspecies of the San Joaquin kangaroo rat and is the smallest of California's kangaroo rats (Culbertson, 1946; Grinnell 1922). It was believed extinct until 1934, when a specimen was collected near Kerman, Fresno County (Culbertson, 1934). The historical range of the Fresno kangaroo rat probably extended north from northcentral Merced County south through southwestern Madera and central Fresno counties (Hoffman, 1974; California Department of Fish and Game, 1991). Agricultural development has resulted in the extirpation of this subspecies from most of the San Joaquin Valley. A survey in the late 1970s indicated that the Fresno kangaroo rat remained on only about 857 acres in western Fresno County (Hoffman and Chesemore, 1982).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

The Fresno kangaroo rat has narrow habitat requirements, occupying only alkali desert scrub communities between 200 and 300 feet elevation (California Department of Fish and Game, 1992). Seasonally flooded or arid alkaline plains with alkaline, clay-based soil and sparse growths of grass and low brush are used. Vegetation, such as saltbush, iodine bush, saltgrass, and alkali blite, provide food and cover for this subspecies (Culbertson, 1946). Areas with a hummocky land surface are used as sites for burrow systems (Culbertson, 1946). The Fresno kangaroo rat is not known to use areas that are cultivated or irrigated; therefore, conversion of an area with native vegetation to crop production eliminates the Fresno kangaroo rat.

Conversion of native alkali desert scrub plains to agriculture is the primary factor responsible for the decline of the Fresno kangaroo rat (Hoffman, 1974). The use of rodenticides may have accelerated the subspecies' decline. Intensive livestock grazing may have also played a significant role in reducing the habitat availability of the Fresno kangaroo rat through soil compaction, damage to rodent burrows, and loss of vegetative cover (Koos, 1977).

RECOVERY EFFORTS

The Fresno kangaroo rat is federally and state listed as endangered. The Service established critical habitat for this subspecies near James Road and near Whites Bridge Road in Fresno County (Knapp, 1975). The latter site is located near Tranquility. Additional habitat is protected at the Alkali Sink Ecological Reserve (932 acres). To ensure genetic viability of the subspecies, it will be necessary to preserve larger blocks (800–2,800 acres) of contiguous habitat (California Department of Fish and Game, 1991). The Service is preparing a draft recovery plan for this and other arid upland and riparian species of the San Joaquin River and Tulare Lake regions.

TIPTON KANGAROO RAT *(Dipodomys nitratoides nitratoides)*

HISTORICAL AND CURRENT DISTRIBUTION

The Tipton kangaroo rat historically occurred in the Tulare Lake Basin, from Lemoore and Hanford in Kings County, to Tipton and Bakersfield on the east, and to the edge of the alkali desert scrub on the west (Uptain, 1990; Williams, 1986). The historical range of this subspecies encompassed approximately 1,716,500 acres. In 1985, it was estimated that less than 4 percent (63,367 acres) of the Tipton kangaroo rat's habitat remained undeveloped, primarily in small blocks not large enough to support viable populations (Williams, 1986). Presently, only 1 percent of the historical population may survive (California Department of Fish and Game, 1991). Approximately 6,434 acres of remaining suitable habitat are preserved in five separate parcels (Williams, 1986; California Department of Fish and Game, 1991). These areas include the federally administered Pixley National Wildlife Refuge, the state-owned Allensworth Ecological Preserve, and TNC's Paine Wildflower Preserve.

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

The Tipton kangaroo rat occurs in alkali desert scrub habitat between 200 and 300 feet elevation in the Tulare Lake Basin (Williams, 1986; California Department of Fish and Game, 1991). Areas with friable soils provide the proper substrate to excavate shallow burrow systems. These systems are located on slightly elevated mounds, such as alluvial fans, or around the base of shrubs, where wind-deposited soils have accumulated. This allows the Tipton kangaroo rat to escape seasonal flooding.

The Tipton kangaroo rat feeds primarily on seeds and has an important role in seed dispersal, influencing plant distribution. It serves as prey for carnivores, such as the badger and the San Joaquin kit fox, a species federally and state listed as endangered. The burrow systems provide refuge to other animals, including blunt-nosed leopard lizard (a species federally listed as endangered), and also serve to aerate soils and increase vegetative productivity (25608 Federal Register 53, July 8, 1988).

Habitat loss to agriculture is the primary reason for decline in population of the Tipton kangaroo rat. The use of rodenticides has accelerated the population decline. In addition, some remnant populations may become extinct because of the loss of genetic diversity and immigration, given the small, isolated nature of the remaining populations.

RECOVERY EFFORTS

The Tipton kangaroo rat is federally and state listed as endangered. The Service is preparing a draft recovery plan for this and other arid upland and riparian species of the San Joaquin River and Tulare Lake regions.

SALT MARSH HARVEST MOUSE *(Reithrodontomys raviventris raviventris)*

HISTORICAL AND CURRENT DISTRIBUTION

The salt marsh harvest mouse is endemic to saltwater and brackish water marshes adjoining San Francisco Bay and its tributaries (Shellhammer, 1982). It was formerly found throughout the extensive marshes that once bordered San Francisco, San Pablo, and Suisun bays (California Department of Fish and Game, 1980). Filling, flooding, or other conversions of the marshes for commercial purposes had removed 79 percent of the tidal marshes by 1979 (Jones & Stokes Associates et al., 1979). Additionally, much of the remaining area was converted to diked wetland, most of which became marginal or unsuitable habitat for the salt marsh harvest mouse (U.S. Fish and Wildlife Service, 1984a). The species is now restricted to fragmented and widely separated saline or brackish emergent wetlands.

Two subspecies of the salt marsh harvest mouse are recognized. The northern subspecies ranges from Gallinas Creek on the Marin Peninsula through the Petaluma, Napa, and Suisun Bay marshes to Collinsville in Solano County. It also occurs from Martinez to Antioch in Contra Costa County (Shellhammer, 1982). The southern subspecies is distributed from south San Francisco Bay around the southern arm of the bay (Fisher, 1965), north to San Pablo on the east side of the bay. An additional population is located near Corte Madera in Marin County.

Known populations of salt marsh harvest mice exist at the Leslie Salt intake and Mare Island in Solano County, lower Tubbs Island in Sonoma County, Novato and Gallinas creeks in Marin County, Albrad Slough and Triangle Marsh in Alameda County, Bair and Bird islands in San Mateo County (U.S. Fish and Wildlife Service, 1984a), and the Palo Alto Bay salt marsh in Santa Clara County (Wondolleck et al., 1976). The species also has been found along the Sacramento River Delta at Grizzly and Joice Island Wildlife Management Areas (Schaub, 1971) and near Collinsville (Shellhammer, 1979) in Solano County.

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Optimal habitat for this species is saline emergent wetland with 100 percent plant cover, consisting predominantly of pickleweeds in association with fat hen and alkali heath (Shellhammer, 1982). Suitable wetlands are 100 or more acres, with an upper edge of peripheral halophytes (salt-loving plants) for refuge during high tides or floods (Shellhammer, 1982). The salt marsh harvest mouse will also use marginal upland habitats (Zetterquist, 1977; Botti et al., 1986).

Habitat destruction is the greatest threat to this species (U.S. Fish and Wildlife Service, 1980). Approximately 80 percent of the original marsh vegetation of the San Francisco Bay Area has been converted to salt ponds, diked wetlands, agricultural land, or commercial developments. Marsh subsidence, changes in salinity, plowing, mowing, burning, and artificial flushing have caused adverse impacts on this species' habitat by changing plant species composition or reducing vegetation cover (Shellhammer, 1982).

RECOVERY EFFORTS

The salt marsh harvest mouse is federally and state listed as endangered. The Service (1984a) developed a recovery plan for the California clapper rail and the salt marsh harvest mouse that emphasizes protection and enhancement of existing marshes and restoration of former habitat. The objectives of the plan are to secure and manage approximately 15,360 acres of occupied essential habitat under various government jurisdictions and approximately 12,800 acres of occupied, unsecured, essential habitat mostly in private ownership. Additionally, the plan states that 27,500 acres of tidal marsh and diked historical bay lands will be restored and enhanced.

SAN JOAQUIN KIT FOX *(Vulpes macrotis mutica)*

HISTORICAL AND CURRENT DISTRIBUTION

Although the precise historical range of the kit fox is unknown, it is believed to have extended from Contra Costa and San Joaquin counties in the north and to Kern County in the south. By the 1930s, the range had been reduced to the southern and western portions of the Central Valley (Grinnell et al., 1937). Surveys conducted between 1969 and 1975 extended the known range of the kit fox back into portions of its historical range in the northern San Joaquin Valley, including Contra Costa, Alameda, and San Joaquin counties (Orloff et al., 1986). Additionally, kit foxes were found in three counties outside the originally defined historical range: Monterey, Santa Clara, and Santa Barbara (Orloff et al., 1986).

The original range of the kit fox was estimated to encompass approximately 8,670 square miles, supporting anywhere between 8,670 and 12,135 adult foxes. By 1975, an estimated 42 percent of suitable habitat had been lost to development, particularly irrigated agriculture, with the kit fox population size estimated at 7,000 individuals (U.S. Fish and Wildlife Service, 1983, California Department of Fish and Game, 1989). Most of the range defined in 1975 still supports kit foxes (California Department of Fish and Game, 1989), although populations are declining (California Department of Fish and Game, 1988) and populations in the northern portion of the species' range are small and isolated (U.S. Fish and Wildlife Service, 1983).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

San Joaquin kit foxes occur in seasonal wetland, alkali desert scrub, grassland, and valley foothill hardwood habitats (U.S. Fish and Wildlife Service, 1983). Before the rapid expansion of irrigated agriculture in the San Joaquin Valley, the alkali desert scrub association was probably the species' prime habitat (Grinnell et al., 1937).

Kit foxes are primarily nocturnal and carnivorous. Major prey species include kangaroo rats, black-tailed hares, desert cottontails, deer mice, and California ground squirrels. Although kangaroo rats are a dominant prey species in the San Joaquin Valley (U.S. Fish and Wildlife Service, 1983), California ground squirrels are the most important prey species in some other portions of the kit fox's range (Balestreri, 1981; Hall 1983; O'Farrell et al. 1987; Clifton 1989). Kit foxes apparently do not require drinking water (Egoscue 1956; Morrell 1972).

The size of kit fox home range varies from 640 to 1,280 acres, with substantial overlap among individuals (Morrell, 1972; Zoellick et al. 1987). The foxes usually inhabit areas with loose-textured soils suitable for den excavation (U.S. Fish and Wildlife Service 1983). Where soils make digging difficult, the foxes frequently use and modify burrows built by other animals (Orloff et al. 1986). Structures such as culverts, abandoned pipelines, and well casings may also be used as den sites. (U.S. Fish and Wildlife Service 1983.)

The foxes change den sites frequently, moving most often in summer. Pairs are formed during winter, and young are born in spring (Morrell 1972). Natal dens are used from December through May, and the same natal dens are often used in subsequent years (U.S. Fish and Wildlife Service 1983). Den changes may occur in response to a depleted prey base or increased numbers of fleas or other external parasites (Egoscue 1956).

The San Joaquin kit fox population has declined primarily because of habitat loss to agricultural, urban, industrial, and mineral development in the San Joaquin Valley (U.S. Fish and Wildlife Service 1983). In 1979, only 6.7 percent of the native habitats in the San Joaquin Valley south of Stanislaus County remained untilled or undeveloped (O'Farrell et al., 1981). Road kills, illegal shooting and trapping, and secondary poisoning and prey reduction from rodent control programs may be significant factors in the species' decline.

RECOVERY EFFORTS

The San Joaquin kit fox is federally listed as endangered and state listed as threatened. The Service approved a recovery plan for the San Joaquin kit fox in 1983 (U.S. Fish and Wildlife Service, 1983), which outlines steps allowing for the reclassification of the kit fox to threatened. Before the consideration of reclassification of the kit fox, three objectives must be achieved: 35,000 acres of habitat must be secured within a high-priority area; protection of the kit fox and its habitat throughout the species' range must be provided; and management of the kit fox must provide at least 1.4 adult animals per square mile on private and public lands. The highest priority kit fox populations are within western Kern and eastern San Luis Obispo counties, the federal lands in the Elk Hills, and the Carrizo and Elkhorn plains (U.S. Fish and Wildlife Service, 1983). The San Joaquin kit fox will also be included in the draft multispecies recovery plan for arid upland and riparian species of the San Joaquin River and Tulare Lake regions being prepared by the service.

CALIFORNIA LEAST TERN *(Sterna antillarum ssp. browni)*

HISTORICAL AND CURRENT DISTRIBUTION

Historically, California least terns occurred throughout coastal regions south of Santa Cruz County (Grinnell and Miller 1944). Currently, nesting populations can be found from San Luis Obispo County to San Diego County, with the greatest number of breeding pairs in Los Angeles, Orange and San Diego counties. On breeding colony occurs in the San Francisco Bay (Fancher, 1992). California least terns are found in the California only in the April to September breeding season.

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

California least terns nest in colonies of 30-50 pairs on expansive stretches of shoreline. They feed on a wide variety of small species of fish and other prey near the shore (Zeiner et al., 1990). Disturbance of nesting habitat by human activities and predation by introduced species such as feral cats and red foxes and by native predators such as American crows and American kestrels. Near developed areas, native species such as raccoons that are tolerant of development exert an unnaturally high predation pressure. Off-road vehicle use, coastal development, and other disturbances have played important roles in reducing available nesting habitat.

RECOVERY EFFORTS

The California least tern was federally and state listed as endangered in 1970. From 1970 to 1991 the estimated number of breeding pairs increased form 600 to 1,830 (Fancher, 1992). Acquisition of nesting areas by public agencies has contributed to better protection of existing colonies. Newly created shoreline areas have contributed to an increase in nesting habitat. A recovery plan for the California least tern was issued in 1980. The plan emphasizes annual breeding population surveys and site management and protection activities, including predator control and protection from human activities.

ALEUTIAN CANADA GOOSE *(Branta canadensis leucopareia)*

HISTORICAL AND CURRENT DISTRIBUTION

Historically, Aleutian Canada geese wintered from British Columbia to California and northwestern Mexico. Although they occurred throughout California, the greatest concentrations were found in the Sacramento and San Joaquin valleys (Grinnell and Miller, 1944).

The subspecies bred throughout the Aleutian Islands and into Russia (Springer, 1977). Predation by introduced arctic foxes eliminated most breeding colonies of the Aleutian Canada goose, and by the 1930s the subspecies was nearly extinct, with only one breeding colony on the tiny island of Buldir (U.S. Fish and Wildlife Service, 1982a).

The present population of Aleutian Canada geese migrates along the northern California coast and winters in the Central Valley near Colusa, and on scattered feeding and roosting sites along the San Joaquin River from Modesto to Los Banos (Jones & Stokes Associates and CH2M Hill, 1986; Nelson et al., 1984). Fall migration usually begins in late August or early September, with birds arriving in the Central Valley between October and early November (U.S. Fish and Wildlife Service, 1980). Spring migration usually occurs from mid-February to early March (U.S. Fish and Wildlife Service, 1980).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Aleutian Canada geese forage in harvested corn fields, newly planted or grazed pastures, or other agricultural fields (e.g., rice stubble and green barley). Lakes, reservoirs, ponds, and flooded

fields are used for roosting and loafing (Grinnell and Miller, 1944; U.S. Fish and Wildlife Service, 1982a). They also roost in large marshes, flooded fields, and stock ponds.

Predation by introduced Arctic foxes on the breeding islands is the primary reason for the population decline (Yparraguirre, 1978). Avian cholera is currently a major threat to the concentrations of Aleutian Canada geese in the Central Valley. This subspecies is particularly vulnerable to cholera outbreaks because most of the population overwinters in a small geographical area. Sport hunting also has added to the species' decline (U.S. Fish and Wildlife Service, 1982a).

RECOVERY EFFORTS

The Aleutian Canada goose is federally listed as threatened. The species is not listed by the state. A recovery plan for the Aleutian Canada goose was approved by the Service in 1978. The plan was revised in 1982 (U.S. Fish and Wildlife Service, 1982a). The plan outlines three primary objectives to be achieved prior to the consideration of de-listing the Aleutian Canada goose: to maintain the wild populations at or above 1,200 individuals; to re-establish self-sustaining breeding populations of 50 pairs or more on three former breeding areas besides Buldir Island; and to continue an active public relations program (U.S. Fish and Wildlife Service 1982a).

BALD EAGLE (*Haliaeetus leucocephalus*)

HISTORICAL AND CURRENT DISTRIBUTION

Historically, the bald eagle bred throughout California; however, the current bald eagle breeding distribution is restricted primarily to the mountainous habitats in the northern quarter of the state, in the northern Sierra Nevada, Cascades, and northern Coast ranges (California Department of Fish and Game, 1992). Bald eagles winter at lakes, reservoirs, and along major river systems throughout most of central and northern California and in a few southern California localities.

By 1972, there were only 26 known active bald eagle territories in California (Thelander, 1973). Various legal and management measures, including the banning of DDT (dichloro-diphenyl-trichloroethane) in 1972 and development and implementation of the Pacific Bald Eagle Recovery Plan (U.S. Fish and Wildlife Service, 1986) and local bald eagle management plans, have contributed to the continuing recovery of the bald eagle breeding population in California since 1973 (California Department of Fish and Game, 1989).

Presently, 100 pairs of bald eagles nest in the state (Dietrich, pers. comm.). Nesting remains primarily restricted to the northern part of the state, with concentrations of birds at Shasta Lake, Claire Engle Lake, Eagle Lake, and Lake Almanor and on the Pit River between Lake Britton and Shasta Lake (Dietrich, pers. comm.). Additionally, three pairs of bald eagles are known to nest on the floor of the Central Valley in Shasta and Tehama Counties (Dietrich, pers. comm.).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Bald eagle nesting territories in California are found primarily in Ponderosa pine and mixed conifer forests (Lehman, 1979). Ponderosa pine is the tree most often used for nesting (Lehman, 1979), although nest sites have been observed in a variety of tree species (Jurek, 1988).

Bald eagle nest sites are always associated with a lake, river, or other large water body and are usually within 1 mile of water. Nests are usually constructed in a tree that provides an unobstructed view of the water body and almost always is the dominant or codominant tree in the surrounding stand (Lehman, 1979). Snags and dead-topped live trees are important habitat components in a bald eagle nesting territory, providing perch and roost sites.

Bald eagles winter along rivers, lakes, or reservoirs that support adequate fish or waterbird prey and have mature trees or large snags available for perch sites. Bald eagles often roost communally during winter, typically in mature trees or snags with open branching structures that are isolated from human disturbance.

Early declines in bald eagle populations have been attributed to human persecution and destruction of riparian, wetland, and coniferous forest habitats (Deitrich, 1985). The most important factor that contributed to the decline of bald eagle populations, however, was environmental contamination resulting from the introduction of DDE (dichloro-diphenyl-dichloroethylene), a metabolite of the agricultural pesticide DDT, into the food chain (Detrich, 1985).

RECOVERY EFFORTS

The bald eagle is federally listed as threatened and state listed as endangered. The Service developed a recovery plan for the Pacific population of bald eagles in 1986 (U.S. Fish and Wildlife Service, 1986). The status of the breeding population was considered the most important criterion for delisting the population. Numerical goals for wintering populations were not established in the recovery plan because of annual fluctuations in migration patterns and habitat use. Wintering habitat must be managed, however, to support existing populations and to allow for the proposed increase in the bald eagle population.

Delisting would be considered on a regional basis if four criteria were met: a minimum of 800 pairs nested in the seven-state Pacific recovery area; the nesting pairs produced an average of at least one fledged young per pair, with an average success rate per occupied site of no less than 65 percent over a 5-year period; population recovery goals were being met in at least 80 percent of the management zone with nesting potential; and there was no persistent long-term decline in any sizable wintering population (greater than 100 birds). The federal listing status was recently changed from endangered to threatened.

AMERICAN PEREGRINE FALCON *(Falco peregrinus anatum)*

HISTORICAL AND CURRENT STATUS

Historically, resident American peregrine falcons occurred throughout most of California (California Department of Fish and Game, 1980; U.S. Fish and Wildlife Service, 1982b). The population increased during winter, when migrating birds arrived from the north (Grinnell and Miller, 1944). Peregrine falcons nested throughout the state, with breeding pairs concentrated along the coast and around the Channel Islands (Grinnell and Miller, 1944). Interior nesting locations included Tule Lake in Siskiyou County, Mono Lake in Mono County, and the inner Coast Ranges in Kern County (Grinnell and Miller, 1944).

Worldwide declines in peregrine falcons occurred following World War II due to the widespread use of chlorinated hydrocarbon pesticides (U.S. Fish and Wildlife Service, 1982b). The population of California peregrine falcons began to seriously decline in the 1950s. From a conservative historical estimate of 100 pairs breeding in California prior to 1947, fewer than 10 nesting sites were believed to be active in 1969 (Herman et al., 1970). In 1970, only two nesting pairs were confirmed, with probably fewer than five nesting pairs statewide (Herman, 1971). Since 1970, additional nesting pairs were located, probably because of increased efforts to locate nesting birds and a limited recovery of the population (U.S. Fish and Wildlife Service, 1982b). In 1980, 39 nesting pairs were confirmed in the state (Boyce, 1980). In 1992, approximately 140 breeding pairs of American peregrine falcons (Walton, pers. comm.) occurred in California, primarily in mountains of the central and north Coast Ranges and Cascade Range (California Department of Fish and Game, 1987).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

American peregrine falcons nest on protected ledges of high cliffs, primarily in woodland, forest, and coastal habitats (California Department of Fish and Game, 1980; U.S. Fish and Wildlife Service, 1982b). They have been known to nest as high as 10,000 feet elevation, but most occupied nest sites are below 4,000 feet (Shimamoto and Airola, 1981). Falcons prefer to nest near marshes, lakes, and rivers that support an abundance of birds, but they may travel several miles from their nesting grounds to forage on pigeons, shorebirds, waterfowl, and songbirds (Grinnell and Miller, 1944; California Department of Fish and Game, 1980). Coastal and inland marsh habitats are especially important in fall and winter, when they attract large concentrations of waterbirds (California Department of Fish and Game, 1980).

The widespread use of organochloride pesticides, especially DDT, was a primary cause of the decline in peregrine falcon populations (U.S. Fish and Wildlife Service, 1982b). High levels of these pesticides and their metabolites (i.e., byproducts of organic decompositions) have been found in the tissues of peregrine falcons, leading to thin eggshells, abhorrent reproductive behavior, and reproductive failure. Other causes of decline include illegal shooting, illegal falconry activities, and habitat destruction (California Department of Fish and Game, 1980).

RECOVERY EFFORTS

The American peregrine falcon is federally and state listed as endangered. The Service developed a recovery plan for the Pacific population of the peregrine falcon in 1982 (U.S. Fish and Wildlife Service, 1982b). The objectives of the recovery plan are to re-establish a self-sustaining population in the Pacific region (i.e., California, Oregon, and Washington). A sustainable population was estimated to be 185 nesting pairs, with a minimum fledgling success average of 1.5 per active pair. Of this minimum number of pairs required prior to consideration of delisting the species, 120 pairs are to be in California. The species may be considered for reclassification to threatened when 122 pairs have been re-established through specified management units in the Pacific region.

These objectives must be met through habitat and population management. Both essential breeding and nonbreeding habitats must be maintained and enhanced. Efforts must be made to maintain and increase the productivity of wild populations through prevention of human disturbances; identification and reduction of mortality factors; establishment of peregrine falcon pairs in suitable habitats; and manipulative management techniques, such as habitat modifications and rehabilitation of sick or injured birds (U.S. Fish and Wildlife Service, 1982b).

CALIFORNIA CLAPPER RAIL *(Rallus longirostris obsoletus)*

HISTORICAL AND CURRENT DISTRIBUTION

Historically, the largest populations of California clapper rail occurred in saline emergent wetlands throughout the south San Francisco Bay (Grinnell and Miller, 1944). Smaller populations were present in marshes along the San Mateo coast and in marshes adjacent to Monterey Bay and the Elkhorn Slough (U.S. Fish and Wildlife Service, 1984a). The historical distribution may have even included coastal marshes of Humboldt Bay (Humboldt County, 1979; Gill, 1979) and Morro Bay (Brooks, 1940).

Overharvesting by commercial and sport hunters led to the depletion of the California clapper rail by the early 1900s (U.S. Fish and Wildlife Service, 1984a). Protection from harvesting was afforded to the species through the establishment of the Migratory Bird Treaty Act of 1913. Clapper rail populations appeared to recover with protection; however, habitat loss accelerated in the early 1900s when marshes were converted to other uses (DeGroot, 1927). By the late 1970s, more than 2,800 acres of marsh habitat had been lost (Gill, 1979).

The current distribution of the California clapper rail is restricted to the San Francisco Bay, where as few as 300 individuals may occupy the remnant native marshes (California Department of Fish and Game, 1991). Recently, California clapper rails have been seen in the Suisun Marsh, an area historically not occupied by the species (U.S. Fish and Wildlife Service, 1984a). It is believed that the increased salinity of Suisun Marsh due to decreased flows from the Delta have allowed the clapper rail to expand into this area (U.S. Fish and Wildlife Service, 1984a). Over 90 percent of the population, however, is still found in the south San Francisco Bay (California Department of Fish and Game, 1991).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

The California clapper rail occupies saline and brackish emergent wetlands. Vegetation in these wetlands is generally dominated by pickleweeds or cord grasses, which are used for nesting. Clapper rail populations have declined in areas where alkali bulrushes dominate. (U.S. Fish and Wildlife Service, 1984a.)

Nesting occurs from mid-March through July in the lower cord grass-dominated marsh zones, near networks of small tidal sloughs (DeGroot, 1927; U.S. Fish and Wildlife Service, 1984a). These sloughs provide protected routes for movement and foraging for the adults and young (U.S. Fish and Wildlife Service, 1984a). Vegetation and drift material is utilized in the construction of the canopy over the platform nest (U.S. Fish and Wildlife Service, 1984a). Cord grass habitat and associated nesting materials may provide more protection from high tides because of the ability of nests to float (Jorgensen, 1975). Additionally, the uniform, dense cover of the cord grass may provide increased protection for young and adults than other more patchy upper marsh areas (Jorgensen, 1975). During winter, clapper rails may be more widely distributed in the marshes and may use the upper marsh vegetation for cover, especially during extreme high tides (U.S. Fish and Wildlife Service, 1984a).

The California clapper rail feeds primarily on invertebrates; in the south San Francisco Bay, the introduced horse mussel, spider clam, and yellow shore crab are primary food items (Moffitt, 1941). The rails become prey to several predators, including the northern harrier, red-tailed hawk, peregrine falcon, and red fox (DeGroot, 1927; California Department of Fish and Game, 1991). Norway rats, as well as the red fox, prey on the young and the eggs (California Department of Fish and Game, 1991).

Loss of tidal marshes is the primary reason for the decline of the California clapper rail. Many of the remaining marshes lack extensive high marsh habitat and have steep earthen levees, making them unsuitable for clapper rails. Additionally, pollution from sewage effluent, industrial discharges, and urban runoff has contaminated its food sources. Predation on young and eggs by the introduced red fox may be responsible for the recent rapid decline of the clapper rail population in the south San Francisco Bay.

RECOVERY EFFORTS

The California clapper rail is federally and state listed as endangered. The Service (1984a) developed a recovery plan for the California clapper rail and the salt marsh harvest mouse. The objectives of the plan emphasize protection and enhancement of existing marshes and restoration of former habitat. The specific objectives are outlined below under "Recovery Efforts" for the salt marsh harvest mouse.

The establishment of the San Francisco Bay National Wildlife Refuge has preserved approximately 40 percent of the remaining clapper rail habitat in the south San Francisco Bay and contains many areas with high potential for marsh restoration. Potential habitat for the rail exists in the Suisun Marsh, if the species is able to continue successfully colonizing this area.

BLUNT-NOSED LEOPARD LIZARD *(Gambelia silus)*

HISTORICAL AND CURRENT DISTRIBUTION

The blunt-nosed leopard lizard once occurred throughout the San Joaquin Valley and surrounding plains and foothills (Montanucci, 1965). Its historical range extended from San Joaquin County south to San Luis Obispo, Santa Barbara, and Ventura counties (California Department of Fish and Game, 1980; U.S. Fish and Wildlife Service, 1985a). Agricultural, urban, and oil field development has resulted in extensive losses of habitat suitable for this lizard (Chesemore, 1980; Stebbins, 1954; U.S. Fish and Wildlife Service, 1985a). O'Farrell et al. (1981) estimated that approximately 7 percent of the San Joaquin Valley remained as potential habitat for blunt-nosed leopard lizards. Present populations are restricted to fragmented patches of native habitats in Merced, Madera, Fresno, Kings, Tulare, Kern, San Luis Obispo, and Santa Barbara counties (U.S. Fish and Wildlife Service, 1985a).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Blunt-nosed leopard lizards occur from the valley floor to 2,400 feet elevation (Stebbins, 1985), inhabiting sparsely vegetated grasslands, canyon floors, gently sloping hills, large washes, and alkali desert scrub dominated by iodine bush, bush seepweed, and saltbush (U.S. Fish and Wildlife Service, 1985a). Areas with native shrubs and from 30 to 50 percent bare ground provide optimum habitat for this species (Chesemore, 1980). The lizards prefer sandy soil but also occur in coarse, gravelly soil and hardpan areas (Montanucci, 1965). Bare ground is preferred for courtship and escape, and shrub cover is needed for foraging and shade (U.S. Fish and Wildlife Service, 1985a). Soils that have been disturbed by plowing or discing typically support low populations of this species, and they are often displaced from such areas (U.S. Fish and Wildlife Service, 1985a).

In optimal habitats, blunt-nosed leopard lizards typically occur at low densities, reaching densities of up to only one lizard per acre (Tollestrup, 1978; U.S. Fish and Wildlife Service, 1985a). Steep foothills, densely vegetated plains, and disturbed habitats probably support substantially lower densities (U.S. Fish and Wildlife Service, 1985a). Consequently, blunt-nosed leopard lizards may require large areas of unaltered habitat to sustain viable populations (Chesemore, 1980). It was estimated that a minimum of 640 acres of good habitat could sustain a population (Tollestrup in U.S. Fish and Wildlife Service, 1985a); however, the actual population size would depend on a variety of factors, including proximity to other populations and immigration, population density and recruitment, current condition of the habitat, and potential for colonization of reclaimed adjacent habitats (U.S. Fish and Wildlife Service, 1985a).

The lizards commonly use small mammal (e.g., kangaroo rat, ground squirrel, and gopher) burrows, and in some areas, the abundance of the lizard may be correlated with the availability of burrows (Montanucci, 1965; Dorff, 1981). The burrows are used for shade, escape, winter hibernation, and egg laying. In areas where burrows are scarce, the lizards construct shallow tunnels under exposed rocks or along banks of earth.

Timing of spring emergence from hibernation strongly depends on temperature, as does daily timing of activity. Individual lizards emerge from hibernation as early as late March, with most lizards active by mid-April. Courtship occurs from early May to mid-June, and egg laying occurs from early June to mid-July. An average of two eggs are laid in a chamber excavated by the female lizards in the back of a rodent burrow. This species is most active during spring, and hibernation usually begins in October. These lizards are predatory; their diet includes insects and small vertebrates, including other lizards (Stebbins, 1985).

Agricultural development and urbanization in the San Joaquin Valley have reduced the amount of native habitat available for blunt-nosed leopard lizards. Intensive cattle grazing may have contributed to the decline of this species by compacting soils, damaging rodent burrows, and denuding grasses and shrubs that support its prey base (U.S. Fish and Wildlife Service, 1985a). Off-road vehicle use and oil and gas development may degrade the habitat, and rodent-control programs that reduce the number of available small mammals reduce the availability of their burrows to the blunt-nosed leopard lizard (U.S. Fish and Wildlife Service, 1985a). Montanucci (1965) suggested that agricultural pest control, especially spraying for leafhoppers, may have contributed to the decline of this species.

RECOVERY PLAN

The blunt-nosed leopard lizard is federally and state listed as endangered. A recovery plan was approved for the species (U.S. Fish and Wildlife Service, 1985a). Reclassification of the species as threatened may be considered when sufficient acreage has been secured to maintain self-sustaining populations of blunt-nosed leopard lizard on the San Joaquin Valley floor. Approximately 30,000 acres of habitat in the San Joaquin Valley should be secured, with acquisition emphasis on optimal habitats containing comparatively high-density lizard populations. Populations will be collectively managed to meet or exceed a minimum average density of one lizard per acre. Delisting of this species may be possible when adjacent foothills and plains habitats of sufficient size to maintain self-perpetuating populations of blunt-nosed leopard lizards have also been secured (U.S. Fish and Wildlife Service, 1985a).

As part of the federal recovery plan, approximately 8,065 acres habitat are currently preserved, including the state-owned Alkali Sink Ecological Preserve (445 acres) in Fresno County and the Allensworth State Park (593 acres), Prairie Wildflower Preserve (4,809 acres), Voice of America transmitter site (630 acres), U.S. Forest Service Horse Pasture (790 acres), and Pixley National Wildlife Refuge (5,125 acres) in Tulare County. (U.S. Fish and Wildlife Service, 1985a.) The blunt-nosed leopard lizard will also be included in the draft multispecies recovery plan for arid upland and riparian species of the San Joaquin River and Tulare Lake regions being prepared by the service.

GIANT GARTER SNAKE *(Thamnophis couchi gigas)*

HISTORICAL AND CURRENT DISTRIBUTION

Historically, the giant garter snake was found throughout the Central Valley, from Butte County south to Kern County. Habitat loss attributable to wetland reclamation and agricultural

development extirpated the giant garter snake from the southern one-third of its range by the 1940s to 1950s (Hansen and Brode, 1980). Presently, populations of the snake are limited to ponds, sloughs, marshes, and rice fields of Sacramento, Sutter, Butte, Colusa, and Glenn counties. Additionally, remnant populations exist along the western border of the Yolo Bypass in Yolo County and along the eastern fringes of the Delta from the Laguna Creek-Elk Grove region of Sacramento County south to Stockton, San Joaquin County (Hansen, 1986; 58 Federal Register 54053, October 20, 1993). The Service recognized the existence of 13 populations of the giant garter snake (58 Federal Register 54053, October 20, 1993). Some populations may not be viable because they are small, highly fragmented, and restricted to small patches of habitat of limited quality. Populations in the Colusa, Butte, Sutter, and American basins are associated with rice production and occupy the agricultural water delivery and drainage ditches (58 Federal Register 54053, October 20, 1993). The largest extant population inhabits the water channels and ditches of agricultural lands in the American Basin at the confluence of the American and Sacramento rivers (58 Federal Register 54053, October 20, 1993).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

The giant garter snake is endemic to emergent wetlands in the Central Valley. Habitats used by the species include marshes; sloughs; ponds; small lakes; and low-gradient waterways, such as small streams, irrigation and drainage canals, and rice fields (58 Federal Register 54053, October 20, 1993). The snake requires adequate water with herbaceous, emergent vegetation for protective cover and foraging habitat. Primary food items include fish, tadpoles, and frogs (Hansen and Brode, 1980). Open areas and grassy banks are needed for basking. Small mammal burrows and other small crevices at higher elevation areas provide refuge from flood waters and winter hibernaculum sites (58 Federal Register 54053, October 20, 1993).

All three habitat components (cover and foraging habitat, basking areas, and protected hibernaculum) are needed. Thus, riparian woodlands usually do not support the giant garter snake because of the lack of basking areas and the lack of prey populations (Hansen and Brode, 1980). Also, larger rivers generally do not support the snake because of predation by introduced fish (58 Federal Register 54053, October 20, 1993).

Habitat loss to agricultural development has been the primary factor in the decline of giant garter snake populations. Small remaining populations are susceptible to predation from fish, mammals, and birds. Additional causes of mortality include vehicular traffic, agricultural practices, and maintenance of water channels.

RECOVERY PLAN

The giant garter snake is federally and state listed as threatened. A recovery plan has not yet been developed by the Service.

CALIFORNIA RED-LEGGED FROG *(Rana aurora draytoni)*

HISTORICAL AND CURRENT DISTRIBUTION

The California red-legged frog was found in scattered populations throughout much of lowland California west of the Sierra Nevada (Stebbins, 1972). Its range extended from coastal Marin County, inland into Shasta County, and south into northwestern Baja California, Mexico (57 Federal Register 45761, October 5, 1992). Habitat loss has resulted in the species' extirpation from approximately 75 percent of its historical range (57 Federal Register 45761, October 5, 1992), including the floor of the Central Valley and probably more than half of the drainage systems in the valley (Hayes and Jennings, 1986). Only three localities are now known to support large breeding populations of the California red-legged frog (57 Federal Register 45761, October 5, 1992).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

California red-legged frogs require cold pond habitats (including stream pools and stock ponds) with emergent and submergent vegetation (Storer, 1925; Stebbins, 1972). Habitats with the highest densities of frogs are deepwater ponds (at least 3 feet deep) with dense stands of overhanging willows and a fringe of cattails (Jennings, 1988; Hayes and Jennings, 1988). Red-legged frogs occur most frequently in intermittent waters that lack fish and bullfrogs (Hayes and Jennings, 1988).

California red-legged frogs lay their eggs in clusters around aquatic vegetation from December to early April. The larvae require approximately 3 to 5 months to complete metamorphosis (Storer, 1925). Adults are highly aquatic when active but are less dependent on permanent water bodies than other frog species (Brode and Bury, 1984). Adults may estivate during dry periods in rodent holes or cracks in the soil (Hansen, pers. comm.).

Although the red-legged frog's disappearance has been linked to overharvesting and loss of wetlands, the causes for its decline are poorly understood (Hayes and Jennings, 1986). Several factors have probably contributed to the decline of red-legged frogs, including overharvest, habitat loss, and an increase in introduced fish and bullfrog populations. Certain areas, such as the San Joaquin Valley, were particularly affected by wetland reclamation and species harvest (Jennings and Hayes, 1984). The continued loss of wetland habitats threatens remaining populations.

The number of permanent ponds in the Central Valley below 4,500 feet has increased (Moyle, 1978), yet most red-legged frogs are restricted to intermittent waters. Hayes and Jennings (1988) suggested that this restriction is the result of the introduction of alien fishes and bullfrogs to wetland habitats with permanent water. Introduced fishes and bullfrogs prey on red-legged frog larvae and adults and compete with them for food.

RECOVERY EFFORTS

The California red-legged frog is federally listed as endangered and is listed as a state species of special concern. A recovery plan for the red-legged frog has not yet been developed by the Service.

FAIRY AND TADPOLE SHRIMP

HISTORICAL AND CURRENT DISTRIBUTION

Most fairy and tadpole shrimp species have been discovered only recently, and historical distributions are not well known. Because of the substantial loss of vernal pool habitat, however, these California endemic species have probably undergone a reduction in their distribution. Each species of federally listed fairy and tadpole shrimp is described below.

Conservancy Fairy Shrimp (*Branchinecta conservatio*)

The Conservancy fairy shrimp is known from the grassland vernal pools of the Central Valley. It has been found in only seven localities: Vina Plains and south of Chico in Tehama County; Jepson Prairie in Solano County; the Sacramento NWR in Glenn County; Haystack Mountain northeast of Merced and San Luis NWR complex in Merced County; and Lockewood Valley in northern Ventura County (Jones & Stokes Associates, file information).

Longhorn Fairy Shrimp (*Branchinecta longiantenna*)

The longhorn fairy shrimp is found along the eastern margin of the central Coast Range from Contra Costa to San Luis Obispo counties (57 Federal Register 36380, August 13, 1992). There are four known disjunct populations: in the Kellogg Creek watershed in Contra Costa County, in the Altamont Pass area in Alameda County (Jones & Stokes Associates, file information), and on the western and northern borders of Soda Lake on the Carrizo Plain in San Luis Obispo County (Eng et al., 1990; Sugnet and Associates, 1993); vernal pools in Ventura County (Balfour, pers. comm.); and one pool at Kesterson NWR in Merced County (U.S. Fish and Wildlife Service, 1994).

Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)

The vernal pool fairy shrimp is widely distributed in vernal pools and swales on the Vina Plains in Tehama County, through most of the Central Valley, and south along the Coast Range to northern Santa Barbara County (57 Federal Register 36380, August 13, 1992). This fairy shrimp occurs in Alameda, Butte, Contra Costa, Fresno, Glenn, Madera, Merced, Placer, Riverside, Sacramento, San Joaquin, Santa Barbara, Shasta, Solano, Sutter, Tehama, Tulare, Yolo, and Yuba counties (Sugnet and Associates, 1993).

Vernal Pool Tadpole Shrimp (*Lepidurus packardi*)

The vernal pool tadpole shrimp was originally thought to occur in the Sacramento Valley from Butte County, south to Sacramento County, and west to Solano County. However, recent surveys have extended the known range north to Shasta County and southeast in the Central Valley to include Stanislaus and Merced counties (Sugnet and Associates, 1993). The current distribution includes Butte, Colusa, Merced, Sacramento, Shasta, Solano, Stanislaus, Sutter, Tehama, and Yuba counties (Sugnet and Associates, 1993).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Fairy and tadpole shrimp live in ephemeral, freshwater emergent wetlands, such as vernal pools, rock outcrop pools, swales, and ponds. They are adapted to the temporary presence of water and to a species-specific set of environmental parameters (e.g., salinity, temperature, and pH) (Simovich and Fugate, 1992). Many fairy shrimp species appear to have only one generation: emerging as adults in response to their specific environmental cues, breeding and depositing eggs in the soil, and finally dying (Zedler, 1987). Once the aquatic habitat has evaporated, the eggs are protected in the soil. When the species-specific environmental conditions are favorable, the eggs hatch and adult shrimp emerge to initiate the process again (Zedler, 1987).

Approximately 90 percent of the fairy shrimp habitat in California has been lost to urban and agricultural development and water, flood control, highway, and utility projects (Eng et al., 1990; 57 Federal Register 36380, August 13, 1992). Additionally, changes in the hydrological pattern, grazing, and off-road vehicle use have altered vernal pool habitat.

RECOVERY EFFORTS

The longhorn fairy shrimp, conservancy fairy shrimp, and vernal pool tapole shrimp are federally listed as endangered. The vernal pool fairy shrimp is federally listed as threatened. The Service has not yet developed recovery plans for these species..

VALLEY ELDERBERRY LONGHORN BEETLE
(Desmocerus californicus dimorphus)

HISTORICAL AND CURRENT DISTRIBUTION

Information on the historical distribution and abundance of the valley elderberry longhorn beetle (VELB) is scarce. The VELB may have always been a rare species; however, the substantial reduction in Central Valley riparian vegetation in the last 150 years has probably caused a reduction in the beetle's range and isolation of the remaining populations (U.S. Fish and Wildlife Service, 1984b).

In 1984, the VELB was known from only three Central Valley drainages: Merced River, Putah Creek, and American River. Additional field surveys in the 1980s detected new locations of

VELB along the Yuba, American, Cosumnes, Sacramento, Mokelumne, Calaveras, San Joaquin, Middle, Tuolumne, Stanislaus, and Merced rivers.

The current range of VELB extends from the northern end of the Central Valley at Redding to the Bakersfield area (Barr, 1991). In the foothills of the Sierra Nevada, adult beetles have been found up to 2,220 feet elevation, and exit holes have been located up to 2,940 feet (Barr, 1991). Along the Coast Ranges, adult beetles have been found up to 500 feet elevation, and exit holes have been detected up to 730 feet elevation (Barr, 1991).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

The VELB's life history characteristics are assumed to follow a sequence of events similar to those of related taxa (U.S. Fish and Wildlife Service, 1984b). Females deposit eggs in crevices in the bark of living blue elderberry shrubs found primarily in valley foothill riparian habitats. Presumably, the eggs hatch shortly after they are laid and larvae bore into the pith of the trunk or stem. When larvae are ready to pupate, they work their way through the pith of the shrub, open an emergence hole through the bark, and return to the pith for pupation. Adults exit through the emergence holes and can be found on elderberry foliage, flowers, or stems, or on adjacent vegetation. The entire life cycle of the VELB is thought to take 2 years from the time eggs are laid and hatch until adults emerge, reproduce, and die (U.S. Fish and Wildlife Service, 1984b).

The presence of exit holes in blue elderberry stems is diagnostic of previous VELB use. Exit holes are cylindrical and are approximately 0.25 inch in diameter. Exit holes can be found from a few inches above the ground to approximately 9 to 10 feet up on stems ranging from 1 to 8 inches in diameter (Barr, 1991).

Although the historical distribution of VELB is unknown, extensive loss of riparian forests of the Central Valley during the past 100 years probably resulted in a decrease and fragmentation of the VELB's range (U.S. Fish and Wildlife Service, 1984b). Insecticide drift from cultivated fields and orchards adjacent to blue elderberry shrubs could affect VELB populations if it occurs when adults are present on the shrubs (Barr, 1991). Herbicide drift from agricultural fields and orchards could also negatively affect blue elderberry shrubs and reduce VELB habitat.

RECOVERY EFFORTS

The VELB is federally listed as threatened; it is not listed by the state. The Service developed a recovery plan in 1984, with the interim objectives to protect three known localities, survey riparian areas in the Central Valley to detect other populations of VELB, and protect the riparian habitats within the VELB's historical distribution. As more information becomes available, the Service will determine the number of sites and populations of VELB required before consideration of delisting the species. (U.S. Fish and Wildlife Service, 1984b.)

DELTA GREEN GROUND BEETLE *(Elaphrus viridis)*

HISTORICAL AND CURRENT DISTRIBUTION

The Delta green ground beetle was first described in 1878 from an unknown location in California, but was not rediscovered until 1967 (Goulet, 1983) or 1974 (U.S. Fish and Wildlife Service, 1985b). The historical distribution of this species is unknown (Goulet, 1983; U.S. Fish and Wildlife Service, 1985b). It is known to occur around Olcott Lake, a large vernal lake, and nearby vernal pools at The Nature Conservancy's Willis Linn Jepson Prairie Reserve, 8 miles south of Dixon, Solano County.

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

The Delta green ground beetle is found along sparsely vegetated edges of vernal pools and lakes. Goulet (1983) suggested that both adults and larvae are generalized predators, but recent observations indicate that the larvae feed primarily on springtails (Collembola) (U.S. Fish and Wildlife Service, 1985b). Because springtails are soft-bodied arthropods requiring moisture to survive, Delta green ground beetle larvae are restricted to moist habitats. Adults seek prey during the day, while larvae are probably nocturnal. Densely vegetated areas may be unsuitable for the adults (U.S. Fish and Wildlife Service, 1985b), which are active from approximately early February to mid-May (Goulet, 1983).

The distribution of the Delta green ground beetle may have been reduced to its present restricted range through land-modifying activities that destroyed or degraded vernal pool habitat. These activities may include agricultural and urban development, flood control, grading, and grazing. Presently, the known occupied habitat of the beetle is protected. Threats to its continued existence are primarily related to its extremely restricted range and its isolation from other suitable habitats in which to colonize.

RECOVERY EFFORTS

The Delta green ground beetle is federally listed as threatened; it is not listed by the state. The two known population sites in Solano County were designated critical habitat by the Service (52809 Federal Register 45, August 8, 1980). In 1985, the Service approved a recovery plan for the Delta green ground beetle (U.S. Fish and Wildlife Service, 1985b). Prior to the consideration of delisting the species, three additional self-sustaining colonies must be established on at least 5,000 acres of natural vernal pool/grassland habitat of the Jepson Prairie Reserve. These new colonies, as well as the existing colonies, must be maintained without threat of extirpation for 10 consecutive years.

KERN PRIMROSE SPHINX MOTH *(Euproserpinus euterpe)*

HISTORICAL AND CURRENT DISTRIBUTION

The Kern primrose sphinx moth was believed to be extinct until its rediscovery in 1974. It is known to occur only in the Walker Basin in Kern County. Since rediscovery, only small areas of suitable habitat in the northwest portion of the basin have been occupied, all of which are within

2 miles of the original colony (U.S. Fish and Wildlife Service, 1984c). The moth's historical distribution may have been confined to the Walker Basin (U.S. Fish and Wildlife Service, 1984c).

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Walker Basin is in the southern Sierra Nevada and is surrounded by mountains more than 6,000 feet in elevation. Most of the basin is devoted to agricultural uses, primarily barley and cattle pasture (U.S. Fish and Wildlife Service, 1984c). The moth occurs in dry, disturbed, sandy-gravelly washes adjacent to fallow fields, where its larval food plant, the evening primrose, grows. In these areas, filarees, baby blue-eyes, rabbitbrush, goldfields, and brome grasses often dominate, and evening primrose is patchily distributed. The moths consistently deposit eggs on the exotic, naturalized filaree, but larvae cannot use this plant for food and die of starvation within a few days.

The flight season of the Kern primrose sphinx moth is from late February to early April, with the peak in mid-March (Tuskes and Emmel, 1981; U.S. Fish and Wildlife Service, 1984c). During this period, females deposit eggs, which take approximately 11 days to hatch. There are five larval stages before pupation in May. Pupation may be delayed or may occur the following year (U.S. Fish and Wildlife Service, 1984c).

The introduction of filaree and other non-native plants into the moth's habitat has probably led to a significant reduction in the reproductive success of the species (U.S. Fish and Wildlife Service, 1984c). Additionally, the conversion of native habitats to agricultural uses has removed most of the moth's habitat. Evening primrose is uncommon in areas grazed by cattle; grazing has a high potential to destroy the moth's habitat (U.S. Fish and Wildlife Service, 1984c). Because of the highly restricted distribution of the Kern primrose sphinx moth, collection of specimens by private and commercial collectors has been and is a potentially serious threat to the species (U.S. Fish and Wildlife Service, 1984c). The females have a slow flight pattern, make frequent stops for oviposition, and are easily caught, increasing the potential for collecting to significantly reduce the reproduction potential of the species.

RECOVERY EFFORTS

The Kern primrose sphinx moth is federally listed as threatened; it is not listed by the state. A recovery plan was adopted by the Service (U.S. Fish and Wildlife Service, 1984c). To be considered for delisting, the present colony of Kern primrose sphinx moth must be protected and an additional three colonies must be established, with a combined total of 5,000 acres of habitat that are secured by easement, long-term agreement, or other protective strategy. Each colony must be maintained without threat from agricultural development, pesticides, disease, or collection for at least 10 consecutive years before delisting will be considered.

LANGE'S METALMARK BUTTERFLY *(Apodemia mormo* ssp. *langei)*

HISTORICAL AND CURRENT DISTRIBUTION

The Antioch Dunes east of the city of Antioch in Contra Costa County historically supported 190 acres of Lange's metalmark butterfly habitat (Thelander and Crabtree, 1994). Currently, it is restricted to a 15-acre portion of the Antioch Dunes.

HABITAT REQUIREMENTS AND REASONS FOR DECLINE

Lange's metalmark butterfly occurs exclusively in open dune vegetation. Adults live for approximately a week during mid-August to mid-September and forage on nectar from naked stemmed buckwheat *(Eriogonum nudum)*, shrubby butterweed *(Senecio douglasii),* and broom snakeweed *(Guttierrezia sarothrae)*. Eggs are laid on the single hostplant, naked stemmed buckwheat, and larvae emerge between late October and February. Pupation occurs between late July and early August (Arnold, 1983).

The dune habitat at the Antioch Dunes has historically been reduced by sand mining and vineyard development. Naked stemmed buckwheat, the single host plant of Lange's metalmark, has been subject to competition by exotic plant species and trampling by recreational users of the dunes. Vegetation has also been cleared for fire prevention and maintenance of a powerline right-of-way.

RECOVERY EFFORTS

The Service purchased 55 acres in the Antioch Dunes in 1980 and established the Antioch Dunes National Wildlife Refuge to protect Lange's metalmark butterfly habitat and habitat for two plant species federally listed as endangered. Public access has been limited, exotic vegetation has been removed from areas of the preserve, and areas have been replanted with naked stemmed buckwheat. The population has increased in size from fewer than 200 in 1986 to almost 2,00 individuals in 1991 (Thelander and Crabtree, 1994). A portion of the Antioch Dunes with Lange's metalmark butterflies is owned by Pacific Gas and Electric Company (PG&E). Since 1991, PG&E and the Service have restored sand dunes in areas that were previously mined or in use as vineyards. Since 1985, PG&E has permitted the Service to manage two parcels on its property and PG&E and the Service have worked cooperatively to restore habitat on these parcels (Thelander and Crabtree, 1994).