

Burrowing Owl (*Athene canicularia*)

Legal Status

State: California Special Concern species

Federal: Protected under the Migratory Bird Treaty Act

Critical Habitat: No critical habitat has been designated for this species.

Recovery Planning: There is no existing recovery plan for this species.

Notes: No changes to federal status proposed. A petition to list the species as threatened in California was reviewed and denied by CDFW in 2009. It is plausible that the species could be listed by the CDFW during the 30-year permit term.

Taxonomy

Burrowing owls are in the owl family Strigidae, under the genus *Athene* and species *canicularia*. Twenty-five burrowing owl subspecies have been named, though some experts believe that there are only fifteen valid subspecies based on morphological and geographical information. Burrowing owls found in the study area are considered by some to be the burrowing owl (*Athene canicularia hypugaea*) subspecies, though there is debate over whether *A.c. hypugaea* should be considered a subspecies (Poulin et al. 2011).

Distribution

General

Burrowing owl is found throughout western North America, from the Great Plains grasslands in southern portions of the western Canadian provinces south through the United States into Mexico. Other burrowing owl subspecies occur in arid, open habitats in southern Florida, the Caribbean Basin, Central America, and South America (Clark 1997; Poulin et al. 2011).

In California, the range of the burrowing owl extends through the lowlands south and west from north central California to Mexico, with a small (perhaps extirpated) population in the Great Basin bioregion in northeast California (Cull and Hall 2007) and the desert regions of southeast California (Gervais et al. 2008). Breeding birds are absent from the coast north of Sonoma County and from high mountain areas

such as the Sierra Nevada and the Transverse Ranges extending east from Santa Barbara County to San Bernardino County.

Although the overall range of the burrowing owl in California has not drastically changed since summarized by Grinnell and Miller (1944), the species has disappeared as a breeding bird from portions of its former range (Center for Biological Diversity et al. 2003; DeSante et al. 2007; Miller 2007; Gervais et al. 2008). Breeding burrowing owls have disappeared from the central coast (Marin, San Francisco, Santa Cruz, Napa, and coastal San Luis Obispo Counties), and Ventura County. Also, breeding burrowing owls have nearly been extirpated from Sonoma, Santa Barbara, Orange, San Diego, coastal Monterey, coastal Los Angeles, and San Mateo Counties with only one to a handful of known breeding pairs in each (DeSante et al. 2007).

Distribution and Occurrences within the Study Area

Historical

Based on a search of the California Natural Diversity Database (CNDDDB) there are four historical burrowing owl occurrences (before 1990) within the permit area. These occurrences are located 6 miles east of Edison, on the western edge of Bakersfield, northeast of Buena Vista Lake just north of Union Road, and between Calloway Drive and Coffee Road 3 miles west of Bakersfield. Three of these occurrences are on lands of unknown ownership and one is on private lands. Within the larger study area there is an additional historical occurrence from 1982 (California Department of Fish and Game 2012).

Recent

As reported in CNDDDB there are 39 recent occurrences (1990 and later) of this species within the permit area, all assumed to be extant. Of these occurrences, 21 are on private land, 5 are within the Tule Elk State Reserve, 2 are on California Department of Water Resources (DWR) land, 1 is on Kern County lands, and 10 are on lands of unknown ownership. All records are for occupied burrows in annual grassland or fallow agricultural fields. Within the study area there are an additional 134 recent occurrences (California Department of Fish and Game 2012a).

Natural History

Habitat Requirements

Throughout their range, burrowing owls require habitat that includes three basic attributes: open, well-drained terrain; short, sparse vegetation; and underground burrows or burrow facsimiles (Klute et al. 2003). However, many areas that provide

these necessary requirements do not have burrowing owls; suggesting additional, less obvious requirements such as prey base reliability, predator abundance, or other factors may be critical for burrowing owls. Prey includes large insects, small mammals, and smaller amounts of birds, reptiles, and amphibians (Poulin et al. 2011). Burrowing owls occupy grasslands, deserts, sagebrush scrub, agricultural areas (including pastures and untilled margins of cropland), earthen levees and berms, coastal uplands, and urban vacant lots, as well as the margins of airports, golf courses, and roads.

Burrowing owls prefer open habitats that provide visibility of approaching predators (Zarn 1974) or contain elevated perches for the same purpose (Green 1983). However, they will tolerate tall vegetation (especially in the rainy season in the early part of the nesting cycle in California) if it is sparse or patchy with open spaces. Burrowing owls will perch on raised burrow mounds or other topographic features such as rocks, tall plants, fence posts, and debris piles to attain better views (Poulin et al. 2011). The presence of burrows, usually excavated by fossorial mammals such as ground squirrels (*Spermophilus* spp.), badgers (*Taxidea taxus*), and tortoises (*Gopherus* spp.), is a critical component of suitable habitat for burrowing owls because burrows provide security for nesting and shelter from predators and weather. The species prefers nesting areas with many available burrows. Satellite burrows likely help fledglings escape predators and avoid inclement weather (Plumpton 1992). In natural settings, burrowing owls often occupy burrows under protective surfaces such as rock (Rich 1984), lava flows (Gleason and Johnson 1985) and limestone (Coulombe 1971), while in human-modified environments they often use burrows under the edges of concrete, asphalt, and rubble piles and readily use artificial burrows (Trulio 1997).

Table 1. Habitat Associations for Burrowing Owl

Land Cover Type	Land Cover Use	Habitat Parameters	Rationale
Annual grassland, saltbush scrub, and Valley sink scrub	Nesting, foraging	Require burrows dug by other animals including the California ground squirrels.	The presence of nest burrows, dug by fossorial mammals such as ground squirrels, is a critical requirement for burrowing owls. Typically forage in habitats characterized by low-growing vegetation.
Agricultural	Nesting, foraging	In human-modified environments they often use burrows under the edges of concrete, asphalt, and rubble piles and readily use artificial burrows. Generally do not nest in orchards and in vineyards.	Often use unlined earthen banks along agricultural ditches when suitable burrows are present. Could forage in orchards and vineyards within 600 meters of suitable nesting habitat.
Urban-Suburban	Nesting, foraging	In human-modified environments they often use burrows under the edges of concrete, asphalt, and rubble piles and readily use artificial burrows	May nest along urban canals, open greenspaces, and vacant lots if suitable burrows are available.
Rural residential	Nesting, foraging	In human-modified environments they often use burrows under the edges of concrete, asphalt, and rubble piles and readily use artificial burrows	May use urban levees, open greenspaces, and vacant lots if suitable burrows are available.

Source: Poulin et al. 2011

Foraging Requirements

This species typically forages in habitats characterized by low-growing, sparse vegetation and opportunistically consumes arthropods, small mammals, birds, amphibians, and reptiles (Gervais et al. 2008; Poulin et al. 2011). Foraging typically occurs within 600 meters of nests (Department of Fish and Game 2012b). Insects are often taken during the day, while small mammals are taken at night. In one California study, crickets and California voles (*Microtus californicus*) were found to be the most common food items (Thomsen 1971). Burrowing owls concentrate their hunting on uncultivated fields, ungrazed areas, and other habitats with an abundance of small mammals (Haug and Oliphant 1990). In urban areas, burrowing owls are often attracted to streetlights, where insect prey congregate.

Reproduction

In California, burrowing owls typically begin pair formation and courtship in February or early March, when adult males attempt to attract a mate. Burrowing owls are primarily monogamous and typically breed once per year; however, burrowing owls have been documented producing two successful broods in the Central Valley (Gervais and Rosenberg 1999). Both sexes reach sexual maturity at 1 year of age. Clutch sizes vary, and the number of eggs laid is proportionate to prey abundance (the more available prey, the more eggs owls tend to lay). Clutches in the western United States range from 1 to 14 eggs, with an average size of 8 eggs (Murray 1976; Gervais et al. 2008). The incubation period is 28–30 days. The female performs all the incubation and brooding, and the male does all hunting at that time. Because incubation begins before the clutch is complete, eggs hatch asynchronously, presumably an adaptation to annual variation in prey abundance allowing for more young to be raised during years when prey is plentiful (Wellicome 1997). The young fledge at 40–45 days but remain near the burrow and join the adults in foraging flights at dusk (Thomsen 1971; Poulin et al. 2011). Natal dispersal away from the nest site was late July to early August in a study in Saskatchewan (Haug 1985).

There is little information on lifetime reproductive success (Haug et al. 1993). Females supplemented with food have higher reproductive success than females without supplemented food, which may explain poor reproductive success in areas with low-quality foraging habitat (Wellicome 1997). Estimates of juvenile annual survival rates (i.e., during their first year of life) range from 0.12 (Lutz and Plumpton 1997) to 0.30 (Thomsen 1971). Estimates of adult annual survival rates range from 0.42 (Johnson 1997) to 0.81 (Thomsen 1971). Rosenberg and Haley (2004) reported annual survival rates of 0.65 for males and 0.62 for females.

Table 2. Key Seasonal Periods for Burrowing Owl

	Jan	Feb	Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec
Breeding			✓	✓	✓	✓	✓	✓	✓			
Migration to Wintering Grounds										✓	✓	
Migration to Breeding Grounds	✓	✓	✓									

Note: Migration varies. Some burrowing owls are year-round residents and others migrate to wintering grounds in the fall and return in late winter or early spring.

Movement

California supports year-round resident burrowing owls and over-wintering migrants (Gervais et al. 2008). Dispersal and migration in burrowing owls that nest in California is variable depending on location and the age of the owls. Many burrowing owls

remain resident throughout the year in their breeding locales (especially in central and southern California) while some apparently migrate or disperse in the fall (Coulombe 1971; Harman and Barclay 2007; Poulin et al. 2011). Burrowing owls breeding north of California and in northern California and at higher altitudes (e.g., Modoc Plateau) are believed to move south during the winter with some birds overwintering in California (Grinnell and Miller 1944; Coulombe 1971; Harman and Barclay 2007). Burrowing owls exhibit strong site fidelity and return to nest in the same areas year after year (Trulio 1997; Zarn 1974). In the Carrizo Plains, adults that failed at nesting tended to move greater distances than adults that were successful (Rosier et al. 2006).

Table 3. Movement Distances for Burrowing Owl

Type	Distance/Area	Location of Study
Breeding male	May forage over 1 square mile (2–3 square kilometers) from nest burrow during nesting season	Saskatchewan
Males	Average 0.9 square mile (2.41 square kilometers) (0.05–1.8 square miles [0.14–4.81 square kilometers]; n=6)	Saskatchewan
Nest territory	Small area around nest is defended	
Dispersal	Highly variable, little information	

Source: Haug and Oliphant 1990; Poulin et al. 2011

Ecological Relationships

Burrowing owls are most often found in grasslands and disturbed ruderal or bare ground areas where ground squirrels occur as the owls use vacant burrows for winter, spring, and often year-round cover, refuge, and breeding. Though burrowing owls are known to use structures such as pipes, culverts, wood piles, and other structures, squirrel burrows are an important habitat component for the species. Eradication of ground squirrels from suitable habitat areas can affect the suitability of these areas for burrowing owls, thereby reducing available habitat for this species. Additionally, efforts to control squirrel or other mammal populations can directly affect burrowing owls (where present) through accidental poisoning by commonly used treated baits and grains. Therefore, appropriate management of ground squirrel populations needs to be considered an important part of managing and conserving habitat for burrowing owl and protecting individuals.

Population Status and Trends

Global: Declining (Klute et al. 2003)

State: Same as above

Study Area: Same as above

Threats and Environmental Stressors

In North America, the burrowing owl is experiencing population declines throughout the northern half of the Great Plains and general population increases in the northwest interior and some southwestern deserts (Klute et al. 2003). In California, the overall breeding range of burrowing owls has not changed much since 1945, but the local distribution of owls has changed considerably (Gervais et al. 2008). Declines and local extirpations have mainly occurred along the central and south coasts, while breeding populations have increased on private lands in agricultural areas in the Central and Imperial Valleys. However, long-term viability of populations on artificially irrigated agricultural lands appears uncertain given the lack of protection, ongoing urbanization, and potential for increasing water shortages in California (Gervais et al. 2008).

The most immediate threats to the burrowing owl are the conversion of grassland habitat to urban and agricultural uses and the loss of suitable agricultural lands to development (Gervais et al. 2008). Equally important is the loss of fossorial rodents, such as ground squirrels, across much of the burrowing owl's historical range. Eradication programs that largely depend on the use of rodenticides have decimated populations of these rodents and have in turn disrupted the ecological relationships on which the owls depend; because burrowing owls typically need other animals to dig their burrows, the loss of fossorial rodents limits the extent of year-round habitat throughout their range (Haug et al. 1993). Other threats include burrow destruction and other anthropogenic factors such as agricultural and construction activity, disking, and shooting, especially during the breeding season (Zarn 1974; Thomsen 1971; Poulin et al. 2011); predation by hawks, owls, badgers, foxes, domestic pets, and others (Coulombe 1971; Green 1983; Haug et al. 1993); vehicular collisions; disease; parasites (Poulin et al. 2011); and secondary poisoning (Remsen 1978; Zarn 1974).

Conservation and Management Activities

Common management efforts employed to conserve existing burrowing owl colonies include prevention of all disturbances during the nesting season, installation of permanent artificial burrows, and management of the vegetation around the burrows by mowing or controlled grazing. Key tools for conserving the species are habitat acquisition through mitigation, protection, restoration of native grasslands,

and management of habitats through grazing, burning, or mowing (Poulin et al. 2011).

Data Characterization

This species has been well studied and thus its life history characteristics are well known. The major information gap associated with this species is likely associated with the fact that observed occurrences of this species are often not reported to the California Department of Fish and Wildlife. Therefore, any estimated numbers for this species are likely underestimated, though it is unknown to what degree.

Management and Monitoring Considerations

As described above under *Ecological Relationships*, appropriate management of mammal populations is a key consideration for this species. Other important considerations are other land management practices (mowing, discing, vegetation clearing) that could affect the suitability of occupied and unoccupied habitats or affect individuals.

Predicted Species Distribution in the Study Area

Model Description

Nesting Habitat

Habitats that provide suitable nesting and foraging habitat include annual grassland, saltbush scrub, and valley sink scrub. Burrowing owls will also nest in agricultural especially along canals and other drainage ditches and areas that provide artificial burrows, though they generally do not nest in orchards and vineyards. In urban areas, nesting habitat occurs in open greenspaces (golf courses, parks, water retention basins, and vacant lots). The presence of burrows dug by fossorial mammals, especially ground squirrels, is critical requirement for burrowing owls.

Foraging Habitat

Areas that provide suitable nesting habitat also provide suitable foraging habitat. Burrowing owls typically forage within 600 meters for nests. Though orchards and vineyards do not provide suitable nesting habitat, burrowing owls could forage within orchards and vineyards that occur within 600 meters of nests.

Model Results

Comprehensive surveys to locate all extant burrowing owl nest locations have not been conducted in the Plan Area or the Study Area. Therefore, modeled nesting and foraging habitat is based on habitat types that burrowing owls utilize. Orchards and vineyards within 600 meters of suitable nesting habitat are shown as suitable foraging habitat. Figure D-4 shows the modeled nesting and foraging habitat for burrowing owls within the Plan Area and the Study Area. CNDDDB occurrences of this species fall within the modeled habitat.

Literature Cited

Printed References

- California Department of Fish and Game. 2012a. California Natural Diversity Database, RareFind 3, Version 3.1.0. Updated July 2012. Western Burrowing Owl. Sacramento, CA.
- California Department of Fish and Game. 2012b. Staff Report on Burrowing Owl Mitigation. Sacramento, CA.
- Center for Biological Diversity, Defenders of Wildlife, California State Park Rangers Association, Santa Clara Valley Audubon Society, San Bernardino Valley Audubon Society, Tri-County Conservation League. 2003. *Petition to the 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*. Available: <http://www.biologicaldiversity.org/species/birds/western_burrowing_owl/pdfs/petition.pdf>. Accessed: date.
- Clark, R. J. 1997. A Review of the Taxonomy and Distribution of the Burrowing Owl (*Speotyto cunicularia*). In Lincer, J. L. and K. Steenhof (eds.), *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report Number 9.
- Coulombe, H. N. 1971. Behavior and Population Ecology of the Burrowing Owl, *Speotyto cunicularia*, in the Imperial Valley of California. *Condor* 73:162-176.
- Cull, R. L. and F. Hall. 2007. Status of Burrowing Owls in Northeastern California. In Barclay, J. H., K. W. Hunting, J. L. Lincer, J. Linthicum, and T. A. Roberts (eds.), *Proceedings of the California Burrowing Owl Symposium, November 2003. Bird Populations Monographs No. 1*. Point Reyes Station, CA: The Institute for Bird Populations and Albion Environmental, Inc.

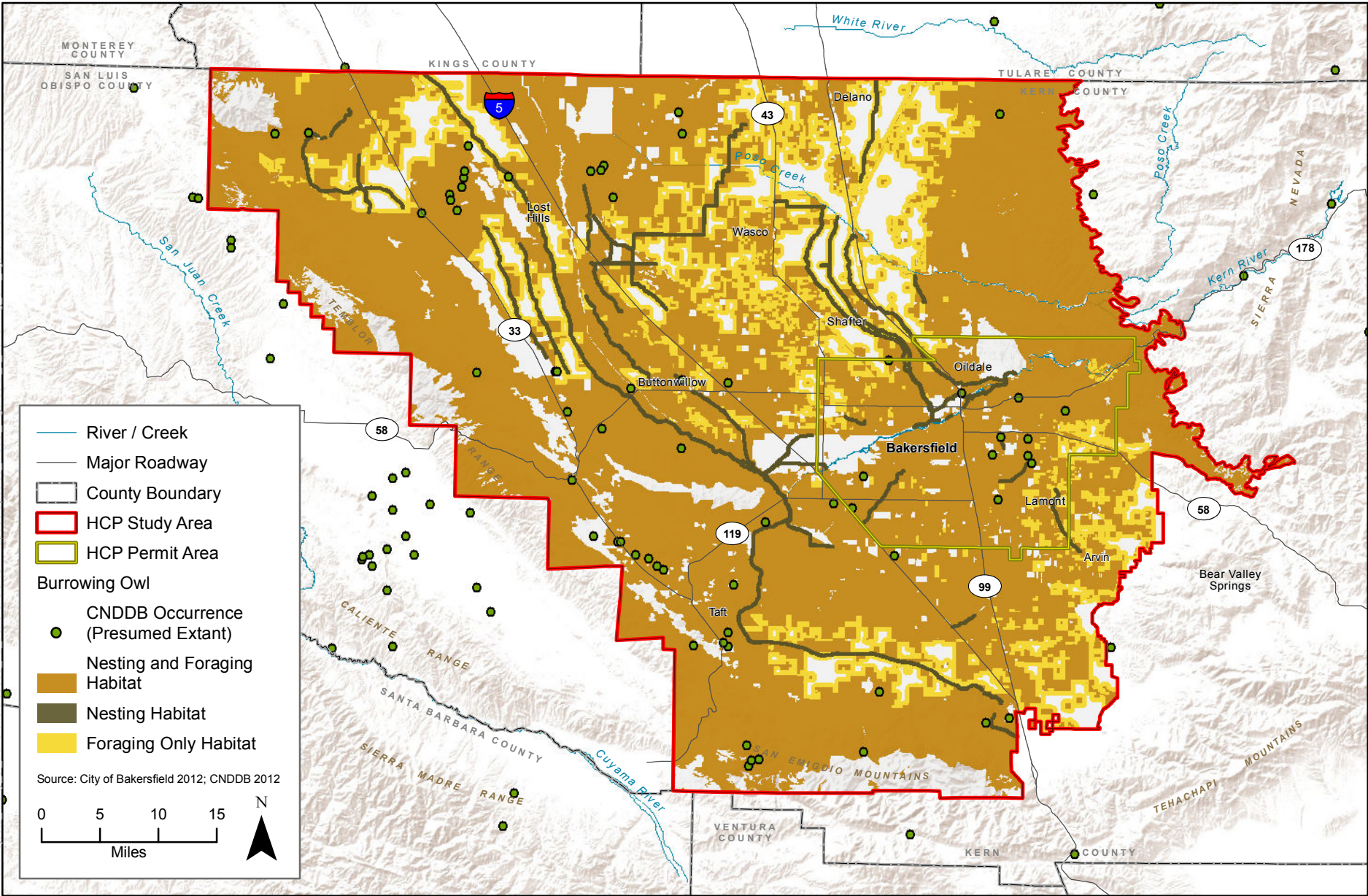
- DeSante, D. F., E. D. Ruhlen, and D. K. Rosenberg. 1997. *The Distribution and Relative Abundance of Burrowing Owls in California: Evidence for a Declining Population*. Unpublished manuscript. Point Reyes Station, CA: The Institute for Bird Populations.
- DeSante, D. F., E. D. Ruhlen, and R. Scalf. 2007. The Distribution and Relative Abundance of Burrowing Owls in California during 1991–1993: Evidence for a Declining Population and Thoughts on its Conservation. In Barclay, J. H., K. W. Hunting, J. L. Lincer, J. Linthicum, and T. A. Roberts (eds.), *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. Point Reyes Station, CA: The Institute for Bird Populations and Albion Environmental, Inc.
- Gervais, J. A., and D. K. Rosenberg. 1999. Western Burrowing Owls in California Produce Second Broods of Chicks. *Wilson Bulletin* 111:569–571.
- Gervais, J. A., D. K. Rosenberg, and L. A. Comrack. 2008. Burrowing Owl. In Shuford, W. D., and Gardali, T., (eds.), *California Bird Species of Special Concern: A Ranked Assessment of Species, Subspecies, and Distinct Populations of Birds of Immediate Conservation Concern in California. Studies of Western Birds 1*. Western Field Ornithologists, Camarillo, CA and California Department of Fish and Game, Sacramento, CA.
- Gleason, R. and D. R. Johnson. 1985. Factors Influencing Nesting Success of Burrowing Owls in Southeastern Idaho. *Great Basin Naturalist* 45:81–84.
- Green, G. A. 1983. *Ecology of Breeding Burrowing Owls in the Columbia Basin, Oregon*. MS Thesis. Oregon State University, Corvallis, OR.
- Grinnell, J., and A. H. Miller. 1944. The Distribution of the Birds of California. *Pacific Coast Avifauna* No. 27. Berkeley, CA: Cooper Ornithological Club.
- Harman, L. M. and J. H. Barclay. 2007. A Summary of California Burrowing Owl Banding Records. In Barclay, J. H., K. W. Hunting, J. L. Lincer, J. Linthicum, and T. A. Roberts (eds.), *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. Point Reyes Station, CA: The Institute for Bird Populations and Albion Environmental, Inc.
- Haug, E. A. 1985. *Observations on the Breeding Ecology of Burrowing Owls in Saskatchewan*. Master's thesis. Saskatoon University, Saskatchewan, Canada. Cited in Haug et al. 1993.
- Haug, E. A. and L. W. Oliphant. 1990. Movements, Activity Patterns, and Habitat Use of Burrowing Owls in Saskatchewan. *Journal of Wildlife Management* 54:27–35.
- Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. The Burrowing Owl (*Speotyto cunicularia*). In A. Poole and F. Gill (eds.), *The Birds of North America*. No. 61.

Philadelphia, PA: Academy of Natural Sciences, and Washington, D.C.:
American Ornithologists' Union.

- Johnson, B. S. 1997. Demography and Population Dynamics of the Burrowing Owl. In J. L. Lincer and K. Steenhof (eds.), *The Burrowing Owl, Its Biology and Management*. Raptor Research Report No. 9.
- Klute, D. S., L. W. Ayers, M. T. Green, W. H. Howe, S. L. Jones, J. A. Shaffer, S. R. Sheffield, and T. S. Zimmerman. 2003. *Status Assessment and Conservation Plan for the Western Burrowing Owl in the United States*. Biological Technical Publication FWS/BTP-R6001-2003. U.S. Fish and Wildlife Service, Washington, D.C.
- Lutz, R. S. and D. L. Plumpton. 1997. Metapopulation dynamics of a burrowing owl (*Speotyto cunicularia*) population in Colorado. In J. R. Duncan, D. H. Johnson, and T. H. Nicolls (eds.), *Biology and Conservation of Owls of the Northern Hemisphere: Second International Symposium*. Winnipeg, Manitoba, Canada.
- Miller, J. 2007. Petition to list the Western Burrowing Owl in California. In Barclay, J. H., K. W. Hunting, J. L. Lincer, J. Linthicum, and T. A. Roberts (eds.), *Proceedings of the California Burrowing Owl Symposium, November 2003*. Bird Populations Monographs No. 1. Point Reyes Station, CA: The Institute for Bird Populations and Albion Environmental, Inc.
- Murray, G. A. 1976. Geographic Variation in the Clutch Size of Seven Owl Species. *The Auk* 93:602–613.
- Plumpton, D. L. 1992. *Aspects of Nest Site Selection and Habitat Use by Burrowing Owls at the Rocky Mountain Arsenal, Colorado*. Master's thesis. Texas Tech. University, Lubbock, TX. Cited in Haug et al. 1993.
- Poulin Ray, L. Danielle Todd, E. A. Haug, B. A. Millsap, and M. S. Martell. 2011. Burrowing Owl (*Athene cunicularia*). The Birds of North America Online (A. Poole Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America Online: <http://bna.birds.cornell.edu/bna/species/061>
- Remsen, J. V. 1978. *Bird Species of Special Concern in California, An annotated List of Declining or Vulnerable Bird Species*. California Department of Fish and Game, Nongame Wildlife Investigation Project PR W-54-R-9, Report No. 78-1. Rich, T. 1984. Monitoring Burrowing Owl Populations: Implications of Burrow Reuse. *Wildlife Society Bulletin* 12:178–189.
- Rosenberg, D. K. and K. L. Haley. 2004. The Ecology of Burrowing Owls in the Agroecosystem of the Imperial Valley, California. *Studies in Avian Biology* No. 27:120–135.
- Rosier, J. R., N. A. Ronan, and D. K. Rosenberg. 2006. Post-Breeding Dispersal of Burrowing Owls in an Extensive California Grassland. *American Midland Naturalist* 155:162–167.

- Thomsen, L. 1971. Behavior and Ecology of Burrowing Owls on the Oakland Municipal Airport. *Condor* 73:177-192.
- Trulio, L. 1997. Burrowing Owl Demography and Habitat Use at Two Urban Sites in Santa Clara County, California. *Journal of Raptor Research* 9:84-89.
- Wellcome, T. I. 1997. Reproductive Performance of Burrowing Owls (*Speotyto cunicularia*): Effects of Supplemental Food. In J. L. Lincer and K. Steenhof, (eds.), *The Burrowing Owl, its Biology and Management: Including the Proceedings of the First International Symposium*. Raptor Research Report No. 9.
- Zarn, M. 1974. *Burrowing Owl* (*Speotyto cunicularia hypugaea*). Habitat Management Series for Unique or Endangered Species, Report No.11, T N 250. Bureau of Land Management, Denver, CO.

Bakersfield Conservation Plan



K:\Projects\1\City of Bakersfield\HCP\mapdocs\Species Model Figures\4 burrowing owl figure.mxd hw 2/1/2013



Figure D-4
Burrowing Owl Modeled Habitat