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THE HOWDY OWLS OF ARIZONA: A REVIEW OF THE STATUS OF *ATHENE CUNICULARIA*

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ABSTRACT.—Available information on the status of the western Burrowing Owl (*Athene cunicularia hypugaea*) in Arizona is limited. To determine its current status, I sent out questionnaires, made personal contacts, conducted field observations, and searched the literature. These data indicated that relatively little is known in Arizona about this uncommon species. This paper summarizes existing information on the Burrowing Owl in Arizona and provides baseline information for future studies. Location records suggest that this species is a widespread, albeit uncommon, bird in Arizona. The data compiled during this study are still not adequate to assess the status of Burrowing Owls in Arizona as of 1998. An annotated bibliography of Burrowing Owls in Arizona is available upon request.

KEY WORDS: *Burrowing Owl*; Athene cunicularia; *Gunnison's prairie dog*; Cynomys gunnisoni; *round-tailed ground squirrel*; Spermophilus tereticaudus; *distribution*; *status review*; *Arizona*.

Los Búhos Cavadores de Arizona: una revisión del estado de *Athene cunicularia*

RESUMEN.—La información disponible sobre el estado del Búho Cavador occidental (*Athene cunicularia hypugaea*)en Arizona es limitada. Para determinar su estado actual, envié cuestionarios haciendo contactos personales, conduje observaciones de campo, e investigue en la literatura. Este articulo resume la información existente sobre el Búho Cavador en Arizona y provee de información básica para futuros estudios. Las localidades registradas sugieren que esta especie es de amplia distribución, a pesar de ser un ave poco común en Arizona. Los datos compilados durante este estudio son aun inadecuados para evaluar el estado del Búho Cavador in Arizona para 1998. La bibliografía comentada sobre el Búho Cavador en Arizona esta disponible por encargo.

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The Western Burrowing Owl (*Athene cunicularia hypugaea*), also known as the howdy owl, is considered to be a generally uncommon, local resident in a variety of habitats within Arizona (Phillips et al. 1964, Monson and Phillips 1981). One exception is in the agricultural lands near Yuma, where they are considered to be common (Monson and Phillips 1981, Rosenberg et al. 1991). Relative to other areas within its range in Canada and the United States of America, not much is known about this species in Arizona. The status of the Burrowing Owl in this state was reviewed in 1979 (Johnson et al. 1979) and again in 1986 (Johnson-Duncan et al. 1988), but results were incomplete. Provided, herein, is a summary of data on Burrowing Owls in Arizona, including distribution, habitat types, and threats to the species.

METHODS

In April 1998, I sent out over 100 questionnaires regarding Burrowing Owls to various federal and state land management and resources agencies, independent biologists, and bird enthusiasts throughout the state. The questionnaire asked for the following information: 1) Are Burrowing Owls known to occur on your property or in your region? 2) Can you provide any locations of Burrowing Owls? 3) Can you determine if the owl population in your area is stable, increasing, or decreasing, and if decreasing then why? and 4) Can you identify any known or potential threats to the owls in your area? Approximately 50% of the questionnaires were completed and returned. I also requested observations from an Arizona/New Mexico rare-bird website (*http://naturesongs.com/birdyverde*). In addition, the Arizona Game and Fish Department provided Arizona Breeding Bird Atlas (ABBA) data from 1993–99. Lastly, I conducted literature searches and field observations, and produced an annotated bibliography and a database containing over 280 general and specific records related to Burrowing Owls in Arizona.

RESULTS AND DISCUSSION

Distribution and Migratory Status. In Arizona, Burrowing Owls are found in a variety of open hab-

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itats that are scattered throughout the state (Fig. 1). There are observations of this species in all but two of the 15 counties (no records from Greenlee County). Of the 13 counties with records, Santa Cruz County lacks a confirmed breeding record.

The migratory habits of Burrowing Owls in Arizona are not well-understood (Phillips et al. 1964, deVos 1998). The populations in northern Arizona are thought to migrate out of the area for the winter months (Woodbury and Russell 1945, Phillips 1947, Phillips et al. 1964, Monson and Phillips 1981, Jacobs 1986, J. Coons, C. LaRue, B. VanPelt pers. comm.). Some authors have referred to the owls as permanent residents in the Flagstaff area (Carothers et al. 1970, 1973) and in the Oraibi Valley on the Hopi Reservation (Bradfield 1974). However, Bradfield's (1974) information was passed secondhand and was not substantiated by direct observation. At present, there are only two winter records from northern Arizona: Snowflake, 22 December 1947, and Springerville, 8 January 1959 (Phillips et al. 1964, Monson and Phillips 1981). According to Tyler and Phillips (1978), these owls are resident everywhere in Arizona except in the northeast. DeVos (1998) suggested that Burrowing Owls in Arizona occur locally in open areas, generally year-round, even in the northeastern part of the state. DeVos (1998) apparently based this suggestion on Bradfield's records, because there were no survey data on this species at that time (R. Glinski pers. comm.). In the northeastern portion of the state, existing records suggest the owls arrive on the breeding grounds around mid-March and migrate out of the area by mid-October (Jacobs 1986, C. LaRue pers. comm.).

The mild winter climate along the Lower Colorado River may provide year-round habitat for this species. Phillips et al. (1964) reported summer, winter, and transient records along the Lower Colorado River Valley. Rosenberg et al. (1991) considered the owls a common resident throughout the Lower Colorado Valley, but less common in the northern region of the valley in winter.

Phillips et al. (1964) contended that the owls from around the Phoenix area (central Arizona) and in southern Arizona (south of Phoenix) were year-round residents. However, Rhea (1983) believed that some of the owls along the Gila River, south of Phoenix, were migratory; in 13 yr, he had seen only two pairs of owls during the winter. Monson and Phillips (1981) suggested that some of the owls in the area east of the San Pedro Valley, in the southeastern region, also migrate in the winter. Zarn (1974) implied that in the winter there is a tendency for resident owls to wander extensively or become strictly nocturnal. Whether the absence of owls from their known burrows in these parts of Arizona was due to migration, wandering, or lack of diurnal activity is unknown.

Habitat. The Western Burrowing Owl typically relies on other fossorial animals to create its burrows (Brandt 1951, Evans 1982, Thomsen 1971, Zarn 1974, Haug et al. 1993). Thus, the presence of a nest burrow seems to be a critical habitat requirement for this species in the western states (Haug et al. 1993); however, the presence of a nest burrow is only one factor that makes an area suitable. Zarn (1974) lists three factors necessary for good Burrowing Owl habitat: 1) openness, 2) short vegetation, and 3) burrow availability. Some fossorial mammals, such as Gunnison's prairie dogs (*Cynomys gunnisoni*) and round-tailed ground squirrels (*Spermophilus tereticaudus*), inhabit open environments, provide burrows and help maintain short vegetation by foraging (Butts 1973, Hoffmeister 1986, deVos 1998).

In the western portion of its range, Burrowing Owls are often associated with mammal burrows in open, dry grasslands, agricultural and range lands, and desert habitats (Haug et al. 1993, deVos 1998, ABBA unpubl. data, N. Brown unpubl. data). Burrowing Owls also inhabit grass, forb, and open shrub stages of pinyon pine (*Pinus edulis*) and ponderosa pine (*Pinus ponderosa*) habitats (Carothers et al. 1973, Karlaus and Eckert 1974, State of California 1990). Other areas in Arizona where owls might be found include natural drainage systems, irrigation canals, near water tanks or corrals on rangelands, and in vacant lots, parks, airports, golf courses, cemeteries, and other disturbed sites in urban and rural areas (Rhea 1983, Rosenberg et al. 1991, Witzeman et al. 1997, deVos 1998, N. Brown unpubl. data). Occasionally owls are found in sandy, sparsely vegetated riparian woodlands in the Lower Colorado River Valley (Rosenberg et al. 1991).

The ABBA surveys (Arizona Game and Fish Dept., Phoenix) recorded them in the following vegetation types: Semidesert Grassland, Plains Grassland, Cropland, Great Basin Desertscrub, Lower Colorado River Biome of Sonoran Desertscrub, Barren ground, Great Basin Grassland, Arizona Upland Biome of Sonoran Desertscrub, Mo-

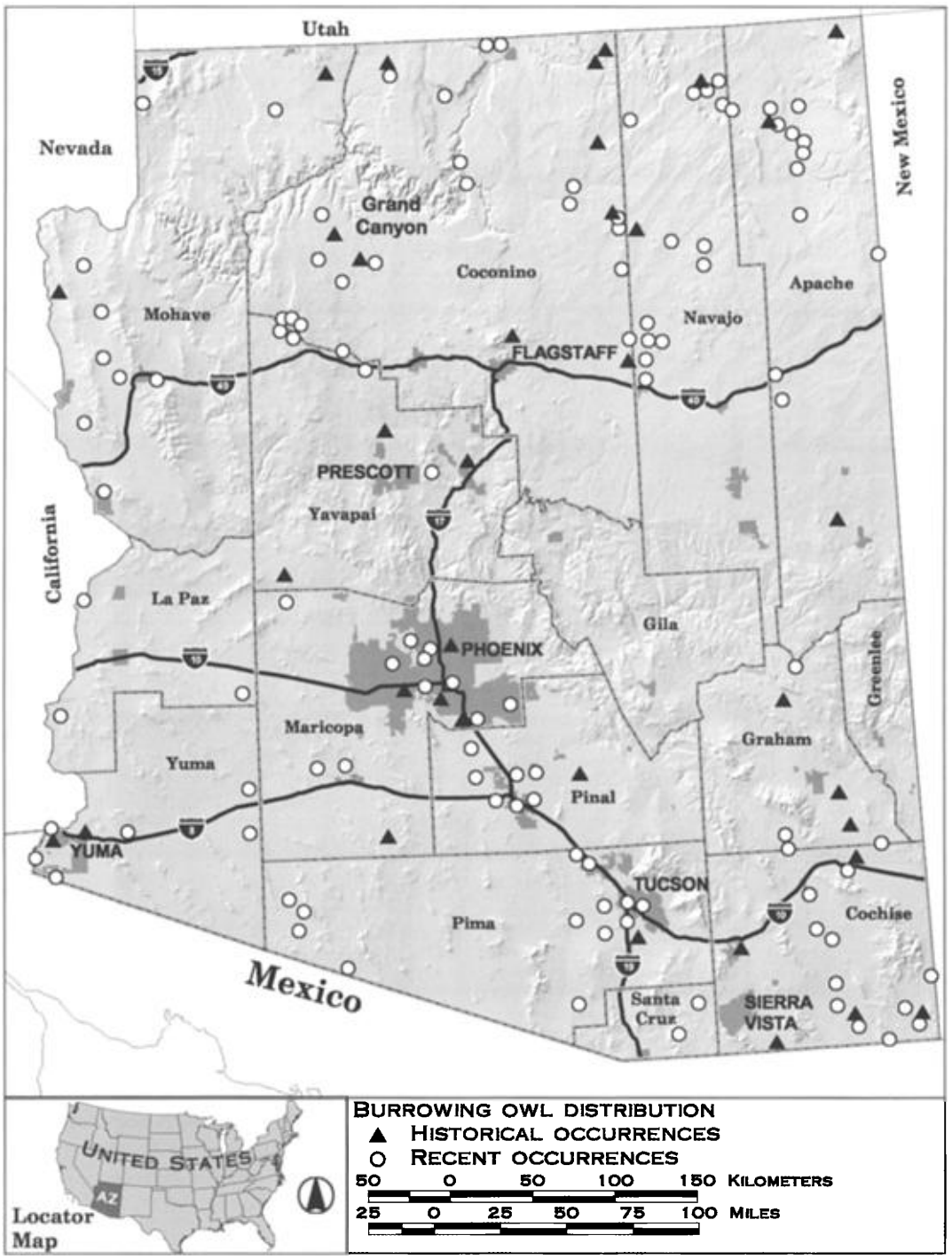

Figure 1. Historical and recent occurrences of Burrowing Owls in Arizona.

javc Desertscrub, Rural (includes canals and pastures), and Residential. From the 1998 survey data, parks, including golf courses and cemeteries, and cultivated woodlands, including orchards and tree farms, may be added to this list.

Carothers et al. (1973) reported the first record of a Burrowing Owl in Flagstaff in ponderosa pine vegetation type on 2 April 1970; P. Snider (pers. comm.) provided a second record from 12 May 1974 on the Northern Arizona University campus, Flagstaff. Because these are the only two records for Flagstaff, these owls may have either wandered in from the grasslands northeast of Flagstaff, where a population was reported (Carothers et al. 1973), or were transients in Flagstaff while on migration.

Much of the natural habitat for Burrowing Owls is on either private or inaccessible lands. Inaccessible lands include closed-to-public government lands and tribal or nation lands. The latter, estimated to be ca. 8 million ha in Arizona (World Almanac Books 1998), are only accessible via major roadways or by daily permits in selected areas.

Nesting. Burrowing Owls nest in holes, burrows, or similar underground structures. In Arizona, animals that excavate burrows include Gunnison's prairie dog, round-tailed ground squirrels, rock squirrels (*Spermophilus variegatus*), California ground squirrels (*Spermophilus beecheyi*), pocket gophers (*Thomomys* spp.), kangaroo rats (*Dipodomys* spp.) (particularly the larger banner-tailed [*D. spectabilis*] and desert [*D. deserti*]), coyotes (*Canis latrans*), kit fox (*Vulpes macrotis*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), skunks (*Mephitis, Spilogale,* and *Conepatus* spp.), badgers (*Taxidea taxus*), and desert tortoise (*Gopherus agassizii*) (Merriam 1890, Visher 1910, Swarth 1914, Phillips et al. 1964, Haug et al. 1993, N. Brown unpubl. data). Prior to their extirpation, black-tailed prairie dogs (*Cynomys ludovicianus*) provided burrows in southeastern Arizona (Osgood 1903, Swarth 1904, 1914, Brandt 1951, Phillips et al. 1964). The owls are known to utilize a variety of man-made structures, such as drain and irrigation pipes and culverts, artificial landscapes (waterfalls), and artificial burrows (Haug et al. 1993, N. Brown unpubl. data). Woodbury and Russell (1945) suggested that the owl burrows they found near Cow Springs were dug by the owls themselves and not by prairie dogs. There is also one record of a pair utilizing a cavity "well off the ground" in a paloverde (*Cercidium* sp.) in the Phoenix area (B. Millsap pers. comm.).

In Arizona, records suggest that the nesting season begins between mid-March and April (Phillips et al. 1964, N. Brown, T. Estabrook, and R. Mannan unpubl. data). The owls often decorate the outside of their burrow and line their nest with an assortment of materials, such as prey remains, pellets, feathers, cow and horse manure, coyote scat, parts of cacti, and artificial materials (Brandt 1951, Zarn 1974, N. Brown pers. observ.).

Changes in Abundance Over Time. Monson and Phillips (1981) considered Burrowing Owls to be locally common near farmlands around Phoenix. However, Witzeman et al. (1997) reported that they were increasingly difficult to find. The three locations where owls can be seen reliably are Scottsdale Community College, Painted Rock Dam, and Chandler Airport (Witzeman et al. 1997, N. Brown unpubl. data).

Monson and Phillips (1981) reported that the February 1949 observation of a Burrowing Owl in north Growler Valley in southwestern Arizona (Sonoran Desertscrub vegetation) was unusual. G. Monson (pers. comm.) stated he had no owls in this area from 1954–62. However, in early 1994, Burrowing Owls were seen and heard in the Growler Valley on the Cabeza Prieta National Wildlife Refuge, and in 1995, nesting was confirmed (T. Cutler and D. Griffith pers. comm.). No year-round surveys have been conducted in this region.

In the Grand Canyon region, Bailey (1939) reported a few records, but the last sighting was in 1937, soon after intensive prairie dog control programs. Burrowing Owls were formerly found near Anita and Pasture washes (Brown et al. 1984), but the vegetation in these areas has changed to dense brush and is presently considered to be unsuitable for this owl (L. Stevens pers. comm.). Brown et al. (1984) suggested that owls may have occurred in other open areas on the north and south rim. Bailey (1939) and Brown et al. (1984) reported no records from along the river bottom of the Grand Canyon, only from the rim. National Park Service (publ. comm. 1937) reported a September observation, from the bottom of the canyon, that was contributed by R. Grater, who had provided many of Bailey's records.

As previously mentioned, prior to 1930s, Burrowing Owls were associated with black-tailed prairie dogs and were somewhat common in southeastern Arizona (Scott 1886, Osgood 1903, Swarth 1904, 1914, Brandt 1951, Hoffmeister 1986, Phillips et al. 1964). After the extirpation of these prairie dogs

by the 1950s, Brandt (1951) suggested that the Burrowing Owl was a rare species in the area. The ABBA data suggest that at least a few pairs are breeding presently in the area, and that recent grazing and grassland management practices in southeastern Arizona may benefit the owls, and the fossorial species that create their burrows.

Burrowing Owls were not found along the Lower Colorado River in the early 1900s, but now they are considered common, suggesting that agriculture (particularly irrigated crops) has benefited them (Rosenberg et al. 1991). This also seems to be the case in California where 71% of the state's population is found in the agricultural land of the Imperial Valley (D. DeSante, E. Ruhlen, and D. Rosenberg unpubl. data).

Threats. Relatively heavily-grazed areas may benefit Burrowing Owls by keeping vegetation short (Kochert et al. 1988). However, overgrazing can potentially lead to a reduction in prey, destruction of burrows, and ultimately to a change in habitat type (Brandt 1951). Also, any agricultural practice, insect, rodent, or predator control programs may adversely affect the owls through habitat change, reduction in prey, increases in predation, and potentially accidental and secondary poisoning (Brandt 1951, Zarn 1974, Marti and Marks 1989).

Burrows are sometimes destroyed when vegetation is cleared or controlled during canal and road maintenance or agricultural and construction activities (Zarn 1974, T. Estabrook and R. Mannan unpubl. data). Some of these activities could be restricted to outside of the Burrowing Owl's breeding season, thus limiting disturbance during this critical period.

Conversion of lands for urbanization or agricultural purposes destroys natural habitat, but may potentially create temporary habitat for Burrowing Owls. Marti and Marks (1989) and deVos (1998) mentioned that newly created or disturbed habitats, modified by urbanization and agriculture, are important but unreliable and temporary habitats. Areas may remain undeveloped for a period of time, long enough for ground squirrels to create burrows that Burrowing Owls can also use; however, the land is eventually developed. Urbanization results in more interactions with humans (collisions with vehicles and windows, harassment and predation by children and pets). Also, urbanization may increase the chances of Trichomoniasis, a disease acquired from doves (T. Estabrook and R. Mannan unpubl. data). Thus, these habitats cannot be considered a basis for stable populations.

Status. The Burrowing Owl is on the U.S. Fish and Wildlife Service's list of Species of Management Concern (USFWS 1995) and is federally protected by the 1972 United States-Mexico Migratory Bird Treaty Act. Burrowing Owls have no special listing by the state of Arizona. However, in October 1998, the Arizona Partners in Flight Program, coordinated by the Arizona Game and Fish Department, designated the Burrowing Owl as a Priority Species in High Elevation Grassland communities (N. Brown publ. comm.).

The status of bird species in southwestern United States has been assessed in the past (Johnson et al. 1979, Johnson-Duncan et al. 1988). However, there has never been enough information available to determine the status of the Burrowing Owl in the southwest. As of 1998, the species' status in Arizona is still unclear. The information presented in this paper is the most comprehensive currently available for Burrowing Owls in the state of Arizona.

Recommendations for Future Work.

(1) Conduct state-wide, year-round field surveys to improve knowledge of Burrowing Owl abundance and distribution.
(2) Study migratory habits of owls in Arizona by initiating telemetry and banding studies at known nest sites and monitoring during winter. If certain populations are migratory, determine habitat needs for both breeding and wintering areas.
(3) Study the owls in their natural habitats to learn more about their behavior, habitat requirements, and association with prairie dogs and other fossorial animals. Some of this research could compliment research on black-footed ferrets (*Mustela nigripes*), involve monitoring of prairie dog towns for plague, and be a component of a multi-species approach to grassland management.
(4) Develop outreach programs to educate the general public on this species. Programs could be designed to educate children in urban environments, so that they may reduce harassment of the owls, and to educate and to provide recommendations to private and public land managers regarding canal maintenance and pest control programs. The results of this review suggest that educational material on

this species for the managers of the canals and the farmers may be needed to reduce the impacts from canal maintenance. Canal maintenance that can impact this owl includes both the clearing of unwanted vegetation, which destroys burrows, and the outright destruction of burrows during erosion control and because burrow systems along the canals weaken the berms. D. DeSante, E. Ruhlen, and D. Rosenberg (unpubl. data) estimated that 92% of the Burrowing Owls in the Imperial Valley nest within 15 m of the banks of the many irrigation canals in this intensively agricultural region, and the same may be true for some of the Arizona populations inhabiting similar areas. Thus, an outreach program addressing these concerns could benefit both the Arizona and California populations.

CONCLUSION

In Arizona, the Burrowing Owl has been, and still may be, threatened by prairie dog and ground squirrel control programs, vegetation control programs, plague (indirectly), conversion of natural habitat, canal maintenance, agricultural pesticides, and overgrazing of rangelands (Brandt 1951, Phillips et al. 1964, Marti and Marks 1989, Haug et al. 1993, deVos 1998; N. Brown, T. Estabrook, and R. Mannan unpubl. data). The importance of Arizona's native grasslands to the conservation of Burrowing Owls was emphasized by deVos (1998), but we need to learn more about the owl's behavior in its natural habitat to better manage for that habitat.

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