

PETITION

TO THE STATE OF CALIFORNIA
FISH AND GAME COMMISSION
AND SUPPORTING INFORMATION FOR



LISTING THE CALIFORNIA POPULATION
OF THE WESTERN BURROWING OWL
(*ATHENE CUNICULARIA HYPUGAEA*)
AS AN ENDANGERED OR THREATENED SPECIES
UNDER THE CALIFORNIA ENDANGERED SPECIES ACT

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Petitioners Center for Biological Diversity, Santa Clara Valley Audubon Society, Defenders of Wildlife, San Bernardino Valley Audubon Society, California State Park Rangers Association, and Tri-County Conservation League petition the California Fish and Game Commission to list the western burrowing owl as a state endangered or threatened species. Petitioners submit this petition pursuant to the California Endangered Species Act, Fish and Game Code §§ 2070 *et seq.*, on their own behalf and on behalf of their members and staff with an interest in protecting the western burrowing owl and its habitat in California.

Lead petitioner Center for Biological Diversity is a nonprofit environmental organization dedicated to the protection of native species and their habitats. The Center works to protect and restore natural ecosystems and imperiled species through science, education, policy, and environmental law.

The Santa Clara Valley Audubon Society works to maintain, preserve, and protect native animal and plant habitats and to foster a greater public awareness of our environment, with emphasis on birds and their ecosystems, particularly in Santa Clara County and the San Francisco Bay Area.

Defenders of Wildlife is a nonprofit organization dedicated to the protection of all native wild animals and plants in their natural communities. Defenders programs encourage protection of entire ecosystems and interconnected habitats while protecting predators that serve as indicator species for ecosystem health.

The San Bernardino Valley Audubon Society is a non-profit corporation dedicated to conserving and restoring natural ecosystems, focusing on birds and other wildlife for the benefit of humanity and the earth's biological diversity.

The California State Park Rangers Association is an organization of park professionals dedicated to advancement of the highest principles of public service, established to support and preserve California State Parks for present and future generations.

The Tri-County Conservation League, Inc. is a public interest corporation with a membership that promotes the educational, recreational and conservation values of the natural resources of the Santa Ana River and its drainage system in Riverside, San Bernardino, and Orange Counties.

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I. EXECUTIVE SUMMARY

Petitioners Center for Biological Diversity, Santa Clara Valley Audubon Society, Defenders of Wildlife, San Bernardino Valley Audubon Society, California State Park Rangers Association, and Tri-County Conservation League submit this petition to list the California population of the western burrowing owl (*Athene cunicularia hypugaea*) as an endangered or threatened species under the California Endangered Species Act, Fish and Game Code §§ 2070 *et seq.* (“CESA”). This petition demonstrates that the western burrowing owl is in serious danger of becoming extinct throughout a significant portion of its range in California and clearly warrants listing under CESA, based on the factors discussed herein.

The western burrowing owl is a small ground-nesting bird of prairie and grassland habitats, which in many areas has adapted to human-altered habitats as urban development and agriculture have eliminated natural grasslands. Burrowing owls in the western United States rely upon burrows dug by burrowing mammals for nests, primarily those of ground squirrels in California. Burrowing owls also require open fields with adequate food supply for foraging habitat, low vegetative cover to allow owls to watch for predators, and adequate roosting sites. These owls can often be seen perched or standing by their burrow or hunting insects, rodents, amphibians, or small birds in open fields. Nesting season is from February through August, with most pairs usually fledging 4 or 5 young. After the nesting season, most owls in California remain throughout the winter as year-round residents and owls from other areas augment resident California populations. Burrowing owls are susceptible to predators that can access their nest chamber, such as foxes, coyotes, skunks, raccoons, and snakes, and are also preyed upon by various other raptor species, such as hawks, eagles, and other species of owls.

Burrowing owls in California historically ranged throughout the Central Valley, were found in suitable habitat in coastal areas from Marin County south to the Mexican border, and sparsely inhabited desert areas in the northeastern and southeastern portions of the state. Densities of owls in some areas of the state have increased with intensive agriculture, such as in the Imperial Valley, southern Central Valley, and lower Colorado River Valley.

Once a widely distributed and common grassland bird, the burrowing owl has been declining significantly in California for at least the last half century. Although early accounts of the burrowing owl reported the species as “probably one of the most common birds in California” and “abundant,” “common,” or “fairly common” range-wide in California, the species has been in continuous decline throughout the state since at least the 1940s. Severe localized declines of owl populations were evident by the early 1900s, for example in the Fresno area, in the region of Los Angeles, and in Orange County. Urbanization corresponding with human population growth has eliminated or greatly reduced breeding populations from large areas where the owl was formerly common, such as in San Diego, Orange, Santa Barbara, Santa Cruz, and Santa Clara Counties.

The decimation of breeding owl populations in Orange and San Diego Counties is indicative of the fate of the species in urbanizing areas of the state. The burrowing owl was once “common everywhere” in coastal San Diego County, with one ornithologist noting that in the late 1860s “burrowing owls stood on every little knoll” around San Diego. Even as late as 1975, burrowing owls were described as “abundant” and “bordering on ubiquitous” in suitable habitat in Orange County and were considered a “regular component” of the coastal environment. By 2001 only 9 or less breeding pairs remained in the entirety of Orange and San Diego Counties.

Breeding burrowing owls have been extirpated from approximately 8% of their former range in California during the last 10-15 years. A comprehensive statewide survey conducted in the early 1990s revealed that breeding owls were entirely eliminated from 5 counties (Napa, Marin, San Francisco, Santa Cruz, and Ventura) and the Coachella Valley, and were nearing extirpation in 6 other counties (Sonoma, San Mateo,

Monterey, San Luis Obispo, Santa Barbara, and Orange). Small breeding populations of owls have likely been extirpated from Humboldt and Mendocino Counties, southwestern Solano County, and western Contra Costa County as well, and breeding owls are rapidly disappearing from southern Los Angeles, western San Bernardino, western Riverside, and San Diego Counties.

Local extirpations of owls become cumulatively significant for the species as owl habitat is destroyed and owls are relocated from urbanizing areas. Burrowing owls have never been successfully reintroduced to a location where they have been extirpated, partly due to the owl's strong fidelity to burrow sites. Owls regularly reuse burrows from one year to the next, and for this reason are not easily forced to move to a different burrow, especially during nesting season.

Based on a survey of the majority of the owl's range in California, an estimated 9,450 nesting pairs of owls remained statewide in the mid-1990s, exclusive of the deserts and Great Basin areas. Recent urban development has eliminated or displaced some of these birds. The number of breeding owl colonies located in the survey area throughout California declined nearly 60% from the 1980s to the early 1990s, and the statewide number of owls is currently thought to be declining at about 8% per year.

Over 71% of California's breeding owls currently live in the margins of agricultural land in the Imperial Valley, an area that comprises only 2.5% percent of the land area of the state. Owls in the Imperial Valley, which primarily nest in burrows in earthen irrigation channels, are facing threats from conversion of agricultural lands to urban development, plans to line earthen canals with concrete, and ground squirrel eradication programs. Over 15% of the state's breeding owls reside in the southern Central Valley, an area undergoing explosive human population growth and rapid conversion of agricultural lands to urban development.

California's remaining burrowing owls are threatened primarily by habitat loss to urban development, persecution of ground squirrels and other burrowing rodents, and intensive agricultural practices. The state-approved practice of relocation of owls from development sites is accelerating local extirpations from rapidly urbanizing areas, such as in Santa Clara County. Other factors contributing to the decline of owls statewide include destruction of burrows through disking and grading, impacts of pesticides, increased predation by non-native or feral species, habitat fragmentation, and other human-caused mortality from vehicle strikes, electrified fences, collisions with wind turbines, shooting, and vandalism of nesting sites.

There are currently no state or federal laws that protect owl habitat and such habitat is rarely purchased by agencies for public lands. An estimated 91% of all owls remaining in California occur on private land, most of it under enormous development pressure. Although federally designated as a Species of Special Concern in 1994, federal regulatory mechanisms such as Habitat Conservation Plans have proved inadequate in protecting significant owl habitat or stopping the rapid decline of the species. State regulatory mechanisms, such as designation as a state Species of Special Concern in 1979, adoption of burrowing owl mitigation guidelines by the California Department of Fish and Game in 1995, state Fish and Game Codes protecting nesting raptors, and limited creation of mitigation banks to purchase habitat, have proved unsuccessful in protecting the burrowing owl and its habitat. The failure of owl conservation efforts in the San Francisco Bay Area is indicative of the limitations of attempts at regional and local conservation planning for non-listed species. To the detriment of burrowing owls, their management has been limited to project-by-project responses to development impacts, an approach that is inadequate for the long-term maintenance of the species in significant parts of its range in California.

Throughout the vast majority of the burrowing owl's range in California, breeding owls persist in only small, declining populations of birds that are highly susceptible to extirpation, as seen in the precipitous decline of owl populations in several areas of the state. The burrowing owl is in imminent danger of becoming extinct throughout a significant portion of its range in California, and requires immediate protection as an endangered or threatened species.

II. STATUTORY FRAMEWORK AND REQUESTED ACTION

Recognizing that certain species of plants and animals have gone extinct “as a consequence of man’s activities, untempered by adequate concern for conservation,” (Fish and Game Code §2051(a)) that other species are in danger of extinction, and that “[t]hese species of fish, wildlife, and plants are of ecological, educational, historical, recreational, esthetic, economic, and scientific value to the people of this state, and the conservation, protection, and enhancement of these species and their habitat is of statewide concern,” (Fish and Game Code §2051(c)) the California Legislature enacted the California Endangered Species Act (“CESA”). The purpose of CESA is to “conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat...” (Fish and Game Code §2052).

To this end, CESA provides for the listing of species as “threatened” and “endangered.” “Threatened species” means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by CESA (Fish and Game Code §2067). “Endangered species” means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease” (Fish and Game Code §2062).

The California Fish and Game Commission (“Commission”) is the administrative body that makes all final decisions as to which species shall be listed under CESA, while the California Department of Fish and Game (“Department”) is the expert agency that makes recommendations as to which species warrant listing. The listing process may be set in motion in two ways: “any person” may petition the Commission to list a species, or the Department may on its own initiative put forward a species for consideration. In the case of a citizen petition such as this one, CESA sets forth a process for listing that contains several discrete steps.

Upon receipt of a petition to list a species, a 90-day review period ensues during which the Commission refers the petition to the Department, as the relevant expert agency, to prepare a detailed report. The Department’s report must determine whether the petition, along with other relevant information possessed or received by the Department, contains sufficient information indicating that listing may be warranted (Fish and Game Code §2073.5). During this period interested persons are notified of the petition and the Commission accepts public comments (Fish and Game Code §2073.3).

After receipt of the Department’s report, the Commission considers the petition at a public hearing (Fish and Game Code §2074). At this time the Commission is charged with its first substantive decision: determining whether the petition, together with the Department’s written report, and comments and testimony received, present sufficient information to indicate that listing of the species “may be warranted” (Fish and Game Code §2074.2). A California Appellate Court has interpreted this standard as the amount of information sufficient to “lead a reasonable person to conclude there is a substantial possibility the requested listing could occur.” (*Natural Resources Defense Council v. California Fish and Game Comm.* 28 Cal.App.4th at 1125, 1129.)

If the petition, together with the Department’s report and comments received, indicates that listing “may be warranted,” then the Commission must accept the petition and designate the species as a “candidate species” (Fish and Game Code §2074.2).

Once the Commission accepts the petition, then a more exacting level of review commences. The Department has twelve months from the date of the petition’s acceptance to complete a full status review of the species and recommend whether such listing “is warranted.” Following receipt of the Department’s status

review, the Commission holds an additional public hearing and determines whether listing of the species “is warranted.”

Notwithstanding these listing procedures, the Commission may adopt a regulation that adds a species to the list of threatened or endangered species at any time if the Commission finds that there is any emergency posing a significant threat to the continued existence of the species (Fish and Game Code §2076.5).

Through this petition, the petitioners request that the Commission list the western burrowing owl as an endangered or threatened species. This petition demonstrates that the western burrowing owl is in danger of becoming extinct throughout all or a significant portion of its range, and that therefore listing “is warranted.” This petition far exceeds the threshold for demonstrating that listing of the western burrowing owl “may be warranted,” and therefore must be accepted by the Commission at the first stage of the listing process.

III. ECOLOGY OF THE WESTERN BURROWING OWL

A. DESCRIPTION

The western burrowing owl (*Athene cunicularia hypugaea*) is a small, brown and white mottled, semi-fossorial¹ owl of prairie and grassland habitats. It is not easily confused with any other owl due to its ground-dwelling nature. Burrowing owls have long, almost bare, stilt-like legs and a stubby tail. Long legs help this ground owl to see over short-grass prairie vegetation in a landscape with few elevated perches, and also aid in running down insect prey. Burrowing owls have a round head lacking ear tufts, white eyebrows, yellow eyes, and a distinct oval facial ruff. Adults are a rich sandy-brown color on the head, back, and upper parts of the wings, and are thickly spotted with whites and buffs on the under-parts. This coloring provides good camouflage in dry grassland habitats. Males and females are difficult to distinguish in the field, although females are usually darker (males may appear faded from spending more time exposed to the sun during the breeding season) and, unlike many other raptors, the female is slightly smaller than the male, which may be an adaptation for squeezing into narrow burrows. Adult birds are about 19-25 cm (about 7-10 inches) tall and weigh an average of 150 grams (Zarn 1974a). Chicks are distinguished from adults by their completely buffy breast and white collar.

B. TAXONOMY

The western burrowing owl belongs to the Class Aves, Order Strigiformes (Owls), Family Strigidae (Typical Owls), Genus *Athene*, Species *cunicularia*, and Subspecies *hypugaea*. As of 1993, up to 18 subspecies of *Athene cunicularia* were recognized (Clark et al. 1978). Two of these occur in North America: the western burrowing owl, *A. c. hypugaea*, inhabiting North and Central America west of the eastern edge of the Great Plains south to Panama; and the Florida burrowing owl, *A. c. floridana*, found in Florida and on the Bahama Islands.

Molina originally classified the burrowing owl as *Strix cunicularia* in 1782. The species has since received several taxonomic changes and been variously placed in the genus *Speotyto* or *Athene*. It was designated as *Athene* by the American Ornithologists' Union ("AOU") in 1983 (AOU 1983), moved back to *Speotyto* in 1991 based on karyotypic evidence (AOU 1991), and reverted to *Athene* in 1997 (AOU 1997).

As for the owl's etymology, Athena was the Greek goddess associated with the owl, and *Speotyto* was derived from the Greek "speos" meaning cave and "tyto" meaning owl. The Latin "cunicularus" means "little miner." The burrowing owl is commonly known as the ground owl, prairie dog owl, or Billy owl, and is referred to as "Lechuza Llanera" in Hispanic cultures.

C. REPRODUCTION AND GROWTH

Western burrowing owls generally adopt burrows excavated by other animals, usually those of ground squirrels (*Spermophilus* spp.), prairie dogs (*Cynomys* spp.), American badgers (*Taxidea taxus*), or other small burrowing animals. Although some burrowing owls may dig their own burrows if the soil is soft enough (burrowing owls in Florida do this on a regular basis), they generally prefer to enlarge and adapt existing mammal burrows. Burrowing owls in California live primarily in ground squirrel burrows, for the most part taking over burrows abandoned by the squirrels. Where burrows are scarce, owls may attempt to nest in pipes, culverts, or artificial nest boxes.

Nest burrows are usually 1 to 3 meters long, with a downward slope of about 15 degrees, a J- or U-shaped bend, and an enlarged nest chamber at the end (Coulombe 1971). Adults usually return to the same

¹ Fossorial = adapted to digging.

burrow or a nearby area each year. Adult males often use one or more “satellite” burrows near the nest burrow during the nesting period, as do juvenile owls for a few weeks after they emerge from the nest. Both sexes prepare the burrow for nesting using their feet, beaks, and wings to scrape out dirt (Thomsen 1971; Martin 1973; Voous 1988). They often begin these renovations at several burrows, eventually selecting the best one as a nest site. The burrow is frequently lined with horse or cattle dung and other material such as grass, feathers, and other debris, but is sometimes left unlined (Thomsen 1971; Martin 1973; Evans 1982; Johnsgard 1988; Voous 1988). It has been speculated that the lining material acts as an absorbent, attracts dung beetles eaten by the owls, masks odors produced by the birds (making detection by predators more difficult), or produces heat by decomposition, controlling temperature and humidity within the nest cavity and aiding in the incubation of eggs (Martin 1973; Green and Anthony 1989). The habit of lining the burrow with manure is so strong that owls will promptly replace dung when it is removed (Martin 1973).

Burrowing owls often nest in loose colonies, which may be a response to local abundance of burrows and food, or an adaptation for mutual defense. Colony members can alert each other to the approach of predators and join in harassment of them. During the nesting season, adult males forage over home ranges 2 to 3 square kilometers in size and the ranges of neighboring males may overlap considerably. A small territory around the nest burrow is aggressively defended against intrusions by other burrowing owls, squirrels, and predators.

Nesting season for the burrowing owl in California (courtship and egg laying) occurs between February 1 and August 30 (CDFG 1994). In the Imperial Valley, pair formation begins as early as mid-January (Coulombe 1971). The male owl conducts courtship displays in front of the burrow. Capable of producing more than 17 vocalizations, the “primary song” is given only by adult males when near the burrow to attract a female. A two-syllable “who-who” is given at the entrance of a promising burrow. This call is also associated with breeding and territory defense. Once a female is enticed to the site, courtship antics involving various postures, vocalizations, and displays undertaken by both sexes, usually within 15 meters of the burrow. Nest site selection begins after pair formation, with the males gathering and distributing most of the nesting material (Anderson et al. 2001).

By February owls are pairing up and can be observed standing together outside the nest burrow. Actual breeding occurs anywhere from March through August, with the peak activity in April and May. Burrowing owls are primarily monogamous for the nesting season, and some pairs in the Imperial Valley may remain together throughout the year (Coulombe 1971).

Females usually produce only one clutch per year, but may lay a second clutch if the first is lost. Pairs are capable of laying a second clutch after the first brood successfully fledges (Gervais and Rosenberg 1999). Burrowing owls will lay up to 12 eggs in a chamber of the nest burrow, one of the largest clutch sizes of any raptor species, although 7 eggs is the norm (Haug et al. 1993). Eggs are laid between March and May depending upon location. The female incubates the eggs for approximately 3 to 4 weeks, while the male brings food to the female and stands guard near the burrow by day. After hatching, the chicks remain in the nest chamber for approximately 2 to 3 weeks. By this time the young are large and the burrow is very crowded, and young birds will often stand at the burrow entrance eagerly waiting for the parents to bring food.

Just before or just after they emerge (mid-May through early August), chicks lose their natal down and gain juvenal plumage. Chicks emerge from the burrow weighing approximately half to two thirds of adult weight and they reach adult weight within a month of emergence (Landry 1979; L. Trulio, pers. observ., 2002). Fledging (acquiring the feathers necessary for flight) occurs about one month post-emergence. Burrowing owl parents will feed young for another 6 to 8 weeks after emergence, with young remaining near the burrow with their parents until fall. By mid-September the young molt into adult plumage and disperse to find their own burrows.

Although there are not good published accounts for life expectancy of burrowing owls since returns of banded owls are sparse, an average longevity of 5 years is informally used (Kennard 1975). The record age for a banded owl in the wild is 8 years and 8 months (Kennard 1975).

Reproductive success may be the most important factor in maintaining population viability for species with relatively low survivorship and a short life span (Emlen and Pilkitch 1989). This is likely to be true for burrowing owls (Gervais and Rosenberg 1999). Burrowing owl adult and juvenile survivorship is highly variable among studies, with between-year return rates from 30-83% (Thomsen 1971; Haug et al. 1993; Clayton and Schmutz 1997).² Although up to 10 young per nest can be fledged in good reproductive years (Gervais and Rosenberg 1999), the number of young successfully fledged from nests in central California in recent years varied from 3 to 6, with most nests fledging 4 or 5 young (DeSante et al. 1997).³ Anecdotal accounts from the early 1900s suggest that 6 to 8 young were usually fledged (Dawson 1923). This apparent reduction in fledging success corresponds with a documented decline of breeding populations of other avian predators in grassland habitats in central California in recent years, such as the loggerhead shrike (*Lanius ludovicianus*) and American kestrel (*Falco sparverius*) (DeSante et al. 1997). Average young fledged per nest was 2.5 in the Imperial Valley population (Rosenberg and Haley 2003).

D. MOVEMENT

Northern populations of the western burrowing owl are migratory, leaving their breeding grounds in the fall, and returning to the same or nearby burrows each spring. In 2000, 2 owls tagged in Canada were located wintering in Mexico (G. Holroyd, pers. comm., 2001). However, most owls nesting in California remain throughout the winter as year-round residents (Brenkle 1936; Ligon 1961; Thomsen 1971; Haug et al. 1993) or appear to wander within the region during the winter months (Coulombe 1971; Martin 1973; Botelho 1996), particularly in central and southern California. Burrowing owls observed in Oakland, California were thought to stay in the burrow during the winter or become strictly nocturnal (Thomsen 1971). In fall and winter, individual owls can appear in unexpected places, such as on the smaller California islands and even offshore (Lamb 1929; Unitt 1984).⁴

California has a large number of burrowing owls in the winter, relative to other portions of their North American breeding range. Migratory owls from other areas are thought to augment resident California populations during the winter months (Coulombe 1971). It is assumed that migrants may be arriving from northern areas that are covered in snow during the winter where their burrows and food may be inaccessible (possibly from as far away as Canada, Washington, Oregon, and Idaho). Migratory owls in central coastal California will leave in mass by the last week in March, and no breeding or pairing of migrants has been observed (J. Linthicum, B. Walton, pers. comm., as cited in Madden 2002).

² Haug et al. (1993) found an adult survivorship of 33-58%. Thomsen (1974) calculated juvenile burrowing owl survival rate to be 30% and adult survivorship to be 81%, based on two years of study at the Oakland Airport in Alameda County. In a study of Canadian burrowing owls, Clayton and Schmutz (1997) found adult female survivorship to be 83%, while adult male survivorship was 46% and juvenile survivorship was 48%. Anderson et al. (2001) reported on annual survival for populations studied from 1997-2000 in the Bay Area (48%), Lemoore Naval Air Station (51%), Carrizo Plain (15%, extrapolated from 3 months of study), and the Imperial Valley (64%).

³ Thomsen (1971) found an average of 3.9 chicks survived to fledging. Martin (1973) reported a mean reproductive success of 4.9 young per pair. At Moffett Field, Santa Clara County, Trulio (1994) found an average fledging success of 2.6 chicks per reproductive pair (s. d. = 1.4) and an average of 1.8 chicks per pair (s. d. = 1.7). Anderson et al. (2001) reported on the mean number of young/nest and young/successful nest for populations studied in the Bay Area (1.5/2.8), Lemoore Naval Air Station (3.1), Carrizo Plain (1.9/4.1), and the Imperial Valley (2.5/2.9) from 1997-2000. J. Barclay (pers. comm., 2002) estimated an overall productivity (number of young surviving to fledging) for the owl population at San Jose Airport from 1996 to 2002 of 3.54 young/pair. Productivity of owls in natural burrows was 2.97 young/pair, and in artificial burrows was 4.08 young/pair, but the natural burrow productivity may be biased on the low side, since Barclay dug up the artificial nests while relying upon visual surveys at the burrow entrance for natural nests (J. Barclay, pers. comm., 2002).

⁴ Lamb (1929) reported on a burrowing owl that came onboard a steamer 8 miles off of southern Monterey County and another that came on board later that day off of Santa Barbara County, in September 1928. The species has been noted on several occasions flying far out at sea (Unitt 1984).

As of October 1993, the U. S. Fish and Wildlife Service Bird Banding Laboratory (“BBL”) records contained 44 encounters of burrowing owls banded in California. Twenty-nine (66%) of these encounters occurred in the same 10-minute blocks where the owls were banded and 10 (23%) occurred in the 10-minute block adjacent to where they were banded. Of the remaining five recoveries, only two represented owls that had moved substantial distances. These were two owls banded in Orange County: a nestling banded in June that was recovered in Mexico (no specific location information) in October; and an owl banded in October that was recovered the following March in Nevada (J. Barclay, pers. comm. 2002).

Of 276 burrowing owls tracked during two consecutive South San Francisco Bay demography studies from 1998 through 2002, the average distance owls moved between breeding seasons was from 0.5 to 0.9 miles (D. Chromczak, unpublished data, 2002). Of the owls monitored, 27% stayed at the same nesting location, 14% moved less than 0.05 miles (~265 feet), 34% moved 0.05 to 0.5 miles, 8% moved 0.5 to 1.0 miles, 14% moved 1.0 to 5.0 miles, and only 2% moved 5.0 to 10.0 miles (D. Chromczak, unpublished data, 2002). Pairs of owls that failed in a breeding attempt have been noted to move up to tens of kilometers before breeding again, even within the same season (J. Gervais, pers. comm., 2003).

Within the breeding season, burrowing owls tend to spend most of their time in the vicinity of the burrow, but will go further afield to hunt (Coulombe 1971). Male owls will forage over home ranges from 2 to 3 square kilometers in size (Haug and Oliphant 1987), concentrating foraging efforts within 600 meters of the nest burrow (Gervais et al. 2003; Rosenberg and Haley 2003). Seasonal movements other than migration may occur. After the young learn to fly, family groups will often move from burrow to burrow, and in the fall young owls will appropriate their own burrow nearby. In the winter, pairs will investigate new burrows and territorial boundaries will be in flux as forming pairs choose their burrows (Thomsen 1971).

As far as daily movements, owls will generally spend most of the day near their burrows, coming out in the late afternoon to perch and beginning to forage at dusk. Adults with young to feed return to the burrow at night (Thomsen 1971).

E. FEEDING

Burrowing owls are primarily crepuscular (active at dusk and dawn) in their foraging, but hunting activity has been observed over 24 hours (Grant 1965; Coulombe 1971; Marti 1974). They will forage in natural, ruderal (areas such as roadsides where vegetation has been disturbed), or manicured grasslands. Burrowing owls prey primarily on large insects and small rodents but will take a wide variety of prey and are known to be opportunistic in their feeding habits (Thomsen 1971; Zarn 1974a). Burrowing owls may hunt from a perch, capturing prey after short flights or glides, or hovering while hunting and returning to the perch after catching their prey. Burrowing owls will also walk, run, or hop after prey on the ground. Hunting style varies with type and activity of prey pursued, time of day, and vegetative substrate (Thompson and Anderson 1988; Haug et al. 1993). Burrowing owls probably also take insects that live in their burrows (Coulombe 1971).

Important food items for burrowing owls include small rodents such as voles (*Microtus* spp.), mice (*Peromyscus* spp., *Mus* spp., *Reithrodontomys* spp., *Zapus* spp.), pocket mice (*Perognathus* spp.), pocket gophers (*Thomomys* spp.), kangaroo rats (*Dipodomys* spp.), and young ground squirrels (*Spermophilus* spp.). It is interesting to note that burrowing owls generally do not hunt the ground squirrels upon which they depend for burrows – although squirrel colonies have many defenses against predators, they do not employ them against burrowing owls (which weigh only one fifth of a full-grown ground squirrel). Burrowing owls also eat a wide array of arthropods (such as beetles, grasshoppers, crickets, dragonflies, and crustaceans),⁵ reptiles, amphibians,

⁵ Arthropods were found to be the main prey item of burrowing owls in the Colorado Desert in southeastern California (Coulombe 1971).

small birds, fish, and even carrion (Bent 1938; Glover 1953; Earhart and Johnson 1970; Thomsen 1971; Zarn 1974a; Gleason and Craig 1979; Conroy and Chesemore 1987; Haug and Oliphant 1990).

Birds documented as prey items of burrowing owls include killdeer (*Charadrius vociferous*), horned larks (*Eremophila alpestris*), western meadowlarks (*Sturnella neglecta*), Wilson's warbler (*Wilsonia pusilla*), American avocets (*Recurvirostra americana*), red-winged (*Agelaius phoeniceus*) and Brewer's blackbirds (*Euphagus cyanocephalus*), black-headed grosbeaks (*Hedymeles melanocephalus*), black terns (*Chlidonias niger*), California least terns (*Sterna antillarum*), mourning doves (*Zenaida macroura*), and various shorebirds (Stoner 1933a; Errington and Bennett 1935; Bent 1938; Neff 1941; Thomsen 1971; Gleason and Craig 1979; Warrick 1982; P. Bloom, pers. comm., 2002; Rosenberg and Haley 2003). Adult owls have also been documented preying on burrowing owl chicks (Botelho 1996; Rosenberg et al. 1998a).

Unexpected prey remains are occasionally found in burrowing owl pellets or burrows, such as remains of spadefoot toads (*Scaphiopus* spp.) found in pellets in Nevada (Bond 1942) and Kansas (Sperry 1941). Crayfish were the most common food item in a study in Colorado (Hamilton 1941) and attacks on large snakes have been documented (Fisher 1893). Pacific Coast newts (*Triturus torosus*) missing their heads were found in an owl burrow in Solano County (Stoner 1932a), and remains of snakes, scorpions, and centipedes have been found in burrows in Solano and Colusa Counties (Stoner 1933a; Neff 1941). Burrowing owls in California have also been known to feed on bats. Thomsen (1971) discovered the remains of a hoary bat (*Lasiurus cinereus*) in pellets collected in Oakland; Hoetker and Gobalet (1999) found the Mexican free-tailed bat (*Tadarida brasiliensis*) to be the dominant vertebrate prey item in 18 owl pellets collected in Bakersfield; and J. Barclay (pers comm., 2002) observed free-tailed bat remains in owl burrows in San Jose.

F. PREDATION

Predators of burrowing owls are of two general types: predators that enter or dig up burrows to eat eggs, nestlings, and/or adult females; or predators that prey on older nestlings and adults when they are above ground. Because burrowing owls are ground nesters, their eggs and young are quite susceptible to predation. Mammals that can access nest chambers and are known predators of the burrowing owl include skunks (*Mephitis mephitis*), badgers (*Taxidea taxus*), foxes (*Vulpes vulpes*, *V. macrotis mutica*, and *Urocyon cinereoargenteus*), raccoons (*Procyon lotor*), and various snakes, including rattlesnakes (*Crotalus* spp.) (Coulombe 1971; Kemper 1996). Species that mainly catch owls above ground include prairie falcons (*Falco mexicanus*), red-tailed hawks (*Buteo jamaicensis*), Swainson's hawks (*Buteo swainsoni*), ferruginous hawks (*Buteo regalis*), northern harriers (*Circus cyaneus*), golden eagles (*Aquila chrysaetos*), great horned owls (*Bubo virginianus*), American crows (*Corvus brachyrhynchos*), coyotes (*Canis latrans*), and possibly short-eared owls (*Asio flammeus*) (Fowler 1931; Haug et al. 1993).

Burrowing owls will often line their burrow with dung, presumably to mask the burrow scent from predators (Martin 1973). In one study of burrowing owl nests in Oregon, only 2 of 15 nests (13%) lost to predation were lined with dung, while 23 of 32 successful nests (72%) were dung-lined (Green and Anthony 1989). Burrowing owls once used bison dung in natural habitats in other states, but now cattle dung is often used. If young owls are alarmed in the nest, they will make a rattlesnake-like buzz to deter predators (Voous 1988). Adults will give a short, low-level "chuck" call to warn of approaching predators, usually accompanied by bobbing the head up and down (Voous 1988).

IV. HABITAT REQUIREMENTS

Historically, western burrowing owls were found in natural areas of open prairies or open shrub-steppe habitat (Coulombe 1971; Butts 1973). The species is characteristic of flat arid areas that have rodent burrows and rare floods. In California, almost none of the owl's original prairie habitat remains. Human population growth and continuous land use changes have forced the species to use human-altered habitats ranging from agricultural irrigation ditches (Coulombe 1971) to urban habitats (Thomsen 1971; Collins and Landry 1977; Trulio 1995). Burrowing owls can tolerate a certain amount of non-threatening human activity, noise, and disturbance as long as other habitat requirements are met. Essential habitat requirements include suitable nesting and foraging habitat and available roosting sites (Coulombe 1971; Voous 1988; Johnsgard 1998).

Typical burrowing owl habitat is open, dry, sparsely vegetated land with available burrows (Zarn 1974a). The State of California Department of Fish and Game's Wildlife Habitat Relationships System (CDFG 1990) database lists 18 major habitat types that support burrowing owls. In most of these habitats, burrowing owls are generally found in open country, where tree or shrub canopies cover less than 30% of the habitat (DeSante et al. 1996). Typical habitats include annual and perennial grasslands, open agricultural areas, deserts, and vacant lots. Other habitats include oak savannah; grass, forb, and open shrub stages of pinyon-juniper and ponderosa pine habitat; sandy beaches; and river bottom lands. Burrowing owls inhabiting urban landscaped areas may live in vacant fields, airports, athletic fields, golf courses, city parks, drainage sumps, railroad beds, and road cuts. Other more subtle characteristics affect burrow suitability. These characteristics include percent vegetative cover, height of vegetation surrounding the burrow, presence of colonial fossorial mammals, soil texture, and presence of perches for horizontal visibility (Green 1983).

Burrow availability is a major factor in defining suitable burrowing owl habitat (Coulombe 1971; Green and Anthony 1989). DeSante et al. (1996) evaluated habitat-related factors associated with the probability of re-occupancy of breeding sites by owls. The presence of ground squirrels was the single highest predictor for re-occupancy. Higher re-occupancy rates were also observed for sites near irrigation canals, sites with more than one pair of owls, and areas with high densities of owls. Burrows excavated by fossorial mammals such as California ground squirrels, prairie dogs, badgers, and marmots (*Marmota flaviventris*) are necessary to the burrowing owl.

Throughout most of California, burrows of the California ground squirrel are used, although in southern desert areas owls use ground squirrel, desert tortoise (*Xerobates agassizii*), or American badger burrows (Weathers 1983). In addition to digging burrows which owls use, the presence of colonial rodents benefits burrowing owls in the form of burrow maintenance between nesting seasons and the two species may assist each other with shared alarm calling behavior warning of predators (Trulio 1994). Natural or unnatural cavities such as rock or lava outcroppings (Gleason and Johnson 1985; Rich 1986), limestone (Coulombe 1971), concrete or asphalt (Trulio 1994) and man-made artificial habitat (Collins and Landry 1977) can occasionally be suitable burrow sites. Artificial burrows require permanent maintenance to provide long-term nesting habitat, otherwise they can become buried (P. Bloom, pers. comm., 2002). Stoner (1933b) even found two burrowing owls occupying holes in hay piles near Dixon.

The burrow protects against predators (Butts 1973; Green and Anthony 1989) and adverse weather conditions (Coulombe 1971), and it creates a microhabitat for arthropods such as earwigs and crickets, which are part of the primary food source (Coulombe 1971). In the Columbia Basin, Oregon, Green and Anthony (1989) studied nest site characteristics in association with nesting failure. They concluded that soil texture was important to long-term suitability of a nest site. They also analyzed the presence, abundance, and height of perches and found particular habitats were used only if elevated perches were present.

Vegetation cover and height are significant habitat factors due to the ground-dwelling nature and small size of the burrowing owl (Coulombe 1971; Zarn 1974a; Green and Anthony 1989; Trulio 1994). Vegetation

cover that prevents the owl from observing approaching predators places the burrowing owl at a severe disadvantage. Vegetation cover between 44-57% was observed at occupied burrowing owl habitat in Santa Clara County, California (Trulio 1994) and in the Columbia Basin 28% cover was optimal (Green and Anthony 1989). Green and Anthony (1989) also found that owls selected areas with a greater percentage of bare ground. High vegetation presents similar disadvantages to owls in observing potential predators. In Oklahoma, owls occupied areas where the vegetation height was 4 inches or less (Butts 1973). In Santa Clara County, occupied burrows were found in areas with an average vegetation height of approximately 6 inches (Trulio 1994). Human-altered habitats that allow an owl to stand near the burrow entrance and effectively watch for approaching predators include grazed areas, areas sprayed with herbicide, and areas where vegetation is removed without harm to the burrow (Coulombe 1971; Green and Anthony 1989; Trulio 1994).

The four ecosystems in which burrowing owls are most prevalent in California are: grasslands adjacent to intensive agriculture; intensive agriculture in which owls nest along irrigation banks; large expansive grasslands; and small patches of grassland surrounded by urban development (Rosenberg and DeSante 1997).

V. RANGE

The western burrowing owl is distributed from the Mississippi River to the Pacific Ocean, north into the prairie provinces of Canada and south to Mexico and western Panama (Haug et al. 1993; Trulio 1998b). Grinnell and Miller (1944) characterized the historical range of the burrowing owl in California as follows:

“Suitable areas (treeless and level) almost throughout the state, from the Oregon line east of the Siskiyou mountains south to the Mexican border, and from the Nevada border and Colorado River west to the ocean shore; includes practically all islands from the Farallones south. Mostly rare or wanting in coastal counties north of Marin and in all mountainous areas. Mainly Lower and Upper Sonoran life zones; but breeds locally in Transition zone, and vagrants go even higher. Altitudes of occurrence extend from 200’ below sea level in Death Valley and around the Salton Sea up regularly to 5300 feet in Lassen County.”

Historically, burrowing owls have been found to reach maximum abundances in wide, lowland, interior valley bottoms and in flat coastal lowlands (Grinnell and Miller 1944). Surveys by DeSante and Ruhlen (1995) found that fully 92% of the breeding owls located throughout California occurred in such lowland areas, generally below 60-300 meters in elevation. These types of habitat are under the most severe pressure from urban development.

Burrowing owls have apparently disappeared from about 8% of their former breeding range in California (J. Barclay, using data from DeSante et al. 1996). DeSante and Ruhlen (1995) determined that breeding burrowing owls had apparently been extirpated since the early 1980s from Marin, San Francisco, Santa Cruz, Napa, coastal San Luis Obispo, and Ventura counties, as well as from the Coachella Valley, and had nearly been extirpated from Sonoma, Santa Barbara, Orange, coastal Monterey, and San Mateo counties. Perhaps only one or two breeding pairs still exist in most of these latter counties. There is some evidence that breeding owls have been extirpated from Humboldt and Mendocino Counties, southwestern Solano County, and western Contra Costa County as well. The species is rapidly disappearing from southern Los Angeles, western San Bernardino, western Riverside, and San Diego Counties. See Appendix 1 for a map of the range of the burrowing owl in California.

VI. HISTORICAL AND RECENT DISTRIBUTION AND ABUNDANCE

The historical and recent distribution and abundance of breeding burrowing owls in California is discussed below, described by region and then by county. Historical literature sources, as well as a number of California and other western museum collections were searched for historical documentation of breeding burrowing owls.⁶ From these sources, a site was considered confirmed as a breeding location if: 1) eggs were collected; 2) a bird was collected during breeding season that had mature reproductive parts; or 3) juvenile owls were seen during or immediately after the nesting season (February 1 through August 31).⁷ A site was considered a probable breeding location if: there was evidence of owl occupation of burrows; single or multiple birds were collected or observed during the nesting season; pairs were observed outside of the nesting season; or multiple birds were observed year-round.

Although numerical data on the statewide historical abundance of burrowing owls do not exist, many early naturalists commented on the widespread abundance of the burrowing owl prior to widespread human population growth and development in California. As early as 1869, burrowing owls were observed in abundance in California, with Canfield (1869) reporting “I have seen them every day for years, hundreds and perhaps thousands of them in all.” Baird (1870) considered the species to be “probably one of the most common birds in California.” Keeler (1891) described the owl as “an abundant resident of the open valleys and foothills of the State.” Grinnell (1915) and Dawson (1923) both noted it was a “common resident” within its range. Dawson (1923) observed that the species enjoyed “an almost unbroken distribution throughout the treeless or lightly timbered sections of the State, from the base of the Sierras down to the ocean’s edge.” Grinnell and Wythe (1927) listed the owl as a “fairly common resident” of the dry interior of the San Francisco Bay Area.

Even by 1944, when a widespread decline in abundance was noticeable, Grinnell and Miller (1944) observed that “numbers in favorable localities [are] large,” although “latterly becoming scarce in settled parts of [the] state.” By 1978, the Department of Fish and Game (Remsen 1978) commented that the “decline noticeable by the 1940s (Grinnell and Miller 1944) has continued through to the present time...the decline has been almost universal throughout California.”

From 1991-1993, a comprehensive census of burrowing owls was conducted throughout most of the breeding range of the species in California (DeSante et al. 1996), which assessed changes in owl distribution from observations made in the 1980s. A copy of DeSante et al. (1996), “The distribution and relative abundance of burrowing owls in California: evidence for a declining population,” is attached as Appendix 3. DeSante et al. (1996) located 1,995 breeding pairs of burrowing owls in California. Based on assumptions of sampling design and the actual area surveyed, DeSante et al. (1996) estimated that 9,266 breeding pairs of burrowing owls existed during 1991 to 1993 in their statewide survey area, which excluded the Great Basin, desert areas, and the Channel Islands. The 95% confidence limits on this estimate extended from 7,884 to 10,370 pairs.

⁶ Literature searched for historical breeding records included American Birds, the Auk, the Condor, North American Bird Bander, Ornithologist and Oologist, Pacific Coast Avifauna, and the Proceedings of the California Academy of Sciences. Museums collections reviewed for egg set data and breeding season collection records included the American Museum of Natural History, California Academy of Sciences, Chicago Academy of Sciences, Cleveland Museum of Natural History, California State University Chico, California State University Long Beach, California State University Northridge, Delaware Museum of Natural History, Field Museum of Natural History, Los Angeles County Museum, Museum of Southwest Biology, National Museum of Natural History, Occidental College, Oakland Museum, Pacific Grove Museum of Natural History, Santa Barbara Museum of Natural History, Smithsonian Museum, Slater Museum of Natural History, University of California Berkeley Museum of Vertebrate Zoology, University of California Los Angeles Fritz Hertzell Museum, University of California Santa Barbara Museum of Vertebrate Zoology, University of California Santa Cruz, University of Nevada Las Vegas, U. S. Geologic Survey Biological Survey, University of Washington Burke Museum, Western Foundation of Vertebrate Zoology, and Yale Peabody Museum. The California Department of Fish and Game’s Natural Diversity Database was also searched.

⁷ The California Department of Fish and Game considers February 1 through the end of August to be nesting season for burrowing owls (CDFG 1994).

DeSante et al. (1996) estimated that fully 71% (6,571 pairs) of the state's breeding population of burrowing owls occurred in the Imperial Valley, where they exist at very high densities (up to about 2.37 pairs per square kilometer). As the Imperial Valley comprises only 2.5% of the state's land base, this is a hugely disproportionate distribution of the species, and a circumstance dependent upon maintenance of current agricultural practices, as will be discussed below. DeSante et al. (1996) estimated 24% of breeding owls (2,221 pairs) occurred in the Central Valley, with over half of those owls (1,396 pairs) in the southern Central Valley, only 594 pairs in the middle Central Valley, and 231 pairs in the northern Central Valley. Only 474 pairs of owls were estimated to be present in the entire area of central western and southwestern California. Of these owls, it was estimated that 227 pairs were in the southern interior region, 165 pairs in the Bay Area interior region, and the remaining 82 pairs were scattered throughout the central coast (8 pairs), central interior (38 pairs), and southern coast (36 pairs) regions. No breeding pairs of owls are thought to remain in the coastal Bay Area and Coachella Valley regions. The findings of DeSante et al. (1996) are more fully discussed below in Section VII on population trends. See Appendix 1 for a map of the recent distribution of burrowing owls in California, and Appendix 2 for a table of current owl distribution and estimated density in California, by region and county.

A. NORTHERN COASTAL CALIFORNIA

The humid coastal belt of northwestern California has generally been considered outside of the range of the burrowing owl. Baird (1870) noted that "from Monterey north this species becomes very rare, or entirely absent on the west side of the Coast Range" and Grinnell (1915) knew of no records of the species north of Marin County in the humid coast strip proper. However, there is some historical evidence of probable breeding of burrowing owls in Humboldt County, near Carlotta and in the Mattole and Eel River Valleys in the early 1900s (Wilder 1916).⁸ There is also a known breeding record from the Middle Fork Eel River drainage in Mendocino County (USDA and USDI 1996). These owl populations are presumably extirpated, as no recent observations of breeding owls in Humboldt or Mendocino County could be located.

B. NORTHERN DESERT RANGE

The northern desert range of the burrowing owl encompasses portions of eastern Siskiyou, Modoc, Lassen, eastern Plumas, and eastern Sierra Counties (DeSante et al. 1996). The owl was apparently never common in most of its northern desert range, except north of Mt. Shasta, where the species was reportedly common in the late 1800s (C. Townsend 1887; C. Merriam 1899). Subsequent accounts of burrowing owl distribution in the northeast part of the state (Dawson 1923; Grinnell and Miller 1944; Small 1974; Zeiner et al. 1990) did not describe local distribution or estimate the number of burrowing owls in the region. A statewide burrowing owl census by DeSante et al. (1996) did not include the northern desert range.

Barclay and Cull (1999) produced a recent population estimate of 90 to 149 pairs of owls within suitable owl habitat in northeastern California (presumed to be 2,647 square miles of portions of Lassen, Modoc, Plumas, Sierra, and Siskiyou Counties). The lower limit of this population estimate uses the mean population density of 0.53 owls/25 km² for the northern Central Valley from DeSante and Ruhlen (1995); the upper limit uses the average owl density of 1 adult/5,683 acres outside prairie dog towns in Oklahoma reported by Butts (1973).

Siskiyou County

Burrowing owls were reportedly common in the 1880s "on the sage-covered districts north of Mount Shasta," about 15 miles from the mountain (C. Townsend 1887; C. Merriam 1899). Historical records confirmed breeding at Gazelle in 1918; and indicated probable breeding at Yreka in 1883 and 1922, at Bray in

⁸ According to Wilder (1916) burrowing owls were once occasionally found in suitable localities in Humboldt County, such as in the Mattole and Eel River Valleys. Wilder (1916) observed one owl occupying a burrow between Carlotta and Alton for a year or two.

1922, near Lava Beds National Monument in 1936 and 1937, and near the northwest corner of Lower Klamath Lake in 1940 (Bond 1939; South 1940; NMNH 2001; CAS 2002a).⁹ Recent breeding season observations in Siskiyou County could not be located, but the species is reported to occur in Shasta Valley, Butte Valley, and in grasslands of the upper Klamath River.¹⁰

Modoc County

Historical records indicated probable breeding at Alturas in 1910 (MVZ 2001).¹¹ Recent breeding season observations in Modoc County could not be located.

Lassen County

Burrowing owls apparently regularly occurred at elevations as high as 5,300 feet in Lassen County (Grinnell and Miller 1944). Historical records indicated probable breeding in Petes Valley in 1929, near Herlong in 1963, and at Milford in 1975 (CSULB 2001; MVZ 2001).¹² Three pairs of owls were observed in the spring and summer of 1975 and 1976 east of Schaeffer Mountain (P. Bloom, pers. comm., 2002).

The only recent burrowing owl records in northeastern California are of nesting birds and other observations in the Honey Lake Basin in eastern Lassen County, from 1992 to 1998 (SAD 1992; Holmes and Novick 1993; BioSystems Analysis, Inc. 1993a, 1993b, 1994, 1995; KEA Environmental 1997, 1998; CNDDDB 2001).

Plumas and Sierra Counties

Historical breeding season observations in Plumas and Sierra Counties could not be located. In the early 1990s, D. DeSante (pers. comm., 2003) located a small colony of about 5 pairs of breeding burrowing owls in Sierra Valley along the Plumas-Sierra County line. This colony was apparently well known to regular Sierra Valley birders for many years.

C. CENTRAL VALLEY

1. NORTHERN CENTRAL VALLEY

The range of the burrowing owl in the northern Central Valley encompasses the southwestern 20% of Shasta County; most of Tehama County; the western 70% of Butte County; the eastern 80% of Glenn County; the western 85% of Yuba County; the western 20% of Nevada County; all but the northwestern 5% of Colusa County; portions of Lake County; all of Sutter County; and the western 40% of Placer County (DeSante et al. 1996).

Although there are historical records of confirmed breeding in almost every county in the northern Central Valley, there are no historical data on abundance of the burrowing owl in this area. DeSante et al. (1996) estimated that 231 pairs of owls remained in the northern Central Valley in the mid 1990s, about 2.5% of the state breeding population. These pairs were associated to a large degree with agricultural lands although substantial numbers occurred in more urban settings and at airports.

⁹ Eggs were collected at Gazelle on 5/9/18 (CAS 2002a). A single bird was collected at Yreka on 8/18/1883 (NMNH 2001). Single birds were collected on 6/8/22 at Yreka and Bray (CAS 2002a). Bond (1939) saw a pair of owls in 1936 and two pairs in 1937 at a cliff area near Lava Beds National Monument, and South (1940) saw an owl and an occupied burrow in January 1940 near the northwest corner of Lower Klamath Lake.

¹⁰ Ray Ekstrom reported "a few pairs" of owls breeding recently at the Siskiyou County Airport, northeast of Montague (D. Cooper, pers. comm., 2002).

¹¹ An owl was collected from the South Fork Pitt River, Alturas, on June 10, 1910 (MVZ 2001).

¹² Historical collections include from Petes Valley (3 birds) on 6/9/29; at Garnier Ranch, 2.4 miles south and 1.5 miles west of Herlong on 4/5/63; and from Milford August 1975; there is also a non-breeding season record from 5 miles north of Observation Peak on 10/17/24 (CSULB 2001; MVZ 2001).

Southwestern Shasta County

Historical or recent breeding season observations in southwestern Shasta County could not be located.

Tehama County

Historical records indicated probable breeding near Red Bluff in 1874, 1884, and 1924 (MVZ 2001; NMNH 2001).¹³ England et al. (1988) failed to find any records or observe any burrowing owls during surveys of the Mill and Deer Creek drainages and higher elevation meadows in Tehama County, during 1980-1987 surveys. Recent observations confirmed breeding near Gerber in 1993 and 1994; and indicated probable breeding near Gerber in 1993 and near Red Bluff in 1994 (CNDDDB 2001).¹⁴

Butte County

Historical records confirmed breeding at Biggs in 1906, and indicated probable breeding at Chico in 1975 (CSUC 2001; NMNH 2001).¹⁵ Recent observations indicated possible breeding southwest of the Chico Airport in 1998 (CNDDDB 2001).¹⁶ This site is threatened by commercial development.

Glenn County

Historical records confirmed breeding at Willows in 1928; and indicated probable breeding at Saint John in 1906, and near Norman in 1934 (DMNH 2001; MVZ 2001; NMNH 2001).¹⁷ Recent observations indicated probable breeding southwest of Orland and possible breeding at two other sites in the vicinity of Orland in 1992 (CNDDDB 2001).¹⁸

Yuba County

Historical records confirmed breeding at Sheep Dip in 1906 (MVZ 2001).¹⁹ Recent breeding season observations in Yuba County could not be located.

Nevada County

Historical records indicated probable breeding near Truckee in 1935 (MVZ 2001).²⁰ Recent breeding season observations in Nevada County could not be located.

Colusa County

Historical records confirmed breeding near Maxwell in 1932 (Neff 1941).²¹ Recent observations confirmed a "good" breeding colony west of Antelope Valley in 1992 and 1993 (breeding in artificial burrows

¹³ Single birds were collected at Red Bluff on 3/11/1874, and on 3/11 and 4/12, 1884 (NMNH 2001); a single bird was collected 7 miles south of Red Bluff on 5/6/24 (MVZ 2001). There are also non-breeding season records from near Red Bluff: at Dale's on Paine Creek on 1/17/28; and at Coyote Creek, 6 miles south of Red Bluff, on 12/28/27 (MVZ 2001).

¹⁴ Recent observations include: 1 adult owl at a burrow site at Little Salt Creek, 5 miles northeast of Red Bluff, on 10/16/92; 1 owl at a burrow site 1.1 miles northwest of Dales, on 2/9/93; 2 adults at a burrow site north of Elder Creek, west of Gerber, on 3/22/93; 2 adults and 5 young at a burrow site 4.5 miles southwest of Gerber on 3/93; 1 adult owl at a burrow at the south end of Dales Lake on 10/16/93; 1 adult 5 miles southwest of Gerber on 6/29/94; 3 adults (1 at the burrow) 4 miles south of Red Bluff, on 7/13/94; and an owl 2 miles northeast of Henleyville on 11/3/94 (possibly used only as a wintering site) (CNDDDB 2001).

¹⁵ Single birds (including one juvenile) were collected from Biggs on 7/13 and 7/14, 1906 (NMNH 2001). A single bird was collected from Chico on 3/31/75 (CSUC 2001). There is a non-breeding season record from Gray Lodge Waterfowl Management Area, December 1966 (MVZ 2001).

¹⁶ Three adults were observed at 2 burrow sites southwest of Chico Airport on 11/12/98 (CNDDDB 2001).

¹⁷ Four eggs were collected from Willows on 6/19/28 (DMNH 2001). A single bird was collected from Saint John on 6/10/06 (NMNH 2001), and two birds were collected 6 miles east of Norman on 8/5/34 (MVZ 2001).

¹⁸ CNDDDB observations include: two adults at a burrow site southwest of Orland, on 4/14/92 (one owl was later killed on the road, the burrow was then completely abandoned); one owl at a burrow site southwest of Orland on 10/9/92; and one owl at a burrow site on the North Fork of Walker Creek, 3 miles east of the Orland Buttes, on 10/10/92 (CNDDDB 2001).

¹⁹ Eggs were collected from Sheep Dip 5/19/06 (MVZ 2001).

²⁰ A bird was collected two miles east of Truckee 3/16/35 (MVZ 2001).

²¹ An inhabited owl den was observed from April-August 1932, 10 miles northeast of Maxwell (Neff 1941). There is a non-breeding season collection record from Colusa Compton Ranch, 8 miles south-southwest of Princeton, on 11/26/26 (MVZ 2001).

after 22 natural burrows were destroyed in 1992); and indicated probable or possible breeding at 8 additional sites west of Arbuckle, Williams, and Maxwell in 1992 (CNDDDB 2001).²²

Lake County

Burrowing owl eggs have been collected from Lake County, but no specific locality or date is given (NMNH 2001). Historical records also indicated probable breeding at Upper Lake throughout the 1890s (Stephens 1895; McGregor 1898; NMNH 2001).²³ In the 1970s, the burrowing owl was still distributed in the Cache Creek and Stanton Creek watersheds (West 1973). Recent breeding season observations in Lake County could not be located.²⁴

Sutter County

Historical breeding season observations in Sutter County could not be located.²⁵ Recent observations indicated a probable breeding colony near Pleasant Grove in 1993 (CNDDDB 2001).²⁶

Placer County

Historical breeding season observations in Placer County could not be located. Recent observations indicated probable breeding northwest of Roseville in 1998 (CNDDDB 2001).²⁷

2. MIDDLE CENTRAL VALLEY

The range of the burrowing owl in the middle Central Valley encompasses all of Yolo and Sacramento Counties; all but the southwestern 5% of Solano County; the eastern 50% of Contra Costa County; the eastern 20% of Alameda County; all of San Joaquin, Stanislaus, and Merced Counties; the western 30% of El Dorado County; the western 55% of Amador County; the western 70% of Calaveras County; the western 25% of Tuolumne County; and the western 60% of Mariposa County (DeSante et al. 1996).

Although there are historical records of confirmed breeding in almost every county in the middle Central Valley, there are little data on overall historical abundance of the burrowing owl in this area. However, the species was documented to have been locally abundant in Solano County (at Fairfield) and Merced County (at Los Banos) in the 1930s (WFVZ 2001), and in Yolo County (at U.C. Davis) and San Joaquin County (at Stockton) in the 1960s (Remsen 1978; Kemper 1996).

An estimated 595 (DeSante and Ruhlen 1995) to 600 (Kemper 1996) pairs of owls remained in the middle Central Valley in the mid 1990s, about 6.4% of the state breeding population. These pairs are thinly distributed in a crescent around the Delta region (in Yolo, Solano, Sacramento, Contra Costa, San Joaquin, Stanislaus, and Merced Counties), and are associated to a large degree with agricultural lands, although substantial numbers occur in more urban settings and at airports.

²² CNDDDB observations include: two owls flushed from burrows in the vicinity of the North Fork of Elk Creek, southwest of Arbuckle in 3/92; 5 burrows 5 miles southwest of Williams with castings present, 3/6/92; one owl flushed from a burrow 5 miles south-southwest of Williams on 3/9/92; an owl flushed from near a burrow 5 miles west of Arbuckle on 3/9/92; a colony of owls south of Mills Orchard April-September 1992 (5 pairs with 21 young) and in 1993 (21 owls - 7 adults, 14 juveniles); 11 miles northwest of Williams on 3/8/92; one owl at a burrow 10 miles northwest of Williams, on 2/11/92 (the burrow site was excavated on 3/8/92 for construction of a pipeline and the owls are possibly extirpated); 1 owl in a burrow complex 5.5 miles north of Mills Orchards, east of Antelope Valley, on 3/5/92 (also active during spring 2001); and castings and recent droppings, 3 miles east of Golden Gate on Funks Creek, on 3/5/92 (CNDDDB 2001).

²³ Birds were collected at Upper Lake on 5/29/1894 (Stephens 1895; NMNH 2001), and on 2/10 and 3/27, 1897 (McGregor 1898).

²⁴ There has been a report of possible recent breeding activity in grasslands north of the town of Clearlake (D. Cooper, pers. comm., 2002).

²⁵ There is a historical non-breeding season collection record from Butte Creek, six miles north of Meridian, on 11/27/25 (MVZ 2001).

²⁶ Five individual owls were observed south-southwest of Pleasant Grove on 7/10/93 (CNDDDB 2001).

²⁷ Owls (never more than 2) were observed northwest of Roseville year-round during 1998 (CNDDDB 2001).

Yolo County

Historical records confirmed breeding at Woodland in 1886 and indicated probable breeding there in 1922 (MVZ 2001; NMNH 2001).²⁸ Recent breeding season observations near Woodland could not be located.

Kemper (1996) reported a “dependable” owl colony on the U. C. Davis campus in 1962, noting that owls could be seen any time then. B. Johnson monitored this colony from 1981, when the colony had 22 pairs, to 1991, when the population plummeted to one adult. This colony increased to several pairs by the late 1990s, but is threatened by development (CNDDDB 2001; B. Johnson, pers. comm., as cited in PHBA 2002). The overall burrowing owl population at Davis has likely declined 50% from 40 pairs in the mid-1980s to 20 pairs in the mid-1990s (PHBA 2002).²⁹ Other owl colonies north of Davis also severely declined or were extirpated in the 1980s: such as a burrowing owl colony adjacent to the Yolo County Airport that had 10 pairs of birds in 1976, that was extirpated by 1983 when the site was flooded to create a pond; and a colony of 3 to 5 pairs observed from 1978 to 1983, near road 102, 2 miles north of Davis, that had only one pair left by 1986 (CNDDDB 2001).

In 1985, B. Johnson (pers. comm., as cited in PHBA 2002) estimated Yolo County’s burrowing owl population on the order of 70 to 80 pairs. Since then, the species has “gone into serious decline in Yolo County,” and as of 1996 the only remaining breeding owls were in pasturelands bordering the Yolo Bypass, south of El Macero, and a few pairs residing near Davis (Kemper 1996; CNDDDB 2001).³⁰ Observations by B. Johnson (pers. comm., as cited in PHBA 2002) suggest that Yolo County’s burrowing owl population has declined approximately 50% since 1985 to 30 or 40 pairs in 2000. As of 2001, owls were known to occupy sites at U. C. Davis, the Yolo Airport, and Mace Ranch Park (CDFG 2002a).

Sacramento County

Historical records confirmed breeding near Freeport in 1899 and near Sacramento in 1901 and 1907; and indicated probable breeding in Sacramento in 1867, 1912, 1926, and 1951 (Storer 1926; Kirsher 1951; MVZ 2001; NMNH 2001; CAS 2002a).³¹ There were a number of nesting colonies of owls in downtown Sacramento as of 1974 (CNDDDB 2001).³² Recent observations confirmed nesting in the vicinity of Rio Linda from 1987-1993, at Mather Air Force Base in 1989, at the Sacramento Army Depot in 1990, and at a number of locations in southern Sacramento from 1991-2001 (CNDDDB 2001).³³ Large populations remain at the Sacramento Army

²⁸ Five eggs were collected from Woodland on 4/5/1886 (NMNH 2001). A bird was collected from Woodland on 3/27/22 (MVZ 2001).

²⁹ Recent CNDDDB observations in the vicinity of Davis include: a pair nesting near County Roads 27 and 102B, approximately 4 miles north-northeast of Davis (possibly extirpated by development by 1989); 2 pairs along the north side of Covell Drain, north side of the city of Davis, on 6/30/90 (1 pair abandoned their nest site, probably due to dog/human disturbances); one owl at a burrow site near Hwy. 128, 3.7 miles east-northeast of Winters, on 3/17/92; 2 birds near Road 31 and Hwy. 113, Davis, on 4/25/95; and 2 owls at a burrow near Drew Ave. and Cowell Blvd. in Davis, on 3/12/2000 (though owls were not observed at this site during May-June 2000) (CNDDDB 2001).

³⁰ Recent CNDDDB observations near the Yolo Bypass include: the vicinity of the Vaughn Ranch, in 1987 and 1989; 2 adults and 3 juveniles near the intersection of Midway Road and Levee Road, approximately 12.5 mi south of Davis, on 1/30/82 and 2/12/82 (on subsequent trips to this site in 1986, 1987, and 1989, no birds were found, and it appeared that the burrows had been disturbed); two family groupings (2 adults, 8 juveniles, and 1 unknown-age) on the east side of Road 104, between Thomsen Road and Midway Road, 12 mi east of Dixon, on 6/30/90, and 3 birds of unknown age on 7/23/96; 2 adults and 4 juveniles, near Road 152, east of Vaughn Ranch, 14 miles east of Dixon, on 6/30/90; 22 owls (at least 10 of which were young, in 4 family groupings) near Road 106, north of Glide Tule Ranch, 9 miles south of Davis, on 6/30/90; 2 adults and 4 juveniles near Road 155, 13 miles southeast of Dixon, on 6/30/90; at least 4 clusters of family groupings near Road 105 and Road 36, 6.5 miles south of Davis, in 1989 (several burrows and owls were seen at this site in 1993); and multiple sightings near Road 155 and West Levee Road, approximately 13 miles southeast of Dixon (1 adult was seen in 1989; 3 adults near a burrow, 5 young, and 2 owls of unknown-age at a burrow in 1990; 2 adults in 1993; and 2 adults on 7/19/96) (CNDDDB 2001).

³¹ Eggs were taken one mile north of Freeport on 4/29/1899, from Haggin’s Ranch, five miles north of Sacramento on 5/8/01, and from the vicinity of Sacramento on 4/27/07 (CAS 2002a). Single birds were collected from Sacramento on 6/20/1867 (NMNH 2001), and on 5/17/12 (MVZ 2001).

³² CNDDDB observations in downtown Sacramento in 1974 include: several colonies with successful nesting in the vicinity of McKinley Park, southwest of the California State Exposition; several colonies with successful nesting immediately southwest of the junction of Howe Ave. and Fair Oaks Blvd. (this site is now completely developed, with no remaining habitat for burrowing owls); and several nesting colonies at Sacramento State College and adjacent levee areas along the American River (CNDDDB 2001).

³³ Recent CNDDDB observations near Rio Linda include: an extensive burrow network with at least 2 to 3 family groups near Elkhorn Blvd, 2 miles west of Rio Linda, where owls have been observed since at least 1987 (in 1993, 2 adults were observed in mid-March, and by mid-July, 14

Depot, southeast of Sacramento Metro Airport, Consumnes River College, and the Sacramento Regional Wastewater Treatment Plant (CNDDDB 2001; SRCSD 2002).³⁴

Solano County

Historical records confirmed breeding near Dixon in 1932 and near Fairfield in 1936; and indicated probable breeding near Vacaville in 1894, and on eastern Grizzly Island in 1927 (Stoner 1933b; MVZ 2001; NMNH 2001; WFVZ 2001).³⁵ A. Anderson noted "lots of owls near Fairfield" in 1936 (WFVZ 2001).

There have been numerous observations in recent years indicating an abundance of breeding owls between the Yolo Bypass and Dixon (CNDDDB 2001).³⁶ There have been numerous colonies observed recently in the vicinity of Vacaville (north of Vacaville and west of Hwy. 505, near the Vaca Dixon Airport, and near Travis Air Force Base) (CNDDDB 2001).³⁷ Breeding owls have also been documented recently in the vicinity of

individuals were observed); one adult owl roosting just west-northwest of 6th and "U" Streets in 1992, and two adults at a burrow here in 1993; and 2 adults and 2 juveniles approximately 4 miles west of Rio Linda, on 6/22/2001 (CBDDDB 2001).

Recent CNDDDB observations at Mather Air Force Base include: 1 adult at a burrow at Bldg 7001, on 4/28/89; 2 adults near Bldg. 7014, on 4/28/89 (a family of burrowing owls had been observed here in the past); at the BX parking lot on 4/28/89; 2 pairs of owls with 3 young at burrows east-northeast of Mather AFB, Rancho Cordova, on 6/14/89; and 1 adult with four young adjacent to the West Gate on 7/15/89 (CNDDDB 2001).

Other recent CNDDDB observations in southern Sacramento include: at least 6 nesting burrows with at least 14 individual owls at the Sacramento Army Depot, in 1990 (this site is threatened by potential closure of the Army Depot and conversion to development); a minimum of 8 adult owls at burrow sites and other burrows that also appeared active approximately 4 miles southeast of Sacramento Metro Airport, on 1/18/91 (the surrounding habitat is scheduled for a housing development); 4 burrows showing signs of recent occupation at the Kiefer landfill site, in April 1994 (area proposed for landfill expansion); 12 occupied burrows, with a total of at least 18 adults (6-12 pairs estimated), at the Cosumnes River College playing field, in 1994; a burrow near the Sacramento Regional Wastewater Treatment Plant, occupied on 2/19/92 and between 1998-2001; and at least 3 owls on 5/16/95 and 1 adult and 2 juveniles on 9/20/2001 near Elder Creek, just west of Franklin Blvd. (threatened by levee "improvements" - owls will be displaced by one-way burrow doors - and development of foraging habitat) (CNDDDB 2001). An owl near a burrow was seen at the Metro Air Park development site, east of the airport, on 3/23/2000 (USFWS 2001).

³⁴ According to the Sacramento Regional County Sanitation District, the burrowing owl population on 2,500 acres of buffer lands around the Sacramento Regional Wastewater Treatment Plant has increased from 12 resident owls in 1991 to more than 20 in 1997, with as many as 38 birds observed in one survey (SRCSD 2002).

³⁵ Stoner (1933b) found two burrowing owls occupying holes in hay piles near Dixon in 1932. There are collection records from Elmira, near Vacaville on 3/4/1894 (NMNH 2001), and from eastern Grizzly Island on 4/24/27 (MVZ 2001). Grinnell and Wythe (1927) observed birds near Rio Vista. Eggs were collected from near Fairfield in April 1936 (WFVZ 2001).

³⁶ Recent CNDDDB observations between the Yolo Bypass and Dixon include: 2 owls (one adult and one of unknown age) near Etzel Road and the old Sacramento Northern RR tracks, approximately 6 miles north of Liberty Farms, on 7/2/89; 4 adults near Hackman Road and Buckley Road, on 7/2/89; 1 adult along Thomsen Road on 7/2/89; two adults near Buckley Road and Midway Road, on 7/2/89; a large colony near Yolano Road, King Road, and Liberty Island Road in 1987 (3 adults and road-killed fledgling seen in 1989, 2 adults in 1990); 1 owl near Miller Road and Robben Road, on 7/1/89; 1 owl near Midway Road and Robben Road on 7/1/89; 1 owl along Robben Road, north of Midway Road, on 7/1/89; 2 adult owls near an occupied burrow near Swan Road and Winship Road, on 6/30/90; 1 owl and several burrows showing owl sign near West Levee Road and Delhi Road, on 6/30/90; 2 family groups (approximately 10 individuals) near the Northern Pacific RR tracks, just north of Etzel Road, on 6/30/90; 1 owl near Robben Road and Midway Road, in 1989 and in 1990; two family groups (each with two adults and at least two young) near Maxwell Lane and Road 104, in 1990 (3 adult owls seen at a burrow here on 4/4/92); 1 owl near Buckley Road and Road 38A, on 6/20/90; Sikes Road, between Trefoil Road and Delhi Road (1 owl seen on 6/30/90, 1 owl seen on 11/29/99, but no owls present after 2/1/2000); 12 owls near Pedrick Road and Binghamton Road on 9/7/89 (3 owls seen at this burrow site in January 1992); 2 adults at a burrow site 4 miles southeast of Dixon on 7/23/96; 2 adults and 2 juveniles 4 miles south-southeast of Dixon, on 7/23/96; 1 adult and 2 juveniles 1 mile northeast of Dixon, on 7/19/96 (owls had inhabited this site year-round for at least the past two years); 2 adults and 2 unknown-age owls 2.5 miles north-northeast of Dixon, on 7/23/96; 2 pairs of adults, one with 4 juveniles 2 miles southeast of Libfarm, on 7/19/96; 5 adults and 8 juveniles 2 miles southeast of Libfarm on 7/23/96; 2 adults near Liberty Island Road and King Road, on 7/19/96; 4 owls of unknown-age near Bulkley Road and Hackman Road, on 7/19/96; 3 adults and 2 juveniles near County Road 104 and Hackman Road, on 7/23/96; 1 owl using two different pipes near Sikes Road and Swan Road, north-northeast of Dozier, on 11/29/99; 1 owl using burrows along Bunker Road, east-northeast of Maine Prairie School, between January-May 2000; 3 owls (2 adults/1 juvenile) using 2 burrows near Swan Road and Sikes Road, on 1/3/2000 and 1/24/2000; single owls at burrows near the Swan Road/Binghamton Road curve, on 1/19/ 2000 and 4/28/2000; and a breeding pair near Hwy. 113 and Midway Road, 2 miles south of Dixon, on 3/7/2000 (CNDDDB 2001).

³⁷ Recent CNDDDB observations north of Vacaville and west of Hwy. 505 include: 2 adult owls and a burrow with owl sign west of I-505, 2 miles north of Sweany Creek, east of the English Hills, on 5/18/92 (a single owl was seen here on 3/18/92); 4 owls near Winters Road, about 5.5 miles south of Winters, on 7/12/94; 1 owl near Allendale Road, west of I-505, about 6 miles south of Winters, on 7/12/94; 2 adults and 4 juveniles near Vaca Valley Parkway and Ackerly Drive, on 6/22/98; and 2 pairs, one with 2 young, near I-505 and Gibson Canyon Creek (north fork), 2 miles west of Vaca Valley Raceway, on 6/18/2000 (this site has been active since at least 1997, with 1-2 pairs present) (CNDDDB 2001).

Recent CNDDDB observations near the Vaca Dixon Airport include: an unknown number of owls found in burrows at the old Vaca Valley Raceway, on 3/12/89 and 1 adult near Weber Road and Lewis Road, on 7/1/89 (CNDDDB 2001). Recent CNDDDB observations near Travis Air Force Base include: 2 adults and a burrow near Hay Road and Dally Road, east-southeast of Elmira, on 9/4/89 (3 owls and a burrow were observed at this site on 3/8/84); at least five burrows, with 8 adults (at least 3 pairs) near Meridian Road, 1 mile east of Travis Field, on 4/9/89; 1 owl at Aero Club Airport, near Peabody Road and Air Base Parkway, Travis AFB, on 3/12/89; yearly reports of owls breeding and residing year-round in the vicinity

Fairfield, and observations along Suisun Bay and the Delta confirmed breeding at Montezuma Slough, and indicated probable breeding in the Montezuma Hills and the vicinity of Rio Vista (USACE 1998; CNDDDB 2001).³⁸

Eastern Contra Costa County

Historical records confirmed breeding at Brentwood in 1915; and indicated probable breeding at Antioch in 1879 (MVZ 2001; NMNH 2001).³⁹ Owls were frequently observed in the vicinity of Byron in the 1980s (Richmond 1985; CNDDDB 2001). There are remaining owl populations in Concord, Pittsburgh, Antioch, Brentwood, Oakley, Byron, the Los Vaqueros watershed, and Vasco Caves Regional Preserve (L. Trulio, pers. comm., 2001; CDFG 2002a; M. Ricketts, pers. comm., 2002; J. DiDonato, pers. comm., 2003).⁴⁰ Recent CNDDDB records confirmed breeding at the Byron Airport in 1993 and 1994, and southeast of Antioch in 2001; and indicated probable breeding near Clifton Court Forebay in 1992, at Byron in 1999, and in the vicinity of Brentwood in 1999 (CNDDDB 2001).⁴¹

Eastern Alameda County

(Stallcup and Greenberg 1974) observed that burrowing owl numbers continued to decline in eastern Alameda County through the 1970s. There have been numerous observations confirming breeding in the vicinity of Altamont Pass and Bethany Reservoir from 1973-2001 (CNDDDB 2001).⁴² There is an owl colony at

of the officer's club at Travis AFB, since 1982; and in the vicinity of Travis elementary school, the post office, vet center, and base exchange, Travis AFB, on 3/12/89 (CNDDDB 2001).

³⁸ Recent CNDDDB observations in the vicinity of Fairfield include: a breeding colony of many burrows (with 9 adults and 4 juveniles) near Cordelia Road and Orehr Road, in 1982; 3 owls occupying burrows near Hillside Drive and Dover Ave., in 1983 (this population was extirpated by a housing development and no owls were observed at this site in 1989); 1 owl near Cement Hill and Clay Bank Road, on 3/12/89; and single owls near Potrero Hills Lane, near the junction of Scalley Road and Hwy. 12, on 10/15/91 and 2/25/92 (this burrow appeared to be inactive on 5/7/92) (CNDDDB 2001).

Burrowing owls breed along the interior levees and drainage canals at Montezuma Wetlands (USACE 1998). Recent CNDDDB observations near Montezuma and near Rio Vista include: 2 pairs (one with 5 young), and 1 pair, at 2 locations between Montezuma Slough and Collinsville Road, northwest of Collinsville, in March 2000; 1 adult at Montezuma Hills, on 12/8/99, as well as on several other occasions; 1 adult at a burrow near Montezuma Hills Road and Toland Lane intersection, Montezuma Hills, on 1/29/2000; 1 adult at a burrow site near Azevedo Road and Cartwright Road, northwest of Rio Vista, on 4/28/2000 (later, the same owl (presumably) was found dead on the road); 1 adult near Emigh Road and Azevedo Road, west of Rio Vista, on 1/21/2000; 1 adult near Emigh Road and Anderson Road, west of Rio Vista, seen numerous times between 12/2/99 through February 2000; 3 adult owls at 3 adjacent burrows near Anderson Road and Montezuma Hills, southwest of Rio Vista, on 12/8/99; 1 adult at a fourth burrow near this site, on 1/3/2000 (this burrow was flooded on 1/24/2000); 1 adult near Robinson Road and Flannery Road, northwest of Rio Vista, seen on multiple visits between November 1999-April 2000; and 1 adult in a burrow near Montezuma Hills Road and Anderson Road, southwest of Rio Vista, on 1/13/2000 (CNDDDB 2001).

³⁹ Eggs were collected from Brentwood on 3/25/15 (MVZ 2001). A single bird was collected in Antioch on 5/20/1879 (NMNH 2001).

⁴⁰ Two pairs of burrowing owls were observed in southeast Antioch throughout the summer of 2002, although no fledglings were ever seen (M. Ricketts, pers. comm., 2002). One of these pairs was evicted in September 2002 from a development site using standard "passive relocation" methods. A separate pair was observed on three occasions just outside the development area, but was not seen during August or September. Neither of the pairs or any other burrowing owls were seen during initial ground disturbance activities in early September and the current location and status of these owls is unknown.

There is a non-breeding season record of a bird collected from Sellers Ave. (by a canal) in Brentwood on 9/11/98 (MVZ 2001). Two other owl pairs were seen occupying burrows within 50 meters of each other on a development site in Brentwood (junction of Highway 4 and Brentwood Blvd.) in 2002 (M. Ricketts, pers. comm., 2002). One of these pairs was confirmed breeding and two young were at the burrow in early June. The other pair was only seen once and apparently did not remain at the site to breed. The breeding pair was not located in an area scheduled for grading in 2002, and the young fledged successfully (current whereabouts are unknown). This area is proposed for future development.

There is a population of 4 or 5 pairs of owls at Vasco Caves Regional Preserve east of Los Vaqueros watershed, with successful breeding recorded over the past few years; and a larger population on adjacent windfarm lands (J. DiDonato, pers. comm., 2003).

⁴¹ Recent CNDDDB observations include: 2 owls and 4 burrows with owl sign, west and southwest of Clifton Court Forebay, on 6/12/92 (threatened by proposed pipeline); a colony of 6 breeding pairs (12 adults and 9 juveniles) near the Byron Airport, in 1994 (owls were passively relocated in 1993 from airport expansion construction areas); 2 adults at Byron on 4/2/99; 1 adult at a burrow 1.5 miles west of Brentwood, on 12/16/96 (threatened by a proposed housing project); 3 adults at 2 burrow sites 3 miles west of Brentwood, on 11/9/99 (threatened by development); and 4 adults and 3 juveniles at two burrow sites at Rolling Hills Ranch, 3 miles southeast of Antioch, on 6/30/2001 (threatened by fire control disking and residential development) (CNDDDB 2001).

⁴² CNDDDB observations in the vicinity of Altamont Pass include: several sightings of owls and/or burrows along Greenville Road near Tesla Road, between 1972 and 1979; several owls near Midway, in 1982; 2 owls and evidence of breeding near North Midway Road, reported in 1983; a burrow with 2 adults along Mendota Canal, 1 mile north of Mountain House, on 9/16/89 (this burrow remained occupied throughout the fall); 2 birds observed leaving a burrow north of Grant Line Road and south of Mountain House Creek, on 3 consecutive nights in May 1992; 2 nests between Patterson Pass and Midway, in 1999 (EBBC 1999); a colony along Altamont Pass Road, 1.5 miles southwest of Mountain House (a single bird was observed during the breeding season, on 4/30/73; owls were passively relocated from an 80-acre area for a proposed golf course in January 2001; 4

Lawrence Livermore Laboratory (L. Trulio, pers. comm., 2001), and a small number of burrowing owls have been observed breeding on the Lawrence Livermore Laboratory Site 300, on the north side of Corral Hollow Road (LLNL 1998; Jones & Stokes 2000).⁴³ No burrowing owls have been observed during field studies at the Carnegie State Vehicle Recreation Area conducted by Jones & Stokes and the California Department of Fish and Game (Jones & Stokes 2000).

San Joaquin County

Historical records confirmed breeding at Waterloo and near Stockton in 1882, near Lathrop in 1896; and indicated probable breeding in the San Joaquin Valley in 1905, at Tracy in 1911, and at Holt in 1930 (Ray 1906; MVZ 2001; WFVZ 2002; CAS 2002a).⁴⁴ In the Stockton area, known populations consisting of at least 17 pairs had dwindled to no more than three pairs from 1968-1978 (Remsen 1978). Burrowing owl colonies were reported in the 1980s at the Stockton Oxidation Ponds near Thornton, near the California Youth Authority facility southeast of Stockton, along Duck Creek northeast of Farmington, and just south-southeast of Mountain House (Richmond 1985; CNDDDB 2001).

A large breeding population remains in the vicinity of Tracy; 41 adults were seen at a colony in southwest Tracy in August 1998 (CNDDDB 2001).⁴⁵ Relatively large breeding colonies are found throughout southern Stockton, at the San Joaquin County Fairgrounds (15+ pairs in 1993), Moss Tract (7 adults in 1998), Walker Slough-French Camp Slough (6 adults and 6 juveniles in 1998), Stockton Metro Airport (4 adults and 6 juveniles in 1999), Stockton Railroad Yard, and Sharpe Depot (4 pairs in 1993, 8 pairs in 1997, 4 pairs in 1998, 7 pairs in 1999, and 13 pairs with 55 young in 2001) (CNDDDB 2001).⁴⁶ There have also been recent

adults were observed on 1/16/2001; 7 pairs and 8 juveniles were observed during monitoring from February-June 2001; all birds observed were outside of the proposed golf course area); 2 birds observed leaving burrow near Midway Road and I-580, on 2 consecutive nights in May 1992 (2 owls were seen here on 6/27/82); 8-10 active burrow sites near Kelso Road and Bruns Ave., north of Bethany Reservoir, between 1992 and 1994; 11 burrows (1 with owl sign) along a pipeline near Grantline Road and Mountain House Creek, on 9/30/92 (burrows were monitored, then excavated in spring 1993 - 1 burrow with an owl nearby seen here on 4/16/93); and 5 dens with owl sign and 1 owl at Altamont Speedway parking lot, on 10/10/97 (CNDDDB 2001).

⁴³ Twenty-one burrowing owl dens (it is not clear how many were occupied) have been recorded at Site 300 (LLNL 1998).

⁴⁴ Eggs were collected from Waterloo and near Stockton on 5/12/1882 (CAS 2002a), and near Lathrop on 5/8/1896 (WFVZ 2001). Birds were collected from the San Joaquin Valley in summer 1905 (Ray 1906), from Tracy on 3/8 and 3/14, 1911, and from Holt on 4/22/30 (MVZ 2001). There is a non-breeding season collection record from Victoria Island on 1/11/39 (MVZ 2001).

⁴⁵ Recent CNDDDB observations in the vicinity of Tracy include: an active burrow with at least 2 resident owls near Jefferson Blvd. and Valpico Road, 2 miles south of Tracy, on 8/11/91; a burrow with 1 adult south of the intersection of Patterson Pass Road and I-580, 5 miles southwest of Tracy, on 7/3/92; 2 owls at a burrow site with owl sign between Delta-Mendota Canal and Schulte Road, 4 miles southwest of Tracy, on 9/28/92 (burrow was monitored, then excavated with CDFG approval - this site is extirpated); a burrow with owl sign (no owls) near Patterson Pass Road and I-205, southwest of Tracy, on 9/29/92; 1 owl at a burrow with owl sign near Patterson Pass Road and Hansen Road, southwest of Tracy, on 9/29/92; a pair of owls at a colony site near Patterson Pass Road and Hansen Road, southwest of Tracy, on 2/11/93 (this was one of several burrows monitored, then excavated with CDFG approval); 1 owl at a complex of 3 burrows with owl sign near Hansen Road and the Delta Mendota Canal, southwest of Tracy, on 4/6/93 (burrows were monitored, then excavated with CDFG approval during spring 1993); a large colony near Schulte Road and the SPRR tracks, Tracy (1 pair with 4 young and another pair with 5 young seen on 7/24/97, 18 adults seen on 5/4/98, 41 adults seen on 8/27/98); 1 adult at a burrow near Byron Road and West 11th Street, west of Tracy, on 8/3/98; 1 juvenile at a burrow near Kelso Road and Byron Bethany Road, southeast of Clifton Court Forebay, on 9/2/89; and 1 bird at a burrow near Tracy Blvd. and I-205, north of Tracy, on 5/30/94 (CNDDDB 2001).

⁴⁶ Recent CNDDDB observations in southern Stockton include: 8 adults (4 pairs) at Stockton Airport and Sharpe Army Depot Complex, south of Stockton, on 6/19/93; 30+ adults (15+ pairs) and an unknown number of juveniles at the San Joaquin County Fairgrounds, Stockton, on 6/19/93; 2 adults at 2 adjacent burrows near Arch Road and Hwy. 99, northeast of Stockton Metropolitan Airport, on 6/12/95; 2 adults and 5 juveniles near Arch Road and Hwy. 99, northeast of Stockton Metropolitan Airport, on 7/2/95; 2 adults and 2 juveniles near Yosemite Ave. and McKinley Ave., southeast of Lathrop, on 7/24/97 (1 adult also observed on 1/21/00); a pair of owls, possibly with eggs, 0.75 miles east of Lathrop, on 3/14/97; 7 adults at a burrow site near Fresno Ave. and West 8th Street, in the Moss Tract area of Stockton, on 2/27/98; 2 adults at a burrow site along Duck Creek, near Airport Way, Stockton, on 3/20/98; 6 adults and 6 juveniles near Walker Slough/French Camp Slough confluence, south of Stockton, on 9/3/98; 1 adult at a burrow near Hammer Lane and Hwy. 99, east of Stockton, on 5/4/99; a small breeding colony 1 mile north of Stockton Metropolitan Airport (2 adults and 2 nearly-mature juveniles seen on 6/24/99, 4 adults and 6 juveniles seen on 7/6/99); 2 adults at a burrow near Fresno Ave. and West 8th Street, South Stockton, on 4/2/99 (the site was to be developed after the 1999 nesting season was over); 2 adults at a burrow near French Camp Road and I-5, south of Stockton, on 5/11/99; 2 adults at a burrow near Carolyn Weston Blvd., west of Manthey Road, south of Stockton, on 5/11/99; 2 adults at a burrow near French Camp Road and Manthey Road, south of Stockton, on 5/11/99; 1 adult at a burrow near junction of Walker Slough and Duck Creek, south of Stockton, on 8/26/99 (+ one dead owl observed that appeared to have been killed by a feral cat); 2 adults and 3 juveniles west of McLeod Lake, northeast of I-5, central Stockton, on 7/8/99; 2 adults at a burrow near French Camp Road and Wolfe Road, near San Joaquin River, Stockton, on 5/11/99; a large breeding colony at Sharpe Depot, Lathrop (8 breeding pairs estimated in 1997; 4 breeding pairs and young observed in 1998; 7 breeding pairs, 3 in natural burrows/4 in artificial burrows and young, observed in 1999; 13 pairs, 11 breeding, produced 55 young, 5/24-6/29, 2001); a large colony at the Stockton railroad yard, near Charter Way and Airport Way, 2 miles south of

observations indicating probable breeding in southwestern San Joaquin County south of I580 (CNDDDB 2001).⁴⁷

Stanislaus County

Historical records confirmed breeding in 1928 in the Del Puerto Canyon area, on the San Joaquin side of the Mount Hamilton Range, and indicated probable breeding there in 1957 (Fowler 1931; MVZ 2001).⁴⁸ Beedy and Granholm (1985) reported that burrowing owls could be found in the foothills west of Yosemite National Park, for example northeast of Waterford in Stanislaus County. Recent records indicated probable breeding east of Oakdale, along Highway 120, in 1990 (SBMNH 2001).

Merced County

Historical records confirmed breeding near Dos Palos in 1923, at Los Banos in 1898, 1932, and 1933; and indicated probable breeding at Los Banos in 1903, at Snelling in 1925, and at Merced in 1908 and 1941 (Dawson 1923; AMNH 2001; MVZ 2001; UCLA 2001; WFVZ 2001).⁴⁹ Egg collector D. De Groot noted “many burrowing owls” in the vicinity of a nest he raided at Los Banos in 1932 (WFVZ 2001). There was a large resident burrowing owl population at the San Luis National Wildlife Refuge, near Los Banos, in the 1970s and 1980s (Stebbins and Taylor 1973; Richmond 1985) - the 1978 population was estimated at 25 pairs (Remsen 1978). Although no systematic surveys have been done, there is apparently still a “healthy” owl population at this Refuge, with recent observations of up to 26 owls in one hour (D. Warren, pers. comm., 2002).

Recent observations confirmed breeding colonies in the vicinity of Los Banos Reservoir (many of these sites are threatened by the proposed Los Banos Grandes Reservoir), and indicated probable breeding along the Hwy. I-5 corridor around San Luis Reservoir, the vicinity of Merced (many of these sites are threatened by the proposed 2000-acre UC Merced campus), and in northeastern Merced County near Kelsey Reservoir (CNDDDB 2001).⁵⁰

Stockton (over 90 burrows were counted in a 1.9 mile stretch of the railroad yard in 1999; 14 owls counted on 10/2 and 10/11, 1999; 18 owls counted on 11/10 and 11/11, 1999; and 1 owl banded on 11/11/99); 2 adults and 3 juveniles at a burrow near Mariposa Road and Hwy. 99, Stockton, on 7/19/00; 4 owls in the vicinity of many burrows near the confluence of Duck Creek and Walker Slough, south end of Stockton, on 10/16/00; and 3 juveniles at a burrow south of Stockton, on 7/9/99 (CNDDDB 2001).

⁴⁷ Recent CNDDDB observations in southwestern San Joaquin County include: 2 resident owls at a burrow and another active burrow site along Smiths Ridge, northeast of Lone Tree Mineral Spring on 10/20/91; 1 owl at a burrow along Hospital Creek, southwest of I-580 junction with I-5, on 9/14/92; and a pair of owls and sign at a burrow just northeast of Lone Tree Mineral Spring on 5/24/01 (no owls observed during a subsequent visit on 6/5/01) (CNDDDB 2001).

⁴⁸ Fowler (1931) reported burrowing owl families living in the canyons on the San Joaquin side of the Mount Hamilton Range (likely the Del Puerto Canyon area) in the summer of 1928. Fowler found the remains of 8 burrowing owls (adults and juveniles) in prairie falcon nests in the area. A bird was collected from the mouth of del Puerto Canyon, four miles west of Patterson, on 4/19/57 (MVZ 2001). There is a recent non-breeding season record from Del Puerto Canyon on 10/17/91 (CNDDDB 2001).

⁴⁹ Eggs were collected from unspecified locations in Merced County in 1896 and 1916; and from Los Banos on 6/8/1898, 5/29/32, and 5/30/33 (WFVZ 2001). Dawson (1923) found several owl burrows near Dos Palos. Breeding season collections include 2 birds from Los Banos on 6/22/03 (AMNH 2001), at Snelling on 4/8/25 (MVZ 2001), from Merced on 6/18/08 (UCLA 2001) and on 7/26/41 (MVZ 2001). There is also a non-breeding season collection record from Snelling on 1/9/15 (MVZ 2001).

⁵⁰ CNDDDB observations near the Los Banos Reservoir include: 1 adult approximately 3 miles west of Los Banos Reservoir, on 8/9/94; 2 adults at a burrow site 1 mile north of Los Banos Valley, on 7/6/98; 1 adult along Salt Creek, 3 miles south of Los Banos Reservoir, on 7/13/98; 9 adults at a burrow site at the north end of Los Banos Valley, on 8/18/98; and 2 adults and 4 juveniles, 5 miles north-northwest of Little Panoche Reservoir, on 7/26/2000 (CNDDDB 2001). CNDDDB observations along the I-5 corridor include: 5 burrows with owl sign along 1 mile of the California Aqueduct, southeast of Dos Amigos pumping plant, on 2/24/93; one adult at a burrow near the intersection of I-5 and Hwy. 152, on 9/3/92 and 2/13/93; one burrow with owl sign at Santa Nella Village, on 3/23/93; and 3 burrows with owl sign southwest of Gustine, on 3/23/93 (CNDDDB 2001).

Recent observations in the vicinity of Merced include: 1 adult and a nearby active burrow 3 miles northeast of Planada, in May 1999; 6 observations of occupied burrows or burrowing owls along Le Grand Canal in 1999; 3 owls and 8 burrows with owl sign south of Yosemite Lake, north-northeast of Merced, on 2/1/2000; and several dozen burrowing owls north of the proposed UC Merced campus site (CNDDDB 2001; URS 2002).

There was a breeding season observation of an owl near a burrow at Kelsey Ranch, just west of Kelsey Reservoir, on 5/1/99 (CNDDDB 2001).

El Dorado County

The species has been recorded historically from near Latrobe (Barlow 1901). Recent breeding season observations in El Dorado County could not be located.

Amador County

Historical records indicated probable breeding in Amador County in 1896 (CAS 2002a).⁵¹ Recent breeding season observations in Amador County could not be located.

Calaveras County

Historical breeding season observations in Calaveras County could not be located. There have been recent observations of burrowing owls along the lower Mokelumne River in Calaveras/San Joaquin Counties (EBMUD 2001), but it is unknown whether these were during breeding season.

Tuolumne County

Historical breeding season observations in Tuolumne County could not be located, other than a report by Beedy and Granholm (1985) that burrowing owls could be found in the foothills along Hwy. 120, west of Chinese Camp. Recent breeding season observations in Tuolumne County could not be located.

Mariposa County

Historical records indicated probable breeding east of Merced in 1941 (MVZ 2001).⁵² Recent breeding season observations in Mariposa County could not be located.

3. SOUTHERN CENTRAL VALLEY

The range of the burrowing owl in the southern Central Valley encompasses the western 70% of Madera County; the southeastern 25% of San Benito County; the western 80% of Fresno County; all of Kings County; the western 50% of Tulare County; and the northwestern 55% of Kern County (DeSante et al. 1996).

Although there are historical records of confirmed breeding in almost every county in the southern Central Valley, there are little data on overall historical abundance of the burrowing owl in this area. However, the species was documented to have been locally abundant at a number of locations such as at Fresno in the early 1900s (Miller 1903; Tyler 1913a), in the Kettleman Hills in the 1940s (Wilson 1945), and at Tulare Lake in the early 1900s (Goldman 1908).

DeSante and Ruhlen (1995) estimated that 1,396 pairs of owls remained in the southern Central Valley in the mid 1990s, about 15.1% of the state breeding population. In contrast to most regions, a substantial number of these pairs (396 pairs) were estimated to live in uplands, although owls are primarily concentrated in low-lying agricultural areas surrounding the mostly dry lake basins, such as the Tulare Lake Basin in Tulare and Kern Counties. Some numbers still exist in remaining grasslands, which are in uplands. Only 14% of the remaining breeding sites were found within 15 meters of irrigation canals (DeSante et al. 1996).

Madera County

Historical records confirmed breeding near Madera in 1917 and 1920, and at Chowchilla in 1900; and indicated probable breeding at Madera in 1939 (CAS 2002a).⁵³ There is one recent breeding season observation northwest of Friant in 2000 (CNDDDB 2001).⁵⁴

⁵¹ A bird was collected from an unspecified location in Amador County on 5/13/1896 (CAS 2002a). There is also a non-breeding season collection record from Amador County in January 1896 (McGregor 1898).

⁵² A bird was collected 20 miles east of Merced on 7/26/41 (MVZ 2001).

San Benito County

Historical records indicated probable breeding at Paicines in 1894 and 1897 (CAS 2002a).⁵⁵ There were several owl observations indicating probable breeding northwest of Hollister in the early 1990s (CNDDDB 2001).⁵⁶ In 2001, Sam Fitton reported burrowing owls to be resident in small numbers in Panoche Valley (D. Cooper, pers. comm., 2002).

Fresno County

Historical records confirmed breeding near Wheatville in 1907, around Fresno in 1912 and 1913, near Monmouth in 1917, near Selma in 1917, near Cantua Creek in 1917, near Firebaugh in 1919, and at Kettleman Hills in 1944; and indicated probable breeding at Fresno and Visalia in the 1920s and near Cantua Creek in 1940 (Tyler 1913b; Storer 1926; Wilson 1945; WFVZ 2001; CAS 2002a).⁵⁷

As early as 1903, Miller (1903) reported that the burrowing owl, “one of the most prevalent species formerly” in the Fresno area “is now becoming extinct wherever the country is thoroughly cultivated.” Tyler (1913a) remarked that although burrowing owls could be heard throughout most of the Fresno region around the turn of the century, “civilization, cultivation, and squirrel extermination have now crowded these little owls farther and farther out to the edges of the Fresno District, to the west side plains and a few other unsettled areas.” Tyler noted that a few owls could be found within cultivated areas, where they nested in waste fields and along roadsides, “but their numbers are limited and it seems only a matter of a few more years until we will be unable to number the Burrowing Owl among the birds of the Fresno District.” Wilson (1945), who listed the species as a “fairly common resident” of the Kettleman Hills, observed owls occasionally during the year in the hills or on the flats and confirmed breeding there in 1944.⁵⁸ By the 1970s, burrowing owl numbers were further decreasing in the Fresno area (Remsen 1978). The population at the federally protected Mendota Wildlife Area was estimated at 30 pairs in 1978 (Remsen 1978).⁵⁹

Currently, very few burrowing owls breed within the Mendota Wildlife Area, but recent observations indicated confirmed breeding along the San Luis Drain, northwest of the Mendota Wildlife Area, in 1987 and 1989; and probable breeding near Monocline Ridge in 1994 and near Huron in 2001; a population of at least 80 pairs nested in 2002 within cracked concrete along the San Luis Drain for a three-mile stretch adjacent to the western boundary of the Wildlife Area (CNDDDB 2001; R. Huddleston, CDFG, pers. comm., 2002).⁶⁰

Kings County

Historical records indicated probable breeding at Hanford in 1882 (CAS 2002a).⁶¹ Goldman (1908) found the burrowing owl “abundant” in the region of Tulare Lake in the summer of 1907. There is currently a

⁵³ Egg sets were collected from 5 miles south of Madera on 5/13/17 and 5/8/20 (2 sets), and from Terry School (northeast of Lemoore NAS on 5/2/17 (CAS 2002a). Juvenile birds were collected from Chowchilla on 6/27, and 6/29, 1900; adult birds were collected from Chowchilla on 6/26/1900 and from Madera on 3/6/39 (CAS 2002a).

⁵⁴ One adult was observed at a burrow site near Hwy. 41, 8 miles northwest of Friant, on 4/4/2000 (CNDDDB 2001).

⁵⁵ Birds were collected from Paicines on 4/1/1894, 1/29/1896, and 2/21/1897 (3 birds) (CAS 2002a).

⁵⁶ Recent CNDDDB observations include: 1 adult at a burrow site 2 miles west-northwest of Hollister Airport, on 2/12/91 and 2/17/91; an active burrow site along Hwy. 25, south-southeast of the Pajaro River, in September 1992; and 1 adult bird observed at a burrow 1.2 miles south of the Hwy. 25 crossing over the Pajaro River, south-southeast of Gilroy, on 3/1/94 and 3/10/94 (CNDDDB 2001).

⁵⁷ Eggs were collected 10 miles north of Wheatville on 4/30/07; near Monmouth on 5/30/17; 3 miles west of Selma on 4/21/17; and near Firebaugh on 4/5/19 (WFVZ 2001). Tyler (1913b) found eggs and feathered young when he opened up four nesting burrows in Fresno County in April 1912. A single bird was collected from 20 miles south of Mendota (near Cantua Creek) on 3/23/40 (CAS 2002a).

⁵⁸ Wilson (1945) saw 4 half-grown owls standing by a burrow near Huron in June 1944.

⁵⁹ A large concentration of 19 burrowing owls was seen near Mendota on 6/14/74 (Stallcup and Greenberg 1974).

⁶⁰ Recent CNDDDB observations include: along the east bank of the San Luis Drain, northwest of the Mendota Wildlife Area, in 1989 (the number of juveniles, adults, and burrows was lower than the number observed in 1987, due to ORV's, indirect poisoning from poison bait stations, and possibly plinking); one adult at a nest site on the eastern edge of Monocline Ridge, in June 1994; and active burrow sites northeast and north-northwest of Huron, from 5/8-5/10, 2001 (CNDDDB 2001).

⁶¹ There is a collection record from Hanford on 5/20/1882 (CAS 2002a).

significant population at Lemoore Naval Air Station (“NAS”), where owls nest in established wildlife areas, runway buffer strips, and adjacent to runways. The number of active burrowing owl nests at Lemoore NAS from 1997 to 2000 has fluctuated from 54 to 85 (Rosenberg and DeSante 1997; Rosenberg et al. 1998a, 1998b; Gervais and Anthony in press). Recent CNDDDB observations indicated probable breeding at several locations in the Kettleman Hills in 1996 and 2001, in northeastern Kings County near Visalia in 1999, and in the Tulare Lakebed area in 2001 (CNDDDB 2001).⁶² At least 5-10 owl pairs were observed from 2001-2002 in the general vicinity of Corcoran along Tulare Lake Drainage District canals and evaporation basin ponds (N. Brown, pers. comm., 2002).

Tulare County

Historical records confirmed breeding on the valley floor at Tulare in 1894 and at Tipton in 1936; and indicated probable breeding at Visalia in 1880, at Earlimart in 1903, and at Tipton in 1911 (MVZ 2001; NMNH 2001; WFVZ 2001).⁶³ The burrowing owl had not been seen in Sequoia National Park since Fry observed them there in 1911 according to Dixon (1933). A former population of several pairs at Shepherd’s Cove, on the north side of the Kaweah River, was gone by 1937 (USNPS 1937; Sumner and Dixon 1953). Beedy and Granholm (1985) noted a collection record from Ash Mountain, in Sequoia National Park.

During the decade from 1968-1978, there was an estimated 70% reduction in suitable burrowing owl habitat in Tulare County (Remsen 1978). Beedy and Granholm (1985) reported declines in Tulare County, but noted that burrowing owls were still fairly common in scattered localities in the lower foothills in the 1980s.

There was confirmed breeding at Pixley in 1998 (Rosenberg et al. 1998a) and recent CNDDDB observations indicated probable breeding at two locations northwest of Visalia in 1990 and 1998, and west of Earlimart in 1990 (CNDDDB 2001).⁶⁴ A colony of owls at Colonel Allensworth State Historic Park (“CASHP”) consisted of 14 breeding pairs in 2002 (Van Mantgem 2002), down from 23 pairs in 1999 (N. Brown, pers. comm., 2002). There is ongoing reconstruction of historic buildings at this park in areas of occupied burrows and foraging habitat. Although there is a burrowing owl management and mitigation plan in place to minimize the impacts, apparently not all of the mitigations are being followed and burrows are being closed without providing new burrows (N. Brown, pers. comm., 2002). At least 1 owl pair nested just north of CASHP along Highway 43 in 2000 (N. Brown, pers. comm., 2002). There are currently several breeding pairs at a site in Alpaugh and 3 owls at the Hebert Preserve that appear to be resident birds (K. Kreitin, pers. comm., 2002). R. Hansen reports that the James K. Herbert Wetland Prairie Preserve, near Highway 137 and Road 168 (owned and managed by Los Tulares Land Trust) has at least 5 known burrowing owl nests, as well as at least 3 wintering owls (N. Brown, pers. comm., 2002).

Kern County

The burrowing owl is known to have occurred historically near Buena Vista Lake, although it was “not common” there in the summer of 1907 (Linton 1908b; DeMay 1942).⁶⁵ Sheldon (1909) reported the species to be “common” south of Poso Creek during the summer of 1908. Historical records confirmed breeding at Semi Tropic in 1917, at Tejon Ranch in 1941, at Grapevine in 1962, and in Antelope Valley in 1964; and indicated

⁶² Recent CNDDDB observations in the Kettleman Hills area include: 2 owls in the foothills on the east side of Kettleman Plain, in 1989; 3 locations along the California Aqueduct at the Kings/Kern County line, on 6/3/96 and 6/4/96; and along Blakeley Canal, southeast of Kettleman City, on 3/15 and 3/23, 2001. Active burrow sites were also observed near Cross Creek, 1 mile south of Settlers Ditch, northwest of Visalia (4 adults), on 3/1/99; 4 miles northeast of Kettleman City, on 3/15 and 3/23, 2001; and 3.5 miles east of Kettleman City (5 active burrow sites), on 3/15 and 3/23, 2001 (CNDDDB 2001).

⁶³ Eggs were collected from Tulare on 4/20/1894 (NMNH 2001) and from Tipton on 3/27/36, where 3 nesting pairs were also observed (WFVZ 2001). Breeding season collection records include from Visalia on 4/1/1880 (NMNH 2001), 3 birds from Earlimart on 6/18/03 (NMNH 2001), and 3 birds from Tipton on 4/27/11 (MVZ 2001).

⁶⁴ Recent CNDDDB observations include: 1 mile west of Road 112, approximately 9 miles north-northwest of Visalia, on 6/26/90; at Colonel Allensworth State Historic Park, on 5/17/90; south of Cross Creek, 4.5 miles southeast of Traver, on 4/10/98 (CNDDDB 2001).

⁶⁵ Burrowing owl bones (likely not more than 500 years old) were taken from a Native American kitchen midden on the southwest shores of Buena Vista Lake from 1933-1934 (DeMay 1942). According to Linton (1908b) the species was “not common” around the lake during May and June of 1907.

probable breeding at Walker Pass in 1891, and at Weldon in 1911 and 1984 (Wheeler et al. 1941; CSUC 2001; MSB 2001; MVZ 2001; NMNH 2001; UCSB 2001; WFVZ 2001).⁶⁶ The California State University at Bakersfield campus had a small plot (40 acres) with burrowing owls: 23 owls were captured in 17 trapping sessions in July 1987 (Barrentine and Ewing 1988). There have been numerous recent observations of owls during breeding season throughout Kern County; breeding has been documented at the Kern National Wildlife Refuge in 1987, in the vicinity of the Tule Elk State Reserve in 1989 and 1990, near the Antelope Plain in 1994, along the California Aqueduct in the vicinity of Buena Vista Lakebed in 1998 and 1999, and in the vicinity of Grapevine in 2001 (CNDDDB 2001).⁶⁷

D. SAN FRANCISCO BAY AREA

The range of the burrowing owl in the San Francisco Bay Area encompasses all of Sonoma, Napa, and Marin Counties; the southwestern 5% of Solano County; the western 50% of Contra Costa County; the western 80% of Alameda County; and all of San Francisco, San Mateo, Santa Clara, and Santa Cruz Counties (DeSante et al. 1996).

Although there are historical records of confirmed breeding in every county in the San Francisco Bay Area, there are little data on the overall historical abundance of the burrowing owl in this area. The burrowing owl in the San Francisco Bay Area was historically “most numerous in parts of Alameda, Contra Costa, and Santa Clara Counties” (Grinnell and Wythe 1927). The species was documented to have been locally abundant in southwestern Solano County (at Benicia) in the 1920s and 1930s (WFVZ 2001), in Alameda County (at Newark) in the early 1900s (WFVZ 2001) and at the Oakland Airport in the 1960s (Thomsen 1971), in San

⁶⁶ Eggs were collected at Semi Tropic Ranch on 4/26/17 (MSB 2001); at an unspecified location in Kern County on 4/18/35 (WFVZ 2001); at Grapevine on 4/30/62 (WFVZ 2001); and at Blackwells Corners (2 sets) on 4/5/64 (WFVZ 2001). Single birds were collected from Walker Pass on 7/2/1891 (NMNH 2001), and from Weldon on 7/2/11 (MVZ 2001) and in spring 1984 (UCSB 2001). Single birds were collected from El Tejon Ranch on 6/28/41 (Wheeler et al. 1941) and from an unknown location in Kern County on 3/16/52 (CSUC 2001). There are non-breeding season collection records from Kelso Valley, 2 miles north of Sorell Ranch, on 11/28/33; and from 2 miles north of McKittrick on 9/12/47 (MVZ 2001).

⁶⁷ Recent CNDDDB observations in northwestern Kern County include: a pair of owls and a single owl at a den along the California Aqueduct near Lost Hills Road, on 3/26/96 and 3/27/96; 1 adult at a burrow site along the California Aqueduct northwest of Lost Hills, on 6/4/96; 1 owl along the California Aqueduct, southwest of Barker Road in the Antelope Plain, on 6/3/96 (2 owls were also seen here in October 1995); 2 adult owls at another site along the California Aqueduct southwest of Barker Road in the Antelope Plain, on 6/3/96; 1 adult and 2 juvenile owls northeast of Kecks Corner, north of Antelope Valley, on 6/23/94 (3 owls were flushed from 3 separate burrows here on 11/17/93); 1 adult observed at a burrow 2.5 miles south-southeast of Lost Hills, on 12/21/95; a pair of owls at a den along the California Aqueduct 2 miles east of Lost Hills Road, south-southeast of Lost Hills, on 5/16/98; 1 owl at a burrow along the California Aqueduct south of Lost Hills Road, on 7/15/96 (a second owl was observed nearby on 5/16/96 and 7/15/96); 4 adults and 1 juvenile at the Kern National Wildlife Refuge, in 1987; an unknown number of owl colonies at 2 sites at Semitropic Ridge, between 6/13/82 and 6/19/82; and an unknown number of owl colonies 1 mile west of Delano, between 6/13/82-6/19/82 (CNDDDB 2001).

Recent CNDDDB observations in western Kern County include: 3 owls (1 flying from a burrow) northeast of Buena Vista Lake Bed, on 9/21/88; 3 owls at a burrow 2.5 miles north-northeast of Tupman, on 6/14/89 (2 adults and 2 juveniles were also seen at this site on 6/21/90); 1 owl near I-5 and Buttonwillow Road, 4 miles north of Buttonwillow, on 3/13/90; owls at 5 locations in the vicinity of Tule Elk State Reserve (3 adults and 4 juveniles were seen at a burrow here on 6/11/89 but by 6/14/89 the burrow had been run over; 2 adults and 6 juveniles were seen on/around the burrow on 6/23/90; 3 adults and 3 juveniles were seen at a 2nd burrow during June 1990; 3 adults and 3 juveniles were observed at a 3rd burrow during June 1990; 2 adults and 3 juveniles were seen at a 4th burrow during June 1990; 3 adults and 2 juveniles were observed at a 5th burrow during June 1990); 2 adults at a burrow along the California Aqueduct, near Tupman Road, on 10/3/94 (owls have used a cluster of burrows here for an extended period of time); 5 adults 3.2 air miles northwest of Tupman, on 6/5/96; 4 burrows and 4 owls northwest of Fellows, on 4/28/98; 1 adult and 1 juvenile along the California Aqueduct at Maricopa Flat, on 8/25/98; 2 adults at a burrow northwest of Fellows, on the western edge of Midway Valley, on 3/17/99; 2 owls at burrows 6 miles northeast of McKittrick on 3/24/99; 3 owls at a burrow west of Buttonwillow, on 4/15/99; 1 adult at a burrow near Crocker Canyon Road, 6.5 miles west of Fellows, on 4/21/99; 1 adult and 3 juveniles along the California Aqueduct southeast of Taft, on 4/27/99; 1 adult at a burrow along the California Aqueduct, on the west side of Buena Vista Lake Bed, on 2/8/2000; 2 adults at a burrow at Richfield oil pumping station, on the southwest side of Buena Vista Lake Bed, on 4/6/2000 (1 adult was observed here on 2/8/2000); and 1 adult at a burrow 3 miles east-southeast of the intersection of Skyline Road and Elk Hills Road, on 3/22/2000 (CNDDDB 2001).

Recent CNDDDB observations in the vicinity of Bakersfield include: 3 owls approximately 6 miles east of Edison, reported in 1987; 1 owl and a burrow near Brimhall Road and Calloway Drive, on the west edge of Bakersfield, reported in 1987; 1 owl near a burrow near Calloway Drive and Coffee Road, approximately 3 miles west of Bakersfield, reported in 1987; 2 burrow sites with at least 2 adults near Bear Mountain Blvd., east of Arvin, on 1/29/90 (CNDDDB 2001).

Other recent CNDDDB observations in Kern County include: 3 owls in the vicinity of Tejon Ranch, west of the Tehachapi Mts., on 1/29/90; 5 owls in the Rand Mountains, 6 miles southwest of Garlock, on 7/10/92; and 1 adult and 1 juvenile near I-5 and the California Aqueduct, southwest of Wheeler Ridge, on 7/9/2001 (CNDDDB 2001).

Mateo County (at Redwood City) in the 1800s (WFVZ 2001), in Santa Clara County (at Palo Alto) in the early 1900s (WFVZ 2001), and in Santa Cruz County in the 1800s and early 1900s (Skirm 1884; McGregor 1901).

DeSante and Ruhlen (1995) estimated that 165 pairs of owls remained in the southern San Francisco Bay Area in the mid 1990s, about 1.8% of the state breeding population. This likely represented a decline of about 53% from the period 1986-1990 (DeSante and Ruhlen 1995; DeSante et al. 1997). Over 65% of Bay Area owl colonies known in the 1980s were gone by the 1990s, and even when new groups located during the 1990s were included, there was still a 51% decline in colonies (DeSante and Ruhlen 1995). Except for a few pairs in the Livermore Valley and a population at Camp Parks in Dublin, virtually all the remaining owls are located in a crescent extending around the southern end of San Francisco Bay, from Palo Alto to Milpitas, north of Highway 101. Almost all the birds are located in parks or in developed urban settings. Breeding owls have now been extirpated from Napa, Marin, San Francisco, and Santa Cruz Counties, and have been nearly eliminated from Sonoma and San Mateo Counties. No breeding pairs have been observed recently on the Bay Area coast, despite the fact that small populations existed in the 1980s. Burrowing owl populations around the north end of San Francisco, San Pablo, and Suisun Bays have been reduced to remnants or extirpated.

Sonoma County

Historical records confirmed breeding at Cotati in 1900, at Santa Rosa in 1901, at Stony Point in 1913, and near Petaluma in 1939; and indicated probable breeding at Petaluma and at Freestone in 1870, at Cotati in 1898 and 1900, and at Napa and Santa Rosa in the 1920s (Storer 1926; Grinnell and Wythe 1927; FMNH 2001; MVZ 2001; PMNH 2001; WFVZ 2001; CAS 2002a).⁶⁸

By the 1970s, when a steady decline in numbers had been reported in Sonoma County for decades (Remsen 1978), the burrowing owl was still an uncommon permanent resident in the open areas of the county, becoming numerous and more widespread in winter (Bolander and Parmeter 1978). Breeding owls were nearly extirpated from Sonoma County by 1987 (Burrige 1995); an extensive census begun in 1991 (DeSante and Ruhlen 1995) confirmed that perhaps only one or two breeding pairs remained in the early 1990s. The last confirmed breeding in the county was at Skaggs Island in 1986 (Burrige 1995).⁶⁹

Napa County

There are several historical non-breeding season records from Napa County, but no records of burrowing owls in northern Napa County since 1963 (Fisher 1900; Grinnell and Wythe 1927; Remsen 1978; MVZ 2001).⁷⁰ Breeding burrowing owls have been extirpated from Napa County since the 1980s (DeSante and Ruhlen 1995).⁷¹

Marin County

Mailliard (1900) as well as Stephens and Pringle (1933) noted the burrowing owl to be a year-round resident in limited areas of Marin County. Historical records indicated probable breeding at Nicasio in 1879

⁶⁸ Eggs were collected from an unspecified location in Sonoma County on 5/15/1891; from Cotati on 5/12/1900 (2 eggs sets), from the Walker Tract, Santa Rosa, on 5/13/01; from Stony Point on 5/10/13; and from 4 miles southeast of Petaluma on 5/10/39 (WFVZ 2001). A male and female were collected from Petaluma on 8/27/1870; a single bird was collected from Freestone on 8/29/1870 (PMNH 2001). Two juvenile birds were collected from Cotati on 6/7 and 7/7, 1900, and adult birds were collected there on 1/23, 1/24, and 6/9 (2 birds), 1898 and 7/7/1900 (FMNH 2001; CAS 2002a). There are non-breeding season records from Santa Rosa on 10/8/01 and 12/24/02 (MVZ 2001; CAS 2002a).

⁶⁹ There were subsequent observations of single birds in Sonoma County, 1 near the old Santa Rosa Air Center in southwestern Santa Rosa (where burrowing owls had traditionally nested for many years), and another near Sears Point, close to Skaggs Island. The CNDDDB has a record of an owl flushed from its burrow at upper Tubbs Island, approximately 1.5 miles northeast of Sears Point on 10/22/88 (CNDDDB 2001). Surveys by the Madrone Audubon Society in 1997 at Skaggs Island and numerous other known historical nesting areas in Sonoma County found no breeding pairs (Leaves Newsletter, Volume 31, Number 1).

⁷⁰ Owls were recorded from vicinity of Mt. St. Helena (Fisher 1900; Grinnell and Wythe 1927). Single birds were collected from Sears Point Cut-Off Road on 10/19/37 and from Huichica Creek on 11/24/39 (MVZ 2001).

⁷¹ A single bird was collected from Napa on 10/19/85 (MVZ 2001).

(CAS 2002a).⁷² The owl was still a “relatively common resident” of open fields around Tomales Bay in 1971 (R. Johnson et al. 1971). Although there were several non-breeding season observations in the 1980s, the last evidence of breeding birds was at Terra Linda in 1976 and 1977, by which time the species was considered to be a very rare, very local breeder, with a very small overall breeding population (Shuford 1993; CNDDDB 2001).⁷³ Breeding owls have been completely extirpated from Marin County since the 1980s (DeSante and Ruhlen 1995).⁷⁴

Southwestern Solano County

Burrowing owls were apparently quite abundant at and near Benicia in the 1920s and 1930s; breeding owls were documented at Benicia before 1922, in 1927, 1930, 1932, 1933, and 1936 (Stoner 1922, 1932a, 1932b, 1933a; WFVZ 2001).⁷⁵ Burrowing owl nests were abundant enough that multiple sets of eggs were collected at Benicia; 7 sets on a single day in 1927, 4 sets over 3 days in 1930, 7 sets on a single day in 1932, and 5 sets on a single day in 1933 (WFVZ 2001). There were non-breeding season observations made northeast of Vallejo in the late 1970s and early 1980s (CNDDDB 2001), but recent breeding season observations in southwestern Solano County could not be located.⁷⁶

Western Contra Costa County

Historical records indicated probable breeding at Albany in 1922 and at Richmond in 1936 (MVZ 2001).⁷⁷ Recent breeding season observations from western Contra Costa County could not be located.

Alameda County

There are confirmed breeding records from Oakland in 1879 and 1881, Hayward in 1907, and numerous records in Newark from 1905 to 1914 (FMNH 2001; MVZ 2001; WFVZ 2001; CAS 2002a).⁷⁸ Historical records indicated probable breeding in Hayward and Fremont in the 1880s, in Berkeley in 1911, in Albany in 1922, and at Livermore in 1896 (FMNH 2001; MVZ 2001; PMNH 2001).⁷⁹ Burrowing owls were “fairly common” residents in Newark (as evidenced by large collections of eggs) through the 1950s, but suffered a “steady, marked decline” through the 1980s due to habitat loss from conversion of fields to urban and commercial development (CNDDDB 2001; WFVZ 2001).

⁷² There is a breeding season record from Nicasio on 3/24/1879 (CAS 2002a). Single birds were also collected from Tiburon in September 1897 (McGregor 1898), from Mill Valley on 9/30/28 (CAS 2002a), and from Fort Barry on 1/21/45 (MVZ 2001). Grinnell and Wythe (1927) observed the species in the drier portions of Marin County.

⁷³ Non-breeding season records include: successive sightings of several owls residing near Abbott's Lagoon at Point Reyes National Seashore, in 1983; and a colony of at least 3 owls observed at St. Vincent School, approximately 1 mile south of Hamilton Air Force Base, on 1/30/84 and 2/6/84 (CNDDDB 2001).

⁷⁴ The U. S. Army Corps of Engineers reported burrowing owls nesting along airfield runways and levees at Hamilton Air Force Base through 1993 (USACE 1991, 1995), but owls were not found there during a 1994 field survey (USACE 1998).

⁷⁵ Stoner (1922) reported capturing burrowing owls in Benicia before 1922. Stoner documented a “few” nests, a nesting female with eggs he had banded in 1930, a road-killed bird in 1932; and a few nests in 1933 (Stoner 1922, 1932a, 1932b, 1933a).

⁷⁶ CNDDDB records include an observation just off Susan Road, northeast edge of Vallejo in 1979; and non-breeding season observations made during the annual Benicia Christmas Bird Count on the lower slopes of Sulphur Springs Mountain, northeast of Vallejo (3 owls on 12/30/79; 1 owl on 12/28/80; 1 owl on 12/27/81; and 1 owl on 12/18/83), although no owls have been observed there since 1983 (CNDDDB 2001).

⁷⁷ A bird was collected from Albany on 3/13/22 (MVZ 2001). An owl was collected at Yacht Harbor in Richmond on 4/26/36 – birds were also collected there on 10/21/38 and in 1966 (MVZ 2001). Non-breeding season collection records include: from San Pablo on 12/27/08; from Point Richmond on 2/27/09; from Rogue Ranch, 4 miles from Concord on 1/7/20; and from El Sobrante on 11/28/73 (MVZ 2001).

⁷⁸ Eggs were collected from Adams Pasture in Oakland on 4/25/1879 (MVZ 2001), and 2 female birds were collected and a nest with 5 fresh eggs observed in April 1881 in Oakland (FMNH 2001). Eggs were collected from Newark on 5/2/05; on 4/16 and 5/11, 1906; on 4/3/07; on 4/11/10; on 4/14 and 5/10, 1911; on 4/1/12; on 3/25/13; and on 4/4 and 4/10 (3 sets), 1914 (WFVZ 2001; CAS 2002a). Three juvenile birds were collected at Hayward on 7/4/07 (CAS 2002a).

⁷⁹ A male bird was collected on 5/23 and a female collected on 9/29, 1881, in Hayward (PMNH 2001). A single bird was collected from Warm Springs in the Fremont area, on 4/12/1889 (MVZ 2001). A single bird was collected in Berkeley in March 1911 (MVZ 2001). Subsequent non-breeding season records from Berkeley include single birds collected at Carleton and Dana Streets on 11/22/36 and on the U. C. campus on 10/26/39 (MVZ 2001); and a bird seen on 1/10/37 (Carter 1937). A single bird was collected in Albany on 3/13/22 (MVZ 2001). A bird was found on Fruitvale Ave. on an unknown date in the 1930s (Grinnell 1936). A male bird was collected in Livermore on 4/7/1896 (FMNH 2001).

Formerly large owl colonies in Alameda County along the Bay shoreline have been severely reduced in size. A population at the Oakland Airport studied by Thomsen (1971) from 1964 to 1966 was once “one of the largest populations of burrowing owls in the Bay Area,” with significant breeding populations remaining at the airport and around San Leandro Bay and Bay Farm Island in the 1970s and 1980s.⁸⁰ There are now very few birds left in this population (L. Trulio, pers. comm., 2001). A large former breeding colony at Jarvis Landing in Newark in the 1970s is now extirpated (CNDDDB 2001).⁸¹

Along eastern San Francisco Bay, there are currently only 5-10 nesting pairs of owls remaining from Newark to Fremont, and also a few pairs near the bay edge (including at Don Edwards National Wildlife Refuge in Newark, Hayward Regional Shoreline in Hayward, the Oakland Airport and Martin Luther King Jr. Regional Shoreline in Oakland) up to Alameda (CNDDDB 2001; L. Trulio, pers. comm., 2001, J. DiDonato, pers. comm., 2003).⁸² Dwindling pairs of owls remain in scattered locations in Dublin (including a colony at Camp Parks), Pleasanton, and the Livermore Valley (CNDDDB 2001; L. Trulio, pers. comm., 2001; M. Ricketts, pers. comm., 2002).⁸³

San Francisco County

Historical records confirmed nesting in San Francisco, and indicated probable nesting on the San Francisco peninsula in 1909 and 1915 (Ray 1916; Hansen and Squires 1917; MVZ 2001; NMNH 2001).⁸⁴ Owls were historically observed as wanderers near Lake Merced (Grinnell and Wythe 1927), and were recorded in Golden Gate Park by Mailliard (1930). The last breeding season record from the City of San Francisco was in 1972 (MVZ 2001).

⁸⁰ The population at the Oakland Airport observed by Thomsen (1971) consisted of 18 breeding adults which produced 40 young in 1965 and 18 breeding adults which produced 31 young in 1966. Two pairs of owls were observed at Bay Farm Island, northwest of Oakland International Airport in 1983; and southeast of San Leandro Bay, several juveniles were observed in 1982 and 2 owls were seen at burrows in 1983 (CNDDDB 2001).

⁸¹ There were repeated observations of up to 16 individual owls at Jarvis Landing, on the east end of the Dumbarton Bridge, between 1972 and 1979 (CNDDDB 2001).

⁸² CNDDDB records indicate that a population along the Hayward shoreline showed a marked decrease from 1990 when at least 4 owl pairs were present, to 1991, when a single owl pair was observed during breeding season (lack of grazing is cited as the reason for decline) (CNDDDB 2001). Recent CNDDDB records from Newark include: 2 adults and 5 juveniles at a burrow site on the east side of Coyote Hills, on 6/29/93 (the main threat here is predation by the introduced red fox); 2 pairs (1 pair with 2 young) in a burrow complex on Cherry Street, near Mowry Ave., from mid-June to mid-July, 1998; and 1 pair at another burrow site near the intersection of Cherry Street and Mowry Ave. on 7/22/98 (this site was threatened by disking) (CNDDDB 2001). Burrowing owls nested at the Alameda Naval Air Station along the airfield runway and along the levees through 1993, but were not found there during a 1994 field survey (USACE 1998). There are small remnant non-breeding owl populations on East Bay Regional Park District lands at Hayward Shoreline (1 or 2 owls with no successful breeding – the population here has declined since the early 1990s mostly due to land management changes and predation by the red fox) and at Martin Luther King Jr. Shoreline Park (from 1 to 5 birds depending on the season, with no successful breeding) (J. DiDonato, pers. comm., 2003).

⁸³ The Dougherty Valley in the San Ramon area south of Mt. Diablo is undergoing rapid urban development with associated owl habitat loss. According to the EIR for the Dougherty Valley Project, burrowing owls have been sighted recently throughout the Dougherty Valley, adjacent to Camp Parks in east Dublin (the entire valley is slated for intensive urban development). The complete number of breeding pairs in the Valley has not been quantified, but 2 pairs were confirmed breeding in 2001 in the middle of grading operations (M. Ricketts, pers. comm., 2002). One of the pairs fledged at least 6 young, while the other fledged 2. The young were excluded from their burrow complexes immediately after fledging (using one-way doors) to make way for grading. As with most passive relocation efforts, the final whereabouts of both the fledgling and adult owls are unknown. Subsequent passive relocation efforts in the winter of 2001-2002 prevented the establishment of nesting territories within the 2002 grading limits. Although the direct mortality of individuals was avoided, loss of nesting and foraging habitat continues in this area.

Five owls were observed at a burrow site near Coronado Lane and Hopyard Road in Pleasanton, on 10/17/90 (this site was threatened by continued development into a business park) (CNDDDB 2001).

CNDDDB observations in the Livermore valley include: individual sightings from 1979 to 1982 near Dagnino Road and Raymond Road, on the northeast edge of Livermore; many sightings from 1973 to 1978 (as many as 6 owls at one time) at Springtown, in northeast Livermore; 1 pair occupying a burrow at Springtown Alkali Sink, in 1993 (this site is threatened by ORV's, altered burn regime, refuse dumping, and invasion by exotic plants); a pair of owls near Dalton Ave. and Ames Street, in Livermore, on 4/20/93 and 5/10/93; and an unknown number of nesting owls near Hartford Ave. and North Livermore Ave., north of Livermore, between March and August 1997 (this site is threatened by a proposed development) (CNDDDB 2001). Owls and evidence of occupied nests were observed from February-April 1999 in west Livermore (this site is threatened by a proposed business park, with no acknowledgement of the species' presence nor any mitigation), and near the Livermore Airport in 1999 and 2000 (L. Tung, pers. comm., 2000).

⁸⁴ The NMNH (2001) has 3 eggs collected from San Francisco, unknown date. Two birds were collected from Ingleside Race Track, San Francisco on 3/15/09 (MVZ 2001). Three owls were spotted at the entrance of a used burrow just south of Visitacion Ave., in February 1915, and several other owl burrows were observed at the time (Ray 1916). A burrowing owl was also captured at 43rd Ave. and Fulton St. in February 1916 (Hansen and Squires 1917).

Burrowing owls historically bred on the Farallon Islands off of San Francisco. Indicative of probable breeding, Bryant (1888) recorded two birds there in the spring of 1887. Dawson (1911, 1923) found a single owl on S. E Farallon in 1911, reporting it to be “a sole survivor, we were informed, of a former breeding colony” that had been shot off because of their persecution of smaller migrant birds. A single burrowing owl egg collected on the Farallones in spring 1911 was donated to the Point Reyes Bird Observatory in 1971 (DeSante and Ainley 1980). DeSante and Ainley (1980) presumed owls must have nested there for only a few years, since there are no other reports of breeding, although remains of owls were found on South Farallon Island in June 1958, June 1964, and May 1965 (Bowman 1961; Tenaza 1967) and single birds were collected from Southeast Island in April 1972, March 1986, and June 1988 (MVZ 2001; CAS 2002a).⁸⁵

Breeding burrowing owls have been extirpated since the 1980s from San Francisco County (DeSante and Ruhlen 1995).

San Mateo County

Historical records confirmed breeding at Redwood City in 1898 and indicated probable breeding at Menlo Park in 1906 (MVZ 2001; PMNH 2001; WFVZ 2001; CAS 2002a).⁸⁶ Collector C. Littlejohn, who collected 2 sets of eggs at Redwood City in the summer of 1898, remarked that although owls were “very numerous” previously, the nests he found were the first seen in 25 years of looking (WFVZ 2001).

Breeding owls were nearly extirpated from San Mateo County by the 1970s (Remsen 1978) and perhaps only 1 or 2 breeding pairs now remain (DeSante and Ruhlen 1995; C. Breon, pers. comm., 2001).

Santa Clara County

At the turn of the century, the western burrowing owl was a common bird of Santa Clara County (Price 1898; Van Denburgh 1899; Fisher 1904). Historical records confirmed breeding in the Santa Clara Valley in 1882, east of Los Gatos in 1890, southeast of Milpitas in 1892, in East San Jose in 1902, and near Palo Alto in 1892, 1901, 1909, 1911, and 1940 (FMNH 2001; MVZ 2001; SBMNH 2001; WFVZ 2001; CAS 2002a).⁸⁷ There are breeding season records of owls from Milpitas in 1883, Stanford in 1893, Alviso in 1901, Steven’s Creek in 1903, and Jasper Ridge at Stanford University in 1909 (MVZ 2001; CAS 2002a).⁸⁸ Egg collector J. Snyder remarked that the species was common near Palo Alto in 1909 (WFVZ 2001). In 1927, Grinnell and Wythe wrote that the bird was still a “fairly common resident in the drier, unsettled interior parts of the [Bay Area] region,” being most abundant in Alameda, Contra Costa, and Santa Clara Counties. However, accounts suggest that by the late 1930s and early 1940s the species was beginning to decline. J. Snyder found burrowing owls to be “very rare” in Palo Alto by 1939, due to lack of ground squirrels to prepare the nesting burrow (WFVZ 2001). The species was noted to be further decreasing in Palo Alto in the 1970s (Remsen 1978).⁸⁹

In Santa Clara County, detailed records of owl locations and their fate are most complete from the early 1980s onward, when the county began experiencing explosive human population growth. In 1989, the

⁸⁵ DeSante and Ainley (1980) characterized the owl as an uncommon visitor to the South Farallon Islands in the fall (approximately 50 fall visitors had been recorded), and a rare resident in winter (a total of 15 birds were recorded, with from 1 to 3 individuals wintering each year), based on Point Reyes Bird Observatory bird counts from 1968-1975. Most wintering birds disappeared by March or April.

⁸⁶ Eggs were collected from Redwood City on 6/13 and 7/9, 1898 (WFVZ 2001). Birds were collected from an unspecified location in San Mateo County on 2/6 and 5/4, 1896 (PMNH 2001); and 2 birds were collected from Menlo Park in 1906 (MVZ 2001). Non-breeding season records include from Palo Alto in October 1897 (McGregor 1898), and from Redwood City on 2/13/14, and 11/6, 11/10, 11/23, and 11/27, 1892 (CAS 2002a).

⁸⁷ Eggs were collected from the Santa Clara Valley on 5/13/1882 (SBMNH 2001); from 8 miles east of Los Gatos on 5/31/1890 (CAS 2002a); from Stanford University on 5/28/1892 (CAS 2002a); from Berryessa, southeast of Milpitas, on 5/28/1892 (FMNH 2001); from East San Jose on 4/1/02 (WFVZ 2001); from near Palo Alto on 5/12/09 (WFVZ 2001) and 5/2/11 (MVZ 2001); and from East Palo Alto on 5/27/40. Juvenile birds were collected during breeding season from Palo Alto on 7/6 and 7/14, 1901 (CAS 2002a).

⁸⁸ Breeding season records include from Steven’s Creek on 3/10/03 (MVZ 2001); Milpitas on 8/20/1883 (CAS 2002a); Stanford on 8/28/1893 (CAS 2002a); Jasper Ridge at Stanford University on 3/31/09 (CAS 2002a); and Alviso on 5/4/01 (CAS 2002a).

⁸⁹ A colony of 5 adults was documented near the Palo Alto dump on 7/3/74 (Stallcup and Greenberg 1974).

consulting firm of H.T. Harvey & Associates compiled a list of 215 sites where burrowing owls were observed between 1984 and 1988 (H. T. Harvey and Associates 1994). Many of these observations were anecdotal and many others were sites confirmed as part of on-going research or systematic owl observation. H.T. Harvey and Associates found that 97% of the sites supported fewer than 10 birds and 81% supported only 1 or 2 birds (H. T. Harvey and Associates 1994).

In the summers of 1995 and 1998, Trulio (1998a) re-surveyed 123 of the 215 occupied sites identified by H. T. Harvey and Associates (1994).⁹⁰ The sites were located in the cities of Palo Alto, Mountain View, Sunnyvale, Santa Clara, and San Jose, including Alviso. Moffett Airfield and San Jose Airport, 2 sites not available to development, were excluded from the survey. The survey results showed a steady decline in remaining owl habitat. In 10 years, 70 of 123 sites (57%) were lost to development, an average of almost 6% per year. Another 12 sites (10%) were reduced in size or habitat quality.⁹¹ At this rate of loss, Trulio (1998a) predicted that all remaining sites on private or city owned land could be lost by 2005.

From their surveys, DeSante and Ruhlen (1995) estimated that approximately 60% of known owl locations in Santa Clara County were lost between the early 1980s and 1993. By 1997, the breeding owl population in the county had dwindled to about 120-141 pairs, distributed in a crescent around the southern San Francisco Bay, with most owls in Mountain View and San Jose (J. Barclay pers. comm., 2002). J. Barclay (pers. comm., 2002) estimates 43 to 47 owl pairs remained in San Jose in 1997 and 39 to 40 pairs remained in 2000, based on a thorough census of 50 previously known breeding locations.

In 2002, Trulio resurveyed 111 of the sites listed by H.T. Harvey that were located on private land. By 2002, only 27% of these 111 locations still contained suitable owl habitat; 66% had been developed completely and 7% were significantly reduced in size (Trulio in press). A number of large sites were not included in this survey because they were on public land and were the subject of more detailed observations. These sites, Bixby, Shoreline and Sunnyvale Baylands Parks, Moffett Federal Airfield, Mission College in Santa Clara, and the San Jose Airport, all continued to support more than 10 owls each in 2002 (J. Barclay, pers. comm., 2002). At these locations, researchers have collected specific data on the number of owls over time. These data show that the numbers of breeding owl pairs have fluctuated over the years.

At Bixby, Shoreline and Sunnyvale Baylands Parks, where little development has occurred, numbers have remained relatively stable since 1997. The 2002 owl population at Shoreline Park in Mountain View was 5 breeding pairs, up from an average of 3 pairs the previous 10 years (P. Delevoryas, pers. comm., 2002).⁹² At Moffett Airfield, which has had little development, breeding owl pairs have fluctuated from a high of 30 pairs to a low of 15 (Trulio 2002, amplified by pers. comm., 2002).⁹³ During this period, the number of breeding pairs at Mission College declined from approximately 30 pairs (Buchanan 1996) to 9 active burrows (Trulio 2002, amplified by pers. comm., 2002); the decline is the result, in large part, of habitat loss at Mission College due to urban development.⁹⁴ At San Jose Airport, active management has helped to substantially increase the number of breeding pairs from approximately 15 pairs in 1988 to 40 pairs in 2002 (J. Barclay, pers. comm., 2002).

⁹⁰ H. T. Harvey and Associates (1994) found that on 97% of the sites there were 10 or fewer owls, and on 81% just 1 or 2 birds survived.

⁹¹ Trulio listed sites completely developed as "lost," those diminished in size or habitat quality as "reduced," and those which could still support a pair of owls as "extant."

⁹² 4 adults and 2 fledglings were observed near Rengstorff Ave. and Charleston Ave., near Mountain View Shoreline Park, in late April 1982. Development of this site began in January 1983, and the last owl observation here was of 2 adults in February 1983. 8 adults (4 pairs) and an unknown number of juveniles were seen at Long Point shoreline at Mountain View Park, north of Moffett Naval Air Station, on 6/22/93 (CNDDDB 2001). 13 adults and 16 young were seen at Shoreline Park in 2002 (P. Delevoryas, pers. comm., 2002).

⁹³ Annual counts of breeding pairs at Moffett Field in recent years have fluctuated from 18 to 27 (CNDDDB 2001); J. Barclay (pers. comm., 2002) estimates 35 pairs currently reside at Moffett Field.

⁹⁴ According to the Mission College web site the breeding population of owls there has recently fallen from 60 owls to about a dozen birds in recent years (15 pairs were recorded in 1998, 6 of which nested successfully, producing 14 chicks; 8 pairs in 1999, 3 of which nested successfully, producing 15 chicks; 7 pairs in 2000, 6 of which nested successfully, producing 13 chicks (only 10 fledged); and 8 pairs in 2001).

Small colonies of owls also persist in Alviso (currently estimated at 15 pairs), San Jose, Santa Clara, and Milpitas (CNDDDB 2001; J. Barclay, pers. comm., 2002).⁹⁵ Formerly large owl populations in the northern San Jose/Alviso area and City of Santa Clara have been significantly impacted in recent years (CNDDDB 2001; J. Barclay, pers. comm., 2002) and former colonies known in urban Sunnyvale in the 1980s and early 1990s have likely been extirpated (CNDDDB 2001; D. Plumpton, pers. comm., 2002).⁹⁶ Breeding owls may have been extirpated recently from Morgan Hill as well (J. Barclay, pers. comm., 2002).⁹⁷

Santa Cruz County

Historical records confirmed breeding at Santa Cruz in 1882 and 1901 (McGregor 1901; SBMNH 2001; WFVZ 2001).⁹⁸ Skirm (1884) described the species as “common” in Santa Cruz County and reported collecting eggs. McGregor (1901) described it as a “fairly common” breeding bird of Santa Cruz County, noting that “fresh eggs can be found at Santa Cruz about April 15.” By mid-century, Streater (1947) reported that the species was “now rare due to the poisoning of ground squirrels” around Santa Cruz.

The species had “greatly declined” in Santa Cruz County by the 1970s (Remsen 1978), with only 2 recently reported sightings – one in February 1969 on the lower UC Santa Cruz campus; another near Moss Landing elementary school (Gordon 1974). Warrick (1982) reported on a population of about 20 burrowing owls inhabiting grasslands on the U. C. Santa Cruz campus that apparently wintered there, as well as nested (CNDDDB 2001).⁹⁹ Burrowing owls have not been documented nesting on the campus since 1987, although owls of unknown origin still occur there in the winter (J. Barclay, J. Linthicum, pers. comm., 2002).

⁹⁵ A small owl colony (2 adults and 3+ juveniles seen on 6/14/2000; and 4 owls seen in January 2001) has been observed north of Hwy. 237, near Los Esteros Road and North First Street, in Alviso (CNDDDB 2001).

Significant breeding populations remain in San Jose at the San Jose International Airport (28 adults/19 juveniles seen in 1990; 12 adults/11 juveniles in 1991; 30 adults/68 juveniles in 1997; 50 adults/92 juveniles in 1998; 48 adults/101 juveniles in 1999; and 62 adults/129 juveniles in 2001) (CNDDDB 2001) and in the Coyote Valley (3 families of burrowing owls with 16 to 22 adults and chicks were seen there in 1998). Recent CNDDDB observations in San Jose include: 2 adults near Karina Court and North First Street, on 4/1/92; 4 owls at a den at the end of Nortech Parkway, 1 mile east of Alviso, on 8/4/93; near Airport Parkway and Guadalupe Parkway, east of the airport (4 adults and 2 juveniles seen on 8/28/93, 9 owls (2 adults, 7 juveniles) banded in 1993); a burrow with owl sign near Monterey Road and Curtner Road, on 3/10/93; 1 owl near a possible burrow site at Silver Creek Hills, on 3/2/2000; a burrow near Tully Road (Swift Lane) and Capitol Expressway (2 adults seen on 6/19/99, 2 adults and 3 juveniles seen on 6/21/2000, and 2 adults and 3 juveniles seen on 7/1/2001); 4 adults and 4 juveniles using 2 burrows on the south side of Devcon Court, from 4/17/2001 to 9/4/2001 (2 owls found dead in July 2001, likely killed by feral animals); and 2 adult owls at a burrow site north of Meadowfair Park, near Aborn Road and King Road, on 3 occasions in July 2001 (CNDDDB 2001).

There are breeding owls at 3Com Corp, near Hwy. 237 and Great America Parkway (5 dead adult owls were collected here on 8/31/91); and east of Great America Amusement Park (1 adult and 1 juvenile were seen at a burrow site on 6/16/99, and 3 adults and 1 juvenile were seen on 7/2/2001) (CAS 2001).

There were owl observations in Milpitas and along Arroyo de las Coches Creek in June 1975 (CDFG 1975). 2 adults and 1 juvenile seen at a burrow near Curtis Ave. and South Main, on 9/15/98 (these owls were "passively excluded" on 10/26/98); and 2-3 adults were documented breeding along Barber Lane, west of I-880, in 1999 (these owls were excluded from the site on 10/18/99) (CNDDDB 2001). Both sites were subsequently developed and the owls are extirpated (CNDDDB 2001).

⁹⁶ A breeding pair of owls was seen between Patrick Henry Jr. High School and Peterson High School - each year from 1981 to 1983 (1 young fledged in 1981, 1 in 1982, and 0 in 1983); there were active owl colonies near Fair Oaks Ave. and Alviso Fwy., and near Hwy. 101 and Mathilda Ave., in northern Sunnyvale in 1983; a colony southeast of the junction of Coyote Creek and Alviso Slough, north of Sunnyvale, was extirpated by 1983; 2 pairs of owl were seen off Caribbean Drive, near Lawrence Expy. and Hwy. 237, on 6/10/99 (CNDDDB 2001).

⁹⁷ Burrowing owls may now be extirpated from Morgan Hill (there were 2 known breeding pairs in 2000, only 1 adult in 2001, and no known owls in spring of 2002) (J. Barclay, pers. comm., 2002). Recent CNDDDB observations in Morgan Hill include: 1 adult at a burrow site near Day Road, southeast of Lions Peak, south of Morgan Hill, on 12/24/92; 2 owls at burrows in Kirby Canyon, 3 miles north of Morgan Hill, from 1991-93; a burrow with signs of occupation, 2 adults, and 1 recently-fledged juvenile near Cochran Road and Hwy. 101, north of Morgan Hill, on 7/14/2000; and El Toro School, and near Calle Mazatlan and East Central Ave., Morgan Hill (1 owl seen on 6/3/98; 2 owls seen shortly after a disturbance created by grading; 2 adults and a maximum of 4 juveniles seen between 6/9/2000 to 8/2/2000; only 1 adult seen during several visits from June to August 2001) (CNDDDB 2001). No adults were seen in Morgan Hill in 2002 (J. Barclay, pers. comm., 2002).

⁹⁸ Eggs were collected from Santa Cruz on 5/20 and 6/1, 1882 (SBMNH 2001; WFVZ 2001) and on 4/15/01 (McGregor 1901). There are non-breeding season records from San Andreas Road, in the vicinity of Watsonville on 12/29/37; and from Santa Cruz in 1900 and on 1/23/38 (MVZ 2001).

⁹⁹ It was reported in 1987 that 2 adults and 2 juveniles were previously observed at the East Field, on the UC Santa Cruz Campus, north of Santa Cruz (this site was threatened by University expansion (CNDDDB 2001). Fourteen owls were reported to winter on the campus in 1994, with an additional owl observed at a winter burrow site between Wilder Creek and Empire Grade, on 12/19/94 (CNDDDB 2001).

Breeding burrowing owls have been extirpated from Santa Cruz County since the 1980s (DeSante and Ruhlen 1995), although wintering birds are often seen in dune and coastal grasslands (L. Trulio, pers. comm., 2001).

E. CENTRAL WESTERN CALIFORNIA

The range of the burrowing owl in central western California encompasses Monterey County; the western 75% of San Benito County; and San Luis Obispo and Santa Barbara Counties (DeSante et al. 1996).

Although there are historical records of confirmed breeding in every county in central Western California, there are little data on overall historical abundance of the burrowing owl in this area. The species was documented to have been locally abundant in Monterey County (around Aromas) in the 1930s (Gordon 1974), in San Benito County (at Paicines) in the late 1800s (Mailliard and Mailliard 1901), and in Santa Barbara County (at Santa Barbara) in the late 1800s (Streator 1886).

Breeding burrowing owls have been eliminated from these specific locations, extirpated from coastal San Luis Obispo County, and very nearly extirpated from coastal Monterey County and the western 75% of Santa Barbara County. DeSante and Ruhlen (1995) estimated that only 82 pairs of owls (0.5% of California's population) persist in the combined central coast, central interior, and southern coast regions. These owls are mostly in isolated pairs and very small groups, and are facing intense development pressure (DeSante et al. 1996).

Monterey County

Historical records confirmed breeding near Monterey in the 1890s and indicated probable breeding in Monterey in 1903 (FMNH 2001; MVZ 2001).¹⁰⁰ Burrowing owls were reported to be "fairly common" during summer (Willett 1908) and probably bred in the lower and upper Salinas Valley and surrounding foothills along the Monterey/San Luis Obispo County line (Roberson 1985; MVZ 2001).¹⁰¹ Owls were probably breeding near Big Sur in 1903-1904 and in the Jolon Valley in 1909 (Pemberton and Carriger 1915),¹⁰² but there are no known recent records of owls from these areas (Roberson 1985). Owls were "plentiful" around Aromas in the 1930s (Gordon 1974) and were found by Grinnell and Linsdale in 1934-1935 at Point Lobos Reserve (Drury 1953). Mowbray (1947) reported never seeing burrowing owls during 2 years of observations at Camp Roberts, in the Upper Salinas Valley, and concluded that they must be present in very small numbers if at all, as he visited all parts of the camp that were typical habitat for the owl.

Breeding was confirmed near Marina in 1972 and owls were thought to still occur within the Big Sur Planning Unit (coastal Monterey County south of Point Sur) in the 1970s (Gordon 1974; USDA 1978).¹⁰³ Roberson (1985) reported them to be a rare resident in the mouth of the Salinas Valley, noting that widespread cultivation had limited habitat to a few remaining colonies. A likely breeding colony was reported north of Castroville in the 1980s (CNDDDB 2001).¹⁰⁴

¹⁰⁰ Eggs were collected from 6 miles north of Monterey on 6/17/1897 and on 5/5/1899 (MVZ 2001). A single bird was collected from Monterey on 3/19/03 (FMNH 2001).

¹⁰¹ A single bird was collected from the Salinas Valley on 8/29/07, and 2 birds were taken 2 miles northeast of San Lucas on 7/16/19 (MVZ 2001). An owl was seen in June 1960 at Gonzales (Roberson 1985). There is a non-breeding season record from Blanco Road on the west side of Salinas on 10/3/36 (MVZ 2001).

¹⁰² Several owls were noted on bare hillsides near the ocean north of the Little Sur River during winter (December-January) of 1903-1904. Owls were seen from May-June of 1909 in the Jolon Valley, but according to Pemberton and Carriger (1915) the burrowing owl was "not a common bird at all" in this area.

¹⁰³ In 1972 a family of burrowing owls was seen close to Hwy. 1, immediately north of Marina (Gordon 1974).

¹⁰⁴ In 1983 owls were reported frequently observed (including a group of 8 owls) along Dolan Road, about 2 miles north of Castroville (CNDDDB 2001).

Breeding burrowing owls have now been completely or very nearly extirpated (perhaps only 1 or 2 breeding pairs still exist) from coastal Monterey County (DeSante and Ruhlen 1995). A 1992 breeding owl survey located only 14 pairs in the entire county, centered near the City of Salinas and rangeland east of King City (Roberson 1993). Most recent observations of nesting colonies in Monterey County are from the Salinas River Valley (CNDDDB 2001) and breeding was confirmed at the Salinas Airport in 1994 (J. Barclay, pers. comm., 2002).¹⁰⁵

San Benito County

The burrowing owl was listed as a “common resident” (although scarce in some years) at Paicines, from 1888-1901 by Mailliard and Mailliard (1901). Historical records confirmed breeding at an unspecified location in San Benito County in 1889, and indicated probable breeding near Panoche in 1936 (MVZ 2001; OM 2001).¹⁰⁶ Other than a breeding pair of owls observed near Hollister since 1999 (P. Delevoryas, pers. comm., 2003), recent breeding season observations in San Benito County could not be located.¹⁰⁷

San Luis Obispo County

Historical records confirmed breeding near San Luis Obispo in 1928, at McMillan Canyon in 1930, south of Coalinga in 1934, and near Simmler in 1949; and indicated possible breeding at Morro in 1939 and Cholame before 1940 (Roberson 1985; MVZ 2001; WFVZ 2001).¹⁰⁸ Breeding burrowing owls have been extirpated from coastal San Luis Obispo County since the 1980s (DeSante and Ruhlen 1995). A substantial breeding population of owls remains at the 200,000-acre Carrizo Plain Natural Area (managed by the Nature Conservancy, BLM, and CDFG) in eastern San Luis Obispo County, which is the largest area of undeveloped grassland habitat for burrowing owls in California (Rosenberg et al. 1998a; CNDDDB 2001).¹⁰⁹ Large numbers of active owl nests can be found here during breeding season: 37 active nests were located in 1997, 32 nests in 1998, and 40 nests in 1999 (Rosenberg and DeSante 1997; Rosenberg et al. 1998b; Rosenberg 1999).¹¹⁰

Santa Barbara County

Historical records confirmed breeding at Santa Barbara in 1875 and 1885 (Streator 1886; NMNH 2001).¹¹¹ Streator (1886) noted that the burrowing owl was “common” at Santa Barbara in 1885. Bartholomew (1940) recorded 7 burrowing owl sightings in 1937 and 1938 in the upper Santa Ynez River and along the crest of the Santa Ynez Mountains.

¹⁰⁵ The species is currently known to occur within Monterey Bay Marine Sanctuary. Recent breeding season observations include: a single bird at King City on 4/14/94; several pairs of breeding owls at the Salinas Airport (2 adults and 4 juveniles observed on 7/10/94, and 1 pair observed in 1999); 6 birds reported and an additional 2 birds that appeared to have nested observed on 8/27/97 between Salinas and Santa Rita (this site was threatened by development); and 2-3 adult owls at Johnson Canyon, east-northeast of Gonzales, in April-May 1998, with 1 adult also observed there in December 1997 (this site was threatened by landfill expansion) (CNDDDB 2001).

¹⁰⁶ A clutch of 8 eggs were collected in San Benito County on 5/17/1889 (OM 2001), and an owl was collected from 3 miles northwest of Panoche on 7/10/36 (MVZ 2001).

¹⁰⁷ A breeding pair of owls was seen north of the town of Hollister, 1 mile south of Shore Road along Highway 25. The birds were first observed in November, 1999 by John Delevoryas. A breeding pair of owls and young were observed from spring through fall in 2000, 2001, and 2002 by J. Delevoryas. Photographs were taken of 1 adult and 1 fledgling in June, 2002 by J. Delevoryas.

¹⁰⁸ Eggs were collected 4 miles north of San Luis Obispo on 4/25/28; at McMillan Canyon on 4/9/30; at Cottonwood Pass, south of Coalinga on 3/24/34; and on the Carrizo Plains, near Simmler on 4/3/49 (WFVZ 2001). Single birds were collected from Morro on 1/13/39 and 2/7/39 (MVZ 2001). There is also a record from Cholame Flats pre-1940 (Roberson 1985).

¹⁰⁹ Recent CNDDDB observations at Carrizo Plain include 2 adults at the south end of Soda Lake, on 3/25/90, and numerous burrows with signs of occupation along Arrowbear Trail, on 3/25/90 (CNDDDB 2001). Other recent non-breeding season observations in San Luis Obispo County include: 1 owl at a burrow and owl sign at several other burrows about 4 miles northeast of Cholame on 10/22/93 (all of these burrows were excavated in November 1993 with CDFG approval); 1 owl at a burrow at Camp Roberts Military Reservation, on 12/22/97; and single adult owls observed at 2 locations at Camp Roberts in 1998 (CNDDDB 2001).

¹¹⁰ J. Gervais (pers. comm., 2003) believes the owl population at Carrizo Plains Natural Area is much larger than survey efforts indicate, due to a survey method limited to finding nesting pairs along roads.

¹¹¹ An immature bird was collected at Santa Barbara on 7/1/1875 (NMNH 2001), and Streator (1886) noted that owls bred there in 1885.

There was probable breeding at Montecito and Santa Barbara in the 1970s (SBMNH 2001), but owl numbers had drastically declined in the Santa Barbara region by then (Remsen 1978).¹¹² The burrowing owl was uncommon, but not rare in the Santa Barbara area in the late 1970s and early 1980s, with owls seen at the U. C. Santa Barbara campus, Santa Barbara Airport, Goleta Slough, and Santa Barbara Community College (R. Panza, pers. comm., 2002).

Lehman (1994) noted that owls had been “formerly much more numerous,” and were “nearly completely extirpated” from Santa Barbara County. By the 1990s only 1 or 2 pairs nested in fields west of Santa Maria and probably also in the Santa Ynez Valley (Lehman 1994).¹¹³ The number of wintering birds had also declined severely during since the 1980s and an average of only 1 or 2 were seen each year along the South Coast east of Gaviota (Lehman 1994). Burrowing owls may possibly still nest in the San Marcos Foothills (SMFA 2002). Owls once nested at Vandenberg Air Force Base, but evidently have not bred there since 1979-1980 when 4-5 pairs nested in rangeland east of Pt. Arguello for 2 consecutive years (there have been only 3 summer records at Vandenberg AFB between 1977 and 1994); although there is still significant use of suitable habitat on the base by migrants and winter visitors (Holmgren and Collins 1999). Breeding burrowing owls have apparently been very nearly extirpated from the western 75% of Santa Barbara County (DeSante and Ruhlen 1995), and according to Lehman (1994), “the species’ future [in Santa Barbara County] looks bleak.”

F. SOUTHWESTERN CALIFORNIA

The range of the burrowing owl in southwestern California encompasses the southern 55% of Ventura County; the southern 50% of Los Angeles County; all of Orange County; the western 40% of San Diego County; the southern California islands; the western 25% of Riverside County; and the southwestern 5% of San Bernardino County (DeSante et al. 1996).

Although there are historical records of confirmed breeding in every county in southwestern California, there are little data on overall historical abundance of the burrowing owl in this area. The species was documented to have been locally abundant throughout Ventura County in the late 1800s (Evermann 1886), throughout western Los Angeles County from the late 1800s into the early 1900s (Willett 1912; FMNH 2001; MVZ 2001; NMNH 2001; WFVZ 2001), in western San Bernardino County (near Chino) in the early 1900s (WFVZ 2001), and throughout coastal San Diego County in the late 1800s (Emerson 1884; Van Dyke 1888; Sharp 1907).

Breeding burrowing owls have now been extirpated from coastal Ventura County and nearly eliminated from Orange, San Diego, and Los Angeles Counties (DeSante and Ruhlen 1995). The species is greatly reduced in numbers and is now quite local in coastal southern California. An estimated 260 nesting pairs (3% of California’s population) persisted in the area in the early 1990s, representing a decline of about 57-85% since the mid 1980s (DeSante and Ruhlen 1995). Owls in Southern California west of the deserts exist at very low densities (much less than 0.01 pairs per square kilometer). Remaining owls in this area are now found only on undeveloped federal lands, having been almost entirely extirpated from private lands by urban sprawl. These owls are mostly in isolated pairs and very small groups, and are threatened by intense development pressure (DeSante et al. 1996).

Ventura County

In the late 1800s the burrowing owl was a “common and generally distributed” nesting bird throughout Ventura County (Evermann 1886). Historical records confirmed breeding at Simi in 1897; and indicated

¹¹² Single birds were collected from Sycamore Canyon, Montecito on 3/22/75, and from Child’s Estate Zoo, Santa Barbara on 7/10/76 (SBMNH 2001).

¹¹³ Recent summer records from Santa Barbara County include an owl seen between July and October in 1984 on More Mesa in Goleta and pairs seen in June 1995 and June-July 1996 on the Santa Maria River levee; it is unknown whether the 1995 pair produced young and the 1996 nesting may have failed when the levee was graded and the nest destroyed (Holmgren and Collins 1999).

probable breeding at Ventura in 1906 and in the southern part of the county in 1911 (MVZ 2001; UCLA 2001; WFVZ 2001).¹¹⁴ The species was known to occur in the 1970s in the Pine Mountain-Sespe-Wheeler Gorge area of the southern Los Padres National Forest, north of Ojai (Stebbins and Taylor 1973).

Breeding burrowing owls have been extirpated from coastal Ventura County since the 1980s (DeSante and Ruhlen 1995).¹¹⁵

Los Angeles County

Numerous historical records confirmed widespread breeding of owls throughout the entire region of what is now the urbanized Los Angeles area, from the 1880s through the 1930s (Hartzell 1888; McGregor 1898; Swarth 1900; Willett 1912; AMNH 2001; FMNH 2001; LACM 2001; MVZ 2001; NMNH 2001; UCLA 2001; WFVZ 2001; CAS 2002a).¹¹⁶ The burrowing owl was apparently once an extremely abundant resident in the Los Angeles region (e.g. Willett 1912).

With urban development, burrowing owl numbers had gone way down in the Los Angeles region by the 1970s (Remsen 1978). There was confirmed breeding at Playa del Rey from the 1960s through the 1980s; probable breeding at Los Angeles and Hermosa Beach in the 1980s; and non-breeding season sightings in the Long Beach area from the 1950s through the 1970s (CNDDDB 2001; CSULB 2001; LACM 2001; WFVZ 2001).¹¹⁷ There were apparently “many” burrowing owls at the California State University, Long Beach campus in the past (C. Collins, pers. comm., 2002), but this population was extirpated by the early 1980s (P. Bloom, pers. comm., 2002). Breeding burrowing owls have most likely been nearly extirpated from southern Los Angeles County.¹¹⁸ Small numbers of breeding burrowing owls persist in the Antelope Valley, in northeastern Los Angeles County; these birds are discussed in the section on the southern desert range, below. Recent raptor surveys throughout most of the Santa Monica Mountains National Recreation Area have beated no nesting burrowing owls, although owls winter there (P. Bloom, pers. comm., 2002).

Orange County

Historical records confirmed breeding at Anaheim in the 1880s and in 1918; at Balboa Beach in 1920; at Buena Park in 1927, 1928, 1935, and 1938; at Newport Beach in 1931 and 1955-1964; near Sunset Beach in 1938; near Cypress in 1945, at Los Alamitos in 1958, Costa Mesa from 1955-1972, and Santa Ana from 1956-1959 (Robertson 1929, 1930; T. Howell 1964; FMNH 2001; LMDBL 2001; SBMNH 2001; WFVZ 2001; J.

¹¹⁴ Eggs were collected at Simi on 5/10/1897 (WFVZ 2001). There are bird collection records from Ventura on 4/21/06 (MVZ 2001) and from the southern part of county on 5/27/11 (UCLA 2001).

¹¹⁵ There is 1 recent breeding season record from upper Dry Canyon, approximately 2 miles north of Simi Valley, on 3/27/90 (CNDDDB 2001).

¹¹⁶ Eggs were collected from: El Monte on an unknown date (FMNH 2001); Los Angeles County in March 1884 (Hartzell 1888); the City of Los Angeles on several occasions in June 1885 (Hartzell 1888; WFVZ 2001), 6/4/1886 (FMNH 2001), 6/25/1887 (NMNH 2001), 1892, 5/30/1893, 5/8/1895, 5/15/1895, 4/11/1898, 4/14/1898, 5/9/1898, 5/24/03, 5/31/03, and 5/2/04 (WFVZ 2001); Anaheim on 5/21/1887 (NMNH 2001); Pasadena on 5/4/1889, 4/26/1892, and 6/11/1894, near Pasadena on 4/17/1895 (MVZ 2001; WFVZ 2001); Barley Field, near Harbor City, in June 1902 (Willett 1912), 4/29/04, 4/26/14, 5/17/14, 5/31/14, 4/18/16 (WFVZ 2001); San Pedro on 5/19/08 and 5/9/09 (FMNH 2001; WFVZ 2001); Hermon Hills, Los Angeles on 4/28/19 and on 5/5/20 (MVZ 2001); Cahuenga on 5/9/1895; 2 miles northwest of Claremont on 5/2/02; Gardena on 5/17/13; Athens on 5/14/21 (2 sets); near Redondo on 5/10/29 (2 sets); near Culver City in May 1934; and near Pomona in April 1938 (WFVZ 2001).

Breeding season records include: birds collected from Highland Park on 3/23/1887 (MVZ 2001); from Cahuenga (now Universal City) on 5/18/1888 (AMNH 2001); from Cienega on 3/7, 3/10, 3/26, and 3/27, 1890 (LACM 2001); from Long Beach in August 1894 (McGregor 1898; LACM 2001) and 3 birds on 7/9/00 (LACM 2001); from Pasadena on 5/22/1895 and 8/14/00 (LACM 2001); several pairs of breeding owls found in fields in northwestern Los Angeles (1 mile northwest of Westlake Park) from 1893 to 1900, when the area was ranch land (Swarth 1900); 3 birds from Point Firmin, near San Pedro on 9/15/06 (MVZ 2001); from Gardena on 3/7/15 (FMNH 2001) and on 6/17/32 (FMNH 2001); a male bird with sexually developed gonads from Redondo Beach on 3/1/08 (LACM 2001) and 5/28/17 (FMNH 2001); from Cedar Hill on 7/12/09 (LACM 2001); from Bixby on 5/29/08 (CAS 2002a); from Palmdale on 4/16/14 (CAS 2002a); from Dominguez on 8/22/17 (LACM 2001); and from Pomona on 3/27/15 (two birds) (UCLA 2001) and on 6/2/25 (MVZ 2001).

¹¹⁷ Eggs were collected from Playa del Rey on 4/3/64 (WFVZ 2001); and nesting was observed in the vicinity of Playa del Rey along Ballona Creek in 1981 (CNDDDB 2001). Pettingill (1953) reported burrowing owls in the banks of Ballona Creek. There were breeding season observations at Los Angeles on 7/28/80 and at Hermosa Beach on 7/20/82 (LACM 2001). Observations in the vicinity of Long Beach include: Lakewood in October 1953; CSULB Campus in January and December 1954; and Long Beach in December 1972 and October 1975 (CSULB 2001).

¹¹⁸ The only known recent observation of a burrowing owl during breeding season in Los Angeles was on 7/13/94 (LACM 2001).

Bath, pers. comm., 2003).¹¹⁹ There are probable breeding records from Santiago Springs in 1903, Seal Beach in 1908, Corona del Mar in 1957, and Irvine in 1968 (CSULB 2001; LACM 2001; NMNH 2001; UCSC 2001).¹²⁰ As early as the 1930s, the burrowing owl in western Orange County was noted to be “far less common than it used to be” according to Robertson (1931), due to the elimination of ground squirrels.

Further owl declines due to development and human impacts were evident in western Orange County before 1960, with documentation of local extirpations and habitat loss in Costa Mesa, Newport Beach, and Santa Ana (J. Bath, pers. comm., 2003).¹²¹ Still, the burrowing owl in Orange County between 1960-1975 could best be described as “abundant,” and for a raptor, “bordering on ubiquitous” throughout the grasslands and non-orchard agricultural areas (P. Bloom, pers. comm., 2002). Burrowing owls were at that time a “regular component” of the coastal Orange County environment in Seal Beach, Huntington Beach, Fountain Valley, Newport Beach, Irvine, Mission Viejo, Corona del Mar, Costa Mesa, Laguna Niguel, and portions of Santa Ana (P. Bloom, pers. comm., 2002). Most vacant fields or flat agricultural acreages greater than 5 acres within 5 miles of the coast had their own pair or colony of owls (P. Bloom, pers. comm., 2002).

Significant nesting burrowing owl colonies were noted along the coast of Orange County from the 1970s to the early 1990s (including Seal Beach, Bolsa Chica, Huntington Beach, Newport Beach, and Irvine), with nesting also observed in southeastern Orange County in 1973 (Wiley 1975; Collins and Landry 1977; UCI 1995; CNDDDB 2001; CSULB 2001).¹²² However, by 1985 less than 10 pairs of owls remained countywide,

¹¹⁹ Eggs were collected from: Anaheim on 5/9/1886 and 5/19/1887 (FMNH 2001); an unspecified locality in Orange County on 5/2/1895 (4 sets) (SBMNH 2001); Anaheim Landing on 4/14/18; Newport Beach on 4/8/31; Buena Park on 5/8/35 and 5/7/38; Sunset Beach on 5/2/38; and near Cypress on 4/28/45 (WFVZ 2001). A burrowing owl nest with 6 eggs was photographed at Balboa Beach in April 1920 (LMDBL 2001). Robertson (1929, 1930) observed parents hunting for 6 young near Buena Park many times in June 1927, a brood of 4 young in 1928, and road-killed owls near Buena Park and Cypress. T. Howell (1964) reported on 2 owls taken from a burrow with 5 young birds at Los Alamitos in May 1958.

¹²⁰ Breeding season collection records include from: Santiago Springs on 8/14/1903 (NMNH 2001); Seal Beach on 3/30/08 (LACM 2001); Corona del Mar in August 1957 (CSULB 2001), and Irvine on 8/21/68 (UCSC 2001). Burrowing owls were reported to inhabit Upper Newport Bay from 1940-1955 (J. Johnson 1990).

¹²¹ J. Bath, Professor of Zoology at California State Polytechnic University, Pomona, compiled historical data for burrowing owls in Orange County (pers. comm., 2003). In the City of Costa Mesa: 6 pairs regularly nested in the earthen sides of Fairview Channel east of Placentia Avenue since 1957 - only 1 pair is nesting in 2003 (impact: unknown, but possibly pesticides from the adjacent Costa Mesa Golf Course); 3 pairs were regularly observed in squirrel burrows in the cliff of the Upper Newport Bay nearest the present Yorktown Lane between 1955 and 1972. Owls were last seen here in September 1972 - at that time the cliff was heavily used for rifle target practice by teenagers (impact: hunting with rifle/target practice) (J. Bath, pers. comm., 2003). In the City of Newport Beach: 2 pairs were nesting between 1955 and 1962 in the walls of a ravine opposite 2161 Mesa Drive, at that time the “Santa Ana Heights” neighbourhood of unincorporated Orange County. They were last seen in June 1962 (impact: grading of land for horse ranch expansion); 5 pairs regularly nested in a large ravine, known locally as “Fossil Gorge” in the Upper Newport Bay between 1955 and 1963. The ravine, now covered, was at the intersection of the present Eastbluff Drive and Backbay Drive (impact: grading for development); 1 paired nested in a burrow in an ancient Indian midden adjacent to Jamboree Road (now Backbay Drive) in the Upper Newport Bay between 1955 and 1964. Last seen in October 1964 (probable impact: some form of human harassment due to its high visibility from the road) (J. Bath, pers. comm., 2003). In the City of Santa Ana: 3 pairs were seen nesting regularly between 1956 and 1958 on a vacant lot at the northeast intersection of Main Street and Warner Avenue - last seen in October 1958 (impact: grading for development); 2 pairs were seen regularly between 1956 and 1959 on a vacant lot at the northwest intersection of Main Street and Warner Avenue - last seen in May 1959 (impact: grading for development); 2 pairs were seen nesting regularly between 1956 and 1958 along the west side of Warner Avenue between Garnsey Street and Flower Street opposite Washington Elementary School (impact: grading for development); 2 pairs were seen nesting regularly between 1956 and 1959 along the edges of a large agricultural field at the northwest corner of the intersection of Bristol Street and Warner Avenue (impact: grading for development) (J. Bath, pers. comm., 2003).

¹²² Twenty artificial nesting burrows were actively used by owls at Seal Beach Naval Weapons Station in 1975 (Collins and Landry 1977). Ten breeding pairs of owls were detected at Seal Beach in 1977; 2 birds were documented there in April 1980; and owls reportedly occupied the site in 1983 (CSULB 2001; CNDDDB 2001). 1 adult owl at a burrow was observed in the vicinity of Bolsa Chica Ecological Reserve, northwest of Huntington Beach, on 1/3/93 (threats there included oil extraction operations, non-native predators, and development) (CNDDDB 2001). A single owl was seen at Huntington Beach in May 1985 (CSULB 2001). 2-4 pairs of owls were observed at Upper Newport Bay Ecological Reserve, Newport Beach from 1980-1981, but none were observed in 1983 (this population is thought to be extirpated due to development and dredging to create Least Tern habitat). There is a non-breeding season record from Irvine in November 1981; a colony of 3-5 pairs of owls was observed northeast of UC Irvine in 1980 and 1981, but their status was unknown in 1988 (the area was under constant development pressure); 1 pair at a burrow site plus 3 other individual owls were observed at U. C. Irvine in April 1990 (the site was threatened by campus development) (CSULB 2001; CNDDDB 2001). Historically, breeding occurred on the U. C. Irvine campus, including at the U. C. Irvine Ecological Preserve, but there have been no observations on the Preserve since 1990 and suitable habitat on campus for nesting has been cleared for faculty housing and construction (UCI 1995). Nesting was observed in southeastern Orange County in spring 1973 (Wiley 1975). There also is a non-breeding season record from Santa Ana in November 1974 (CSULB 2001).

outside of the population at the Naval Weapons Station, Seal Beach (P. Bloom, pers. comm., 2002).¹²³ Extensive raptor nest surveys throughout the county have confirmed that breeding burrowing owls have since been nearly extirpated from Orange County (DeSante and Ruhlen 1995; P. Bloom, pers. comm., 2002). Now, the last remaining pairs of breeding owls in Orange County are located at Seal Beach, where numbers were down to 3 pairs or less in 2001 (4-5 pairs nested there between 1990-2000) (P. Bloom, pers. comm., 2002), and Fairview Channel in the City of Costa Mesa, where only 1 nesting pair remains (down from 6 pairs that regularly nested there since 1957) (J. Bath, pers. comm., 2003).

San Diego County

The burrowing owl was once widespread and quite common in coastal San Diego County. Van Dyke (1888) claimed that in the late 1860s in San Diego, “burrowing owls stood on every little knoll.” Emerson (1884) found the burrowing owl “not uncommon” in the Poway Valley in the 1880s, and Sharp (1907) noted it “common everywhere” around Escondido, based on 16 years of observations from 1891 to 1897. Historical records confirmed breeding at: Poway in 1884 and 1885; National City in 1895 and 1910; Escondido on numerous occasions from 1902 to 1931; La Presa before 1907; Point Loma in 1917, 1920, and 1922; near Santee in 1920 and 1921; Rancho Santa Fe in 1932; San Pasqual in 1902, 1906, 1907, 1910, and 1916; Oceanside in 1931; San Diego on numerous occasions from 1862 to 1936; and Crown Point in 1936. Probable breeding was documented at: San Diego in 1893 and 1894; Jacumba in 1894; San Onofre from 1904-1906; Chula Vista and San Luis Rey in 1908; Lemon Grove in 1914; Escondido in 1920; La Puerta Valley in 1922; and La Jolla in 1935 (Emerson 1884; Dixon 1906; Sharp 1907; Unitt 1984; AMNH 2001; CMNH 2001; FMNH 2001; MVZ 2001; NMNH 2001; SBMNH 2001; UCLA 2001; WFVZ 2001; CAS 2002a).¹²⁴ Breeding was confirmed at Twin Oaks between 1889 and 1894, at Witch Creek in 1906, and in the Santa Margarita Mountains in 1931. These observations as well as a specimen collected during breeding season at Oak Grove in 1892 suggest the species had occurred in the foothill zone of San Diego County as well (F. Merriam 1896; Unitt 1984; AMNH 2001; WFVZ 2001).¹²⁵

Burrowing owls apparently persisted in urban areas of San Diego into the 1930s (Abbott 1930a). Abbott (1930) noted owls had been driven away from downtown, but subsisted “wherever there is any extent of vacant land,” and were “common” between downtown and Mission Hills.¹²⁶ Further declines were noted in San Diego County in the 1970s (Remsen 1978). Usually only a single pair at a time was seen at a locality, with a maximum of 5 birds observed at North Island Naval Air Station, Coronado, in May 1978 (Unitt 1984).¹²⁷ Other localities still inhabited in the late 1970s included San Marcos, near Palomar Airport in Carlsbad, Mission Bay, Lower Otay Lake, and the Tijuana River Valley (Unitt 1984). Camp Pendleton had a small population of about 8 pairs of owls in 1972, but between 1975 and 2000 there have never been more than 2 pairs there and usually

¹²³ Seal Beach Naval Weapons Station was apparently used as a release area for owls relocated from land used for development projects (D. Cooper, pers. comm., 2002).

¹²⁴ Eggs were collected from: Poway in April 1884 and on 4/5/1885 (Emerson 1884; WFVZ 2001; FMNH 2001); National City on 5/17/1895 and 5/1/10 (MVZ 2001; WFVZ 2001); Escondido on 4/25/02, 5/6/02, 4/5/03, 4/12/04, 4/26/04, 6/3/05, 4/22/06, 5/2/13, 6/6/17, 6/8/17, 5/1/19, 5/10/24, and 4/15/31 (MVZ 2001; WFVZ 2001; AMNH 2001); Crown Point on 5/2/36 (NMNH 2001); Point Loma on 5/2/17, 4/18/20, 5/1/20, and 5/1/22 (WFVZ 2001); near Santee on 5/13/20 and 4/16/21 (WFVZ 2001); Rancho Santa Fe on 5/12/32 (WFVZ 2001); San Pasqual on 4/20/02, 4/22/06, 4/21/07, 3/18/10, and 4/20/16 (WFVZ 2001); Oceanside on 4/12/31 and 4/15/31 (WFVZ 2001); and San Diego on 4/3/1862, 6/22/1880, 5/11/1881, 4/5/1894, 5/13/1894, 4/23/1897, 5/19/12, 4/28/15, 4/27/20, 5/7/20, 4/9/31, 5/2/32, and 4/18/36 (AMNH 2001; SBMNH 2001; NMNH 2001; WFVZ 2001; CAS 2002a). Two juvenile bird specimens taken by Sharp (1907) at La Presa on August 28 still had some down. Unitt (1984) noted 41 historical collection records of eggs, from April 5 to June 8. Breeding season collection records of birds include: from San Diego on 3/30/1893, 6/28/1893, 7/27/1893, and 5/23/1894 (AMNH 2001; CMNH 2002); from Jacumba on 5/24/1894 (NMNH 2001); from Chula Vista on 5/31 and 6/2, 1908 (AMNH 2001) and San Luis Rey on 7/10/08 (UCLA 2001) and 7/12/08 (2 birds) (CAS 2002a); from Lemon Grove on 8/28/14 (UCLA 2001); from Bernardo Mountain south of Escondido on 4/28/20; from La Puerta Valley on 3/12/22 (MVZ 2001); and from La Jolla on 4/10/35 (NMNH 2001). Dixon (1906) saw 2 owl pairs in San Onofre from 1904-1906, but noted the species was “not common” there.

¹²⁵ Eggs were collected from the Santa Margarita Mountains on 4/11/31 (WFVZ 2001). Two juveniles were collected from Witch Creek on 8/22/06; single birds were also collected there in 11/1894 and on 5/30 and 8/24, 1904 (AMNH 2001). Burrowing owls nested at Twin Oaks between 1889 and 1894. F. Merriam (1896) once saw 9 owls sitting around one burrow. A bird was collected at Oak Grove on 4/11/1892 (Unitt 1984).

¹²⁶ Abbott (1930) observed owls from 1921 to 1930 in the heart of the business district, and in culvert drains of El Cajon Blvd. before it was paved. Owls were also heard throughout April 1930 at Monte Vista Ranch, 15 miles east of San Diego (Abbott 1930b).

¹²⁷ R. Stanley (pers. comm., 2001) observed a colony of burrowing owls (somewhere between 5-10 birds) during 1975-1978, while stationed on North Island.

just 1 pair inhabiting the entire 196 square mile reservation (P. Bloom, pers. comm., 2002). By the 1980s, owls were an “uncommon and declining resident” with only 7 definite breeding locations and 7 probable breeding locations remaining in San Diego County in 1984 (Unitt 1984).¹²⁸ Their range still included the entire coastal lowland of San Diego County, but urbanization had “greatly restricted the extent of suitable habitat” (Unitt 1984).

The burrowing owl is now on the verge of extirpation in San Diego County. As of 2001, only 6 confirmed breeding locations, 1 probable breeding location, and 1 possible breeding location remained in the County (P. Unitt, pers. comm., 2001).¹²⁹ A single individual recorded near Upper Otay Lake (brought to the attention of P. Unitt by a bulldozer operator) was probably the last in that area, and only a single pair nested near Lake Henshaw in 2001. Only North Island, Ream Field (Imperial Beach), and Otay Mesa are left as sites of populations with even short-term viability. Most or all of the Otay Mesa habitat is slated for development, and at the other 2 colonies the owls are discouraged because they prey on Least Terns (P. Unitt, pers. comm., 2001).¹³⁰

Southern California Islands

Grinnell (1915) noted that the species “occurs regularly on several of the Santa Barbara group of islands,” and Dawson (1923) described the burrowing owl as “one of the characteristic birds of the Santa Barbara Islands.” Although there have been observations of owls on all the islands off southern California, probable breeding records from all the islands except for San Miguel and Anacapa Islands, and apparent documented breeding on Santa Catalina, the resident status of the species has been controversial.¹³¹

Northern Channel Islands

Wintering owls are currently found on the northern Channel Islands but there are no breeding owls there (Jones and Collins 2003; B. Latta, pers. comm., 2003).

San Miguel Island

Local ranchers told Willett (1910) there were “a few” owls on San Miguel Island, but he observed none during June surveys. Owls were reportedly “numerous” in 1939 (Jones and Collins 2003). Not enough data are available prior to 1973 to assess its status earlier in the century (Jones and Collins 2003). Burrowing owls are currently an uncommon winter visitor to San Miguel Island and breeding at the present time is unlikely (Jones and Collins 2003).

¹²⁸ There was confirmed nesting reported during the 1980s in the Tijuana River Valley near the coast, at North Island Naval Air Station, and at Fiesta Island in Mission Bay; and reports of frequent owl sightings at southern “Delta Beach,” on Coronado Island (CNDDDB 2001).

¹²⁹ Recent CNDDDB observations include: 2 burrows, containing at least 8 birds, on Otay Mesa, on 7/26/93 (this site was threatened by extension of the Otay Mesa border crossing facility, but Caltrans was possibly to provide artificial burrows); an unknown number of birds and burrows at Kearny Mesa, in September/October 1993 (this site was threatened by development); and 1 adult owl along Black Mountain Road, east of Del Mar, on 3/4/99 (this site was threatened by residential development) (CNDDDB 2001).

¹³⁰ San Diego County Least Tern colonies have a long history of anti-predator measures conducted by U. S. D. A. Wildlife Services (formerly Animal Damage Control). The activities of this federal agency have contributed more to the recent extirpation pulse of burrowing owls along the San Diego coast than any other known form of mortality (P. Bloom, pers. comm., 2002).

¹³¹ There have potentially been several extirpations and immigrations on the islands. Lynch and Johnson (1974) characterized extirpations from the islands as “presumed,” since to their knowledge owls had never been proved to nest on any of the California Islands. Hunt and Hunt (1974) believed that since the burrowing owl is a notoriously wide-ranging visitor and vagrant, and may be an opportunistic invader of unoccupied areas, these extirpations and immigrations were likely to have been entirely natural events unaffected by man. However, Garcelon and Roemer (1990) enumerated poisoning and persecution of ground squirrels in the 1950s and 1960s, historical shooting, egg collecting, nest destruction, and trapping of bald eagles on the Channel Islands, activities which may also have negatively impacted or extirpated burrowing owls. One problem of evaluating burrowing owl status on the islands has been that they are a species easily overlooked by a short survey, and because of their mostly nocturnal habits, they are not easily observed except around known roosting or nesting burrows, and therefore definitive evidence of breeding is difficult to obtain (Jones and Collins 2003).

Santa Rosa Island

Streator (1888) mentioned that owls were “not very common” on July 3, 1892. Pemberton (1928) believed the species “should be present” on Santa Rosa Island. Although he did not see owls, he was told the species was there and given an accurate description by residents - ranchers in 1927 said that it bred there. There is one breeding season collection record from East Point on 3/13/50 (MVZ 2001). A ranch foreman told Diamond (1969) on July 12, 1968 that he saw burrowing owls “about two months ago.” The burrowing owl is currently an uncommon to infrequent winter visitor, and possibly a former breeding resident (Jones and Collins 2003).

Santa Cruz Island

Linton (1908a) reported owls to be “fairly common in suitable localities” on Santa Cruz Island. The burrowing owl is currently an uncommon winter visitor, with no indication of breeding, now or in the past (Jones and Collins 2003).

Anacapa Island

A. Howell (1917) reported owls were seen several times on Anacapa Island. All historical records but 1 (July 1967, 2-3 owls) are from October 1 to April 12 (Jones and Collins 2003). Burrowing owls apparently still inhabit Anacapa Island (Schoenherr et al. 1999; L. Dye, pers. comm., 2003), although a recent National Park Service project to poison invasive rats on the island reportedly killed 4 owls (FFA 2002).

Southern Channel Islands

Burrowing owls are thought to currently breed only on Santa Barbara and Santa Catalina Islands and appear to be only a transient or winter visitor on the other Channel Islands (Jones and Collins 2003).

Santa Barbara Island

A. Howell (1917) remarked that the species “seems to be lacking on Santa Barbara Island.” Despite active searches (Jones and Diamond 1976), burrowing owls were not found on this island until March 1927, when Pemberton (1928) located 2 birds on the southern part of the island. Owls were absent during surveys in 1939, scarce or absent in 1950 and 1958, and common from 1954 to 1957 (Sumner unpublished report, as cited in Jones and Diamond 1976; Jones and Diamond 1976). These sightings represent 1 extirpation event and 2 invasions of burrowing owls on the island (Hunt and Hunt 1974).

Diamond (1969) found 6 pairs present during the summer of 1968, and Hunt and Hunt (1974) found at least 3 and possibly 6 pairs resident there May through July 1972. Owls were seen almost daily and regularly flushed from burrows in 1968, 1972, and 1973. One or 2 pairs were seen in 1974, and 2 pairs were seen in 1975 and 1976 (Jones and Diamond 1976), however Murray et al. (1983) reported burrows but no owls found from 1975 to 1979. Drost and McCluskey (1992) reported on a small population of approximately 20 burrowing owls extirpated by barn owls in 1984 and again in 1987, following crashes in the deer mouse population. Drost and McCluskey (1992) estimated a population of 20-25 birds on the island from 1982-1987, with direct counts of from 13-18 birds in mid-winter roosts. Owls have bred on the island in most or all recent years (Jones and Collins 2003).

San Nicolas Island

Streator (1888) first recorded the species on San Nicholas Island in autumn of 1886. According to A. Howell (1917), Keeler (1907) also recorded the species there, and there is a record of uncertain breeding significance for 1945 (Jones and Diamond 1976). In 1963, W. Townsend (pers. comm., as cited in Jones and Diamond 1976) found a year-round population and defended burrow. The claim by Lynch and Johnson (1974) that W. Townsend noted no evidence of breeding apparently contradicts personal communication by W. Townsend (Jones and Diamond 1976). Despite 36 visits and over 1000 hours of field observations by Jones, Schreiber (1970), Diamond, and others in 1968, 1973, 1974, and 1975, the sole records were single sightings in

October 1974 and September and November 1975. Several individuals were seen between January and May 1976, but all these owls had left the island by mid-May. One extirpation of the species from San Nicolas Island between 1963 and 1968 can be assumed conservatively (Jones and Diamond 1976).

A few recent summer records (from May to August) suggest that owls may now be breeding in small numbers (Jones and Collins 2003). An alternative explanation is that the recent intensive survey effort on this island is turning up a few mid-summer strays that may have been overlooked in the past (Jones and Collins 2003).

Santa Catalina Island

Grinnell (1898), who saw a single owl on a hilltop in the interior of Santa Catalina Island in December 1897, was told that the species became “quite numerous” on the island at times. A. Howell (1917) saw a single owl several times in April 1911. Birds were collected from the island during breeding season in 1940 and 1941 (FMNH 2001; LACM 2001).¹³² According to Jones and Diamond (1976), breeding had been documented on the island. A maximum of 4 owls were seen on July 21, 1978 (Jones and Collins 2003). Burrowing owls were located during a survey of raptors on Santa Catalina Island between February and June 1994, and are still thought to be uncommon resident breeders on the island (CIC 2002; Jones and Collins 2003). Recent Breeding Bird Surveys suggest that numbers have declined on the island since the 1970s, but no direct comparisons are possible (Jones and Collins 2003). Some current and former breeding sites are Fisherman’s Cove, Upper Buffalo Reservation, the vicinity of Little Harbor, and Middle Canyon (Jones and Collins 2003).

San Clemente Island

Breninger (1904), Keeler (1907), and Linton (1908c) all collected specimens here and referred to the species as “resident,” and A. Howell (1917) noted that owls could be found in some numbers on certain parts of San Clemente Island. There is a breeding season collection record from the island on 3/24/18 (DMNH 2001). A nest with 2 or more small young was found during the summer of 1975 (Jones and Collins 2003), and according to Jones and Diamond (1976), breeding had been documented on the island. The burrowing owl is currently a regular winter visitor in small numbers, and has bred at least once recently (Jones and Collins 2003). With one exception, all modern records have been from September through April, with a maximum of 7 owls seen on November 10, 1996 (Jones and Collins 2003).

Western Riverside County

Historical records confirmed breeding at Riverside from 1878 to 1890 and at Norco in 1927; and indicated probable breeding in Riverside in 1892 and 1893, at San Jacinto Lake in 1895, at Lake Elsinore in 1907, at the base of the San Jacinto Mountains in 1908, and near Moreno in 1941 (Bailey 1917; AMNH 2001; MVZ 2001; NMNH 2001; UWBM 2001; WFVZ 2001; CAS 2002a).¹³³ Single nesting pairs documented in La Sierra and Norco in the 1980s were extirpated by the early 1990s (J. Bath, pers. comm., 2003).¹³⁴ Significant breeding colonies were documented at the San Jacinto Wildlife Area, near Lakeview, and at Lake Perris State Recreation Area (“SRA”) in the 1980s (CNDDDB 2001; LACM 2001).¹³⁵

¹³² There are collection records from an unknown location on 3/8/41 (LACM 2001), from Haypress Canyon on 3/1/40 (FMNH 2001), and from Little Harbor on 2/29/40 (FMNH 2001).

¹³³ Eggs were collected at Riverside on 4/28/1878 (WFVZ 2001), 5/13/1882 (NMNH 2001), 4/16/1886 (WFVZ 2001), 4/13/1887 (WFVZ 2001), 5/8/1888 (UWBM 2001), and 4/14/1890 (UWBM 2001); and an immature bird was collected from Norco on 5/22/27 (MLZ 2001). Breeding season bird collection records include: Riverside in April 1893 (NMNH), 11/18/1887, 12/24/1891 (2 birds), on 4/8/1892, and 4/13/1892 (MVZ 2001); San Jacinto Lake on 6/25/1895 (AMNH 2001); Lake Elsinore in summer 1907 (Bailey 1917); the base of the San Jacinto Mts., at Cabazon on 5/23/08; Bannly (Banning?) on 6/12/08; Valle Vista on 9/2/08 and 9/4/08 (MVZ 2001); and 2 miles north and 2 miles west of Moreno on 3/9/41 (CAS 2002a).

¹³⁴ In the City of La Sierra 1 pair was seen nesting between Collett Elementary School and Collett Park between 3/02/1985 through 8/1987 (impact: grading for development) and in the City of Norco 1 pair was seen regularly since 1982 at an open field at the northwest intersection of California Avenue and Seventh Street - last seen in 1992 (impact: burrows became over-grown with rye grass) (J. Bath, pers. comm., 2003).

¹³⁵ A colony of “many” owls was observed in 1980 at Lake Perris State Recreation Area (CNDDDB 2001). Sightings in 1982 at the San Jacinto Wildlife Area include: an active burrow with 2 adults and 5 fledged young, 2 miles north of Lakeview; an active burrow with 2 birds, 1.5 miles north-northeast of Lakeview; 2 birds one-half mile north of Lakeview, on May 26 and May 28; 2 adults and 4 fledged young approximately 2-4 miles

The U. C. Riverside database developed for the Western Riverside County Multi-Species Habitat Conservation Plan (“MSHCP”) includes approximately 82 records of burrowing owls within the past 10 years in the area. The Western Riverside MSHCP documents that owls have been detected east of the Jurupa Mountains, along the Santa Ana River, at Lake Mathews, at Good Hope, Alberhill, Murrieta, March Air Reserve Base, the Lake Perris/Mystic Lake area, the Badlands, within the vicinity of Beaumont and Banning, San Jacinto, Valle Vista, between the San Jacinto River and Lakeview Mountains, west of Hemet, the area around Diamond Valley Lake, east and south of Lake Skinner, along Santa Gertrudis Creek and Tualota Creek, in Long Canyon, and along De Portola Road (Dudek and Associates 2002). Historically, there were a large number of owl locations concentrated within the Moreno Valley area, however due to urban development, the number currently within this area is unknown (Dudek and Associates 2002).

Through 2001, there were small breeding populations of burrowing owls remaining in southwestern Riverside County in the vicinity of Perris, Lakeview, and Temecula, and a colony (15 adults and 10 juveniles in 1999) near the Pechanga Indian Reservation (CNDDDB 2001).¹³⁶ California State Parks Inland Empire District staff conducted thorough burrowing owl surveys in suitable habitat at Lake Perris SRA and San Jacinto Wildlife Area (“SJWA”) during the nesting season of 2002 (La Claire 2002). At Lake Perris SRA, a total of 12 owls and 7 sites were recorded, and at SJWA 32 owls and 10 sites were observed (La Claire 2002). Owls are currently nesting at March Air Force Base in artificial nest boxes, however portions of this base are now decommissioned and no agency or entity has responsibility for protecting or maintaining these nest boxes (P. Bloom, pers. comm., 2001). Most remaining owl colonies in western Riverside County are very small, highly fragmented, unprotected, and on the brink of extirpation through 2002 (P. Bloom, D. Cooper, pers. comm., 2002).

Southwestern San Bernardino County

Historical records confirmed breeding near Highlands in 1896 and 1897, near Chino in 1916, and at San Bernardino in 1883, 1885, 1886 and 1899; and indicated probable breeding at Redlands in 1902-03, near Oak Glen in 1910, near Chino in 1915 and 1926, and near San Bernardino in 1883, 1886, 1892, and 1928 (Hartzell 1888; Stephens 1902; Willett 1912; Van Rossem 1914; CHAS 2001; CMNH 2001; FMNH 2001; MVZ 2001; NMNH 2001; WFVZ 2001; CAS 2002a).¹³⁷ Egg collector H. Edwards reported owls to be “fairly common”

north of Lakeview; an active burrow with 1-2 birds, 2.6 miles north of Lakeview, from September through early October; and up to 4 birds 2.8 miles north of Lakeview, during July (CNDDDB 2001). Owls were also seen at Riverside on 8/31/1982 (LACM 2001), and near Romoland (2 burrows and 2 owls) on 10/7/89 (CNDDDB 2001).

¹³⁶ Recent CNDDDB sightings in the vicinity of Perris include: 4 occupied burrow sites in 1997, located within a 2 mile stretch of the Perris Valley Drain, 1 mile east of Perris (2 burrows being used by 2 adults and at least 1 juvenile were seen during surveys May 19-27, 1997; 2 adults were observed at a burrow site during surveys May 19-27, 1997; 2 adults and at least 1 young were observed at one burrow and 2 adults and at least 4 young at a second burrow) (these owls were threatened by the pending excavation of the Perris Valley Drain and were to be passively relocated); 2 adults at a burrow off Goetz Road, 3.5 miles south of Perris, on 3/30/99; and 2 adults and 4+ juveniles at a nearby burrow on 5/10/99 (CNDDDB 2001). Surveys at the Lake Perris State Recreation Area found 15 owls occupying 9 burrows in June 2000, 4 owls occupying at least 3 burrows in July 2001, and 12 owls at 7 burrows from May through July 2002 (California Department of Parks and Recreation, unpublished data).

Recent CNDDDB sightings in the vicinity of Lakeview include: 2 adults and 2 active burrows approximately 2 miles southeast of Lakeview, in 1992 (these owls were threatened primarily by construction of a flood control dam, secondarily, by an increasing rural population); and 1 adult with 2 fledged juveniles near the junction of Hwy. 74 and Warren Road, San Jacinto Valley, on 10/7/98 (by 10/9/98 this site had been disked, and the owls had not been seen there since – their remaining habitat was threatened by disking and mowing and future development) (CNDDDB 2001).

Recent CNDDDB sightings in the vicinity of Temecula include: 1 owl at a burrow at Temecula, on 11/2/94 (owls here were threatened by development, grading and disking, roads, dumping, and burning); 2 adults at a burrow 1 mile south of Lake Skinner, from 3/11/98 through 4/27/98 (this site was threatened by a proposed residential subdivision); 1 adult at a burrow 1 mile southwest of Skunk Hollow, on 5/8/99 (this site was threatened by grading and disking and existing and planned development); 1 adult at a burrow on the south side of Wilson Valley, 3 miles north of Aguanga, from March to June 1999; and a large colony of 25 owls (15 adults, 10 juveniles) at Redhawk Golfcourse, just north of Pechanga Indian Reservation, on 7/1/99 (CNDDDB 2001).

¹³⁷ Eggs were collected from: an unspecified location in San Bernardino County in April 1887 (Hartzell 1888); east Highlands on 4/11/1896 and 4/3/1897 (Willett 1912; WFVZ 2001); San Bernardino on 4/28 and 4/29/1883 (Stephens 1902) and 5/2/1899 (WFVZ 2001); and near Chino (2 sets) on 4/16/16 (WFVZ 2001). An owl chick was collected from San Bernardino on 5/08/1885 (NMNH 2001). Breeding season collections and observations of birds include: San Bernardino on 4/20/1883, 3/18/1886, 5/31/1886 (2 birds), and 4/28/20 (CHAS 2001; CMNH 2002; CAS 2002a); Redlands (5 birds) between 12/31/02 and 2/14/03 (FMNH 2001); between Oak Glen and Beaumont in summer of 1910 (Van Rossem 1914); Los Serranos Country Club near Chino on 5/4/26 (MVZ 2001); Reche Canyon, 4 miles south of San Bernardino on 6/11/28 (MVZ 2001); and 3 miles south of Chino on 3/3/15 (FMNH 2001).

near Chino in 1916, noting a colony of several dozen pairs and collecting 2 egg sets (WFVZ 2001). Scattered observations around San Bernardino County include a breeding colony observed near Lockhart in the 1970s, and probable breeding at Joshua Tree National Monument in 1961 and in the Lucerne Valley in 1981 (CNDDDB 2001; CSULB 2001; UCSB 2001).¹³⁸

Small numbers of breeding owls in Redlands, Colton, Rancho Cucamonga, and Chino Hills have been extirpated recently (J. Bath, pers. comm., 2003).¹³⁹ Remaining breeding owl populations in western San Bernardino County in the vicinity of San Bernardino, Chino, and Ontario continue to decline due to impacts by development and human harassment (CNDDDB 2001; J. Bath, pers. comm., 2003).¹⁴⁰ As of 2003, an estimated 56+ owl pairs remain in Chino and an estimated 40+ pairs remain in Ontario; all of these owls live in habitat

¹³⁸ 3 pairs of owls (1 pair with at least 2 young) and a burrow with 4 immature owls were seen in the Harper Lake Marsh area, northeast of Lockhart, in 1978 (CNDDDB 2001). Single owls were collected from Joshua Tree National Monument in May 1961 (CSULB 2001) and from Lucerne Valley on 8/3/1981 (UCSB 2001).

¹³⁹ In the City of Redlands, 2 pairs were seen nesting at southwest corner of the intersection between California Street and Lugonia Avenue during the 1985-1991 seasons (impact: grading for development) (J. Bath, pers. comm., 2003).

In the City of Colton, within the "Agua Mansa District," approximately ¼ mile east of Pepper Avenue and approximately 1/8 mile north of Slover Avenue, 2 owl pairs were observed occupying abandoned coyote dens on August 31, 1991. This unusual site was vegetated by plant species consistent with the Delhi Sands segregate of the Riversidian form of Coastal Sage Shrub, and was also occupied by Delhi Sands Flower Loving Fly (*Rhaphiomidas terminatus abdominalis*) habitat. Grading of site by Union Pacific (?) Railroad, in part, triggered the listing of this fly on Sept. 23, 1993. Impact: grading of railroad easement for unknown reason. Another owl pair was seen nesting in Colton on 6/19/2002 in a rock outcropping between Pellister Road and La Cadena Lake, but these owls have not been seen since (impact: disturbance due to adjacent grading for development) (J. Bath, pers. comm., 2003).

In the City of Rancho Cucamonga, 3 pairs were seen occupying burrows in earthen flood control ditch at southwest corner of the intersection between Haven Avenue and Fourth Street between 1992 and 1999, but not since (impact: modification of earthen flood control channel and grading of adjacent land) (J. Bath, pers. comm., 2003).

In the City of Chino Hills, 1 pair nested between 1992 and 2002 on San Antonio Channel approximately 200 meters north of Grand Avenue – owls were last seen December 6, 2002 (impact: disturbance due to adjacent grading for development) (J. Bath, pers. comm., 2003).

¹⁴⁰ In San Bernardino, an undetermined number of owls utilized a burrow site at Norton Air Force Base in 1983 (this site may be threatened by development due to base closure); 2 adults, 4 juveniles, and 4 burrows with signs of recent activity were observed in West Colton on 8/15/98 (this site was threatened by proposed development); and 2 adults were observed at a burrow site between south Fontana and Crestmore, on 8/20/98 (threats to these owls include disking and proposed development) (CNDDDB 2001).

In the City of Chino: 1 pair was seen at the Agricultural Department grounds of Don Antonio Lugo High School between 4/03/1984 and 5/22/1988 (probable impact: increased student activity); 3 pairs nested at the southeastern corner of Chino Avenue and 12th Street (Hottinger Family Meats Company at 5437 Central Avenue) from 3/22/1982 to 8/03/1990, and 1 juvenile was found dead by road kill 5/13/1991 on Chino Avenue at the northern edge of this location (probable impacts: disturbance of habitat by freight trucks using site to turn around; trapping of squirrels – on several occasions a man was seen attempting to trap ground squirrels at the site by using a wooden crate); 1 pair nested at the rear corporate yard of a company at 13445 12th Street during the 1994 nesting season (impact: nest abandonment due to harassment - an employee was observed throwing rocks at the owls); 1 pair nested regularly in drainage pipe on the back lot of a shopping center opposite the U.S. Post Office on Walnut Avenue during the 1991 and 1992 nesting seasons - there was a sudden (after one week) disappearance of the owls and squirrels (suspected impact: grading and use of rodenticide - a man was observed placing a rodenticide into adjacent squirrel burrows); 1 pair was seen regularly nesting at 14622 Ramona Avenue (now the Caliber Collision Center) between 1982 and 1991 (impact: grading for development); 2 pairs were seen at 4201 Eucalyptus Avenue adjacent to San Antonio Channel between 10/05/1977 and 3/22/1986 (impact: grading for development); 1 pair was seen to nest 3/22/1982 to 12/26/1991 at the vacant dairy at the southwest corner of the intersection of Edison Avenue and Cypress Channel (impact: grading for development); 2 pairs were seen to nest 3/22/1982 to 12/26/1984 in a vacant lot at the northeast corner of the intersection of Edison Avenue and San Antonio Avenue (impact: grading for development); 1 pair nested regularly on the eastern bank of San Antonio Channel at the Inland Empire Utilities Agency's Waste Water Reclamation Facility at 14950 Telephone Avenue - the owls were last seen on 6/11/1996; 11 pairs occupied burrows since March 1976 in back lot corporate yards in the large area bounded by Chino Avenue (to the north), Benson Avenue (to the east), Schaefer Avenue (to the south), and 12th Street (to the west), declined due to grading of back lot corporate yards - 3 pairs continued nesting at 13382 Benson Avenue (front yard of Rapid Industrial Plastics Company, Inc.) until the nesting season of 1991 (impact: corporate workers plugged burrows with wire, bottles, and other objects during their lunch hour, landscaper of property plugged burrows with gravel and grass cuttings); 4 pairs were observed nesting on a vacant lot on 12th Street approximately 60 meters north of the County of San Bernardino County Junior Fair Grounds since 1988, declining to 2 pairs – a development proponent's consultant installed one-way doors on the burrows of these pairs (impact: grading for development, use of one-way doors); 1 pair was observed in a corporate graveled parking lot on 12th Street approximately 120 meters north of the County of San Bernardino County Junior Fair Grounds until 1993 (impact: a man was seen shooting at the owls and attempting to trap the owls with a wooden crate); 2 pairs were observed nesting on the grass parking lot of the County of San Bernardino County Junior Fair Grounds between 1983 and 1994 (impact: burrow destruction due to increased vehicular use) (J. Bath, pers. comm., 2003). Four active owl burrows with evidence of long-term use and 6 owls (including 3 juveniles) were observed along the southern bank of San Antonio Channel "Chino Creek," west of Chino State Prison, on 9/14/86, 3 adult owls were also seen here on 1/30/88 (CNDDDB 2001); owls abandoned the site when the San Bernardino County Department of Transportation and Flood Control ceased weed abatement and tumbleweed (*Amaranthus albus*) overgrew the burrows (J. Bath, pers. comm., 2003).

In the City of Ontario, 3 pairs were seen occupying burrows until 2002 along fence line adjacent to Hwy. 15 (Ontario Freeway), approximately 460 yards north of Jurupa Avenue (impact: grading for development) (J. Bath, pers. comm., 2003).

An adult owl was observed northeast of Baldy Mesa from March 23 to June 10, 1989 (CNDDDB 2001; USBLM 2002), but owls are unlikely to breed there (D. Cooper, pers. comm., 2002).

threatened by development (J. Bath, pers. comm., 2003).¹⁴¹ Most remaining owl colonies in western San Bernardino County are small, highly fragmented, unprotected, and now on the brink of extirpation (P. Bloom, pers. comm., 2002).

G. IMPERIAL VALLEY

The majority (71%) of the state burrowing owl population, an estimated 5,600 to 6,570 nesting pairs, inhabits the Imperial Valley (DeSante and Ruhlen 1995; DeSante et al. in press). Burrowing owls in the Imperial Valley are commensal with the round-tailed ground squirrel (*Spermophilus tereticaudus*) and now occur almost exclusively in un-lined earthen banks along irrigation ditches. Historically, burrowing owls within the Imperial Valley were present in low densities, similar to populations in the undisturbed deserts surrounding the valley (DeSante et al. 1997; Rosenberg and Haley 2003). Along with the intensification of agriculture in the 1900s, the burrowing owl population in the Valley grew to one of the largest and most dense populations in California. Coulombe (1971) estimated 3.3 pairs/km² within an 8-km² area of the Imperial Valley during the 1966-67 breeding season. Coulombe (1971) also estimated that 20-25% of the Imperial Valley breeding owl population remains during the winter, with probable immigration from the north and emigration to the south. Even though there is winter immigration, Imperial Valley owls are thought to be reproductively isolated from owls in other areas (Rosenberg and Haley 2003).

Historical records confirmed breeding at Silsbee in 1909, at Toros in 1928, at an undisclosed location in the Imperial Valley in 1931, near Westmoreland and east of El Centro in 1934, at Greason Slough in the 1960s, at Salton Sea National Wildlife Refuge in the 1980s, and at Palo Verde in 1984; and indicated probable breeding at Calipatria in 1922 and 1988, at Westmoreland in 1956, and at Seeley in 1977 (Coulombe 1971; CNDDDB 2001; CSULB 2001; LACM 2001; MVZ 2001; SBCM 2001; UCLA 2001; UCSB 2001; WFVZ 2001).¹⁴² Coulombe (1971) observed owls commonly during the 1960s along canal banks throughout the year, calling them a “conspicuous feature” of irrigated farmlands. Population studies conducted by Coulombe (1971) southwest of El Centro revealed owl densities ranging from 1 to 16.3 owls per mile along Greason Slough and the New River. Coulombe (1971) was able to locate and band 19 owls from one-half mile of continuous habitat along the Dahlia Drain Canal, near El Centro, and estimated a density of 20-25 owls per square mile there from 1966-1967. There are insufficient data to determine if this population declined from the mid-1980s to the early 1990s (DeSante and Ruhlen 1995). Recent owl observations have been recorded near El Centro and at

¹⁴¹ In the City of Chino: there are approximately 30+ owl pairs in Chino’s sphere of influence area known as “Subarea 2” currently under pre-annexation planning (General Plan Amendment EIR, SCH # 2000121036), with development recently approved on 3/25/2003 (2,447 acres are planned for 8,064 homes, commercial, and public facilities); there are 7 owl pairs on approximately 717 acres of “surplus real property” of the California Institute For Men that is being sold by the Department of General Services (“DGS”) for the development of a 100-acre college campus, up to 2,200 residential homes, an elementary school, recreational parks, and a business center - an environmental impact report is expected to be circulated in 2003; 8 owl pairs reside on an additional 2,500 acres DGS is studying whether or not to sell for development; 14 pairs were documented nesting in 1980 on grass turf at the airport entrance of the Chino Airport, owned and operated by the County of San Bernardino – this population has declined to 6 pairs last seen on 2/15/2003 (impact: reduction of foraging habitat by grading, increase in airport pedestrian activity on turf) and is threatened by proposed urbanization under the Airport Master Plan revision; 9 pairs were seen on the banks of Cypress Channel between Chino Avenue and Edison Avenue since 1974 - these have declined to only 2 pairs seen on 3/21/2003 (impact: loss of adjacent foraging habitat by grading; plugging of nests by field crews of the County of San Bernardino Department of Transportation and Flood Control); and 3 pairs are currently nesting at the water detention basins of the Martin Verhoeven Dairy at 6718 Eucalyptus Avenue - this site is zoned for eventual residential development (J. Bath, pers. comm., 2003).

In the City of Ontario, approximately 40+ pairs of owls occurring on the 8,200 acres of the City of Ontario’s Annexation Area No. 163 (formerly known as Ontario’s Sphere of Influence of the San Bernardino’s Agricultural Preserve) are threatened by future development (J. Bath, pers. comm., 2003).

¹⁴² Confirmed breeding observations include eggs collected at: Silsbee on 4/5/09 and 4/6/09 (MVZ 2001); Toros in the Salton Sink on 4/1/28 (WFVZ 2001); an unidentified locale in the Imperial Valley on 5/26/31 (WFVZ 2001); 3.5 miles northeast of Westmoreland on 4/18/34 (SBCM 2001); 7 miles east of El Centro on 5/30/34 (SBCM 2001); and Palo Verde in April 1984 (WFVZ 2001). Coulombe (1971) documented extensive nesting along Greason Slough in the 1960s - at least 20 owls were seen along 1 to 1½ miles of irrigation canals near Vendel Road and Bannister Road, at the south end of the Salton Sea NWR. Probable breeding observations include birds collected at: Calipatria on 4/3/1922 (LACM 2001); Westmoreland (2 females) in February 1956 (CSULB 2001); Seeley on 8/06/1977 (UCLA 2001); Salton Sea Beach on 3/19/1983 (UCSB 2001); and at least a dozen owls and their burrows reported along Gentry Road, southwest of Calipatria, in 1988 (CNDDDB 2001).

Calipatria (CNDDDB 2001; LACM 2001).¹⁴³ Rosenberg and Haley (2003) estimated a current owl density of 8.3 pairs/km² at the southern rim of the Salton Sea in the Imperial Valley, one of the highest densities of burrowing owls reported.

H. COACHELLA VALLEY

Breeding populations of the burrowing owl historically resided in the Coachella Valley, which encompasses the central 15% of Riverside County, the northeastern 5% of San Diego County, and the central-northern 5% of Imperial County (DeSante et al. 1996).

Forty historical locations have been recorded for burrowing owls in the Coachella Valley (CVAG 2001), including confirmed breeding at Thermal and Indio in the 1920s (SBCM 2001).¹⁴⁴ The majority (36 of 40) of these observations were during the spring and summer months, which probably indicated resident birds, potentially on breeding territories (CVAG 2001). However, an influx of wintering burrowing owls may occur in the Coachella Valley, and the known location information for this species does not allow a determination of wintering birds, as the month of observation is not consistently reported (4 of the known locations report only the year of observation).

Prior to urban development, burrowing owls were regularly observed in empty lots along Washington Avenue in Bermuda Dunes and around the Palm Springs Airport (CVAG 2001). Surveys in the early 1990s found no owl pairs in the Coachella Valley despite the fact that small populations existed there in the 1980s, and breeding owls have apparently been extirpated from the Coachella Valley (DeSante et al. 1996).

There is some belief that some owls may still occur along roads and levees in agricultural areas at the eastern end of the Coachella Valley, within lands covered by the Coachella Valley Multi-Species Habitat Conservation Plan, and there are a handful of recent breeding season observations of owls in the Coachella Valley (USFWS 1995; CNDDDB 2001; LACM 2001).¹⁴⁵ However, biologists from CDFG and the Coachella Valley Water District who routinely visit the agricultural drains and associated levees around the Salton Sea reported only 1 recent burrowing owl observation in the Coachella Valley (CVAG 2001).

I. SOUTHERN DESERT RANGE

The range of the burrowing owl in southern desert areas encompasses the eastern 85% of Inyo County (excluding the Panamint Range); the southeastern 30% of Kern County; all but the southwestern 15% of San Bernardino County; the northeastern 30% of Los Angeles County; the eastern 50% of Riverside County (excluding the Coachella Valley); the eastern 50% of San Diego County; and 50% of Imperial County (excluding the Imperial Valley) (DeSante et al. 1996).

Burrowing owls in the southern desert range are in small, scattered populations, and have historically never been common (DeSante et al. 1996). Grinnell and Swarth (1913) believed burrowing owls were “very rare or entirely absent on the desert side of the [Peninsular] range.” Garrett and Dunn (1981) gave an overview of the owl’s distribution in southern California deserts: “It is quite scarce on the northern deserts from the e [east] Mojave Desert north through Inyo Co...While it is largely resident in the region there is some winter

¹⁴³ Eight owls were seen along the Eucalyptus Lateral 2 Canal, 3 miles southwest of El Centro, on 12/11/90 (CNDDDB 2001), and birds were collected from Calipatria on 6/18/1995 and 6/16/1999 (LACM 2001).

¹⁴⁴ Eggs were collected at Indio on 3/20/27 and at Thermal on 4/21/29 (SBCM 2001). There are historical breeding season records from Indio on 3/2/42 and at an unspecified location in the Coachella Valley on 5/9/81 (LACM 2001). There are historical photographs from the Coachella Valley of 2 adult owls near a burrow at Thermal in August 1955, 2 birds south of Mecca in May 1955, and nest holes at Mecca in May 1955 (CAS 2002b).

¹⁴⁵ Recent breeding season observations include 1 owl at Willow Hole on May 9-10, 1995 (USFWS 1995); 1 owl at Mecca on 8/2/96 (LACM 2001); and 1 owl near a burrow site near the Coachella Canal, northeast of Thermal, on 4/7/2000 (CNDDDB 2001).

movement of more northerly birds into the southern and coastal parts of the region...Open desert scrub is widely but sparsely inhabited.”

Displacement of owls due to development in the Coachella Valley may have slightly increased owl numbers in southern desert areas, as they became merely uncommon rather than rare (Weathers 1983). Breeding bird surveys between 1980 and 1989 indicated increasing numbers of owls in the lower Sonoran deserts and lower Colorado River Valley in southeastern California (Haug et al. 1993). It is thought that the burrowing owl may have expanded into the lower Colorado River Valley with the expansion of agriculture because this species was not reported from the valley in the early part of the century (Grinnell 1914; K. Rosenberg et al. 1991). Owls are now considered a fairly common resident in the valley (Rosenberg et al. 1991; D. DeSante, pers. comm., 2003), with a decrease in abundance in the northern areas of the valley in winter (Rosenberg et al. 1991).

DeSante et al. (1996) did not survey the southern desert range of the burrowing owl, and there is virtually no published literature on the distribution or seasonal movements of owls in the Mojave Desert (Campbell 1999). Campbell (1999) compiled 53 records (only 13 of which have specific locales and dates, with probable or confirmed breeding at 5 locales) of burrowing owls within the West Mojave Plan Area (“WMPA”), which are thought to represent a small sample of the locations where owls have recently been or are currently present. Although no focused owl surveys have been done, Campbell (1999) indicated that the species is currently “uncommon, local or patchy in occurrence, and currently in slow decline,” and believes the total breeding population within the WMPA could be in the range of a few hundred pairs.¹⁴⁶ S. Myers, (pers. comm., 2002) believes that that owls are “locally rare to uncommon” and declining in the West Mojave, noting they have disappeared from a number of locations due to urban development.

Inyo County

There are historical records of breeding populations in the Owens Valley, Death Valley, and the Panamint Mountains and confirmed breeding at Bishop in 1939 (Fisher 1893; Grinnell 1923; Gilman 1934; Wauer 1962, 1964; MVZ 2001; NMNH 2001; SDMNH 2001).¹⁴⁷ Pettingill (1981) reported burrowing owls nesting at Death Valley National Monument and residing all year in the Owens Valley, from Bishop southward. Garrett and Dunn (1981) reported the species “quite scarce” on the northern deserts from the East Mojave Desert north through Inyo County. There are records of breeding owls at China Lake Naval Air Weapons Station (“NAWS”) from 1978 to 1984 (USBLM 2002),¹⁴⁸ and there apparently was a small colony of about 6 pairs of owls there in the mid-1980s (P. Bloom, pers. comm., 2002). Burrowing owls still occur at China Lake NAWS, but the Base management plan offers no detailed information and does not provide any specific

¹⁴⁶ The 9.4 million-acre West Mojave Plan Area encompasses most of California's western Mojave Desert. It extends from Olancha in Inyo County on the north to the San Gabriel and San Bernardino Mountains on the south, and from the Antelope Valley on the west to the Mojave National Preserve on the east. Although most of this area coincides with the southern desert range excluded from surveys by DeSante et al. (1996), there is some overlap with areas in eastern Los Angeles County and southwestern San Bernardino County that are covered in Section VI.F on southwestern California.

¹⁴⁷ Eggs were collected from Bishop on 6/30/39 (SDMNH 2001). In the Owens Valley, eggs were collected from Laws on 4/23/16 (MVZ 2001); and birds were collected during breeding season from the Owens Valley on 6/26/1891 (NMNH 2001), from Laws on 4/23/16 and 7/7/17 (MVZ 2001), from 2.5 miles southeast of Lone Pine on 6/12/17 (MVZ 2001), and from 2 miles north of Independence on 6/30/17 (MVZ 2001).

Grinnell (1923) concluded that burrowing owls were “native in, and doubtless breed ‘at large’ in” Death Valley, based on his 1917 study of the area. Gilman (1934) observed a burrowing owl in Death Valley from 1933 to 1934 and Wauer (1962) recorded the species there throughout the year, indicating that it was a permanent resident, and known to nest.

In the Panamint Mountains, Fisher (1893) found a nesting pair at Bennett Well; a single owl was collected from Emigrant Canyon, on 6/8/17 (MVZ 2001); and Wauer (1964), who noted that the owl was known to nest in valley alluvial fans of the eastern slope of the Panamint Range, found a single bird at its burrow on the Johnson Canyon fan in October 1961 and observed a single bird with no sign of a burrow or breeding near Harrisburg Flat in July 1959.

¹⁴⁸ Historical observations at China Lake Naval Weapons Center include: “especially high” numbers in 1978 in valleys in the Mojave “B” ranges; 12 sightings in March 1979; 1 owl seen in October 1979; 1 owl at Haiwee Spring on 7/7/80; 2-3 adults and 3 juveniles at the NWC Golf Course on 8/24/80; 1 owl at the sewage treatment plant on 6/9/81; a family group of 4 owls at Amity Spring in June 1982; 1 owl at Mesquite Spring in June 1982; 2+ owls near Mirror Lake in March 1984; 1 owl near Mirror Lake on 5/15/84; and 2 owls at an unspecified location on 8/13/84 (USBLM 2002).

conservation measures since owl is not a listed species (China Lake NAWS 2002). There is a recent breeding season observation east of the White Mountains in 1994 (CNDDDB 2001).¹⁴⁹

Southeastern Kern County

Historical records confirmed breeding at the Desert Tortoise Natural Area, northeast of California City in the 1970s, and indicated probable breeding at Mohave in 1918 (Berry 1973; MVZ 2001).¹⁵⁰ Burrowing owls have been observed regularly within the last decade at the Desert Tortoise Natural Area (M. Conner, pers. comm., 2002). Campbell (1999) compiled 23 records of burrowing owls within the 301,000-acre Edwards Air Force Base (“AFB”); all of these have no specific locale or date. Although there have been no focused surveys, burrowing owls have been seen nesting since 1999 in as many as 6 sites simultaneously on the western half of the Base, where more typical owl habitat exists; preliminary data suggest that there are far fewer owls on the eastern half of the Base (R. Montijo, pers. comm., 2003). The Base management plan does not provide any specific conservation measures since owl is not a listed species (Edwards AFB 2001), but the known nest sites and owls are under no immediate threat from development or other activities and the population appears to be stable (S. Myers, pers. comm., 2002; R. Montijo, pers. comm., 2003). There are also 2 known nest sites immediately to the west and south of the Base, where human encroachment and activity appears to be a problem (R. Montijo, pers. comm., 2003).

San Bernardino County

Garrett and Dunn (1981) reported the burrowing owl “quite scarce” in the East Mojave Desert, but “rather common in agricultural areas” within the Colorado River Valley.¹⁵¹ Burrowing owls were noted to breed in the Kingston Range, in northeast San Bernardino County, with observed owl densities of 1.4 birds/100 acres during summer surveys (Stone and Sumida 1983). There are historical reports of owls nesting at the train yards and the sewage plant in Barstow (USBLM 2002) and a burrow with up to 4 owls was observed at the train yards throughout the summer of 2002 (Rado 2002). There are recent breeding season records near Goffs (D. Cooper, pers. comm., 2002) and Victorville in the Mojave Desert (CNDDDB 2001; USBLM 2002).¹⁵² Burrowing owls still occur at Twentynine Palms Marine Corps Air Ground Combat Center (“MCAGCC”), but the management plan for the MCAGCC offers no detailed information and does not provide any specific conservation measures since the owl is not a listed species (MCAGCC 1996). Burrowing owls can still be found around Victorville (perhaps 10-15 pairs may remain), Apple Valley, Hesperia, and Lucerne Valley, but are declining due to rapid urban development (S. Myers, pers. comm., 2002). There is a report of a resident burrowing owl near El Mirage in 1991 (BWS 1991).

Northeastern Los Angeles County

There are historical nesting records from the Antelope Valley, in northeastern Los Angeles County (Daggett 1904; MVZ 2001; UCSB 2001).¹⁵³ It is conservatively estimated that a minimum of 10 breeding territories have been active in Antelope Valley most years between 1970-2000 (P. Bloom, pers. comm., 2002) and small numbers of breeding owls persist around Lancaster and Palmdale, however burrowing owls in northeastern Los Angeles County are declining and threatened by development pressure (CNDDDB 2001; D. Cooper, S. Myers, pers. comm., 2002).¹⁵⁴

¹⁴⁹ A single bird was observed southwest of Deep Springs College, east of the White Mountains, on 5/29/94 (CNDDDB 2001).

¹⁵⁰ A single owl was collected from Mohave on 3/15/18 (MVZ 2001), and Berry (1973) recorded breeding at the Desert Tortoise Natural Area, northeast of California City.

¹⁵¹ In the East Mojave, there is a non-breeding season collection record from 2 miles northeast of Kelso, on 1/3/38 (MVZ 2001). Along the Colorado River, it was reported in 1986 that a minimum of 5 owls were observed on the Fort Mojave Indian Reservation, approximately 5 miles north of Needles (CNDDDB 2001).

¹⁵² A burrowing owl was seen roosting at a burrow site at Victorville on 4/3/97 (USBLM 2002).

¹⁵³ Breeding season records of owls in the Antelope Valley include: Fairmont on 7/27/04 (MVZ 2001); Antelope Valley in June 1971; and Pearblossom on 6/11 and 6/12, 1972 (UCSB 2001). There are reportedly historical reports of owls nesting at the Poppy Preserve in Antelope Valley.

¹⁵⁴ Recent CNDDDB observations in Antelope Valley include: 10 fledglings seen 5 miles southwest of Rosamond, on 6/28/93; a fledged juvenile bird at Ave. B and 95th Street West, on 6/10/99; a family of owls at a burrow near Ave. B and 270th Street West in 1999 (1 owl in April and May, a female and young on June 6, and 2 adults and 6 juveniles on June 27); a burrow with fledged young near Ave. C and 250th Street West, on

Eastern Riverside County

Garrett and Dunn (1981) reported the burrowing owl to be “rather common in agricultural areas” within the Colorado River Valley.¹⁵⁵ Burrowing owls nested in Deep Canyon (south of Palm Desert), from the floor of the Coachella Valley to the base of the Santa Rosa Mountains (Ting and Jennings 1976; Weathers 1983). Other than reports of owls nesting in the Blythe area,¹⁵⁶ recent breeding season observations in eastern Riverside County could not be located.

Eastern San Diego County

Burrowing owls once nested in the Borrego Valley and probably in the Borrego Badlands in eastern San Diego County (Unitt 1984). A couple of pairs historically observed in the Borrego Springs area were apparently extirpated by the 1980s (Unitt 1984), but small numbers of owls are still likely to occur in the Anza-Borrego Desert (Unitt 2002). Recent breeding season observations in eastern San Diego County could not be located.

Imperial County (excluding the Imperial Valley)

Burrowing owls are reported to be common in agricultural areas within the lower Colorado River Valley (Garrett and Dunn 1981; Monson and Phillips 1981; Rosenberg et al. 1991; D. DeSante, pers. comm., 2003). Recent breeding season observations in eastern Imperial County could not be located.

6/11/99; an occupied burrow near 256th Street West and Ave. D, on 3/26/99; and an adult bird and presumed nesting near 110 Street West and Ave. B, on 5/19/99 (CNDDDB 2001). 1 adult owl was observed at a burrow site in the Anaverde Valley, southwest of Palmdale, on 10/7/2000 (CNDDDB 2001).

¹⁵⁵ Two adults were presumed to be breeding at a site 4.5 miles northwest of Blythe, along the Colorado River, in 1974 (CNDDDB 2001).

¹⁵⁶ Burrowing owls are reported to be “scarce,” in the Blythe area, with at best 12-14 pairs in the summer and 2 wintering pairs (R. Higson, pers. comm., 2002).

VII. POPULATION TRENDS

The western burrowing owl has declined significantly throughout its range in North America (Haug et al. 1993; DeSante et al. 1997; James and Espie 1997). The species was listed as endangered in 1995 in all the provinces in Canada in which it breeds (Haug et al. 1993) and is listed as threatened in Mexico (AGFD 1995). In the United States, it is listed as a federal Species of Special Concern. The majority of the mid-western and western states within the owl's range have listed the species: it is listed as endangered in Minnesota and Iowa (James and Ethier 1989; Marti and Marks 1989), threatened in Colorado (Anderson et al. 2001), and as a state Species of Special Concern in Kansas, Nebraska, Oklahoma, South Dakota, North Dakota, Montana, Idaho, Utah, Washington, Oregon, and California (Sheffield 1997a). It is estimated that California supports the largest remaining breeding and wintering populations of the species (James and Ethier 1989; DeSante et al. 1993; Anderson et al. 2001).

J. Barclay (pers. comm., 2001, using data from DeSante and Ruhlen 1995) estimates that breeding owls have been extirpated from approximately 8% of their former range in California during the last 10-15 years. Surveys by DeSante and Ruhlen (1995) and information in this petition document that breeding owls have been entirely eliminated from 5 counties (Napa, Marin, San Francisco, Santa Cruz, and Ventura) and the Coachella Valley, and likely have been extirpated from Humboldt and Mendocino Counties, southwestern Solano County, and western Contra Costa County as well. DeSante and Ruhlen (1995) documented that breeding owls are now near extirpation in 6 other counties (Sonoma, San Mateo, Monterey, western San Luis Obispo, Santa Barbara, and Orange) and information in this petition indicates the species is near extirpation in southern Los Angeles, western San Bernardino, western Riverside, and San Diego Counties as well. Excluding consideration of desert areas where the species has never been common, breeding owls have apparently been extirpated from at least 6,460 square miles, or 10.2% of their former range in California, and are trending toward extirpation in at least an additional 16,475 square miles, or 26.1% (see Appendix 2).¹⁵⁷

From the 1980s to the mid-1990s, the California breeding owl population was estimated to be declining in abundance at a rate of 8% per year (DeSante and Ruhlen 1995; DeSante et al. 1996). The winter abundance of burrowing owls in California has also declined significantly since the 1970s, with Christmas Bird Count abundance data showing a mean decline of 1.2 % per year from 1959-1988 (James and Ethier 1989; Sauer et al. 1996).

Although the burrowing owl was once considered to be “probably one of the most common birds in California” (Baird 1870), and was subsequently described as “abundant” (Keeler 1891), “common” (Grinnell 1915; Dawson 1923), or “fairly common” (Grinnell and Wythe 1927) range-wide in California, the species has been in continuous decline throughout the state since at least the 1940s (Grinnell and Miller 1944; Zarn 1974a; Arbib 1976; Remsen 1978). Localized declines of owl populations were noted by the early 1900s, for example in the Fresno area (Miller 1903; Tyler 1913a), in the region of Los Angeles (Willett 1912), and in Orange County (Robertson 1931).

Statewide, burrowing owl declines have accelerated greatly in the last 20 years (James and Ethier 1989; Trulio 1997; DeSante and Ruhlen 1995; DeSante et al. 1996; DeSante, et al. in press), Significant declines documented statewide (DeSante and Ruhlen 1995), in central California (DeSante et al. 1997), and in localized urban areas (e.g. Trulio 1998a) show an annual population loss of approximately 8% per year. The Institute for Bird Populations completed an extensive three-year study (1991-1993) of burrowing owl populations throughout the species' breeding range in California, exclusive of the Great Basin, desert areas, and the Channel

¹⁵⁷ Even including the large sparsely populated desert areas, breeding owls have been extirpated from 6.2% of their former range and are trending toward extirpation in an additional 15.9%.

Islands, where the species has never been common (DeSante and Ruhlen 1995; DeSante et al. 1996).¹⁵⁸ Based on the 1,995 breeding pairs of burrowing owls located by this survey, it was estimated that between 7,884 and 10,370 breeding pairs of burrowing owls existed statewide during 1991 to 1993 (DeSante and Ruhlen 1995; DeSante et al. 1996).¹⁵⁹ Although numerical survey data from earlier years with which to compare these estimates do not exist, early descriptions compared with current levels indicate the present abundance of burrowing owls in California is but a fraction of the historical level.

The current distribution of California's burrowing owl population is extremely heterogeneous and clumped. It is estimated that over 71% of the state's breeding owls, outside of the Great Basin and desert regions, inhabit the Imperial Valley, a very compact geographic area comprising only 2.5% the state's land mass (DeSante and Ruhlen 1995). DeSante and Ruhlen (1995) estimated 14% of California's owls reside in the southern Central Valley, and 11% breed in the central and northern Central Valley and southern San Francisco Bay Area combined. Only 2% of the state's breeding owls occur in the remainder of central and southern California west of the deserts, in small and extremely fragmented populations. Aside from the Imperial Valley population and the sparsely populated Great Basin and desert areas, only an estimated 2,731 breeding pairs of burrowing owls remain throughout the rest of California, and nearly half of these owls are concentrated in the southern portion of the Central Valley (DeSante and Ruhlen 1995).

Throughout the statewide census area, nearly 60% of the breeding groups of owls known to have existed during the 1980s had disappeared by the early 1990s (DeSante and Ruhlen 1995). This documented decrease in the numbers of breeding groups of owls during the decade of the 1980s was particularly heavy in the Central Valley (about 50% loss) and was astronomical in the heavily urbanized central-western and southwestern areas of California (about 70% loss) (DeSante and Ruhlen 1995). In the Central Valley alone, the fact that about half of the previously known breeding groups of owls disappeared within a decade suggests serious cause for concern for the future of this species in California.

A burrowing owl population survey was conducted focusing on central California in 1991 (DeSante et al. 1997).¹⁶⁰ Within the survey area, 83 breeding groups totaling 362 pairs of owls were previously known. In 1991, only 64 breeding groups totaling 318 pairs were found in a census of this area, despite the expenditure of 2,111 person hours searching 6,195 square kilometers for owls. Even using conservatively adjusted population estimates, the number of breeding groups in this region decreased 23-52%, and breeding pairs decreased 12-27% from 1986 to 1991. This is decrease of at least 4.6% per year for breeding groups and 2.4% per year for breeding pairs of owls. DeSante et al. (1997) re-surveyed the central California region in 1992 and 1993. Owl breeding groups in this region decreased a further 16.7% from 1991-92 and remained constant from 1992-93. The number of breeding pairs increased by 3.1% from 1991-92 (presumably because of excellent breeding success in 1991), but decreased by 5.2% from 1992-93.

DeSante et al. (1997) found the rate of population decline to be the greatest in the Outer Coast region (comprised of coastal Sonoma, Marin, San Francisco, coastal San Mateo, and Santa Cruz Counties). No owls were found in these areas during surveys in 1991. Only 103 owl pairs were located in the Bay Area region (comprised of interior Sonoma, Napa, western Contra Costa, Alameda, and Santa Clara Counties), and 233 pairs were located in the Central Valley region (comprised of Yolo, Sacramento, Solano, eastern Contra Costa, San Joaquin, Stanislaus, Merced, and the western portions of El Dorado, Amador, Calaveras, Tuolumne, and Mariposa Counties). Using conservative population estimates based on these surveys, DeSante et al. (1997)

¹⁵⁸ In this survey, DeSante and Ruhlen (1995) censused virtually all 5-km by 5-km blocks where burrowing owls were recorded as breeding birds during the decade of the 1980s, as well as a stratified random sample of nearly 500 additional 5-km by 5-km blocks. A total of 6,856 person-hours were spent surveying for burrowing owls during the 3 years of the census on 16,035 square kilometers of the California census area.

¹⁵⁹ See Appendix 3 (DeSante et al. 1996) for an explanation of the methodology used for the survey and the statewide population estimate.

¹⁶⁰ The central California survey region was bounded by Sonoma, Napa, Yolo, Sacramento, and El Dorado Counties inclusive on the north; Santa Cruz, Santa Clara, Merced, and Mariposa Counties inclusive on the south; by the 610-m contour line in the Sierra Nevada Mountains on the east; and by the Pacific Ocean on the west.

concluded there were 153 pairs in the Bay Area region (plus an additional small population of about 10 pairs in the Livermore area), and 720 pairs in the Central Valley region. No breeding pairs remain in the Outer Coast region. The number of owl pairs per breeding group also decreased, mostly in the San Francisco Bay Area, but also in the portions of the Central Valley included in the survey by DeSante et al. (1997).

Recent demographic studies of 4 of the largest remaining owl populations in California (Imperial Valley, Carrizo Plain, Lemoore NAS, and San Jose area) suggest variable population trends over 5 years, with each population experiencing good and bad years for survival and reproduction (D. K. Rosenberg et al., unpublished data; Gervais 2002, Ronan 2002, Rosenberg and Haley 2003). There appears there may be a meta-population dynamic linking at least populations among the Carrizo Plain, the San Jose area, and the Central Valley around Lemoore; owls banded at Naval Air Station Lemoore have been recovered as breeders at the Carrizo Plain and the San Jose area. In addition, the number of breeding pairs in the Central Valley (Naval Air Station Lemoore) and the Imperial Valley study sites remained nearly constant between 1997 and 2000, despite dramatic fluctuations in productivity and survival (Gervais 2002, Rosenberg and Haley 2003).

Because of its isolation, the apparently stable Imperial Valley owl population cannot be counted upon as a source population to augment the very small and declining populations inhabiting southwestern California and other areas of the state. Potential dispersal from the Imperial Valley population to declining populations elsewhere in the state may be limited by unsuitable intervening habitat and by the dispersal characteristics of the resident Imperial Valley population itself (DeSante and Ruhlen 1995; DeSante et al. in press). Imperial Valley owls may be reproductively isolated from other breeding owls in California except possibly a few desert-breeding pairs (Rosenberg and Haley 2003). The loss of breeding owls from any region in California is particularly significant because there are no known locations in the state where a breeding population of burrowing owls has been eliminated and subsequently been reestablished.

VIII. NATURE, DEGREE, AND IMMEDIACY OF THREAT

The burrowing owl is a species in crisis throughout most of its range in California. DeSante and Ruhlen (1995) estimated that at least 50% of the state's owl population was lost in the previous decade in both urban and agricultural areas of the state. This rate of decline was a loss of approximately 8% of the population per year. Breeding burrowing owls have recently been extirpated from 5 counties and nearly eliminated from 6 entire counties as well as portions of 4 others. Owls throughout the vast majority of the state persist in small fragmented populations or as individual pairs. The largest remaining owl populations face a host of direct and indirect threats.

The declines of burrowing owl populations are linked to land use trends throughout the state. Dramatic human population growth and urban development characterize the areas of greatest owl population losses. Direct habitat losses to urban conversion is the primary cause of decline, compounded by habitat quality reduction due to surface disturbances and elimination of burrowing rodents. The development pressures extirpating the state's burrowing owl population continue unabated.

Burrowing owls have continued to decline in California despite their habitat flexibility. Although owls have adapted to human-altered landscapes, essential habitat attributes must be present to support the species. Essential habitat attributes are the presence of suitable nesting habitat and adequate foraging habitat near or adjacent to nesting habitat. Suitable nesting habitat consists of burrows, semi-fossorial animals, short grass, and perches. Foraging habitat may be long or short grass and must support adequate populations of small rodents and large insects and other owl prey species.

The primary factors affecting the viability of the California burrowing owl population include:

- Loss of nesting and foraging habitat to human uses such as urbanization, which results in direct mortality and lower population numbers as available habitat decreases.
- Destruction of nests during urban development and agricultural activities by surface disturbances such as disking, blading, grading, and over covering, which may result in direct mortality of adults and young and may reduce the habitat quality and carrying capacity.
- Elimination of burrowing rodents, through means which may result in direct owl mortality, as well as ultimately making an area unsuitable for owls, thereby reducing available habitat.
- Relocation of owls out of occupied habitat to accommodate urban development, which rarely results in successful breeding at the relocation sites, and crowds remaining owls onto smaller and smaller patches of habitat.
- Predation of young birds by non-native and feral animals, which significantly reduces nesting success and productivity.
- Mortality due to vehicle collisions and other anthropogenic causes.

A. URBAN DEVELOPMENT

Over 85% of burrowing owls in California are found on agricultural land in the Imperial and Central Valleys (DeSante and Ruhlen 1995), the most rapidly urbanizing areas of the state, according to California Department of Finance ("CDF") population growth statistics (CDF 1993, 1994, 2001). These areas are threatened in the short and long-term by human population growth and rapid development, which is converting open fields and agricultural lands to residential and commercial uses. Unfortunately, the flat open grasslands preferred as habitat by burrowing owls are prime development sites and owls currently have little protection from powerful economic development pressures. By the year 2040, it is projected that 5 million acres of agricultural land in California, or 17% of today's farmland base, will be lost due to urban expansion (Medvitz and Sokolow 1995).

Loss of nesting and foraging habitat for owls is the biggest consequence of urban development (Zarn 1974; Konrad and Gilmer 1984; Barclay et al. 1998). If owls are not detected during studies required by the California Environmental Quality Act, they can be directly killed when their burrows are bulldozed. A significant indirect effect of urbanization is reduced reproductive success where construction occurs at a site without destroying the nests. A study in Florida showed fledging rates for remaining burrowing owls at sites where construction occurred were significantly less than at sites next to construction or with no construction (Millsap and Bear 1988).

Imperial County is an area of extremely rapid human population growth. In 1993, Imperial County had the highest human population growth rate of California's 58 counties and it ranked 6th in population growth in 2000, with virtually all growth concentrated in the Imperial Valley (CDF 1994, 2001). With an annual growth rate of 2.9 to 3.6 % (Medvitz and Sokolow 1995; CDF 2001), Imperial County's human population is projected to increase from 150,000 currently to 504,000 by 2040, an increase of 335% (CDF 2001). The California Department of Conservation ("CDOC") Farmland Conversion Report (CDOC 1994, 2000) documented the conversion of at least 3,544 acres in Imperial County from agricultural to urban and built-up land from 1990 to 1998 (with only 36% of lands mapped).

The Central Valley is also rapidly urbanizing. The CDOC Farmland Conversion Report (CDOC 1994, 2000) recorded 74,006 acres of land converted from agricultural to urban and built-up uses from 1990 to 1998 in all the Central Valley counties. The Association of Bay Area Governments ("ABAG") projects the population of the Central Valley is projected to double by 2020 (CDF 1993).

In the southern Central Valley, Madera, Kings, Tulare, Kern, and Fresno Counties ranked 2nd, 4th, 5th, 8th, and 10th in the state, respectively, in population growth rate as of 1993, with an average growth rate of over 3% (CDF 1994). Kings and Madera Counties ranked 4th and 7th in population growth in 2000, with 3.0% and 2.9% growth rates that year, and Kern County also had growth rate greater than 2% (CDF 2001). Development projects such as the proposed U. C. Merced campus at Lake Yosemite in Merced County, which will develop 10,300 acres of open space grassland with known nesting populations of owls in the next 20 years, threaten remaining large owl populations. The Tejon Ranch Company has approvals for a massive 1,460-acre industrial development in southern Kern County within the range of the owl, and has plans for a 23,000-unit residential development, resort development, golf courses, and more. Eventually all 270,00 acres of Tejon Ranch Company's agricultural and ranching land in southern Kern and northern Los Angeles Counties may be at risk of development.

Human population growth has also exploded in the northern and central portions of the Central Valley, where numerous sites occupied by burrowing owls within the past few years are threatened by commercial and residential development (CNDDDB 2001; CDFG 2002a). Placer County was the fastest growing county in the state in 2000, with a 3.5% growth rate (CDF 2001). San Joaquin and Yolo Counties ranked 8th and 10th in growth in 2000, with 2.7% and 2.5% growth rates, and Sacramento County had a growth rate greater than 2% that year (CDF 2001). According to California Department of Fish and Game ("CDFG") documents, from 1995-2001, at least 9,000 acres of occupied owl habitat and over 15,000 acres of potential owl habitat in San Joaquin County were lost to development; an unknown amount of occupied habitat and over 13,000 acres of potential habitat were lost in Sacramento County, and at least 460 acres of occupied habitat and over 600 acres of potential habitat were lost in Solano County during the same time period (CDFG 2002a).¹⁶¹

¹⁶¹ The actual amount is likely significantly higher, since the list of projects with potential impacts to owls is not comprehensive, and many sites considered potential habitat may have actually been occupied habitat.

Proposed development projects in Yolo and Solano Counties threaten significant owl populations there.¹⁶² Recent development projects in eastern Alameda and Contra Costa Counties have impacted owl colonies and several proposed projects would impact occupied owl habitat.¹⁶³

Remaining owl populations on private lands in the Bay Area face enormous development pressure, which has been particularly severe in the southern San Francisco Bay Area. For example, in Santa Clara County, over 90% of the agricultural land was abandoned during the past century, and for the most part urbanized, with over half the valley floor now developed (Bell et al. 1994). In Santa Clara County, the conversion of rural/agricultural lands to urban uses has resulted in a 60% decline in the owl population in that County in 10 years (DeSante and Ruhlen 1995; L. Trulio, pers. comm., 2001).¹⁶⁴ The burrowing owl population at the Oakland Airport, formerly one of the largest in the Bay Area, has now been significantly reduced and is threatened by further airport expansion.¹⁶⁵ Many of the remnant owl populations in Alameda and Contra Costa Counties have also been severely impacted and face future development threats.¹⁶⁶ Ongoing development projects threaten most of the remaining owls on private lands in Santa Clara County with imminent extirpation (L. Trulio, pers. comm., 2002).¹⁶⁷ The human population of Santa Clara County is projected to increase 47% by

¹⁶² Burrowing owls have been documented at the Mace Ranch Park site in Davis since at least 1997, when agricultural cultivation ceased and before development began (PHBA 2002). A 1,000 home development with a school, shopping center, and park has been built at this site, with nesting owls occupying a 33-acre parcel surrounded by development. Burrowing owls continue to occupy the site even though it was disked annually from 1998 to 2000 during the nesting season. Weed abatement activities at this site during May 2000 may have resulted in the take of at least 1 burrowing owl and the destruction of at least 1 nest site (CDFG 2002a). At least 3 productive nests and 15 juveniles were observed here during summer 2000 (CNDDDB 2001). The Davis City Council approved converting 5 of these acres to playing fields in September 2002, despite acknowledgement in the EIR of “potentially significant direct and indirect impacts on burrowing owls and burrowing owl habitat,” and warnings by biologists that the remaining habitat patch after development will be too small to support owls (PHBA 2002). In 1998, the University of California, Davis transferred a site previously deemed an Open Space Reserve for burrowing owls to developers, for conversion to student housing. At Montezuma Marsh in Solano County, occupied owl habitat is to be buried in several feet of toxic dredge sediments as part of a “restoration” project. The Montezuma project is expected to directly impact 7 pairs of owls (CDFG 2002a).

¹⁶³ In eastern Alameda County, the recent Mountain House Golf Course and PG&E projects directly impacted 4 pairs of owls, and the East Altamont Energy Center impacted an estimated 7-8 pairs (CDFG 2002a). In eastern Contra Costa County, the recent Equilon project in Byron and the Williamson Ranch Plaza project in Antioch each directly impacted 2 pairs of owls, and the Denova project in Concord directly impacted 1 pair (CDFG 2002a). Grading and disking for development threaten remnant owl populations in Antioch, Brentwood, and Oakley. The proposed expansion of Los Vaqueros Reservoir threatens occupied owl habitat there. A proposed golf course development threatens owl populations at Altamont Pass.

¹⁶⁴ A number of recent development projects in San Jose (including Cisco, Novell, AMD, Agilent, Agnews Developmental Center, Agnews East, Pacific Bowie, FRIT, VTA, Mission College, 3Com, Santa Clara University, Sobrato, and Errante) directly impacted an estimated 42 pairs of owls (CDFG 2002a). The owl population at Mission College dropped recently from 60 owls to less than a dozen. In 1990, the college decided to lease about 70 of its 100 acres of open space to developers to build a shopping mall. As of 1998, only 12 of the original 16 pairs remained, and as of 2001, only 8 pairs remained. There may only be enough remaining habitat to support about 8 pairs in the long run (L. Trulio, pers. comm., 2002). The first week of February 2001, the college placed one-way doors over 92 squirrel holes so burrowing owls could no longer use them as shelter.

Development in the City of Morgan Hill has apparently recently extirpated the breeding owl population there, before a promised owl habitat conservation program could be implemented (J. Barclay, pers. comm.). The recent Cisco, Townsend Milpitas, and Caltrans projects in Milpitas directly impacted 4 pairs of owls (CDFG 2002a).

¹⁶⁵ The Oakland Airport, which is undergoing a major expansion project, was ordered as a result of a lawsuit in 2001 to conduct a new Environmental Impact Report (EIR) for the project, because planners had ignored CDFG concerns about the impacts of the expansion on the burrowing owl population. CDFG indicated the mitigation proposed in the draft EIR for the burrowing owls “is not adequate for their protection and does not follow the Department’s guidelines for the species.” Among other things, CDFG questioned the adequacy of the draft EIR’s proposed one-to-one replacement ratio for destroyed owl burrows, it requested more information about the location and size of the mitigation area, and it asked the airport to explain how it planned to permanently protect the mitigation site from conversion to other uses. The final EIR did not provide for new or modified mitigation measures in response to the CDFG comments, nor did it contain any new standards for replacement of burrows destroyed by construction. Also absent was any explanation, as requested by CDFG, why the number of acres proposed for the replacement habitat would be sufficient, how the replacement habitat will be protected, or where it will be specifically located. In spite of the fact that the airport had been alerted to some significant problems by the agency with technical expertise in species conservation, the mitigation measures proposed in the final EIR are essentially identical to those proposed in the draft EIR. CDFG subsequently made an agreement that will allow the airport to relocate many owls and “mitigate” with conservation land purchased in Byron, in eastern Contra Costa County.

¹⁶⁶ The recent Port of Oakland Project directly impacted 6 pairs of owls and the recent Evershine, ESS, and Applied Materials projects in Fremont, and the Denova project in Concord each directly impacted a pairs of owls (CDFG 2002a). The proposed Catellus development in Fremont threatens a population of burrowing owls.

¹⁶⁷ The City of San Jose expects to destroy over 2000 acres of owl habitat over the next 20 years (plus potentially an additional 1,250 acres intended as mitigation land, which was scrapped when the City’s owl plan was abandoned). The proposed Cisco “campus” in Coyote Valley will develop 150 acres of open space that currently supports 3 families of burrowing owls (16 to 22 adults and chicks were located there in 1998), and will leave a remaining open space too small to support owls. The proposed Metcalf Energy Center will destroy 10 acres of grassland containing a burrow that was occupied in February 1999.

2040 (ABAG 1999). According to the CDFG, Central Coast Region, at least 84 owl pairs, approximately one-half of the Bay Area population (DeSante et al. 1997), have been directly impacted by development activities in the past 3 years, within the southern and eastern portions of the Bay Area (Contra Costa, Alameda, and Santa Clara Counties) (CDFG 2002a). The Association of Bay Area Governments (“ABAG”) projects the population of the San Francisco Bay Area will have increased by 1.4 million people (22%) from 1995 to 2020 (ABAG 1999).

In southern California, planned developments in western Riverside and San Bernardino Counties threaten many of the significant breeding colonies remaining there.¹⁶⁸

The ongoing closure of military bases and their conversion to commercial and residential development is a major threat that could reduce or extirpate significant owl populations. Large owl populations reside at Lemoore Naval Air Station in Kings County and Moffett Airfield in Santa Clara County; populations also occur at other bases such as Alameda Naval Air Station in Alameda County and southern San Diego County Naval Bases. If these sites are closed and their grasslands developed, their owl populations could be lost. For example, NASA plans to develop 500 acres of land (1,930 housing units) at Moffett Field in Mountain View, Santa Clara County, with only 81 acres protected as a burrowing owl preserve. The EIR will be approved in 2002, with construction through 2017. The potential closure and development of the Sacramento Army Depot and Norton Air Force Base in western San Bernardino County threaten burrowing owl colonies.

B. THREATS TO IMPERIAL VALLEY AND SOUTHERN CENTRAL VALLEY OWL POPULATIONS

The vast majority of California’s breeding burrowing owls reside in the Imperial Valley (71%) and the southern Central Valley (14%) (DeSante and Ruhlen 1995). DeSante et al. (in press) note that “given the rapid development of much of the grassland and desert regions of California, the apparent extirpation of the species in the Coachella Valley immediately north of the Imperial Valley, the reduction in numbers in other parts of California, and the lack of a state-wide conservation strategy, the importance of the Imperial Valley population may increase.”

The Imperial Valley owl population (which may be reproductively isolated from other populations) faces ongoing threats to its habitat and numbers, including habitat loss to development (as discussed in Section VIII.A above), cement lining of earthen canals or burying of conveyance structures, levee maintenance and repair operations including ground squirrel eradication, mowing, high exposure to agricultural poisons, a low-calcium diet, and relatively low reproductive success (DeSante et al. in press).

Because of the large numbers of owls that reside within the agricultural matrix of the Central and Imperial Valleys, changes in agricultural practices, particularly regarding water distribution and conveyance

¹⁶⁸ A 2,028 acre urban development is proposed adjacent to the cities of Temecula and Murrieta in western Riverside County. Three public agencies and 9 private entities applied in July 2000 for a Habitat Conservation Plan and 30-year Incidental Take Permit for 19 urban development projects in this area. The burrowing owl is one of the covered species for the HCP. 554 acres of burrowing owl habitat would be destroyed by the project, with 61 acres of habitat conserved as “mitigation.” Pacific Bay Properties applied in December 1999 for a 30-year Incidental Take Permit for a 2,000 home development within the Rancho Bella Vista Community Specific Plan Area, between state route 79 and Lake Skinner Reservoir, in western Riverside County.

In San Bernardino County, the City of Chino General Plan authorizes low to high-density housing development on most of the agricultural land around the Chino Airport, including the majority of occupied owl locations in the vicinity of Chino (J. Bath, pers. comm., 2003). In one case consultants installed one-way door devices on burrows to eliminate the owls before the CEQA process started, so that the project can go through with a Negative Declaration instead of an EIR; in another case the city issued a grading permit before public CEQA hearings were held (J. Bath, pers. comm., 2003). The Department of General Services is selling for development 717 acres of surplus state property in the City of Chino with one of the largest stable colonies of burrowing owls known in the Prado Basin area (J. Bath, pers. comm., 2003). The City of Ontario General Plan proposes to convert 8,200 acres of existing agricultural grasslands, and develop 31,000 homes, with only a mere 50 acres of raptor habitat provided as “mitigation” (G. Stewart, D. Guthrie, pers. comm., 1997). This plan, when combined with the 2,447-acre plan of the City of Chino, will impact the largest burrowing owl population in the Inland Empire (J. Bath, pers. comm., 2003).

(e.g., Clemings 1996), have the potential to quickly affect California's burrowing owl population (Anderson et al. 2001; Rosenberg and Haley 2003). Almost all of the owls in the Imperial Valley, and many owls in the southern Central Valley nest within or along water ditches, canals, and earthen drains.¹⁶⁹ Habitat destruction in the form of altered water conveyance structure is a major risk for owl populations in the Imperial Valley (Gervais et al. 2003). The state of California is currently lining up a series of water transfers from agricultural to urban areas, including a massive transfer from the Imperial Valley to San Diego. Part of this transfer involves efficiency improvements to Imperial Valley waterworks, including lining many of the earthen canals where burrowing owls live with concrete, converting open drains into pipeline drains (burrowing owls inhabit the inside banks of the drains), and fallowing large acreages of agricultural land which currently serve as foraging habitat. These activities could permanently eliminate owl burrows (CH2MHILL 2001) and reduce foraging habitat.

The main factor controlling owl abundance in the Imperial Valley seems to be availability of burrow sites (Coulombe 1971). Although 1,000 miles of canal banks were present in 1971, only a fraction of them are suitable habitat for owls at any given time. Canals that supply water are not suitable for nesting due to periodic rises in water level and the potential for flooding. About one-third of the canal mileage is drainage canals, which are subject to dredging every few years, which destroys established burrow sites. Coulombe (1971) and Rosenberg and Haley (2003) documented owl nests destroyed by dredging of drains and grading of roads in the Imperial Valley. Coulombe (1971) counted 13 pairs of owls along 4 miles of canal in 1966, but could find no owls 1 month later, after the canal was dredged. Flooding, caused by the overflow of delivery ditches, has caused nest destruction and killed young (Rosenberg and Haley 2003). The development of tall vegetation along the banks of canals or drains can also prevent owls from nesting (Rosenberg and Haley 2003). Thus, the only suitable habitat in the agricultural matrix is areas where agriculture is not in progress (Coulombe 1971).

Despite the high densities of burrowing owls in the Imperial Valley, reproductive success there is relatively low compared to other populations in California, with an average of only 2.5 young per nest (Rosenberg and Haley 2003). Imperial Valley owls produce smaller average clutch sizes relative to other California populations, but at least in some years owl productivity there was not limited by egg-laying (J. Gervais, pers. comm., 2003). Burrowing owls elsewhere in the state produce up to 11 eggs but owls only average 6 eggs in the Imperial Valley, and clutch sizes there have never exceeded 8 eggs; of those, few individuals fledge (Rosenberg and Haley 2003). This reduced productivity may be due to close nesting; e.g., in Oregon, nests closer to 110 meters to neighboring nests had lower reproductive success (Green and Anthony 1989). However, lack of calcium-rich vertebrate prey has been shown to reduce reproductive success of burrowing owls in the Imperial Valley. Year-round cultivation and flood irrigation presumably maintains very low rodent populations, thus rodents represented only 0.2% of the total prey found in burrowing owl stomachs in one study in the Imperial Valley, while in other locations, rodents and other vertebrate prey represented 8-52% of the diet (York et al. 2002). Small clutch sizes in the Imperial Valley have been attributed to the scarcity of rodents and other calcium-rich food items in the diet; in fact, owl productivity increased when the diet was supplemented with rodents (Haley 2002; York et al. 2002).

With 71% of the state's burrowing owl population occupying only 2.5% of the state, the Imperial Valley represents a single population of extreme importance. The size of this population is an inadvertent but fortunate by-product of agricultural land use. Should management or land use change even slightly, the most significant population of owls in California could be reduced or lost.

C. DESTRUCTION OF BURROWING RODENTS

Numerous researchers have identified elimination of burrowing rodents through control programs as the primary factor in the recent and historical decline of burrowing owl populations (Anderson et al. 2001).

¹⁶⁹ Most (92%) of the owls in the Imperial Valley nest within 15 meters of irrigation canal banks (DeSante et al. 1996).

Farmers and ranchers, with help from the federal government, have long practiced all-out warfare against burrowing rodents. For example, persecution of the prairie dog has reduced them to just 2% of their original numbers (Trulio 1998a). Widespread ground squirrel control programs were begun in as early as 1869, when the state legislature authorized the payment of bounties on squirrels (Gordon 1996), and are currently carried out on more than 9.9 million acres in California (Marsh 1987). In some primarily agricultural counties, the ground squirrel population has been reduced and maintained at perhaps 10-20% of the carrying capacity. Ground squirrels are still considered vermin and are the victims of ongoing eradication campaigns. Individual landowners and managers on grazing, vineyard, and crop production lands conduct extensive rodent control programs involving shooting, poisoning with acute toxicants, anticoagulants, and fumigants, trapping, and sealing burrows (Butts 1973; Salmon et al. 1982; Rosenberg et al. 1998a). Burrowing owls have been incidentally poisoned and their burrows destroyed during eradication programs aimed at rodent colonies (Zarn 1974b; Remsen 1978; Collins 1979; Gordon 1996; P. Bloom, pers. comm., 2002).

Acute toxicants used to eliminate squirrels have included zinc phosphide, strychnine, and sodium fluoroacetate (Compound 1080 - which is no longer registered for use in California). These poisons may adversely affect burrowing owls. In Kings County, anticoagulants and fumigants are usually used (Rosenberg et al. 1998a). Anticoagulants include chlorophacinone, diphacinone, Fumarin, Pival, and warfarin. More effective second generation anticoagulants such as brodifacoum, difenacoum, and flocoumafen are also used to kill rodents, primarily in bait forms (Rosenberg et al. 1998a). Primary poisoning and secondary consumption through the ingestion of poisoned rodents are possible for burrowing owls. In an experiment where mice killed by anticoagulants were fed to Northern saw-whet (*Aegolius acadicus*), great horned (*Bubo virginianus*), and barn owls (*Tyto alba*), all the owls exposed to diphacinone and brodifacoum showed symptoms of poisoning and death resulted, while 1 of 6 died from ingesting bromadiolone-killed rats (Medenhall and Pank 1980). Barn owls also showed significant mortality when fed rodents killed by Flocoumafen and brodifacoum (Newton et al. 1994; Wyllie 1995). Fumigants used on ground squirrel burrows include aluminum phosphide, carbon bisulfide, and methyl bromide, with unknown, but potentially harmful effects on owls.

Healthy colonies of burrowing rodents are an essential attribute for burrowing owl habitat. Periodic elimination of ground squirrels inhibits the persistence of owls, which rely on squirrels for nest burrows (DeSante et al. 1996). Ground squirrels also benefit burrowing owls in the form of burrow maintenance between nesting seasons and shared alarm calling behavior (Trulio 1994). In agricultural areas such as the Central Valley and the Imperial Valley, rodenticides are often used on levees to control numbers of ground squirrels, which can undermine levees through their digging. Exposures to rodenticides and direct killing of owls by gassing (Zarn 1974a) could be problematic in areas like the Imperial Valley, where a large proportion of owls nest on or near levees.

D. RELOCATION OF OWLS

Burrowing owls in California are commonly discouraged from nesting at or translocated from occupied burrows, either through active or passive relocation or eviction, to accommodate urban development. Active relocation is the process of moving owls from occupied burrows to other burrows off-site, by trapping owls and temporarily holding them in enclosures on relocation sites, then releasing them at the relocation sites. Passive relocation is the process of encouraging owls to move from occupied burrows to other natural or artificial burrows, and may entail using one-way devices on burrows that force the subject owls to relocate. Eviction is forcing owls to evacuate previously occupied burrows by physically preventing them from re-occupying those burrows, without any provision of alternative burrows.¹⁷⁰ Such relocation activities are intended to avoid “take” (direct mortality or harm to owls) and are often encouraged by regulatory agencies such as the California Department of Fish and Game (CDFG 1995). Unfortunately, the potential for take is only part of the impacts of

¹⁷⁰ The sealing or plugging of occupied burrows is illegal, as nests are protected under the California Fish and Game Code. However, unoccupied burrows, even those owls have recently used for nesting, are not necessarily protected all year.

development projects, and relocation of owls is not designed to mitigate for the habitat loss, habitat fragmentation, and reduced owl survivorship caused by development.

Many of the active relocation efforts for burrowing owls that have been monitored have failed to establish viable owl populations at the relocation sites, with owls either disappearing completely, attempting to return to the capture site (where their burrows have often been destroyed), or exhibiting low breeding success at the relocation site (Harris 1987; Delevoryas 1997; Trulio 1997). One of the reasons for this is that burrowing owls are very site tenacious and are not easily forced to move to a different burrow, especially during nesting season (Trulio 1997). Such burrow fidelity is a widely recognized trait, with owls regularly reusing burrows from one year to the next (Martin 1973; Wedgwood 1976; Green 1983). A study by Green (1983) found an average of 76% of owl burrows were reoccupied the next year. Trulio (1994) reported that over a 3-year time span at a site in northern California, 73% of nest burrows or burrows within 100 meters were reoccupied the next year.

Many active relocation efforts involve moving owls to artificial burrows. A significant problem with artificial burrows is that they require permanent maintenance to provide long-term nesting habitat, otherwise they can become buried (P. Bloom, pers. comm., 2002). Another potential problem with active relocation is that moving owls in this manner likely stresses the birds (Trulio 1997). Another failure has been the lack of requirement for long-term management of owl habitat at release sites.

Harris (1987) noted that only 1 of 8 (12.5%) previous active burrowing owl relocations in California was even remotely successful in terms of establishing breeding at the new location, with 2 of the 6 relocated owls in that instance remaining and breeding on the site for up to 3 years. Owls released during 2 spring relocations returned to the capture site within 1 month of release (Feeney 1997). Three of the relocations were done in the fall, and the timing of the other relocations was unknown (H. T. Harvey and Associates 1993).

Delevoryas (1997) reported on the failed active relocation in 1990 of 5 pairs of owls from Mission College in Santa Clara to 2 sites 31 kilometers to the south. The owls were trapped in mid-February and released in mid-March, just as breeding season was getting underway. The first season 2 of the 5 pairs (40%) bred successfully, with only 2 nestlings surviving to fledging (it is unclear if the fledglings survived to the following breeding season). Of the 10 translocated owls, 5 left the site, 1 was killed, and 4 adults plus the 2 fledglings remained at the relocation sites in 1991. By 1992 only 2 owls remained, and by 1994 only 1 owl remained. The site was not maintained for burrowing owls after the first year - the site was disked, and artificial burrows were not maintained (P. Delevoryas, pers. comm., 2003).¹⁷¹

Trulio (1997) compiled known information on active burrowing owl relocations conducted in California. Of 27 owls relocated to new burrows, 17 (63%) disappeared within a year of release and 7 (26%) flew back to their original site. Only 4 owls (14%) attempted to breed at their new locations (1 owl bred at the new site before disappearing). Only 2 owls (7%) bred successfully, and only 1 owl (4%) stayed on the site for 2 breeding seasons. In addition to the failure of 93% of these owls to successfully breed at the relocation sites, the fate of most of the relocated owls was unknown, as the majority disappeared.

In 1997 H. T. Harvey & Associates successfully translocated 8 owl pairs to a relocation site at the San Jose/Santa Clara Water Pollution Control Plant buffer lands. All but 1 pair (which may have been moved too late in the breeding season) remained on the relocation site, and successfully raised chicks to the age of

¹⁷¹ Several reasons were posited for the failure of the relocation effort. The mortality of 1 adult owl was due to inadequate closing of the nesting box by researchers, allowing access to predators. At 1 relocation site, the landowner (IBM Corporation) failed to follow the agreed-upon management plan, and the foraging habitat at the site was disked and left fallow during a period when nestlings and fledglings would need the most amount of food for growth. Also, researchers fed the owls too many mice while they were held in hack aviaries at the site, and surplus mice cached by owls in the burrows likely led to increased predation.

fledging; about 11 pairs nested at this relocation site in 2002, most of which nested in artificial replacement burrows constructed in 1997 (D. Plumpton, pers. comm., 2002).

The unfortunate result of most active relocation efforts has been the loss of known occupied owl habitat to development, with very little proven nesting success at relocation sites and the ultimate fate of most translocated owls unknown. Clearly, the practice of active relocation of burrowing owls as a “mitigation” for development impacts is detrimental to preserving owl populations.

For most passive relocations conducted in California, there is no way of knowing where the evicted owls go or whether they are able to breed successfully in other areas. The current lack of knowledge on the results of passive relocation is largely due to the failure of CDFG to require studies in areas where owls are evicted. The consultants that are hired to do this work do not conduct studies (e.g., color banding or radio-tracking) that evaluate the success of passive relocation. There is no legal requirement to do this, and developers rarely have any interest in the fate of the owls beyond moving them out of the way of development projects. For example, in the City of Chino, consultants are putting one-way door devices on burrows to eliminate owls before the CEQA process starts, so that projects can go through with a Negative Declaration instead of an EIR (J. Bath, pers. comm., 2002).

However, if the process of passive relocation is properly refined and used appropriately, it has the potential to be an important conservation tool, for example when applied to permanently protected lands such as large military reservations, used to discourage nesting in close proximity to airport runways, or used to avoid take for temporary disturbances (such as pipelines, paving, etc.) by moving owls short distances (J. Barclay, P. Bloom, pers. comm., 2002). Passive relocation of owls can work if the birds are moved short distances (i.e. under 5 miles) and the habitat they are moved to is managed for them. Burrowing owls should never be translocated or forced to move to unprotected private property. Predators must also be taken into consideration - if owls are moved from an urban area where they have only been exposed to feral cats, Red-tailed Hawks and Northern Harriers, they will probably do poorly if moved to an area with coyotes or red foxes (P. Delevoryas, pers. comm., 2003).

There have also been several failed reintroduction attempts (long distance movement to formerly occupied parts of their range) of burrowing owls. DeSmet (1997) reported that of 169 young and 85 adults captured in South Dakota and released into temporary aviaries and artificial burrows in Manitoba, Canada, only 1 of these birds (0.4%), a juvenile, was seen the next year. Martell et al. (1994) reintroduced 104 fledgling owls from South Dakota to hack sites in Minnesota, distances of 450 and 600 kilometers away. None of these birds were seen after the summer they were released. After a decade of owl family relocations from Washington State to British Columbia (Dyer 1988; Dyer pers. comm. as cited in Trulio 1997) the program has not successfully established a self-sustaining population.

The mixed results of active relocation, the failure of reintroduction efforts, and the misuse of passive relocation techniques indicates that it is imperative to protect remaining occupied burrowing owl habitat and owl populations in situ. Unfortunately, the CDFG is informally encouraging translocation of owls from occupied habitat in rapidly urbanizing areas (e.g. in Santa Clara County). The practice of translocating owls as “mitigation” eliminates occupied habitat without adequate mitigation for the true impacts of development. As a relatively adaptable species, all that burrowing owls must be afforded in order to survive is habitat, and if that habitat is systematically removed for the convenience of development, owls will predictably disappear.

E. AGRICULTURAL PRACTICES

Although agricultural environments can support very high densities of burrowing owls (Rosenberg and Haley 2003), they may also pose threats to owl populations through pesticide exposure, destruction of nest burrows by farm equipment, seasonal food scarcity exacerbated by farming practices, or extermination of

burrowing mammals (Desmond et al. 2000). Although intensive agricultural practices can have impacts on the productivity of burrowing owls, current agricultural practices in California are not thought to be a significant threat to the persistence of viable breeding owl populations, as evidenced by the apparent coexistence of high concentrations of burrowing owls with agricultural operations in the Imperial Valley and southern Central Valley. The California Endangered Species Act includes an agricultural exemption (California Fish and Game Code §2087(a)) allowing for “accidental take of candidate, threatened, or endangered species resulting from acts that occur on a farm or a ranch in the course of otherwise lawful routine and ongoing agricultural activities.”

The dramatic alteration of 98% of the original prairie habitat in the United States has been linked to the reduction in western burrowing owl populations (Evans 1982; Sheffield 1997a; Trulio 1998a). As long ago as the 1930s it was recognized that intensive cultivation of grasslands and native prairies was a major factor in declining burrowing owl populations (Bent 1938). Conversion of pastures to cropland (Grant 1965; Konrad and Gilmer 1984; Ratcliff 1986), and cultivation of grasslands (Grant 1965; Faanes and Lingle 1995) limit burrowing owl populations through the destruction of nesting habitat.

Although many of the state’s remaining burrowing owls survive in the margins of agricultural areas, such as along roadside embankments and earthen irrigation canals and drains, intensive agriculture can be detrimental to the survival of burrowing owls. The apparent strong selection of irrigation canals for nesting by burrowing owls in agricultural areas may not indicate that this habitat is preferred over habitat well removed from the canals, but rather because of the intensive agriculture and disking and plowing of fields, the levees may provide the only available nesting habitat (DeSante and Ruhlen 1995). Ninety percent of California’s burrowing owls are concentrated in wide, flat lowland valleys, basin bottoms, and coastal plains – terrain where the majority of agricultural development has occurred and is expected to continue to occur. Intensive agriculture has been shown to result in the loss of burrows, loss of foraging habitat, creation of sub-optimal nesting habitat, and increased vulnerability to predation, and may also reduce the chance that unpaired owls will be able to find mates (Haug and Oliphant 1987; Haug et al. 1993). Because burrowing owls in agricultural systems spend a large proportion of their time foraging in fields (Rosenberg and Haley 2003), heavy pesticide use (discussed in Section VIII.F below) will also remain a potential threat to these populations.

Disking, Plowing, and Mowing

One obvious impact of intensive agriculture is disking and plowing of owl burrows. Disking or tilling of the land destroys burrows and potentially the owls in these burrows. Mowing is a preferable alternative, but tractors used to pull mowers, and occasionally the mowers, can cause mortality.¹⁷² The use of large-tired mowers when mowing grasslands can reduce the risk of nest damage and restricted use of mowing when young chicks emerge (May-June) prevents destruction of young (Rosenberg et al. 1998a). In addition, fields which may be needed as foraging habitat can be disked and left fallow, reducing the prey base during a period when nestlings and fledglings would need the most amount of food for growth.

Grazing

Livestock grazing can have positive benefits for burrowing owl habitat, as many researchers have noted that burrowing owls prefer grasslands grazed by cattle or rodents (Anderson et al. 2001). Grazed areas may attract ground squirrels, increasing burrow availability, and also provide habitat with low vegetation height and reduced ground cover, allowing owls to stand near the burrow entrance and effectively watch for approaching predators (Coulombe 1971; Green and Anthony 1989; Trulio 1994). One of the largest populations of burrowing owls in the San Joaquin Valley was found in grassland on private land that was heavily grazed, although not to the point of exposure of bare soil (Rosenberg et al. 1998a). However, heavily grazed pastures tend to have a very low relative abundance of prey; thus heavy grazing in burrowing owl foraging areas may be

¹⁷² Mowers used at Lemoore Naval Air Station have crushed a small number of burrows and in one incident, owl chicks were killed when they were flushed away from the burrow rather than into it as the mower passed overhead (J. Gervais, pers. comm., 2003).

detrimental to the species (Dechant et al. 1999). The major negative impact of livestock grazing is control of ground squirrels in the name of enhancing livestock production (see Section VIII.C above, discussing destruction of burrowing rodents). Range management practices associated with grazing potentially affect population densities of prey species for burrowing owls, such as California vole (*Microtus californicus*), western harvest mouse, and deer mouse; these species do poorly in heavily grazed pastures, as they need a minimum build-up of thatch to achieve moderate population densities (Holmgren and Collins 1999). Grazing can positively affect owls if it is effectively managed and monitored (Rosenberg et al. 1998a), but the complete effects of grazing on burrowing owl habitat and populations are unknown (Anderson et al. 2001).

Other Agricultural Impacts

Many owls nesting along the California Aqueduct in the Central Valley face threats from maintenance and repair of embankments. Heavy irrigation has been known to drown both squirrels and owls (Miller 1903). Robertson (1931) noted instances of burrowing owls drowning in irrigation pipes (where they were forced to nest for lack of nesting holes) in western Orange County. The federal government and private landowners undertake extensive eradication programs to rid agricultural lands of predators and “pest” species. Although not targeted, burrowing owls are occasionally taken in leg hold traps (ADC 1993, 1994, 1995). Burrowing owl mortality from entanglement in barbed-wire fencing has also been documented (Lohofener and Ely 1978). Deliberate destruction and filling in of owl nest burrows has been noted recently along irrigation canals in agricultural areas in Arizona, specifically in Tucson, Phoenix, and Yuma (Brown and Mannan 2002), and similar vandalism may be occurring in agricultural areas in California. None of these impacts are likely to pose population-level threats to owls.

F. PESTICIDES

Use of insecticides and rodenticides in burrowing owl habitat can reduce the food supply and the number of burrowing mammals, and may also be toxic to owls (Ratcliff 1986; James and Fox 1987; James et al. 1990; Baril 1993; PMRA 1995; Hjertaas 1997; Sheffield 1997b). Burrowing owls have been reported to ingest poisoned rodents and to forage on the ground for insects in areas littered with poison grains (Butts 1973; James et al. 1990).

The largest breeding concentrations of burrowing owls are located in the Imperial Valley and in the southern San Joaquin Valley (DeSante et al. 1997), some of the most intensively farmed lands in the U. S. (Gilmer et al. 1982; Griggs 1992). The pervasive use of agricultural chemicals, including organochlorine, organophosphorus, and carbamate pesticides, and the existence of trace elements such as selenium, can potentially impact individual owls in these areas. Owls can be exposed by direct contact, ingestion from preening feathers, and through their diet, which includes insects, small vertebrates, crayfish from irrigation ditches, and potentially contaminated fish carrion (Gervais et al. 1997). Burrowing owls are known to scavenge dead rodents and other prey items, making them highly susceptible to secondary poisoning (Sheffield 1997b). Even low levels of chronic pesticide exposure may be detrimental to burrowing owls when combined with other stressors, although documentation of persistent pesticides in a biotic system does not infer the origin of contamination or its potential effects (Gervais and Anthony in press). It is unclear whether owls selectively use agricultural fields and whether they will do so following pesticide application, when large pulses of dead and dying invertebrate prey may suddenly be available (Gervais 2002). Studies at Lemoore NAS by Gervais (2002) and Gervais et al. (2003) did not find selection or avoidance by owls of fields recently treated with pesticides, and no owls appeared to have died following use of treated fields.

Burrowing owl populations in the San Joaquin Valley (Lemoore Naval Air Station), the Imperial Valley (Salton Sea National Wildlife Refuge), and Carrizo Plain Natural Area were sampled for contaminants in 1996 (Gervais et al. 1997). These sample sites were chosen to be representative of the general agricultural practices in the area. Gervais et al. (1997) found that burrowing owl eggs from Lemoore contained high concentrations of DDE, ranging from 1.5 to 33 ppm wet weight. Feathers from owls nesting at Lemoore that were also

contaminated with DDE indicated recent local exposure. Eggs from Salton Sea NWR and Carrizo Plain contained up to 0.38 and 3.4 ppm DDE, respectively. Eggs collected near Pixley in Tulare County in 1998 also contained traces of DDE (Rosenberg et al. 1998b). Although the burrowing owls in this study did reproduce successfully, the contaminant loads may make them much more vulnerable to unrelated stresses, such as exposure to other toxicants or weather. Some owl populations maintain substantial body burdens of persistent pesticides that may inhibit reproduction (Gervais et al. 2000).

In a follow-up study from 1998 to 2001, Gervais and Anthony (in press) sampled burrowing owl eggs at Lemoore NAS, and found levels of DDE varying over 4 levels of magnitude, but only 2 eggs with DDE levels worthy of serious concern (J. Gervais, pers. comm., 2003). DDE levels were not by themselves associated with reproductive failure, but contaminant concentrations in combination with low rodent abundance in the diet were related to reduced productivity (Gervais and Anthony in press). Variation within and among egg contaminants within years suggested that egg contaminant patterns may be the result of immigrating owls from more contaminated sites, and to a lesser extent, to varying patterns in prey availability.

Despite a long-standing ban on the use of DDT, its degradation product DDE remains a threat to wildlife in the San Joaquin Valley (Anderson et al. 2001). DDE has been documented in the eggs of terns (*Sterna* spp.), egrets (*Egretta thula*, snowy egret and *Ardea alba*, great egret), and herons (*Ardea herodias*, great blue heron and *Ncticorax ncticorax*, black crowned night heron) in San Francisco Bay (Ohlendorf and Fleming 1988; Ohlendorf and Marois 1990; Hothem et al. 1995), of herons and egrets in the Imperial Valley (Ohlendorf and Marois 1990), and of prairie falcons in Pinnacles National Monument, where it was associated with impaired reproduction (Jarman et al. 1996).

Gervais et al. (1997) also compared current eggshell thickness to burrowing owl eggs from 45 nests from central and southern California collected prior to 1937, and found that eggshell thickness in 1996 had declined over 20%. Eggs from Lemoore in the San Joaquin Valley were significantly thinner than those from the Salton Sea NWR or Carrizo Plain. Chemicals such as dicofol, used as a miticide on cotton and citrus crops, can cause eggshell thinning and toxicity in at least some captive raptors (Schwarzbach 1991), including the screech owl (*Otus* spp.) (Rohm and Haas Co. 1991). However, the effects of dicofol on captive birds have never been documented in the field and dicofol is apparently not a risk to wild bird populations although it is possible that individual birds are occasionally impaired (J. Gervais, pers. comm., 2003). Large amounts of difocol are used in the Imperial Valley and southern Central Valley: the average annual application of difocol was over 7,000 pounds in Imperial County from 1990-1999 (CDPR 2001), 175,000 pounds in Fresno County from 1993-1995, and 67,000 pounds in Kings County from 1993-1995 (CDPR, as cited in Anderson et al. 2001). Dicofol was never detected in the eggs of owls at Lemoore NAS, despite the wide use of the chemical there (Gervais and Anthony in press).

Exposure to the organophosphorus pesticide chloropyrifos was detected at Lemoore by footwash samples (Gervais et al. 1997) even though none was reported used within 1 kilometer of the study site prior to the sampling. Although organophosphorus compounds do not bioaccumulate and have relatively low environmental persistence, they pose some threat to owls through direct mortality. For example, organophosphorus insecticide exposure was documented to cause red-tailed hawk mortality in California orchards (Hooper et al. 1999). Large amounts of chloropyrifos are used in the Imperial Valley and southern Central Valley: from 1993-1995, an annual average of 110,000 pounds was applied in Imperial County, 497,000 pounds was applied in Fresno County, and 229,000 pounds was applied in Kings County (CDPR, as cited in Anderson et al. 2001). Organochloride residues have been found in adult and juvenile burrowing owls in Saskatchewan, but no effect on reproduction was noted (Haug and Oliphant 1987).

Carbamate compounds such as carbofuran and aldicarb, which share similar chemical and toxicological properties with organophosphorus pesticides, have also caused wildlife mortality (Mineau et al. 1999). Available evidence indicates that carbamate insecticides such as carbofuran and carbaryl negatively impact

burrowing owl populations (PMRA 1995; Sheffield 1997a, 1997b). Carbofuran, an insecticide, has caused a significant negative impact on survival and reproductive success of owls when sprayed over nest burrows (James and Fox 1987). The impact was believed to be due to direct toxicity, but indirect mortality as a result of contaminated prey may also be significant (Haug et al. 1993). Carbofuran is highly toxic to many birds, with one granule being sufficient to kill a small bird. Bird kills have occurred when birds ingested carbofuran granules, which resemble grain seeds in size and shape, or when predatory or scavenging birds have ingested small birds or mammals that have eaten carbofuran pellets (USEPA 1991). Red-shouldered hawks (*Buteo lineatus*) have been poisoned after eating prey from carbofuran-treated fields (Smith 1992), and Eastern screech owls (*Otus asio*) showed mortality from secondary poisoning when fed rodents killed by carbofuran (Sheffield 1997b). To protect birds, the EPA initiated a ban on all granular formulations of carbofuran in 1994, however there is no ban on liquid formulations of carbofuran. Of particular danger to burrowing owls are uses of this chemical in corn and alfalfa fields (Anderson et al. 2001). Large amounts of carbofuran and aldicarb are used in the Imperial Valley and southern Central Valley: an annual average of over 47,000 pounds of carbofuran was applied to forage crops in Imperial County from 1990-1999 (CDPR 2001); from 1993-1995 an annual average of over 7,900 pounds of aldicarb was applied in Imperial County, 55,000 pounds was applied in Fresno County, and 63,000 pounds was applied in Kings County (CDPR, as cited in Anderson et al. 2001).

Chemicals used for rodent control or as pesticides could adversely affect the reproductive success, survivorship, and prey base available to owls as they rear their offspring in agricultural areas (Peakall 1970; Henny et al. 1984; James and Fox 1987; Wiemeyer et al. 1989). Rodenticides and herbicides are often used to control numbers of ground squirrels and plant growth on levees. This is problematic in areas where a large proportion of owls nest in levee banks, such as in the Imperial Valley. In pastures where strychnine-coated grain is used to control ground squirrels, weights of breeding burrowing owls were found to be significantly lower than on control pastures and owls had slightly decreased breeding success compared to control owls (James et al. 1990), suggesting a sub-lethal effect or that less was food available. Anti-coagulants (such as brodifacoum) and other types of rodenticides (such as strychnine) have been shown to cause mortality in many different owl species, with the ingestion of as little as one poisoned prey item (Sheffield 1997b). The National Park Service has aeriually dropped grain pellets laced with brodifacoum 3 times since 2001 on Anacapa Island in southern California to control invasive black rats (*Rattus rattus*), killing 4 burrowing owls on the island (FFA 2002).

The burrowing owl's habit of feeding on aquatic organisms from agricultural drainage ditches makes it vulnerable to selenium, a naturally occurring element that is leached from soils through irrigation. Selenium has caused considerable damage to other bird species in the Central Valley (Ohlendorf et al. 1986, 1987, 1988). A number of pesticides deserve attention and further research as potentially negatively affecting burrowing owls, including Aldicarb, Chloropyrifos, Def, Diazinon, Dicofoc, Endosulfan, Lindane, Metam sodium, Methidathion, and Paraquat dicholoride (Rosenberg et al. 1998a).

Although agricultural contaminants can impact owls, studies of reproduction and survival in agricultural areas found no population-level effects of pesticides on owls (Gervais et al. 1997; Gervais 2002; Gervais et al. 2003; Gervais and Anthony in press). Because owls are central-place foragers, pesticide risks may be mitigated by avoiding pesticide applications near nest burrows and by maintaining a 500-600 meter buffer zone to prevent most primary and secondary poisonings (Gervais et al. 2003).

G. PREDATION

Introduced predators and changes in concentrations of natural predators due to anthropogenic ecosystem changes have impacted burrowing owls and continue to be a threat. As habitats have been altered and top predators exterminated, subsequent increases in mesocarnivores such as foxes, coyotes, and badgers may be taking a large toll on burrowing owls (Sheffield 1997a; Wellicome 1997). On Santa Barbara Island, California, a small population of approximately 20 burrowing owls was extirpated by barn owls in 1984 and again in 1987

following crashes in the deer mouse (*Peromyscus maniculatus elusus*) population (Drost and McCluskey 1992). In healthy burrowing owl populations natural predation is probably not a significant threat, but it may cause a significant decrease in viability for fragmented and remnant owl populations, especially when combined with other impacts, such as development, persecution of burrowing rodents, pesticides, or predation by nonnative species.

Predation by introduced red foxes (*Vulpes vulpes*) and feral cats is a serious problem for the burrowing owl, and urbanization has increased predation upon owls by domestic dogs (*Canis familiaris*) and domestic cats (*Felis domesticus*) (Coulombe 1971; Martin 1973; Green and Anthony 1989). Domestic cats accounted for 6 (30%) of the known owl deaths at a Florida study site (Millsap and Bear 1988). Feral cats are reported to be killing burrowing owls at Shoreline Park in Mountain View, Santa Clara County (P. Delevoryas, pers. comm., 2002). Dogs can also damage owl habitat: Thomsen (1971) estimated that dogs caused 20% of the observed damage to burrows at a study site in Oakland.

H. DISEASE

Diseases and parasites have not been documented to have direct impacts on burrowing owl populations. However, burrowing owls in California may be vulnerable to the West Nile virus (*Flavivirus* spp.). Since 1999, West Nile virus has been identified in more than in 138 species of birds found dead in the United States, including 7 species of owls (CDC 2002). This mosquito-borne virus is rapidly spreading westward across the United States (and is expected to take hold in California by summer of 2003) and has recently begun killing numerous raptors in the Midwest, including red-tailed hawks and great horned owls by the thousands, as well as black vultures (*Coragyps atratus*) and bald eagles (*Haliaeetus leucocephalus*) (Rappole et al. 2000; Russell 2002). Epizootics of sylvatic plague (*Yersinia pestis*) that affect rodent colonies could negatively impact and even eliminate burrowing owl populations indirectly by reducing available habitat (Dechant et al. 1999). Regarding parasites, fleas (*Echidnophaga gallinacea*) are frequently mentioned in the literature as common inhabitants of owl burrows and some birds have been known to carry lice (*Colpocephalum pectinatum*) (Thomsen 1971)

I. SMALL POPULATION SIZES

Small population size is a significant concern for California's burrowing owl population, since owls persist only in small fragmented and remnant colonies or small numbers of breeding pairs throughout the majority of their range in California. Although there is no good information on what population size of owls is vulnerable to local extinction, the viability of small populations partially depends upon the likelihood of immigration. A small effective population size predisposes small owl populations to a higher risk of extinction.

It is a widely recognized ecological principle that, in general, small isolated or fragmented populations are more vulnerable to extinction than large ones (Pimm 1991; Noss and Cooperrider 1994). Noss and Cooperrider (1994) identified four major factors that predispose small populations to extinction: (1) environmental variation and natural catastrophes like unusually harsh weather, fires, or other unpredictable environmental phenomena; (2) chance variation in age and sex ratios or other population parameters (demographic stochasticity); (3) genetic deterioration resulting in inbreeding depression and genetic drift (random changes in gene frequencies); and (4) disruption of metapopulation dynamics (i.e., some species are distributed as systems of local populations linked by occasional dispersal, which wards off demographic or genetic deterioration).

Many remaining owl populations in California are presumed to be reproductively isolated populations, making them more vulnerable to localized extirpations, absent the possibility of significant immigration of breeding owls from other areas (DeSante et al. 1997). Owls in the Imperial Valley are thought to be reproductively isolated from other populations to the west and thus not available as a source population to

augment the very small and declining populations inhabiting southwestern California and other areas of the state (DeSante et al. 1997). However, from recent banding studies conducted on fledglings at Lemoore NAS, there is some evidence that some burrowing owls are capable of dispersing widely and recruiting successfully into other populations (Gervais 2002).¹⁷³ Additionally, recent genetic analyses of burrowing owls from 3 demographic study sites (Lemoore NAS, Carrizo Plains, and the Imperial Valley) failed to identify population differentiation or evidence for genetic inbreeding or population isolation (Korfanta 2001).

Small owl populations have an increased likelihood of extirpation due to natural or anthropogenic impacts, can suffer from reproductive isolation and inbreeding, and are susceptible to increased predation. Stochastic environmental factors such as drought or prey reduction are more likely to eliminate small populations of burrowing owls (Trulio, unpubl. data, as cited in Buchanan 1997; DeSante and Ruhlen, unpubl. data). A population of burrowing owls studied in Davis, California showed higher genetic similarity than a collection of geographically separated owls, suggesting that some inbreeding was occurring in this wild population, likely as a result of small population size due to population subdivision (B. Johnson 1997a, 1997b).

The persistence of burrowing owl colonies in Saskatchewan was strongly correlated with higher habitat continuity, less patch edge, and more neighboring colonies (Warnock 1996, 1997; Warnock and James 1997). Fragmentation of remaining grassland habitat has been shown to increase populations of burrowing owl predators in Canada (Wellicome and Haug 1995; Warnock 1997) and may allow predators to find owl nests easily (James et al. 1997; Warnock and James 1997). In fragmented landscapes, burrowing owls may forage greater distances within larger home ranges and spend more time away from the nest, making them more vulnerable to predators (Haug 1985). In Saskatchewan, crowding of owls into smaller habitat patches may increase nest abandonment through events such as depredation (both intra- and inter-specific), foraging interference, and aggression (Warnock and James 1997). Fragmented agricultural landscapes may also increase vehicle collisions with owls (Clayton and Schmutz 1997).

Johnson (1997a) reported on the extinction of a small population of burrowing owls in less time than a population viability model predicted. Even large burrowing owl populations can decline at rapid rates. Owl numbers in Canada have been declining at a staggering rate of 16% per year nationwide since the early 1980s, and in excess of 20% per year in the Prairie Provinces (Saskatchewan, Alberta, and British Columbia) (Haug et al. 1993; Shyry et al. 2001; Wellicome and Holroyd 2001). In Nebraska, a population of burrowing owls in one area fell by 63% between 1990 and 1996 (Desmond et al. 2000).

J. OTHER ANTHROPOGENIC FACTORS

Fire Control

In many urban areas with burrowing owl habitat, open fields are disked for weed control to reduce the threat of fires. Disking or tilling of the land destroys burrows and potentially the owls in these burrows (Trulio 1998b). Mowing is a viable alternative that does not destroy birds or burrows. Several Bay Area entities, such as Moffett Federal Airfield and the cities of Palo Alto and Mountain View, have changed from disk to mowing on their lands to prevent the destruction of owls. The City of San Jose passed an ordinance in April 2001 prohibiting disk, with some exceptions (J. Barclay, pers. comm., 2002).¹⁷⁴ The Santa Clara Valley Fire Marshall's Office is currently reviewing its weed abatement policy. However, most cities within the range of the owl have no such ordinances or policies. Private landowners throughout California are still permitted to disk their lands, and 91% of remaining burrowing owls are on private land (DeSante et al. 1996).

¹⁷³ Gervais (2002) found evidence that owls fledged at NAS Lemoore recruited into other breeding populations in the San Jose area and Carrizo Plain National Monument, up to 160 km away.

¹⁷⁴ These exemptions are for: property less than 2 acres, land used for the production of agricultural products, fire breaks up to 30 feet wide, 400 acres of water pollution control plant lands used to dispose of reclaimed water, and lands identified by a qualified ornithologist as having little or no potential as burrowing owl nesting habitat.

Vehicle Strikes

The propensity of burrowing owls for nesting in roadside banks makes them particularly vulnerable to being hit by vehicles. Vehicular strikes are often a significant source of burrowing owl mortality (Konrad and Gilmer 1984; Haug and Oliphant 1987; Millsap and Bear 1988; Haug et al. 1993; Kemper 1996; Clayton and Schmutz 1997), because owls have a relatively high tolerance for vehicular disturbance (Coulombe 1971; Plumpton and Lutz 1993) and often fly low to the ground (Anderson et al. 2001). Vehicle collisions are the primary mortality factor for adult owls in some fragmented environments (Clayton and Schmutz 1997). Vehicle strikes of owls were once common in Orange County before the near-extirpation of the species, including strikes of several banded birds in the early 1970s (P. Bloom, pers. comm., 2002). Vehicle caused mortality is a concern for the owl population at the Carrizo Plain Natural Area (Rosenberg 1999) and has been documented frequently at Lemoore Naval Air Station (J. Gervais, pers. comm., 2003).

Naive juveniles are particularly vulnerable when feeding on road-kills or on insects attracted by warm pavement at night. Rosenberg (1999) noted that as chicks at Carrizo Plain became capable of flight, they commonly began to hunt as a family group, frequently on roads. The risk of vehicle collision is likely greater in developed areas with dense human population or along areas where owls nest predominately near roads (Anderson et al. 2001). Higher post-fledging mortality due to vehicle collisions was noted to occur in agricultural landscapes with more than 90% of the land area under cultivation compared to an un-fragmented rangeland with less than 20% cultivation (Clayton and Schmutz 1997; Paige 1998). Off-road vehicle activity is also a threat to owl habitat as their burrows can be crushed and their nest sites disturbed (CVAG 2001).

Aircraft Strikes

Although burrowing owls are an unlikely species for bird air strikes, there have been documented deaths from collisions along runways (Rosenberg et al. 1998a). Powerful jets have the ability to “inhale” birds from some distance away (Rosenberg et al. 1998a). Another potential cause of mortality in and around airports is the powerful “wake turbulence” from aircraft wings (J. Barclay, pers. comm., 2002). Several colonies of burrowing owls at airports nest in close proximity to runways, such as at Oakland Airport in Alameda County, Moffett Airfield and San Jose International Airport in Santa Clara County, Lemoore Naval Air Station in Kings County, and North Island Naval Air Station in San Diego County. Military aircraft are especially prone to strikes because they frequently fly at high speeds and at low altitudes where birds are most active. Lemoore NAS and North Island NAS reported 130 and 132 aircraft/bird collision incidents, respectively, from 1981 to 1998 (BASH 2002). China Lake NAWS reported 27 such incidents from 1981 to 1992 (NAWS China Lake 2002). It is unclear whether any of these strikes involved owls. A study of bird-aircraft strikes at 11 naval bases in California and Arizona reported raptors composed 4.4% of known bird-strikes from 1981 to 1991 (Kuenzi and Morrison 1998). Lemoore Naval Air Station has a management plan that reduces the number of owls near the airfields by altering habitat and blocking burrows adjacent to runways (Rosenberg et al. 1998a), and although large numbers of owls nested along runways and taxiways there, aircraft strikes appeared to be very rare (J. Gervais, pers. comm., 2003). San Jose Airport has also approved a burrowing owl management plan that manages owls away from the center of runways (J. Barclay, pers. comm., 2002).

Electrified Fences

Electrified security fences killed more than 3,000 protected birds, including 144 burrowing owls, at 13 California state prisons from 1993 to 1998 (USFWS 1998). The highest kill was 102 burrowing owls from 1993-1997 on the electrified fence at Calipatria State Prison, Imperial County, prior to modifications by the California Department of Corrections (CDC) (CDFG 2002a; York et al. 2002). Protective netting, expected to cut the number of bird deaths by 90%, was installed in 1998 at 13 of the state’s then 25 prisons with electrified fences. However, roughly half the remaining prison fences are presumably still killing owls. The CDC is already retrofitting many other existing prisons with electrified fences, but no further installation of protective netting is planned. The proliferation of prisons in rural areas with electric fences can be expected to kill burrowing owls in those areas. A 50-year CDC Electric Fence Habitat Conservation Plan currently being

prepared presumes that 15-17 owls will be killed per year (850 owls total), with only 72 acres of protected land proposed as mitigation (CDFG 2002a).

Wind Turbines

Turbines at wind energy facilities at Altamont Pass in eastern Alameda and Contra Costa Counties and the Montezuma Hills in Solano County kill large numbers of raptors through collision or electrocution, including burrowing owls (Estep 1989; Howell 1997). Six years of raptor mortality studies in the early 1990s determined that a mean of 2.8 raptors were killed annually per 100 turbines at study sites in both areas (Howell 1997). Burrowing owl mortality is reportedly a “common occurrence” at the Altamont Pass wind facilities (G. Hunt, pers. comm., 2003). There are other major developed wind resource areas at Tehachapi Pass in Kern County and San Geronio Pass in Riverside County, but it is unknown if there is owl mortality at these locations.

Shooting

Shooting has been a significant source of burrowing owl mortality in former times (Grinnell and Miller 1944). Between the 1860s up until the 1970s, collectors shot literally thousands of burrowing owls - these specimens now reside in museums and collections. Although shooting for collecting purposes is no longer a problem, shooting by vandals is still an issue (e.g. Zarn 1974). Shooting caused 66% of the known mortality at a study of burrowing owl sites in Oklahoma (Butts 1973). Wedgwood (1978) discussed 3 burrowing owl colonies in Canada destroyed by shooting, Evans (1982) identified shooting as a problem in Sonoma County, a Boy Scout shot 4 owls at Laguna Niguel in Orange County (P. Bloom, pers. comm., 2002), and a small colony at Upper Newport Bay was apparently extirpated by shooting in the 1970s (J. Bath, pers. comm., 2003). Shooting remains a likely cause of at least limited mortality in the Mojave Desert (Campbell 1999) and in Santa Clara County (C. Breon, pers. comm., 2003).

Vandalism

Thomsen (1971) estimated that 65% of the damage to burrows at her owl study site at the Oakland Airport was caused by humans, and cited plugging of burrows as a possible cause of loss of eggs and young. Some of the recent owl declines in the Cypress Channel owl population in Chino have been due to plugging of burrows (J. Bath, pers. comm., 2003).¹⁷⁵ Illegal trash dumping has also been observed to impact burrowing owls (CVAG 2001; J. Bath, pers. comm., 2003). Remsen (1978) reported on an owl burrow deliberately destroyed by vandals. J. Bath (pers. comm., 2003) has documented several instances of human harassment that likely contributed to localized extirpations of owls in western San Bernardino County (see footnote 140 on page 47). Human harassment of burrowing owls and vandalism of burrows will likely increase with urbanization.

Other Mortality

Burrowing owls have been found dead apparently trapped in pipes and PVC mining claim posts (Brattstrom 1995; CNDDDB 2001).¹⁷⁶ Falconers flying their birds at rabbits once commonly killed burrowing owls in southern California (P. Bloom, pers. comm., 2002). There is a long history of anti-predator measures at Least Tern colonies in San Diego County, conducted by the Wildlife Services Agency (formerly Animal Damage Control), under the U. S. Department of Agriculture. The activities of this federal agency have contributed more to the recent extirpation pulse of burrowing owls along the San Diego coast than any other known form of mortality (P. Bloom, pers. comm., 2002). Owls in southern California observed preying on Least Tern chicks have been shot and killed (even owls breeding nearby with young), with no attempt made to capture or relocate the owls (P. Delevoryas, pers. comm., 2003).

¹⁷⁵ Field crews with the San Bernardino Department of Transportation and Flood Control have been plugging burrows known to have been formerly occupied during nesting season, claiming to have an agreement to do so with the California Department of Fish and Game (J. Bath, pers. comm., 2003, conversation with Ken Miller of SBDTFC).

¹⁷⁶ Five adult owls were found dead in a pipe at 3-Com Corp. in Santa Clara, in Santa Clara County, on 8/31/91 (CNDDDB 2001); and burrowing owls were found dead in PVC mining claim posts in the Hackberry and Castle Mountains in San Bernardino County in January 1990 (Brattstrom 1995).

IX. INADEQUACY OF EXISTING MANAGEMENT EFFORTS

Federal, state, and local regulatory mechanisms have failed to protect the burrowing owl and its habitat in California. Although numerous federal, state, and local agencies manage burrowing owls and their habitat, they have failed to adequately protect or compensate for the loss of owl habitats (Anderson et al. 2001). Grasslands are not specifically protected by law and are rarely protected by state, federal or municipal reserve systems. Protections for other endangered, threatened and rare grassland species may serve to protect some fraction of owl habitats in some parts of California. However, there is no specific habitat protection for burrowing owl habitat, and in parts of the state where listed species do not exist, owl habitat cannot currently be protected. Because no recovery plans currently exist for the burrowing owl, management of owls has generally been incidental or as a byproduct of other management purposes (i.e. mowing at airports) and taken the form of local impact mitigation included in environmental impact assessment documents. This mitigation often includes the translocation of owls and localized extirpation of breeding colonies. Burrowing owl management has been limited to project-by-project responses to development impacts and is inadequate for the long-term maintenance of the species in significant parts of its range in California. Without statewide protection of burrowing owls and their habitat, the predictable outcome of present trends is the extirpation of the species throughout most of its range in California.

A. FEDERAL REGULATORY MECHANISMS

1. Federal Designation as a Species of Special Concern Under the Endangered Species Act

The U.S. Fish and Wildlife Service listed the western burrowing owl under the Endangered Species Act (“ESA”) as a federal Category 2 Candidate Species in 1994 (USDI 1994). This designation was changed to a “Migratory Nongame Species of Management Concern” in 1995 (OMBM 1995), and it was subsequently reclassified as a Species of Special Concern (“SSC”) in 1996. In 1996 the Category 2 designation was discontinued. None of these designations provide formal protection to the species. Neither the protections of Section 9 of the ESA (prohibiting “take” of the species) nor the protections of Section 7 (requiring all federal agencies to ensure that their activities do not jeopardize the continued existence of the species) apply to SSC species. SSC species will not have critical habitat designated, nor will they receive recovery plans.

The stated purpose of the SSC designation is to allow landowners and other project proponents to plan early for the protection of species that are not yet listed but are likely to become listed in the future. Some Habitat Conservation Plans, completed under Section 10 of the ESA by project proponents in order to obtain a permit for take of species that would otherwise be prohibited under Section 9, do contain some mitigation for SSC species. In addition, the U. S. Fish and Wildlife Service does encourage federal agencies to consider SSC species during Section 7 consultation. However, these informal protections are implemented only at the discretion of the landowner and do not provide sufficient protection for the burrowing owl. As noted above, 91% of the burrowing owls remaining in the state are located on private lands (DeSante et al. 1996) and the threats to these populations are not subject to any federal regulation.

2. Federal Listing of Other Species Within the Range of the Burrowing Owl

Listing under the federal ESA for other species that overlap with the burrowing owl in habitat and range could conceivably provide some protection to the species. Suitable habitat for burrowing owls overlaps somewhat with habitat for federally listed species and species of concern such as the San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia sila*), listed and special-status kangaroo rats (*Dipodomys ingens*, *D. nitratooides nitratooides*, *D. n. exilis*, *D. n. brevinasus*), San Joaquin antelope squirrel (*Ammospermophilus nelsoni*), San Joaquin pocket mouse (*Perognathus inornatus inornatus*), Tular grasshopper mouse (*Onychomys torridus tularensis*), desert tortoise, and Mohave ground squirrel (*Spermophilus mohavensis*). The primary way in which the burrowing owl could benefit from the listing of

these species is through protection of owl nesting and foraging habitat shared with these species. Many, if not all, of these species have continued to decline since listing, raising questions as to whether federal listing has adequately protected these species themselves, let alone species that merely overlap somewhat in range. Additionally, the vast majority of remaining burrowing owls live in the margins of agricultural areas, which are not protected habitat for any listed species.

3. Habitat Conservation Plans

There are a number of federal Habitat Conservation Plans (“HCP’s”) in California under which the western burrowing owl is a covered species. However, the burrowing owl is not a federally listed species, and since HCPs are not required to benefit non-listed species, they are not a mechanism adequate to protect burrowing owls.

The HCP provisions of the ESA were intended to provide a net benefit to threatened and endangered species, in return for providing landowners with regulatory certainty and permits to impact or otherwise “take” listed species and their habitats. In theory, HCPs can help protect and restore habitat, including habitat for non-listed species covered under the plan. Unfortunately, most HCPs fail to live up to this promise, and simply function as exemptions from the ESA’s species and habitat protection policies. Arguably, a few HCPs make the best of difficult situations on private lands, and may even help species’ recovery to some extent. However, since HCPs are not required to have a net benefit to listed species or contribute to their recovery, there is considerable reason to be skeptical of the ability of HCPs to protect populations and habitat for covered non-listed species such as the burrowing owl.

A nationwide study of HCPs by the National Center for Ecological Analysis & Synthesis and the American Institute of Biological Sciences (Kareiva et al. 1999) found that most HCPs contribute to habitat losses for the targeted species, fail to meet recovery goals, and suffer from poor planning and plan evaluation. Among the failures of HCPs discussed by Kareiva et al. (1999): nearly 30% of HCPs “take” 100% of the focal species’ populations or habitat in the permit area; about 50% of HCPs allow 50% or more of the species’ populations or habitat in the plan area to be “taken”; 43% of the time, HCPs failed to provide sufficient mitigation measures; 23% of the time, species and their habitats will be “taken” before mitigation measures have been implemented and found effective - most HCPs fail to reduce allowed “take” levels or use other more conservative approaches in the face of inadequate information or uncertainties; 33% of HCPs failed to secure up-front funding to ensure that mitigation actually occurs; and 81% of HCPs studied will have irreversible impacts.

Not surprisingly, Kareiva et al. (1999) found that HCPs which fail to adequately conserve species also tend to lack rigorous impact assessments and planning. The Kareiva et al. (1999) study found that: 75% of the time, impacts to species were not adequately studied by HCPs; 42% to 49% of the time, HCPs failed to quantify how much of a species’ habitat and population, respectively, will be “taken”; most HCPs used low quality data to evaluate their mitigation measures; and 25% of the time, sufficient information did not exist to determine how HCPs would affect the species’ viability.

These inadequacies should be kept in mind while reviewing HCPs approved in California. Of the approximately one dozen approved HCPs (of more than 100 acres) that specifically cover the burrowing owl, none are in the Imperial Valley, where 71% of state’s breeding owl population resides. There are also no approved HCPs covering the northern Central Valley, where 6.4% of the state owl population lives, nor in the Bay Area or central western California, areas containing 1.8%, and 0.5% of the state’s owl population, respectively.

There are 6 approved HCPs covering over 163,000 acres within the range of the owl in the southern Central Valley, where 15% of the state population lives. These include ARCO Western Energy HCP (120,320

acres), Nuevo-Torch HCP (21,800 acres), Kern Water Bank HCP (19,900 acres), Seneca and Enron Oil and Gas HCP (650 acres), and Corrections Corporation of America HCP (425 acres), all in Kern County and portions of Tulare and Kings Counties. The Kern Water Bank HCP mentions no specific protections or mitigations for the burrowing owl.

Three approved HCPs cover about 55,000 acres within the range of the owl in the middle Central Valley, where 2.5% of the state population exists. These are the Natomas Basin, City of Sacramento HCP (53,342 acres), Natomas Basin Metro Air Park HCP (1,981 acres), and the Tiechert Vernalis Project HCP, Phases 1&2 (300 acres). These are all 50-year plans.

Most of the remaining approved HCPs are in San Diego County, including the San Diego MSCP, encompassing a 582,243 acre planning area, Fieldstone/La Coasta HCP (1,955 acres), and San Diego Gas & Electric HCP (124 to 400 acres). The Fieldstone/La Coasta HCP will conserve 55 acres on-site and “take” 280 acres of potential owl habitat. Only 31% of the existing grasslands and 45% of the presumed potential owl habitat will be conserved under the San Diego MSCP, which will impact 8 known owl breeding locations and conserve 12 known historic locations. Unfortunately, only 1 protected owl population within the San Diego MSCP (at Otay Mesa) has any long-term viability (P. Unitt, pers. comm., 2001).

The Lake Mathews HCP (5,993 acres) and North Peak Development Project HCP (997 acres) fall within the range of the owl in Riverside County. The Lake Mathews HCP protects 710 acres off-site in Metropolitan mitigation bank lands, and “takes” 344 of 3,046 acres (11%) of the occupied owl habitat on the site. The North Peak Development Project HCP protects 31 acres on-site and 100 acres off-site, and “takes” 147 acres of potential owl habitat.

There are a few pending HCPs that specifically cover the burrowing owl, including the Pleasant Valley, City of Coalinga HCP (250 acres) in Fresno County, and Assessment District 161 HCP, covering 19 projects (3,094 acres) and Pacific Bay Properties HCP (798 acres) in Riverside County. The Pacific Bay Properties HCP would impact 87 acres and preserve 108 acres of potential owl habitat. The Western Riverside County Multiple Species HCP (1,260,000 acres) covers the burrowing owl as well as 141 other species, but will only conserve 9% of remaining agricultural lands, 27.5% of remaining grasslands, and 54% of remaining coastal sage scrub habitat, and will not adequately protect the owl. In fact, only 50% of 12 known populations in Western Riverside County would be protected in the most optimistic circumstances if the plan is approved as currently written (see below). As these HCPs are not yet in place, they cannot be counted on to provide even minimal protection to the burrowing owl. There are a few approved HCPs that do not specifically cover the burrowing owl but may overlap its habitat, including the San Joaquin County HCP, Metro Bakersfield HCP, and Stephen's Kangaroo Rat HCP, but there is no guarantee that these HCPs will protect the burrowing owl. The Kern County Valley Floor HCP (1,990,400 acres) is being developed in the southern San Joaquin Valley within the range of the burrowing owl, but again the owl is not a covered species in that plan.

Roughly 85% of the state’s remaining owls have no coverage under approved or pending HCPs. Of the 15% that may have coverage, the HCPs allow for varying levels of development and destruction of occupied or potential burrowing owl habitat, with appropriate “mitigations.” Although some owl habitat is theoretically protected for the 20-50 year life of these plans (assuming there are no problems with monitoring, funding, etc.), the overall result of these HCPs is a net loss of burrowing owl habitat.

For example, burrowing owls are known to occur throughout the entire 21,800 acres covered by the Nuevo-Torch HCP in Kern County. The plan estimates 13% of this habitat (1,700 acres) will be “disturbed” by oil and gas activities authorized by the plan. Potential threats identified are that owls will be “directly injured or killed by land clearing and compaction, by vehicle strikes resulting from increased project related traffic, through inadvertent entrapment in collapsed dens or burrows, by oil spills, and by wildfires...started during construction activities...may be subject to harassment resulting from increased levels of disturbance, vehicle

use, and through the implementation of certain mitigation measures, such as excavation of burrows.” Note that the mitigation measure allowing excavation of burrows, which will be “excavated by hand and refilled to prevent reoccupation,” sanctions destruction of owl habitat. While this mitigation avoids direct “take” of owls, it does not adequately mitigate for the habitat loss.

The Nuevo-Torch HCP acknowledges significant impacts to burrowing owls: “oil and gas activities involving ground disturbance may impact the species. Destruction of the burrows may result in a net reduction of burrowing habitat used by these animals for shelter, reproduction, and escape cover. Animals may be displaced into adjacent areas resulting in increased predation, exposure, or stress through disorientation and loss of shelter.”

The Natomas Basin site in Sacramento has an estimated 247 miles of canals and ditches and associated agricultural fields that are potential burrowing owl habitat, and 2,187 acres of “enhanced upland reserve habitat” would be established for the owl. However, mitigation measures include not disturbing occupied burrows during the nesting season unless juveniles are determined to be able to survive on their own, and maintaining a 300 foot buffer around occupied burrows during construction (relocation will take place if that is not “feasible”). Thus, the HCP permits urban encroachment to within 300 feet of burrows, and allows for relocation.

The Metro Air Park development HCP establishes 2% of the project area as habitat reserve land, only ¼ of which would be potentially suitable habitat for the burrowing owl. If burrowing owls are found during surveys on the other 98% of the project area, the “mitigations” include not disturbing occupied burrows during nesting season (as already required by state Fish and Game Code) unless “approved by a biologist;” acquiring and permanently protecting a minimum of 6.5 acres of foraging habitat adjacent to occupied burrowing owl habitat per paired or unpaired bird (although it is not specified whether this will be on-site); enhancing existing or creating new burrows at a 2:1 ratio when destruction of a burrow is “unavoidable;” use of passive relocation techniques (i.e. preventing owls from reoccupying nests); and a caveat that the project sponsor “should” provide funding for long term management and monitoring. The amount of habitat protected and mitigation measures proposed do not inspire confidence that burrowing owls will persist on this site to be managed and monitored.

The Tiechert Vernalis HCP goes one step further, conceding that the preservation and persistence of the burrowing owl is “not a priority,” and offers no mitigation for loss of burrowing owl habitat. The plan advocates destroying ground squirrels and their burrows and planting vegetation taller than 36”, so as not to attract burrowing owls to the site. If no burrowing owls, California red-legged frogs, California tiger salamanders, or San Joaquin kit foxes are found during surveys, plowing or disking of the land is authorized. If owls are found, they will not be disturbed during breeding season unless “approved by a biologist,” and passive relocation (i.e. preventing owls from reoccupying nests) is the preferred option. The stated intent of this HCP is to remove burrowing owls from the project site and destroy burrowing owl habitat.

An HCP being prepared for the West Mojave planning area, which covers 9.5 million acres, has proposed to include the burrowing owl as a covered species. The target species of the West Mojave HCP are the desert tortoise and the Mojave ground squirrel. The plan would allow take of burrowing owls throughout much of the planning area where owls do not co-occur with the target species, such as in urbanized areas. The only potential protection for burrowing owls in the plan is through land acquisition and creation of a small, unspecified owl conservation area near the Antelope Valley Poppy Preserve. One problem with the plan is that there are no surveys or baseline data to determine how many owls are in the area or how many will be taken through activities allowed under the plan (M. Connor, pers. comm., 2002).

The Western Riverside MSHCP, with preparation nearing the final stages, intends to conserve only 6 of the 12 core populations of burrowing owls at Lake Skinner area, Diamond Valley Lake area, the playa west of Hemet, Mystic Lake, Lake Mathews, and along the Santa Ana River, with sufficiently large blocks of habitat to

maintain viable populations. Only 16 of the 38 precise point locations for burrowing owls (and of 82 overall locations in the region from the past 10 years) fall within the proposed assembled reserve. Additionally, only 21% of the primary habitat for burrowing owls throughout western Riverside county (agriculture, grassland, playa, and vernal pool habitats) is proposed for inclusion within the assembled reserve, and reserve lands are to be purchased from willing sellers only and thus protection is not assured. The plan also relies heavily on presumed successful translocation of burrowing owls into the reserve areas from development sites.

A draft HCP is currently being prepared for the Imperial Irrigation District (“IID”) Water Conservation and Transfer Project. The proposed project would involve IID conserving and transferring the right to use up to 300,000 acre-feet per year of Colorado River water to San Diego County Water Authority, Coachella Valley Water District, and/or the Metropolitan Water District. The IID plans to line a small percentage of their earthen irrigation canals with concrete.¹⁷⁷ The HCP also covers operations and maintenance activities along IID drains and canals. IID cleans 20% of its canals and ditches each year, through chaining, disking, side scraping, and use of Roundup, Rodeo, and Direx. The Draft HCP specifies avoidance and mitigation measures for burrowing owls, but has been criticized for having vague adaptive management provisions and guidelines and for failing to address the potential impacts of pesticides on owls.¹⁷⁸

4. Conservation Banks

The U. S. Fish and Wildlife Service acknowledges a small number of conservation banks in California where land can be purchased by developers, essentially as “mitigation” credits for habitat destruction elsewhere. The ideal is to allow for larger habitat areas protected in banks that are more efficient and cost effective to manage instead of small, isolated properties. However, the conservation bank approach for burrowing owls implicitly endorses extirpation of owls from areas of high development by not requiring on-site conservation measures, ensuring that owls will eventually be eradicated from urban areas. Additionally, the small number of conservation banks with owl habitat, their extremely small size, and the rising cost of purchasing suitable land for habitat make this approach incapable of protecting significant populations of owls. So far the only conservation bank formally identified by the Fish and Wildlife Service with suitable habitat for burrowing owls in California is a small area (251 acres) at Dolan Ranch in Colusa County. It is unclear how many, if any, breeding owls occur there.

B. STATE REGULATORY MECHANISMS

1. State Designation as a Species of Special Concern Under the California Endangered Species Act

The burrowing owl was designated as a state Species of Special Concern (“SSC”) by the California Department of Fish and Game in 1979. The practical benefit of this designation to the burrowing owl has been

¹⁷⁷ There are 1,667 miles of IID canals in the Imperial Valley; about 70% of these are lined, and about 537 miles are earthen channels. While up to 100% of currently unlined canals will be available to line (537 miles) under the HCP, only 1.74 miles of canal (0.1% of the entire system) are currently proposed for lining. The estimated abundance of owls along canals in the Imperial Valley is 4.7 pairs/mile; lining 1.74 miles would likely displace 16 owls. The IID expects to construct about 72 miles of lateral canals that would potentially provide suitable owl habitat. It is estimated that about 4 owls could be displaced per year because of drain and canal rerouting (this is not a permanent habitat loss, as the owls can relocate to the new canals) and maintenance.

¹⁷⁸ The Draft HCP proposes to implement a worker and farmer education program; minimize the potential for operations and maintenance activities to injure individual owls by avoidance of burrows that do not compromise the integrity of the channel embankment and lining; filling or impacting burrows from October through February after surveying by a biologist to ensure an owl is not present in the burrow; careful management of grading spoils; and replacement of impacted burrows by a two-to-one ratio in appropriate areas (regardless of whether the burrow was currently in use). The IID will also conduct a 12-15 year demographic study of the Imperial Valley burrowing owl population.

According to the Western Environmental Law Center (WELC 2002), the Draft HCP fails to adequately identify, evaluate, and provide mitigation for the increased concentrations of toxic chemicals, including pesticides, which will occur in agricultural runoff in the drains and canals within the IID service area. The HCP does not address the extent to which herbicides will be sprayed directly on occupied burrows, the potential direct toxicity impacts on owls, or indirect impacts from contact with water or prey with elevated levels of pollutants.

minimal. Such status may call attention to the species and prompt more information to be collected about the loss of its habitat in Environmental Impact Reports and other documents, but it has not halted the habitat loss or other factors causing the decline of the species.

The inadequacy of the SSC designation to protect burrowing owls is vividly demonstrated by the current status of the species in Santa Clara County. Because occupied habitat in Santa Clara County is so minimal, it may already be too late to preserve suitable mitigation sites (adequate breeding and foraging habitat for viable long-term survival of healthy breeding colonies) within the county, due to the fast pace of development project approval and construction. CDFG's current mitigation policy for the area is to evict owls from Santa Clara County and preserve habitat in Byron in Contra Costa County. There are no supporting data that the loss of owls in Santa Clara County will be compensated for in Byron, which is approximately 50 miles away, outside the Bay Area.

2. California Environmental Quality Act

The environmental review process under the California Environmental Quality Act ("CEQA") should theoretically provide some protection to burrowing owls. CEQA declares that it is the policy of the state to "[p]revent the elimination of fish or wildlife species due to man's activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities." (California Public Resources Code, Section 21001(c)). When the CEQA process is triggered, it requires full disclosure of the potential impacts of proposed projects. The operative document for major projects is usually the Environmental Impact Report (EIR).

Theoretically, besides ensuring environmental protection through procedural and informational means, CEQA also has substantive mandates for environmental protection. The most important of these is the provision requiring public agencies to deny approval of a project with significant impacts when feasible alternatives or feasible mitigation measures can substantially lessen such effects. In practice, this mandate is rarely implemented, especially with regard to the burrowing owl. Project proponents and approving agencies almost universally dismiss alternatives that would protect burrowing owls and other wildlife as "infeasible".

CEQA requires a full public disclosure of the potential environmental impacts of proposed projects. The public agency with primary authority or jurisdiction over the project is designated as the lead agency and is responsible for conducting a review of the project and consulting with other agencies concerned with resources affected by the project. Section 15065 of the CEQA guidelines require a finding of significance if a project has the potential to "reduce the number or restrict the range of a rare or endangered plant or animal." Species that are eligible for listing as rare, threatened, or endangered but are not so listed are given the same protection as those species that are officially listed with the state.

Once significant impacts are identified, the lead agency has the option to require mitigation for effects through changes in the project, claim a categorical exemption, or to decide that overriding considerations make mitigation infeasible. In the latter case, projects may be approved that cause significant environmental damage, such as destruction of sensitive species. Protection of listed species through CEQA is therefore at the discretion of the lead agency involved. CEQA provides that when overriding social and economic considerations can be demonstrated, project proposals may go forward, even in cases where the continued existence of the species may be threatened, or where adverse impacts are not mitigated to the point of insignificance.

For example, Trulio (1998a) documented the utter failure of the CEQA process to protect burrowing owl habitat in Santa Clara County. Surveys by Trulio (1998a) of 123 of 215 known owl occupancy sites in Santa Clara County (H. T. Harvey and Associates 1994) showed a steady decline in remaining owl habitat. In 10 years, 70 of 123 sites (57%) were lost to development, an average of almost 6% per year. Another 12 sites

(10%) were reduced in size or habitat quality.¹⁷⁹ At this rate of loss, Trulio (1998a) predicted the remaining sites on private or city owned land could be lost by 2005, despite the existence of CEQA. Trulio (1998a) noted that the following factors likely explain the failure of CEQA to protect owl habitat: lack of CEQA review, failure to identify owl habitat during CEQA review, use of Categorical Exemptions, use of Overriding Considerations, and ineffective mitigation measures. Many lead agencies declare significant impacts to owls, then approve the project despite those impacts pursuant to a Statement of Overriding Considerations which concludes that the benefits of the project outweigh the harm to the owls. This was the case when the City of Alviso, in Santa Clara County, approved its General Plan in 1998, with 18 significant, unavoidable impacts, including loss of habitat for burrowing owls.

The burrowing owl is a species frequently overlooked during the CEQA process and often detected just prior to ground-disturbance, too late in the CEQA process to allow for adequate mitigation planning. This results in last-minute efforts to mitigate impacts to burrowing owls, such as relocation out of development areas. Trulio (1998a) noted that in her experience, when owl habitat is identified during the CEQA process, mitigation other than avoidance is nearly always proposed, meaning that owl habitat is nearly always destroyed or reduced.

Another problem is that the treatment of burrowing owls has been wildly inconsistent between regulatory agencies and between different regional branches within a single agency, such as CDFG. At best, CDFG occasionally requires mitigation for destruction of burrowing owl habitat by purchase of mitigation bank habitat at a ratio of 6.5 acres/owl pair, which is in no way based on the biological needs of the species (see the discussion below). CDFG does not even require that this habitat be in the general vicinity of the habitat-destroying project, virtually ensuring that breeding burrowing owls will continue to be systematically extirpated from the most rapidly urbanizing areas of its range. Even if mitigation banking were consistently applied and implemented, this requirement would be inadequate to protect the species from extirpation through most of its range. Many mitigations do not even approach this 6.5 acre figure, such as the Cisco Systems development in north San Jose, where CDFG protested, but declined to challenge an EIR proposing to set aside 21.7 acres of owl habitat for a colony of 16-22 owls (roughly 2 acres/pair) and destroy 130.9 acres.

The active relocation of burrowing owls has become a widespread management technique in California (Trulio 1995; Delevoryas 1997; Feeney 1997). Standard procedure for lead agencies statewide has been to declare that significant impacts could be avoided by simply moving owls out of the way of development, thereby avoiding take. Relocation does avoid direct owl mortality, but does not mitigate for habitat loss. There also has been little success at establishing long-term nesting of owls at relocation sites. There are little data supporting the premise that owls moved long distances (greater than 300 feet) or evicted from their burrows can survive or reproduce successfully (Trulio 1997), yet this continues to be the most common “mitigation” for development projects which result in the destruction or alteration of owl habitat. Rarely does mitigation require the creation or restoration of owl habitat to replace the habitat that will be destroyed, nor are there often requirements to manage for long-term viability of owls at release sites. Of owls that have been moved, the vast majority generally will disappear from or abandon the new location, often returning to the eviction site (Harris 1987; Dyer 1988; H. T. Harvey and Associates 1993; Martell et al. 1994; Delevoryas 1997; DeSmet 1997; Feeney 1997; Trulio 1997).

The movement of owls out of the way of development has resulted in a net loss of owl habitat and fails to preserve owl populations at existing locations. Translocation is an incomplete mitigation, as it may function to prevent the direct killing of birds, but birds are eventually lost as available habitat decreases. Current mitigation and other management plans do not function to prevent the ultimate decline of the owl population. Despite the CDFG publication of a “Draft Staff Report on Burrowing Owl Mitigation” in 1995 (discussed more fully below), the limitations with CEQA still remain.

¹⁷⁹ Trulio listed sites completely developed as “lost,” those diminished in size or habitat quality as “reduced,” and those which could still support a pair of owls as “extant”.

3. CDFG Mitigation Guidelines

In the absence of endangered species laws or state agency guidelines to protect an obviously declining species, and in an attempt to develop a consistent, logical means for avoiding direct owl mortality, defining impacts, and suggesting reasonable mitigation, the biological community formed the California Burrowing Owl Consortium (“CBOC”) in 1989. The CBOC prepared a document entitled “Burrowing Owl Survey Protocol and Mitigation Guidelines” in 1993, intended to standardize determinations of owl presence and impact assessment (CBOC 1997). After submission of this document, the Department of Fish and Game subsequently prepared a “Draft Staff Report on Burrowing Owl Mitigation,” which borrowed extensively from the CBOC’s document (CDFG 1995).

The CBOC guidelines were intended to assist individuals (in the private or agency sectors) faced with mitigating direct impacts to burrowing owls; this document was not intended to address region-wide, long-term conservation planning for the species. The guidelines have been widely used by agency and private biologists from 1994 to the present, but have also been badly misused and misinterpreted.

In trying to determine a number that represented an impact threshold, CBOC took into account the fact that owls move, sometimes long distances (e.g., Haug and Oliphant 1990), and also nest in areas that might appear to have only a small proportion of suitable habitat. The threshold question hinged on how close development could come to a burrow without a significant impact and whether projects with a modest footprint (e.g., pipelines and transmission lines) could be declared to have significant impacts to an owl home range encompassing scores, if not hundreds of acres. Using a combination of intuited disturbance distances (a few dozen meters) and territorial considerations, biologists with the CBOC selected a 300-foot radius around an occupied burrow (6.5 acres) as the amount of habitat estimated to be a threshold where significant impacts should be considered. This area was not purported to be the amount of habitat needed to support a pair of burrowing owls, nor was it meant to be used as a way to manage for a sustainable population of owls.

However, in 1999, CDFG agreed to a development project in the City of Santa Clara on a site that supported 9 pairs of owls, and declared the number of owl pairs multiplied by the 6.5 acre figure was acceptable mitigation. The replacement acreage did not have to be in the vicinity of the project and it did not have to be in place for 2 years. There is now an unofficial “owl bank” for south Bay projects located in Byron in eastern Contra Costa County, re-enforcing the perception that CDFG has abandoned efforts to protect owls in the urban Bay Area. According to the CDFG, Central Coast Region, this mitigation requirement of conservation and long-term management of 6.5 acres of existing burrowing owl habitat has been applied to at least 84 owl pairs directly impacted by development activities in the past 3 years, within the southern and eastern portions of the Bay Area (Contra Costa, Alameda, and Santa Clara Counties) (CDFG 2002a). The required mitigation acreage has been purchased at 3 small mitigation banks in eastern Alameda and Contra Costa Counties (CDFG 2002a). Use of these conservation banks as acceptable mitigation preserves only a very small amount of burrowing owl habitat in exchange for the likely eventual extirpation of owl populations from the eastern and southern Bay Area.

4. California Fish and Game Codes

State protection of California’s burrowing owls exists only in the form of Fish and Game Codes that protect bird nests (§3503) and birds of prey and their nests (§3503.5). Fish and Game Code §3503 states “it is unlawful to take, possess, or needlessly destroy the nest or eggs of any bird, except as otherwise provided by this code or any regulation made pursuant thereto,” and under California Fish and Game Code §3503.5 “it is unlawful to take, possess, or destroy any birds in the orders Falconiformes or Strigiformes (birds-of-prey) or to take, possess, or destroy the nest or eggs of any such bird except as otherwise provided by this code or any regulation adopted pursuant thereto.” While these code sections prohibit the actual destruction of nests or

intentional killing of birds, they have provided inadequate protection for habitat. These codes do not protect unoccupied burrows or previously occupied burrows outside of the nesting season that provide potential future nesting habitat. Also, because of their subterranean habitats, burrowing owls can go undetected and be inadvertently destroyed by ground-disturbing activities such as permitted bulldozing and unregulated activities such as plowing, disking, or grading, which kill burrowing owls and destroy nests in the process. There does not seem to be any enforcement of these codes and it is unknown whether these codes have ever been used to prosecute illegal “taking” of burrowing owls or owl nests and eggs. Illegal take of burrowing owls is certainly occurring in California, with documented instances of bulldozing of burrows, shooting, vandalism and other activities, as discussed in Section VIII above. These Fish and Game Codes also fail to address the fact that “take” of owls is occurring through active and passive relocation of owls, activities that are a significant mechanism of extirpation of owls from urbanizing areas. State-sanctioned relocation efforts often result in disguised or delayed “take” of owls, as discussed in Section VIII.D above.

5. Natural Community Conservation Plans

The state “Natural Communities Conservation Planning Act” was enacted in 1991, purportedly to provide for comprehensive, regional multi-species planning. The entirely voluntary Natural Communities Conservation Planning (“NCCP”) program is intended to preserve blocks of contiguous habitat large enough to sustain viable populations of listed species and to prevent the need for additional listings, while still allowing for “compatible and appropriate” economic growth and development. However, the NCCP Act, unlike the federal ESA, contains no regulatory standards for plan approval and implementation.

Only 3 NCCPs have been approved within the range of the burrowing owl, all in San Diego and Orange Counties, where there are perhaps less than a dozen breeding pairs of owls left. These NCCPs have been set up too late to capture any long-term viable nesting habitat for the species. P. Bloom has surveyed all existing and potential Orange County NCCP lands and found no nesting owls (P. Bloom, pers. comm., 2002). Similarly, the San Diego County NCCPs do not contain any viable long-term nesting habitat. While the NCCP areas constitute significant habitat preservation efforts, the burrowing owl nesting habitat that has been protected is too small and therefore of marginal significance for burrowing owl protection. On a positive note, wintering burrowing owls utilize NCCP and proposed NCCP lands on a regular basis in Orange and San Diego Counties (P. Bloom, pers. comm., 2002).

The San Diego Multi-Species Conservation Plan (“MSCP”), an NCCP that is also a federal HCP, only has the potential to protect 1 viable breeding population of owls, as discussed in the section on HCPs above. The other 2 NCCPs are the Orange County Sub-regional Plan (“SRP”), and the San Diego Gas & Electric Co. NCCP. As for the Orange County SRP, the Central-Coastal portion of the SRP has been approved, and mentions the burrowing owl as a species of concern. No direct protection or mitigation was proposed for the species as of 1996. The Notice of Preparation for the Southern portion of the SRP was released in September 2001, but does not specifically address the burrowing owl. No information is available on the Northern portion of the NRP, which is pending. The San Diego Gas & Electric Co. NCCP will modify 400 acres, identified as potential habitat for 110 species of concern, including the burrowing owl. The plan identifies the potential impacts as “direct killing, or injury to, individual animals,” especially those animals that may be in nests or in burrows...in the ground.” Among the flaws of the southern California NCCPs are their lack of clear standards, lack of reliable sources of funding, and failure to provide for adequate independent scientific input (Jasny 1997).

No NCCPs are approved or planned in the Imperial Valley, where 71% of the state’s breeding owls reside, nor in the southern or northern Central Valley, which support 15% and 6.4% of the state owl population, respectively. A few NCCPs are pending within the southern range of the burrowing owl, including the Joint Water Agencies Sub-regional Plan, Western Riverside County MSHCP, San Bernardino Valley-wide MSHCP, and Palos Verdes Peninsula Sub-regional Plan. In the middle Central Valley, Merced County is now in the

planning stages for an NCCP, and the following areas are anticipated to implement future NCCP Planning Agreements: South Placer Legacy Area, Yolo County, Solano County, and South Sacramento County.

The NCCP program is still experimental in nature and cannot be relied upon to protect or recover burrowing owl populations in California. Very few NCCPs have been approved or implemented, and significant unanswered questions remain about their biological integrity and long-term viability. Some of the problems with the NCCP process are that it is heavily weighted in favor of economic development, rather than species recovery goals; it is politically driven, rather than science driven; there are insufficient monitoring mechanisms; the voluntary nature of the program limits its effectiveness; landowner and industry representatives and their consultants dominate the planning process; and the program does not ensure adequate funding to carry out NCCP acquisition programs (Jasny 1997; Mueller 2001). Unfortunately, the NCCP process is also being used to undermine other state protections for species and to weakens citizens' and local governments' ability to obtain and/or enforce species protections through other legal mechanisms, which may provide stronger protection than the NCCP process (Mueller 2001).

6. Mitigation Banks

The California Department of Fish and Game acknowledges 43 mitigation banks in existence or in the process of being created in California, where land can be purchased by developers, essentially as "mitigation" credits for habitat destruction elsewhere. The ideal of these mitigation banks is to consolidate the acquisition of mitigation land, and credits for mitigation, into large and biologically meaningful parcels (CDFG 2002b). However, the mitigation bank approach for burrowing owls implicitly endorses extirpation of owls from areas of high development by not requiring on-site conservation measures, ensuring that owls will eventually be eradicated from urban areas.

The California Environmental Resources Evaluation System (CERES) only identifies 1 mitigation bank in California with habitat and conservation credits for burrowing owls, the 92.5 acre Springtown Reserve in Livermore, Alameda County, which is still under development (CERES 2002). The California Department of Fish and Game has unofficially sanctioned the use of several other small mitigation banks in eastern Alameda and Contra Costa Counties to "mitigate" for the loss of burrowing owl habitat to urban development in eastern and southern San Francisco Bay Area. These include the Byron Conservation Bank (120-142 acres), Brushy Creek Conservation Bank (120 acres), and the Haera Conservation Bank (299 acres plus the potential for expansion by several hundred acres). There is also a small mitigation bank in Placer County (315 acres) with potential habitat for burrowing owls, but it is unclear how many owls are there.

The small number of mitigation banks with owl habitat, their extremely small size, and the rising cost of purchasing suitable land for habitat make this approach incapable of protecting significant populations of owls.

C. REGIONAL AND LOCAL GOVERNMENT PLANS

The lack of statewide consistency in interpreting owl protection guidelines developed for (but never formally adopted by) the California Department of Fish and Game has led to confusion, conflict, and disarray in the regulatory community and among consulting biologists. Failed conservation efforts in the San Francisco Bay Area are indicative of the limitations of attempts at regional and local owl conservation planning for non-listed species.

Regional Plans

Members of the CBOC met with the California Secretary of the Resources Agency in 1995 and the Director of the Department of Fish and Game in 1998 to discuss ways to enhance burrowing owl conservation in the San Francisco Bay Area other than listing the species (there was a perception that listing might lead to intentional eradication of burrows from private lands through disking). An approach involving regional

conservation planning by the Department of Fish and Game and local/municipal habitat conservation was agreed upon, and the California Audubon Society introduced a bill to the California legislature in 1999. This bill would have provided funds for the Department of Fish and Game to prepare a Burrowing Owl Conservation Strategy for the Bay Area, however during legislative review this bill was amended to apply to other species and eventually was not funded.

It is worth noting that every city in the southern San Francisco Bay that was approached with the concept of cooperating on a multi-city (i.e., regional) plan opted instead for its own separate plan. The result was a different approach to similar problems of habitat loss in the same locality, and the need to reinvent the process multiple times as a result of these decisions.

County Plans

The General Plans for the 37 California counties that still have breeding burrowing owls (excluding the counties in the desert range of the species, where owls have always been sparse) were reviewed, and none of these plans mention or require any mitigation for loss of burrowing owl habitat.

The Fresno County General Plan typifies the treatment of special status species under county level planning efforts. Protection policies are couched in qualifiers, such as “where possible,” and there is no guaranteed protection of sensitive habitat if it is “not practicable.” For example, the plan commits to “*support efforts to avoid the “net” loss of important wildlife habitat where practicable*” and “ensure the conservation of large, continuous expanses of native vegetation to provide suitable habitat for maintaining abundant and diverse wildlife populations, *as long as this preservation does not threaten the economic well-being of the county*” [italics added]. The plan does not specifically mention the burrowing owl, but does discuss protecting the San Joaquin kit fox in the context of mandating that the County “shall promote effective methods of pest (e. g. ground squirrel) control on croplands bordering sensitive habitat that do not place special-status species at risk, such as the San Joaquin kit fox.” Of course, effective ground squirrel control puts the long-term survival of burrowing owl populations at risk.

Under the Fresno County General Plan, if protecting wildlife habitat is deemed unfeasible, “mitigation” is required. However, compliance with existing environmental laws, such as CDFG codes, U. S. Fish and Wildlife Service regulations, and the Migratory Bird Treaty Act are considered part of the mitigations. The County acknowledges that development under the plan will destroy specific habitat types that support special-status animals, and that although implementation of its mitigation policies would somewhat reduce impacts for development within the County’s jurisdiction, they would not be reduced to a less-than-significant level. The impacts of future development under the plan are deemed to be significant and unavoidable for development within the County and other city jurisdictions.

City Plans

Repeated conflicts between burrowing owls and development projects, especially in southern San Francisco Bay, have led some municipalities to consider preparing city-wide burrowing owl conservation programs for their respective jurisdictions.

The City of San Jose, in Santa Clara County, attempted the most ambitious such project in 1998 and spent 2 years developing a Burrowing Owl Habitat Conservation Strategy and Implementation Plan (“Plan”), which was fashioned after the Habitat Conservation Plan model for federally-listed species. The Plan would have provided a consistent way to evaluate impacts to burrowing owls and burrowing owl habitat from development according to their General Plan through 2020. The Plan proposed a development fee for every acre of open space land developed (although the fee was the most obvious way to fund the Plan, the Plan also contained other funding mechanisms) to create an endowment fund to maintain and monitor owl habitat. This funding mechanism would have resulted in the management of several hundred acres of burrowing owl habitat on dual-purpose land in San Jose, without the need to purchase prohibitively costly land (in the range of \$1

million/acre). Development was expected to consume over 2,000 acres of owl habitat over 20 years, which would be mitigated by 1,250 managed acres of owl habitat within the City's urban service area. Unfortunately, the City Council denied the Plan in May 2000 without even bothering to read it, due to objections by the building industry over the proposed development fee, concerns by the City that it would cause undue restraint of commercial development in San Jose, and the perception that they were being held to a higher standard of mitigation than neighboring entities (as in the 6.5 acres/pair mitigation for owl habitat in Byron allowed for development in Santa Clara). Shortly after the rejection of the Plan, the City, in a self-serving interpretation of the CBOC guidelines, offered a "less than significant" free pass to a development project at Lake Cunningham Park, because it impacted less than 6.5 acres of owl habitat.

The City of Morgan Hill, in Santa Clara County, began preparing a city-wide burrowing owl habitat conservation program in 2000. The City committed in 1999 to prepare such a plan as part of the approval of a development project that affected burrowing owl habitat. Unfortunately, breeding burrowing owls may have been extirpated from Morgan Hill during the time the plan was being prepared (J. Barclay, pers. comm., 2002).

In San Bernardino County, the City of Chino General Plan authorizes low to high-density housing development on much of the agricultural land around the Chino Airport, including the majority of occupied owl locations in the vicinity of Chino (J. Bath, pers. comm., 2001). The City of Ontario General Plan proposed to convert 8,200 acres of existing agricultural grasslands, and develop 31,000 homes in an area that supports a large burrowing owl population in the Inland Empire with only a mere 50 acres of raptor habitat provided as "mitigation" (G. Stewart, D. Guthrie, pers. comm., 1997). Litigation over this plan resulted in a settlement offering some burrow owl protection measures, which are likely inadequate to protect the owls (J. Bath, pers. comm., 2003).¹⁸⁰

A local management plan emphasizing on-site relocation and off-site habitat replacement (outside of the Santa Clara Valley) was recently developed for the Mission College owl population in Santa Clara County, where owls numbers have fallen from 30 pairs to 8 pairs in 5 years (Trulio 2002). This type of offsite habitat replacement is detrimental to local owl populations in the Santa Clara Valley region and the affected owls will lose most of their foraging habitat to development under this plan. The inevitable loss of the Mission College population is a perfect example of the simple relationship between habitat loss and species extirpation. (Delevoryas 1997; Trulio 1998a, 2002).

¹⁸⁰ The settlement measures for the litigation on the Ontario General Plan ("Settlement") include consultation by the City of Ontario with CDFG to determine long-term suitable owl habitat and require avoidance measures (Settlement Page 3, Item 2b). Unfortunately a consultation with CDFG does not guarantee protection for the owls, as CDFG has a record of signing off on other projects in the area that have harmed owls and destroyed owl habitat. If Ontario determines that an "unconstitutional taking" would occur in protecting the owl habitat, then the alternative measure for mitigating impacts will consist of a mitigation fee (Settlement Page 4, Item 2c) of \$2,000 per acre (Settlement Page 3, 1st paragraph). A land trust would be formed (Settlement Page 6, Item 5) to receive mitigation fees, with up to 25% of the mitigation fee expenditures allowed for recovery of the endangered Delhi Sands Fly ("DSF") rather than burrowing owls (Settlement Page 4, Item 2 d). Although Ontario has not surveyed for the DSF or burrowing owls, it arbitrarily claims (Settlement Page 4, Item 2d) that habitat that benefits the DSF can be expected to benefit burrowing owls. The mitigation fee of \$2,000 per acre is grossly insufficient to purchase the 6.5 acres per burrowing owl nest called for in the CDFG protocol. The appraised value of land per acre in this area ranges between approximately \$60,000 and \$160,000, and low-end parcels in Chino are expected to rise in value after Chino approves their Subarea 2 General Plan Master on 3/25/2003. The land trust can use the mitigation funds to purchase "offsite mitigation lands," (Settlement, page 6, section 4 b [iii]), but there has been no showing that there are "offsite mitigation lands" suitable for the owls.

X. RECOMMENDED MANAGEMENT AND RECOVERY ACTIONS

This petition has documented significant local extirpations and ongoing and dramatic population declines of burrowing owls throughout the majority of their range in California, as well as the complete failure of regulatory agencies and current management efforts to reverse this trend. The factors causing burrowing owl declines and the threats to the majority of remaining owl populations can only be addressed by providing elevated legal protection to the species. Without endangered or threatened status, future management policy will continue to emphasize protecting individual birds without addressing cumulative habitat loss or other factors reducing the survivorship of owls. Ultimately, the protection of the burrowing owl in California hinges on strong habitat protection regulations.

The California Burrowing Owl Consortium has recommended management and recovery actions for the burrowing owl. These include: protecting remaining breeding pairs (especially those that are part of large breeding groups); protecting and enhancing breeding habitat; and amending management and land use plans to ensure recovery of the species.

A. LIST THE BURROWING OWL AS A STATE ENDANGERED OR THREATENED SPECIES

The western burrowing owl should be immediately listed as endangered or threatened throughout its range in California. Listing the burrowing owl will allow the California Department of Fish and Game to apply consistent protection measures for breeding owls and for essential owl habitat. Listing would also allow for the development of a statewide recovery plan and prioritization of recovery efforts.

B. PROTECT REMAINING BREEDING GROUPS AND PAIRS AND PROTECT AND ENHANCE BREEDING HABITAT

Owl populations at risk in agricultural and urban areas should be identified and guidelines developed for managing and protecting owl habitat. Nest protection and habitat management efforts in agricultural areas will differ from those in urban settings.

In agricultural areas, protecting nests is a primary goal. Although little is known about how owls use the agricultural landscape, owls have been found nesting in burrows along levees and berms, and they most likely forage in agricultural fields. Nest sites are at risk if burrows are filled or squirrels are killed to protect levees, so promoting protection and tolerance of ground squirrel populations where owls exist or might be encouraged to re-colonize is essential.

Urban owls require both nest site and foraging area protection, as both are constantly being lost to development. Protection of nest sites can be achieved more easily than preventing the loss of foraging lands. Management in urban landscapes requires incorporating owl requirements into open space planning and providing foraging habitat in areas compatible with human uses. Where several adjacent development projects are scheduled, they should be planned to maximize the amount of open habitat by clustering buildings, parking lots, and facilities to allow owls the use of contiguous foraging habitat. Cities and counties could begin a program of setting aside areas of suitable owl habitat into perpetuity, guaranteeing that owls have adequate breeding, foraging, and wintering habitat and ensuring the continuance of the species.

Cities and counties with resident and/or migratory burrowing owls within their jurisdictions should adopt weed abatement measures that are not destructive to owls or their nests. To that end, mowing rather than disking should be encouraged for both publicly and privately owned lands, and municipalities should adopt alternate methods of weed control to curb herbicide spraying.

Native grasslands should be retained and restored. Most burrowing owls now live at an artificially high population density in a narrow niche on the margins of agricultural lands. If management practices change slightly, these populations cannot be depended upon to buffer environmental perturbations. Burrowing owls should be reintroduced and their native grassland habitat restored wherever possible.

C. AMENDMENTS TO EXISTING MANAGEMENT AND LAND USE PLANS

Because the burrowing owl is a widely distributed species that occurs in patches, effective protection can likely be achieved only through large scale planning efforts. A statewide recovery plan, which would be enabled by listing the species, should be developed through the California Department of Fish and Game. This plan must address owl habitat needs in the face of current land-use trends. The statewide plan should also quantify the number of owls and amount of habitat in easily managed areas such as on public lands and on lands owned by willing private landholders. Nest protection and habitat management can more easily be implemented under these conditions. County and city general plans should then address the protection and restoration of owl habitat appropriate for their areas, while remaining consistent with the CDFG recovery plan. Environmental impact documents for projects which impact owls must then comply with local planning documents and CDFG requirements. Municipalities must be required to implement statewide burrowing owl recovery guidelines as part of the CEQA and planning process.

D. AGENCIES AND ORGANIZATIONS THAT SHOULD BE INVOLVED

The agencies and organizations that should be involved in planning and implementing burrowing owl recovery plans include: federal agencies such as the U. S. Fish and Wildlife Service, U. S. Bureau of Land Management, U. S. Army Corps of Engineers, U. S. D. A. Wildlife Services, and the USGS Biological Resources Division; state agencies such as the Department of Fish and Game, California Coastal Commission, and Department of Water Resources; and regional agencies such as the San Francisco Bay Conservation and Development Commission and the Association of Bay Area Governments. The Burrowing Owl Consortium and landowners and managers with owl populations, such as counties, cities, water districts, park districts, military bases, golf courses, airports, the Farm Bureau, and private landowners should all be involved in the development and implementation of a recovery plan.

E. BURROWING OWL MANAGEMENT IMPACTS ON OTHER SPECIES

Several other wildlife species may benefit from increased protection for burrowing owls in different parts of the burrowing owl's range in California. Increased grassland habitat protection for burrowing owls in the southern San Joaquin Valley would complement conservation efforts for the San Joaquin kit fox (*Vulpes macrotis mutica*), blunt-nosed leopard lizard (*Gambelia sila*), various listed and special-status kangaroo rats (*Dipodomys ingens*, *D. nitratooides nitratooides*, *D. n. exilis*, *D. n. brevinasus*), San Joaquin antelope squirrel (*Ammospermophilus nelsoni*), San Joaquin pocket mouse (*Perognathus inornatus inornatus*), and Tulare grasshopper mouse (*Onychomys torridus tularensis*).

Increased protection of burrowing owls would also benefit Swainson's hawks (*Buteo swainsoni*), California horned larks (*Otocoris alpestris actia*), American badgers (*Taxidea taxus*), and Salinas pocket mice (*Perognathus inornatus psammophilus*) in the overlapping portions of their respective ranges. In the Mojave Desert, increased protection of burrowing owls would complement protection of desert tortoises (*Xerobates agassizi*) and Mohave ground squirrels (*Spermophilus mohavensis*). The habitat of the endangered Delhi Sands Flower Loving Fly (*Rhaphiomidas terminatus abdominalis*) in Colton, Fontana and Mira Loma overlaps with probable burrowing owl habitat.

Management and recovery of burrowing owls is not expected to significantly negatively impact other wildlife species. Increased owl numbers could impact local populations or concentrations of some prey species.

Burrowing owls are known to prey on California least terns (*Sterna antillarum brownii*), a federally endangered species, at colonies on North Island and Ream Field (Imperial Beach) in San Diego County (P. Unitt, pers. comm., 2001). Owls are hazed away from tern nests at Ocean Beach and also discouraged in the vicinity of snowy plover (*Charadrius alexandrinus nivosus*) nesting areas in the region.

F. MONITORING PROGRAMS AND STUDIES

Researchers and trained volunteers will be needed to monitor the effectiveness of any management guidelines to recover burrowing owls. The following monitoring programs and studies are critical to successful habitat management:

- * Continued refinement of the statewide population estimate;
- * Defined demographic parameters in stable, decreasing, and increasing populations to determine causes of declines and mechanisms to reverse declines;
- * Development of realistic population goals for long-term species survival;
- * Studies of dispersal, adult and juvenile survivorship, and causes of mortality in natural, agricultural, and urban environments;
- * Studies of reproductive success and survivorship of birds under varying management schemes;
- * Studies determining the impact of pesticides on birds in agricultural settings;
- * Studies of immigration of birds into local populations from other populations in and outside the state;
- * Studies determining the necessary effective population size for long-term persistence; and
- * Studies of methods that are most effective at increasing existing populations.

Burrowing owl research is currently being conducted on these topics by the following researchers:

- * Genetic relationship of California burrowing owls: Clark Winchell, North Island, San Diego
- * Population viability, reproductive effort, dispersal, and passive relocation: Lynne Trulio, San Jose State University
- * Demography study of burrowing owl populations in urban, agricultural, and grassland habitats: Daniel Rosenberg, Institute for Bird Populations
- * Population monitoring, demography, and management at San Jose Airport since 1990: Jack Barclay

XI. SIGNATURE PAGE

Submitted this 7th day of April, 2003

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XII. INFORMATION SOURCES

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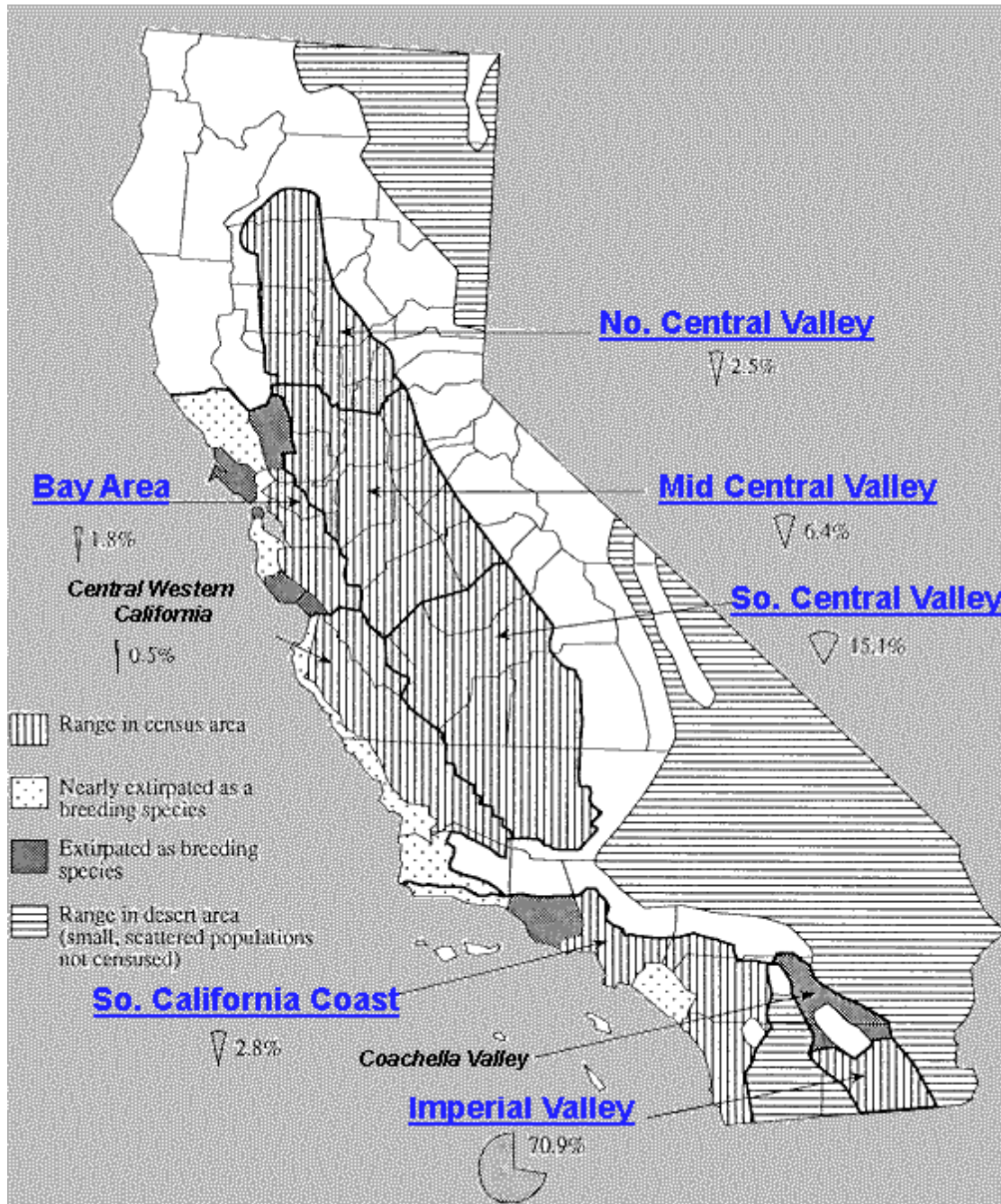
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XII. APPENDICES

A. APPENDIX 1 – CALIFORNIA BURROWING OWL RANGE AND DISTRIBUTION MAP



State Map: Produced by John H. Barclay, using data derived from a census of burrowing owls in California 1991-1993, David F. DeSante and Eric D. Ruhlen. Institute for Bird Populations, 1995.

B. APPENDIX 2 – TABLE OF ESTIMATED DENSITY, BREEDING PAIRS, AND POPULATION TREND, BY REGION*

Region (County)	Area Within Burrowing Owl Range (mi ²)	Estimated Density (pairs/km ²)	Estimated # of Breeding Owl Pairs (Year of Estimate)	Population Trend
Northern Desert Range	2,650	0.021-0.035	90-149 (1999)	unknown
E Siskiyou	945		32-53 (1999)	unknown
Modoc	615		21-35 (1999)	unknown
Lassen	910		31-51 (1999)	unknown
E Plumas	130		4-7 (1999)	unknown
E Sierra	50		2-3 (1999)	unknown
Northern Central Valley	8,275	0-0.02	231-244 (1993)	unknown
SW Shasta	770		unknown	unknown
Tehama	2,230		unknown	unknown
Butte	1,165		unknown	unknown
Glenn	1,055		unknown	unknown
Yuba	545		unknown	unknown
W Nevada	200		unknown	unknown
Colusa	1,100		unknown	unknown
Lake	unknown, small		unknown	unknown
Sutter	605		unknown	unknown
W Placer	605		unknown	unknown
Middle Central Valley	11,450	<0.01-0.03	594-597 (1993)	unknown
Yolo	1,035		30-40 (2000) ^a	50% decline since 1985 ^a
Sacramento	1,015		unknown	unknown
Solano	830		unknown	unknown
E Contra Costa	400		unknown	unknown
E Alameda	165		unknown	unknown - hist. declines ^b
San Joaquin	1,435		unknown	unknown - hist. declines ^c
Stanislaus	1,520		unknown	unknown
Merced	2,010		unknown	unknown
W El Dorado	540		unknown	unknown
W Amador	330		unknown	unknown
Calaveras	720		unknown	unknown
W Tuolumne	575		unknown	unknown
W Mariposa	875		unknown	unknown
Southern Central Valley	15,000	0.03-0.05	1,363-1,396 (1993)	unknown
Madera	1,500		unknown	unknown
SE San Benito	350		unknown	unknown
Fresno	4,800		unknown	unknown - hist. declines ^d
Kings	1,435		unknown	unknown
W Tulare	2,420		unknown	unknown - hist. declines ^e
NW Kern	4,495		unknown	unknown

* Density and population estimates from DeSante and Ruhlen (1995), DeSante et al. (1996), and information in this petition unless otherwise noted, except northern desert range estimates from Barclay and Cull (1999) using density values from DeSante and Ruhlen (1995) and Butts (1973). Area within burrowing owl range derived from Barclay state map in Appendix 1.

^a Estimate by B. Johnson (pers. comm., as cited in PHBA 2002).

^b Declined through the 1970s (Stallcup and Greenberg 1974).

^c Declines were noted in the Stockton area 1968-1978 (Remsen 1978).

^d Miller (1903), Tyler (1913a), and Remsen (1978) reported declines in the Fresno area.

^e Remsen (1978) and Beedy and Granholm (1985) noted declines.

Region (County)	Area Within Burrowing Owl Range (mi ²)	Estimated Density (pairs/km ²)	Estimated # of Breeding Owl Pairs (Year of Estimate)	Population Trend
S. F. Bay Area	6,465	<0.01	165-170 (1993)	50% decline since mid-1980s
Sonoma	1,600	0	1-2 (1993)	nearly extirpated
Napa	795	0	0 (1993)	extirpated
Marin	590	0	0 (1993)	extirpated
SW Solano	45	<0.01	0? (2002)	nearly extirpated
W Contra Costa	400	<0.01	0? (2002)	nearly extirpated
Alameda	660	<0.01	unknown	declining
San Francisco	90	0	0 (1993)	extirpated
San Mateo	530	0	1-2 (2001)	nearly extirpated
Santa Clara	1,315		120-141 (1997) ^f	declining
Santa Cruz	440	0	0 (1993)	extirpated
Central Western CA	9,895	<0.01	46 (1993)	declining
Monterey	3,325		~14 (1992) ^g	nearly extirpated
San Benito	1,050		unknown	unknown
Coastal San Luis Obispo	3,015	0	0 (1993)	extirpated
Santa Barbara	2,195		unknown	nearly extirpated
Carrizo Plain (Eastern SLO)	310		>32-40 (2003) ^h	apparently stable^h
Southwestern CA	8,380	<0.01-0.11	263-311 (1993)	57-85% decline since mid-1980s
S Ventura	1,025		unknown	nearly extirpated
S Los Angeles	2,040		0? (2002)	nearly extirpated
Orange	785		≤3 (2002)	nearly extirpated
W San Diego	1,710		6-8 (2001)	nearly extirpated
Southern CA Islands	unknown, small		unknown, very few	unknown
W Riverside	1,810		unknown	declining - near extirp. ^{?i}
SW San Bernardino	1,010		unknown	declining - near extirp. ^{?i}
Imperial Valley	1,840	0.08-2.37	6,571-6,719 (1993)	apparently stable
Coachella Valley	1,530	0	0 (1993)	extirpated
Central Riverside	1,090	0	0 (1993)	extirpated
NE San Diego	210	0	0 (1993)	extirpated
N Imperial	230	0	0 (1993)	extirpated
Southern Desert Range	37,450	unknown	unknown	unknown
Inyo	8,580		unknown	unknown
SE Kern	2,450		unknown	unknown
San Bernardino	17,140		unknown	declining ^j
NE Los Angeles	1,220		≥10 (2000) ⁱ	declining ^j
E Riverside	3,620		unknown	unknown
E San Diego	2,140		unknown	unknown
Imperial	2,300		unknown	unknown
Statewide Total	103,245		9,365-9,682+	declining 8% per year

^f 1997 Santa Clara countywide estimate by J. Barclay (pers. comm., 2002).

^g 1992 survey by Roberson (1993).

^h The owl population at Carrizo Plain, which was missed by the DeSante et al. (1996) surveys, may be larger than recent surveys (Rosenberg and DeSante 1997; Rosenberg et al. 1998b; Rosenberg 1999) indicate (J. Gervais, pers. comm., 2003).

ⁱ Estimate by P. Bloom (pers. comm., 2002).

^j Estimate by S. Myers (pers. comm., 2002).

- C. APPENDIX 3 - DESANTE ET AL. 1996, "THE DISTRIBUTION AND RELATIVE ABUNDANCE OF BURROWING OWLS IN CALIFORNIA: EVIDENCE FOR A DECLINING POPULATION"