

# California Partners in Flight Desert Bird Conservation Plan



## Burrowing Owl (*Athene cunicularia*)



Photo by Martin Meyers

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### RECOMMENDED CITATION

Bates, C. 2006. Burrowing Owl (*Athene cunicularia*). In The Draft Desert Bird Conservation Plan: a strategy for reversing the decline of desert-associated birds in California. California Partners in Flight. <http://www.prbo.org/calpif/htmldocs/desert.html>

### SHORTCUTS

[range map](#)

[references](#)

### SUBSPECIES STATUS:

There are two subspecies of Burrowing Owls in North America (Dechant et al. 2003, Johnsgard 1988). The breeding range of *Athene cunicularia hypugaea* extends south from southern Canada into the western half of the United States and down into Baja California, Mexico, and central Mexico. *A. cunicularia floridana* occurs in Florida and adjacent

islands. The winter range is similar to the breeding range except that most owls from the northern areas of the Great Plains and Great Basin migrate south (Haug et al. 1993).

## **MANAGEMENT STATUS:**

California Species of Special Concern. Protected under the Migratory Bird Treaty Act and as a "bird of prey" under the Raptor Recovery Act. Included in the National Audubon Society's first Blue List of bird species undergoing non-cyclic population declines and extreme habitat loss. In Arizona it is a species of special concern and is considered a BLM Sensitive Species.

## **DISTRIBUTION:**

### **HISTORICAL BREEDING DISTRIBUTION:**

Burrowing Owls were once a common, locally abundant species throughout much of California and Arizona. By the 1940s', Burrowing Owls had become scarce in many portions of the desert southwest as a result of shooting and elimination of ground squirrel burrows (Grinnell and Miller 1944). During the last 10-15 years, Burrowing Owls have been extirpated from approximately 8% of their former range (J. Barclay, pers. comm. in Klute et al. 2003) including Sonoma, Marin, Santa Cruz, and Napa counties.

### **CURRENT BREEDING DISTRIBUTION:**

Burrowing Owls are widely distributed in proper habitat throughout the lowlands of the state, but rare along the coast north of Marin County and extremely rare east of the Sierra Nevada crest (Small 1994). Burrowing Owls are fairly common residents along the Lower Colorado River Valley (Rosenberg et al. 1991) and around the agricultural areas of the Imperial Valley. They are rare in the undisturbed desert areas of the eastern and southeastern portion of California (Small 1994). Breeding in Central California has been reduced to only three isolated populations: the Central Valley, southern San Francisco Bay between Alameda and Redwood City, and near the Livermore area (DeSante et al. 1997).

## **ECOLOGY:**

### **AVERAGE TERRITORY SIZE**

Nesting territory size was 4.8-6.4 ha in Minnesota (n = 2) and 4-6 ha in North Dakota (n = 5-9 pairs) (Grant 1965). Foraging areas are considerably larger than nesting areas. In s. Sackatchewan, mean foraging territory size for males ranged from 14 to 481 ha (Haug 1985, Haug and Oliphant 1990). Home range and foraging area may overlap between different pairs, with only the burrow being actively defended (Coulombe 1971, Johnsgard 1988).

## **FOOD HABITS**

### **FORAGING STRATEGY:**

Burrowing Owls hunt by walking, running, hopping along the ground, flying from a perch, hovering, particularly over tall vegetation, and fly-catching in mid air. Prey is caught with the feet then transferred to the beak for carrying and is presented to the female or chicks. Burrowing owls are known to cache food in their burrows. They hunt throughout the 24-hour day, but are mainly crepuscular, hunting at dusk and dawn. Burrowing Owls tend to hunt insects in daylight and small mammals at night. Their keen binocular vision is very useful because they hunt mostly in the early evening and into the night (Corman and Wise-Gervais 2005). When hunting from a position on a fencepost, they use a bobbing motion which amplifies the effect of their binocular vision and provides depth perception.

### **DIET:**

Burrowing Owls are opportunistic, primarily feeding on arthropods (grasshoppers, beetles, scorpions, other ground insects), small rodents, amphibian, reptile species, birds (especially doves), and carrion (Zarn 1974, Tyler 1983, Johnsgard 1988, Thompson and Anderson 1988, John and Romanow 1993).

## **BREEDING HABITAT:**

Burrowing Owls nesting habitat consists of open areas with mammal burrows. Habitats include dry open rolling hills, grasslands, fallow fields, sparsely vegetated desert scrub with gullies, washes, arroyos, and edges of human disturbed lands (Small 1994, Klute et al. 2003). They inhabit golf courses, airports, cemeteries, vacant lots, and road embankments, wherever there is sufficient friable soil for a nesting burrow (Haug et al. 1993).

## **SITE FIDELITY**

Individual Burrowing Owls have moderate to high site fidelity to general breeding areas, prairie dog colonies, and even to particular nest burrows (Klute et al. 2003). Burrow and nest sites are reused at a higher rate if the bird has reproduced successfully during the previous year. In non-migratory populations, they use and maintain burrows year-round (Haug et al. 1993).

## **NEST SITE:**

Favored nest burrow sites are those in relatively sandy sites (possibly for ease of modification and drainage), areas with low vegetation around the burrows (to facilitate the owl's view and hunting success), holes at the bottom of vertical cuts with a slight downward slope from the entrance, and slightly elevated locations to avoid flooding. In addition to burrows, the owls also require perching locations and frequently use fence posts or the top of mounds outside the burrow.

## **NEST CONCEALMENT**

Before the start of egg laying, adults will often adorn their burrows with various types of ornaments believed to help disguise the owls' scent such as animal dung, shredded paper, cigarettes butts, and pieces of torn cloth.

## **NEST TYPE:**

The nest burrow is a long underground burrow lined with grass and roots (Corman and Wise-Gervais 2005). Burrowing Owls typically use burrows created by other animals such as prairie dogs, kangaroo rats, ground squirrels, especially the California ground squirrel (Collins 1979), kit foxes, and desert tortoises.

## **BREEDING BIOLOGY:**

### **BREEDING TERRITORY SIZE AND DENSITY:**

Nesting densities vary from eight pairs per 1.5 km<sup>2</sup> in optimal habitat to one pair per 58 km<sup>2</sup> in poor quality habitat (Johnsgard 1988).

### **DISPLAYS:**

Grant (1965) observed a display flight characterized by rapid ascent of approximately 30 m, hovering for 5-10 seconds, rapid descent of 15 m and repeat of this sequence. Thomsen (1971) observed circular flights of approximately 40 m in diameter performed mainly by males. Other displays observed near the nest burrow include mutual billing and preening of head and facial areas, presentation of food to female, male singing Primary Song (Haug et al. 1993).

### **MATING SYSTEM:**

Monogamous (Ehrlich et al. 1988). In non-migratory populations of California, both pair retention and pair splitting observed (Thomsen 1971).

### **CLUTCH SIZE:**

7-9 eggs (Ehrlich et al. 1988).

**INCUBATION:**

The female incubates the eggs and the male is responsible for providing her with food during this period.

**INCUBATION PERIOD:**

21 to 28 days (Ehrlich et al. 1988).

**DEVELOPMENT AT HATCHING:**

Altricial.

**NESTLING PERIOD:**

The owlets open their eyes and begin to show evasive behavior at 5 days (Baicich and Harrison 1997). At approximately two weeks of age, chicks will huddle around the entrance of the burrow to await food (Johnsgard 1988). Chicks are able to take short flights at 4 weeks of age, and can fly well by 6 weeks of age. Fledging occurs at 44 days (Landry 1979).

**PARENTAL CARE:**

Male does all the hunting while young require brooding. Female begins hunting as young become less dependent (Haug et al. 1993). Burrowing Owls often relocate chicks to "satellite" burrows to presumably reduce the risk of predation (Desmond and Savidge 1998) and possibly to avoid nest parasites (Dechant et al. 1999).

**POST FLEDGING BIOLOGY OF OFFSPRING:**

Dispersing young use satellite burrows in the vicinity of their natal burrows for about two months after hatching before departing the natal area (King and Belthoff 2001).

**NUMBER OF BROODS:**

Burrowing Owls typically raise one brood per year, but replacement clutches are often laid if the first attempt is lost (Corman and Wise-Gervais 2005).

**BROOD PARASITISM:**

Never observed (Haug et al. 1993).

**LANDSCAPE FACTORS**

**ELEVATION:**

Burrowing Owl nests have been found from 200 feet below sea level at Death Valley up to 12,000 feet at the Dana Plateau in Yosemite (CDFG 2000).

**FRAGMENTATION:**

In California, Burrowing Owls have shown incredible tolerance for human encroachment and degradation of native habitats. The primary criterion for Burrowing Owl occurrence is a nest burrow (Klute et al. 2003).

**DISTURBANCE:**

Although Burrowing Owls are relatively tolerant of lower levels of human activity, human-related impacts such as shooting and burrow destruction adversely affect this species (Zarn 1974, Haug et al. 1993). Artificially enhanced populations of native predators (e.g., gray foxes, coyotes) and introduced predators (e.g., red foxes, cats, dogs) near Burrowing Owl colonies are also problematic (Zeiner et al. 1990). Burrowing Owls also get tangled in loose fences,

abandoned wire, fishing line, rat traps, and loose string/yarn.

#### **ADJACENT LAND USE:**

Loss of Burrowing Owls on private lands within urban areas is expected under current land-use regulations (Klute et al. 2003). Because of the large numbers of Burrowing Owls that reside within the agricultural matrix of the Central and Imperial valleys, change in methods of farming practices, particularly water conveyance, is likely to impact Burrowing Owl numbers (Rosenberg and Haley In press).

#### **PESTICIDE USE:**

A significant negative impact on survival and reproductive success, believed to be due to direct toxicity, was observed when Carbofuran, a carbamate insecticide, was sprayed over nest burrows (James and Fox 1987). Burrowing Owls have been incidentally poisoned and their burrows destroyed during eradication programs aimed at rodent colonies (Zarn 1974, Remsen 1978, Collins 1979). Indirect mortality due to contaminated prey may be significant, but this is unknown to date (Haug et al. 1993). Municipal governments and agricultural representatives should be encouraged to reduce or restrict the use of pesticides and to use pesticides of low toxicity to nontarget species (Thomson 1988).

#### **PREDATORS:**

Documented predators at burrows include badgers, skunks, snakes, domestic cats and dogs, and weasels. Burrowing Owls found as prey remains in Swainson's Hawk (*Buteo swainsoni*) and Ferruginous Hawk (*B. regalis*) nests. Merlins (*Falco columbarius*), Prairie Falcons (*F. mexicanus*), Peregrine Falcons (*F. peregrinus*), Great Horned Owls (*Bubo virginianus*), Red-tailed Hawks (*B. jamaicensis*), Cooper's Hawks (*Accipiter cooperii*), and American Crows (*Corvus brachyrhynchos*) have all been seen or suspected as predators of adult and young Burrowing Owls (Wedgwood 1978, Konrad and Gilmer 1984, Millsap and Bear 1988, Martell 1990).

#### **DEMOGRAPHY AND POPULATION TRENDS:**

##### **DEMOGRAPHY:**

A multi-site demographic study initiated in 1997 found survival rates ranging from 0.23 - 0.61 (Rosenberg et al., unpubl. data).

##### **POPULATION TRENDS:**

Data for Western Burrowing Owls in most of the U.S. are insufficient to estimate trends in abundance. Limited data suggest that they are decreasing in some areas, but may be stable or increasing in others (Klute et al. 2003). Surveys in California in 1986-91 found population decreases of 23-52% in the number of breeding groups and 12-27% in the number of breeding pairs of owls (DeSante et al. 1997).

##### **MANAGEMENT ISSUES:**

Management measures proposed for Burrowing Owls include protecting burrowing mammal populations to provide nesting habitat for burrowing owls (Green 1983), creating artificial burrows where natural burrows are destroyed or limited (Grondahl and Dockter no date, Collins and Landry 1977, Trulio 1995, Clark 2001), providing artificial perches for hunting and predator observation where perches are limited, and managing vegetation for foraging habitat through fire or grazing (Green 1983). The CDFG (1995) has prepared guidelines for appropriate mitigation to minimize impacts to Burrowing Owls. Mitigation measures include avoiding impacts if feasible, avoiding disturbing owls during the breeding season, protecting sufficient foraging habitat, passively relocating owls if necessary, and enhancing existing habitat with artificial burrows if there are unavoidable impacts to occupied burrows.

1. Loose dogs and cats can directly affect Burrowing Owl habitat by digging out the nest or removing chicks.

**OPTION:** Leash law for dogs and requiring all cats to be house bound or leashed in areas where burrowing owls are present. Implementation of a removal program for all feral dogs and cats on public lands.

2. Heavy recreational use of Burrowing Owl habitat, especially off-road vehicle use that compact soils, can negatively affect habitat quality and potentially cause direct disturbance to burrowing birds.

**OPTION:** Implement land use standards, habitat stewardship, habitat enhancement programs with an aggressive public education and population monitoring program.

3. Burrowing Owls will nest near trails and along canal banks created for agriculture. In these locations, burrows are susceptible to collapse from heavy farm equipment.

**OPTION:** Where possible provide stable artificial burrows.

4. Land uses that alter hydrology can have indirect negative effects on Burrowing Owl habitat.

**OPTION:** Coordinate voluntary stewardship agreements with landowners.

5. Upslope activities (e.g., road-building) impacting hydrology.

**OPTION:** Manage upslope activities so that hydrologic functions in Burrowing Owl habitat can be maintained.

6. Historic loss or alteration of high quality habitat.

**OPTIONS:** Promote and implement habitat restoration projects.

7. The poisoning of ground squirrels and destructive weed control practices have caused a decline in migratory bird populations.

**OPTION:** Carefully evaluate poison control methods and eliminate spraying during breeding bird season.

#### **MONITORING METHODS AND RESEARCH NEEDS:**

Coordinated, range-wide research on population demographics needs to be conducted to determine population declines (Holroyd and Wellicome 1997, Holroyd et al. 2001). The following are some suggested research needs:

1. Work to clarify status.

2. Conduct a standardized statewide survey to monitor population trends.

3. Evaluate reproductive success, site fidelity, and survivorship of selected populations.

4. Monitor population responses to restoration, prescribed fire, grazing, mowing and other management actions.

5. Study the effects of human impacts such as OHV use and pesticides.

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