Burrowing Owl

Athene cunicularia

Original prepared by Ernest E. Leupin

Species Information

Taxonomy

The Burrowing Owl belongs in the monotypic genus *Athene* (AOU 2002). There are 18 recognized subspecies in North and South America (Clark et al. 1978) of which two occur in North America: *A. cunicularia. floridana*, found in Florida, the Bahamas, and other Caribbean islands and *A. cunicularia hypugaea*, found throughout Mexico, western United States, and southwestern Canada (Cannings 1978).

Description

Small owl (23–28 cm) with round head lacking ear tufts; yellow eyes; body is dull brown with pale bars and spots; underside and breast are lighter and barred with brown; white-barred on tails and wings. Tail is short and wings are large. Males and females have a similar appearance.

Distribution

Global

The western subspecies (*A. cunicularia hypugaea*) is found from Canada to Panama. In Canada, it occurs in Manitoba, Saskatchewan, Alberta, and British Columbia.

British Columbia

In British Columbia, Burrowing Owls were historically found north to Kamloops, west to Ashcroft, and east to the Purcell Mountains, with populations in the Fraser River Delta (Hjertaas et al. 1995; Campbell et al. 1990). There are historical breeding records of wild birds in Creston, Merritt, Cache Creek, Kamloops, and the Lower Mainland. At present, the Burrowing Owl is confined to areas within the Thompson-Okanagan Plateau (D.J. Low, pers. comm.). In the 1980s and 1990s, reintroductions efforts took place in Oliver, Merritt, Cache Creek, and Kamloops. Released populations are concentrated in four main areas in the Thompson-Nicola Region: Lac du Bois Grasslands, Knutsford, Hamilton Commonage, and Quilchena.

The current extent of wild populations in British Columbia is mostly unknown. There are consistent reports of Burrowing Owls near Merritt, which suggest the existence of a small remnant population in the area. In all other areas, reports of wild Burrowing Owls are sporadic and isolated and thus cannot be considered as breeding populations. The occurrence of unbanded birds at release sites may indicate the presence of wild birds in the area, or could simply be progeny from released birds that were missed during previous banding efforts.

Non-breeding records have been made in the Beaver Valley west of Horsefly, Delta, Nanaimo, Campbell River, and the west Kootenays, although these are believed to be accidental events.

Forest region and districts[1]

Southern Interior: Cascades, Kamloops, Okanagan Shuswap (Penticton)

Ecoprovinces and ecosections

CEI: FRB (non-breeding)

GED: FRL, NAL (non-breeding)

SIM: EKT (non-breeding)

SOI:[2] NIB, NOB, NOH, OKR, SOB, SOH (breeding), STU, THB

1 Current breeding distribution.

2 Breeding in SOI only.

Burrowing Owl
(Athene cunicularia)

Note: This map represents a broad view of the distribution of potential habitat used by this species. The map is based on several ecosystem classifications (Ecoregion, Biogeoclimatic and Broad Ecosystem Inventory) as well as current knowledge of the species' habitat preferences. This species may or may not occur in all areas indicated.

Biogeoclimatic units

BG: xh1 (NOB, OKR, SOB), xh2 (THB), xw1 (NIB, THB), xw2 (FRB), xw3

CDF: mm (FRL, NAL)

IDF: dk1a (NIB, STU), xh1a (NOB, OKR, STU), xh2a (NIB, THB), xm (FRB)

PP: dh1 (SOH), xh1 (NOB, SOB), xh1a (NOB, OKR, SOB), dh2 (EKT)

Broad ecosystem units

BS, SS, (CF, ES on the coast)

Elevation

335–1250 m

Life History

The following life history information is specific to the western subspecies with emphasis on populations in Canada and North American prairie populations. Because detailed life history observations for wild birds in British Columbia are scarce, the data presented for British Columbia owls reflect observations made from captive-bred and released individuals in the Thompson-Nicola region unless otherwise indicated.

Diet and foraging behaviour

Burrowing Owls are opportunistic predators (Wellicome 1997; Leupin et al. 2000), preying primarily on insects and small mammals (Plumpton and Lutz 1993). During the day, owls prey on insects near the burrow; whereas, foraging for small mammals occurs predominately at night. For British Columbia's released population, small mammals comprised approximately 55% of the biomass in their diet and this proportion varied little throughout the year. In contrast, invertebrate prey consumption reflected the seasonal availability of the various species (Maser et al. 1971; Dickinson et al. 1994). Owls consumed coleopterans almost exclusively during the spring and early summer, but gradually shifted to grasshoppers as the season progressed. The diet of released owls is similar to that observed in wild populations (Leupin et al. 2000).

Several studies have identified small mammals as an important prey base for Burrowing Owls (Hjertaas et al. 1995). Vertebrate prey appear to be limiting during brood rearing (Wellicome 1997), which suggests that productivity is limited by low population levels of small mammals.

Reproduction

Owls return to breeding areas in April and May (Wellicome 1997; Leupin and Low 2000). In western North America, Burrowing Owls do not dig their own burrows, but rather occupy burrows made by fossorial mammals. Burrows are typically modified by enlarging burrow diameter and nest chambers (Coulombe 1971). Males choose a suitable burrow and advertise for females by calling. Burrows used by owls in British Columbia include those dug by Badger (*Taxidea taxus*), Coyote (*Canis latrans*), and Yellow-bellied Marmot (*Marmota flaviventris*) (Howie 1980; Bryant 1990). Nesting burrows and entrances are lined with cow manure chips prior to egg laying. The lining of burrows with manure is believed to be an evolutionary strategy to reduce predation by masking their scent to avoid detection (Coulombe 1971; Wellicome 1997).

Egg laying in wild populations typically begins in late April–late May (Coulombe 1971; Haug 1985). In British Columbia's captive bred/released populations, releases are purposely delayed to minimize mortality of released owls by migrating raptors. As a result pairing and nesting typically occurs between May and July (Leupin et al. 2000).

Mean clutch size for wild populations is between 3.6 (Plumpton and Lutz 1998) and 8.3 (Olenick 1987). Mean clutch size in released populations in British Columbia is 5.6 (Leupin et al. 2000). Young hatch after 21–30 days of incubation and emerge from the nest 20–25 days later. Fledglings begin moving between burrows shortly thereafter. Mean brood size for wild populations ranges between 2.1 and 6.3 (Hjertaas et al. 1995). In released populations in British Columbia, the mean brood size is 4.1 (Leupin et al. 2000).

Site fidelity

Philopatry and nest-site fidelity in Burrowing Owls is poorly understood. In Colorado, Plumpton and Lutz (1998) found that 92% of banded owls were never re-encountered the year following banding. However, a large proportion of the birds that returned (75% males and 63% females) occupied formerly used sites.

Home range

Home range for radio-collared males averaged 2.41 km^2 (range 0.14 km^2–4.81 km^2) in a foraging study near Saskatoon in 1989; although 95% of all detections were made within 600 m of the nest site (Haug and Oliphant 1990). A study conducted in southern Saskatchewan in 1997 reported significantly smaller home ranges (average 0.35 km^2, range 0.08 km^2 –0.49 km^2) (Sissons et al. 1998). The small home ranges observed were thought to have resulted from a superabundance of small mammals in the Canadian Prairies in that year (Wellicome et al. 1998).

In British Columbia, released captive-bred radio-collared males (n = 2) were observed mostly within 300 m of the nest site. Hunting movements were made at approximately 1 hour intervals and the average distance was 800 m (range 200–1500 m) (Leupin, unpubl. data).

Although this species has a clustered distribution, intra-specific competition has been reported if nests are too close (<110 m) (Hjertaas 1990). For released owls in British Columbia, the average distance between selected nesting burrows is 200 m and no territorial conflicts have been observed (D.J. Low, pers. comm.). One wild male was observed chasing off two released males at a release site where two captive-bred females were present (D.J. Low, pers. comm.).

Dispersal and migration

Juveniles disperse soon after fledging. Movements and distance away from the natal burrow increase in frequency and distance over time (Clayton 1997). Migration of birds from British Columbia typically occurs in September and October (Leupin et al. 2000); however, some of the released owls in British Columbia have remained over winter at, or near, release sites (Leupin et al. 2000).

Migration routes and areas used for overwintering are for the most part unknown (Wellicome 1997). Banded birds from Alberta and Saskatchewan have been relocated in Texas and Northern Mexico (G. Holroyd, pers. comm.). There are three recovery records (one each from Washington, Oregon, and California) for released birds banded in British Columbia. These recoveries suggest that B.C. owls use migration routes through the Great Basin in Washington and Oregon and into the southern coastal plain region of California (Leupin et al. 2000). However, these results should be interpreted with caution as they are from captive-bred birds and may not represent natural population's migration patterns.

Habitat

Structural stage

1: non-vegetated/sparse
2: herb

Important habitats and habitat features

Nesting

Important habitats include short grass, sparsely vegetated areas with available burrows in which to nest, as well as densely-vegetated areas adjacent to nesting areas to supply an adequate prey base (Wellicome 1997). In British Columbia, Burrowing Owls are associated with communities dominated by big sagebrush (*Artemisia tridentata*), antelope-brush (*Purshia tridentata*), and bunchgrass (*Agropyron* and *Festuca* spp.).

In the North American prairie, nesting habitat is strongly associated with ground squirrel (*Spermophilus* spp.), Black-tailed Prairie Dog (*Cynomys ludovicianus*), Yellow-bellied Marmot, Badger, Red Fox (*Vulpes vulpes*) and Coyote burrows and dens (Wellicome 1997; Desmond and Savidge 1998). In British Columbia, burrow availability is considered a limiting factor for this species.

Nest locations are usually located in areas where vegetation is shorter and less dense than the surrounding landscape (Green and Anthony 1989).

Green and Anthony reported nest locations in areas with short grass (0–10 cm) and weedy herbaceous species. Short grass is preferred perhaps because it enables the detection of predators, or because of availability of invertebrate prey.

Foraging

Burrowing Owls forage in a variety of habitats; however, foraging habitat close to the nest is important. Insects are taken from sparsely vegetated areas near the nest burrow (Wellicome 1997). Foraging for small mammals occurs in areas that are more densely vegetated. Haug and Oliphant (1990) found that nocturnal foraging was concentrated in roadside ditches, uncultivated fields, and ungrazed fields where taller vegetation prevailed. In British Columbia, released owls were observed foraging in a similar fashion. Night foraging was carried out mostly along riparian areas in ephemeral ponds and moisture seepage sites, and to a lesser extent along the sides of gravel roads.

Conservation and Management

Status

The Burrowing Owl is on the provincial *Red List* in British Columbia. Originally designated as *Threatened* in Canada (COSEWIC 1978), it is now considered *Endangered* (COSEWIC 2002). (See Summary of ABI status in BC and adjacent jurisdictions at bottom of page.)

Trends

Population trends

Population declines of the western subspecies have been reported throughout most of its range including serious declines in Canada (Holroyd 1998) and many parts of the United States (G. Holroyd, pers. comm.). A survey of 19 U.S. state wildlife agencies in 1992 reported declines in nine states; none reported increases (James and Espie 1997). In 1998, California reported the disappearance of 60% of known breeding groups initially reported in 1980 (Barclay et al. 1998). Texas also reported a 58% decline between 1990 and 1996 (Desmond and Savidge 1998).

In Canada, declines are well documented (Wellicome 1997). Generally, the population appears to be declining at a rate >10% annually (Holroyd 2000). In 2000, the population estimate for Alberta and Saskatchewan is 1000 pairs (Holroyd 2000). The rate of the decline in the last two decades has been sharp. Alberta reported declines from 1500 pairs in 1978 to 842 pairs in 1996 (Wellicome 1997). Significant declines were also reported in Saskatchewan from a program that relies on rural landowners to report Burrowing Owl sightings on their land. In 1988, 232 landowners reported 721 pairs whereas 485 landowners reported only 88 pairs in 1997 (Operation Burrowing Owl). In 1977, Manitoba's population was estimated at 100. In 2000, no pairs were reported and the species is now considered effectively extirpated (De Smet, pers. comm.).

In British Columbia, historical information suggests that Burrowing Owls were a regular breeding

Summary of ABI status in BC and adjacent jurisdictions (NatureServe Explorer 2002)

BC	AB	CA	ID	MT	OR	WA	Canada	Global
S1B, S2N	S2B, S2N	S2	S3S4	S3B, S2N	S2B	S3B S2N	N2B	G4

species. However, reports of wild breeding populations have not occurred since 1996. Reports of naturally occurring breeding pairs are a rare occurrence and the species was considered extirpated in British Columbia (Fraser et al. 1999). In 1989, a captive breeding and release program was initiated to reintroduce Burrowing Owls into historical sites. Since the inception of the reintroduction program, a total of 208 owls have been released (average = 26 birds per year). Ten years of reintroduction efforts of captive bred owls have not resulted in a self-perpetuating population.

Habitat trends

The general concern for Burrowing Owl populations in British Columbia is the availability of suitable grassland habitat. Grasslands make up <1.5% of the total land area in British Columbia (Chutter 1997). Suitable habitat for Burrowing Owls in British Columbia has declined. Native grasslands have been converted to agricultural crops, orchards, and urban areas, and remaining habitats are highly fragmented. However, some areas near Kamloops where crops were historically grown have been reverted to native grasslands. In addition, ground squirrel control programs have reduced burrow supply.

The historical diversity of vegetation, prey base, and symbiotic fossorial mammals is no longer sufficiently represented on the provincial landscape in a manner that satisfies the life-requisite needs of the Burrowing Owl (D.J. Low, pers. comm.).

Threats

Population threats

The sources of direct mortality include insecticide and rodenticide use, predation, vehicular collisions, and shooting (Wellicome 1997). The relative impacts of each can vary considerably between locations.

Insecticides can cause adult and juvenile mortality and affect reproductive performance because target species are often those that make up a significant portion of the owl's diet. In Saskatchewan, exposure to carbofuran, a systemic insecticide, at nesting sites resulted in a 54% reduction in the number of young produced and a 50% reduction in the proportion of pairs successfully fledging young relative to untreated areas (James and Fox 1987).

Some predator populations have increased considerably since historical times. The increases are believed to be associated with agricultural development. Main predators are Coyote and avian predators. Red-tailed Hawks (*Buteo jamaicensis*) and other raptors have benefited from the creation of perching structures (trees and fences) in grassland systems. In British Columbia, captive bred released birds are highly susceptible to predation during the first week after being released (Leupin and Low 2000).

Vehicular collisions also contribute to mortality, although the magnitude of the problem is difficult to assess. Wellicome (1997) suggested that the effects of vehicle mortality on Burrowing Owl populations in Alberta are low. However, the effect of vehicular collisions may be significant in areas where traffic is heavier or areas with higher road densities. In British Columbia, vehicular collisions do not appear to be of significance. Of 220 owls released since 1992, only one death is known to be from a vehicle collision.

Although mortalities associated with shooting do occur, they are difficult to quantify. Most shootings are likely accidental, as Burrowing Owls can easily be mistaken for ground squirrels or prairie dogs at a distance. Shootings are believed to be infrequent and of little effect to the overall population (Wellicome 1997).

Habitat threats

Elsewhere in their breeding range, the threats to this species have been clearly outlined (Hjertjaas et al. 1995; Holroyd 1998). In British Columbia, there is little supporting literature that details the factors responsible for decline (but see Howie 1980 and Bryant 1992). It is likely that the threats to Burrowing Owls in this province are commensurate with those observed elsewhere.

Grassland systems in British Columbia have been lost or fragmented as a result of forest encroachment, urban expansion,, and conversion of native grassland to agriculture (e.g., orchards). In addition to habitat loss and fragmentation, several anthro-

pogenic activities have contributed to the degradation of the remaining habitats. These include burrowing mammal eradication, incompatible grazing regimes, early homestead stone removal from fields in ground squirrel habitats, fire suppression, and noxious weed introduction (Todd 1998; Leupin et al. 2000; D.J. Low, pers. comm.). These activities have contributed to decreases in burrow availability, loss of horizontal vegetation heterogeneity, decreases in vertebrate prey base, and increased predation, all of which contribute to elevated mortality rates (D.J. Low, pers. comm.). Howie (1980) identified the reduction in Badger populations as a main factor responsible for the Burrowing Owl decline.

Legal Protection and Habitat Conservation

Raptors are not covered by the federal *Migratory Bird Convention Act*. In British Columbia, the Burrowing Owl is designated as an Endangered Species under the *Wildlife Act*. It is one of a few species listed in Section 34b of the *Act* for which the nest is protected year-round, regardless of whether it is active.

Due to the Burrowing Owl's national status, a national recovery team was established to direct research and conservation activities towards down-listing the species in Canada. A recovery team was also established in British Columbia. The BC Recovery Team has forged strong working relationships with range landowners to promote Burrowing Owl habitat stewardship. The commitments made by local landowners ensure habitat availability and sustainable management strategies that incorporate habitat requirements of the Burrowing Owl. These commitments are verbal and are not legally binding. Unless covenant documents are prepared on private lands, the commitment to protect Burrowing Owl habitat may not provide for long-term protection of the habitat.

Only a small proportion of existing Burrowing Owl habitat is under Crown ownership. Some habitat occurs within protected areas such as the Lac du Bois Grasslands Provincial Park and the Osoyoos Desert Centre. Range use plans under the results based code (RBC) may provide some degree of habitat conservation on Crown land, provided these plans contain objectives and strategies for maintaining important habitat features outlined in this account (see below).

Current legislated protection and protected areas have resulted in relatively small, fragmented habitat pockets that are embedded in a larger matrix of privately owned properties; the latter not being subject to RBC guidelines. Despite extensive research and recovery efforts, as of yet no effective management measures have been proven to stabilize or increase Burrowing Owl population numbers in British Columbia.

Identified Wildlife Provisions

Sustainable resource management and planning recommendations

- Consider fossorial mammals and availability of suitable burrows. Protection of grassland habitat is not sufficient unless burrows are available.
- Maintain connectivity of grassland habitats by managing and protecting remnant habitats throughout the Great Basin.
- Ensure long-term availability of suitable habitats through management strategies aimed at increasing burrowing mammal populations.
- Within sites maintain a mosaic of grassland habitat in a variety of structural stages.

Wildlife habitat area

Goal

Maintain or recover nesting and foraging habitat for Burrowing Owls in appropriate juxtapositions.

Feature

Establish WHAs at active nest sites as recommended by the Burrowing Owl Recovery Team.

Size

Roughly 300 ha but will depend on site-specific factors, such as habitat suitability and number of breeding pairs.

Design

WHAs should include the nest site (burrow), roost burrows, and approximate home range. Based on home range studies, an area of 1000 m radius around the nest site is recommended (Haug and Oliphant 1990; Sissons et al. 1998). Where more than one family occurs in close proximity, the WHA should be centred on all nest locations and the total area increased to at least 490 ha (1250 m radius).

The WHA should be designed to prevent disturbance to the nest sites but should also contain important areas for foraging (e.g., tall grass areas and riparian areas without trees or large shrubs).

General wildlife measure

Goals

1. Prevent physical damage to burrows.
2. Maintain both nesting and foraging habitat structure and critical features (i.e., ground cover and tall grass for prey species as well as short grass areas for nesting Burrowing Owls).
3. Minimize disturbance to nesting sites.
4. Minimize road mortality.
5. Minimize threat of predation.
6. Prevent forest encroachment.

Measures

Access

- Restrict vehicular access within 500 m of nest sites during the breeding season (1 April to 31 July). Limit all vehicular access year-round within 150 m of known nest locations.
- Do not construct roads or trails.

Pesticides

- Do not use pesticides.

Range

- Plan livestock grazing to maintain desired structure of plant community, desired stubble height, and browse utilization. If damage from livestock is found to be degrading vegetative structure, fencing may be required. Consult MWLAP for fencing arrangements.
- Do not graze during the breeding season (1 April through 31 July).
- Do not concentrate livestock within WHA.
- Maintain tall grass structure in areas designated to provide foraging habitat.
- Maintain dense understorey with sufficient residual cover suitable for small mammals in riparian areas through methods such as placement of salt licks, water developments, fencing, or herding.
- Do not mow during the breeding season (April through July).

Recreation

- Do not develop recreational sites or trails.
- Do not use recreational vehicles (i.e., off-road vehicles) within WHA.

Additional Management Considerations

Where possible, control forest encroachment into natural grassland habitat with controlled prescribed burning. Fall burning or manual removal of seedlings and saplings is preferred in Burrowing Owl WHAs.

The current shortage of burrows has resulted from the historical reduction of fossorial mammal populations in the southern Interior of British Columbia. Currently, artificial burrows (nesting and security) are placed in areas containing suitable nesting and foraging habitats. Although artificial burrows are an effective short-term enhancement technique, they should not be considered an ultimate solution (Bryant 1990). Yellow-bellied Marmot (*Marmota flaviventris*), Columbia Ground Squirrel (*Spermophilus columbianus*), and Badger (*Taxidea taxus*) are three native fossorial species that still persist, albeit in low numbers, in British Columbia's grasslands. Therefore, any management activities that benefit these populations will ultimately be beneficial to Burrowing Owls.

Despite intensive efforts to determine the reasons for the decline of Burrowing Owl populations, no significant positive changes have been achieved to permanently increase populations of Burrowing Owls in Canada. Return rates for banded owls are relatively low (Hjertaas 1992), which suggest that mortality rates during migration and wintering may

be an important factor for Canadian populations. International efforts to ensure winter and migration habitat availability should become a priority to complement recovery efforts in British Columbia and other Canadian provinces.

Information Needs

1. Migratory routes.

Cross References

Badger, "Columbian" Sharp-tailed Grouse, Great Basin Spadefoot, Long-billed Curlew, Western Rattlesnake

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