

# BURROWING OWL MANAGEMENT GUIDELINES FOR MUNICIPALITIES IN ARIZONA

Prepared by the Burrowing Owl Working Group

## BACKGROUND

A number of municipalities in Arizona intend to apply to the US Fish and Wildlife Service (USFWS) for an incidental take permit under Section 10(a)(1)(b) of the Endangered Species Act and permit lengths range from 30 to 50 years. A corresponding habitat conservation plan (HCP) is needed to address conservation and mitigation measures for all species covered by the permit and individual technical teams are tasked with developing these measures. The western burrowing owl, *Athene cunicularia hypugea*, is one species identified for coverage under these incidental take permits. The primary conservation measure proposed for the burrowing owl focuses on managing spatially discrete areas that will provide nesting and/or wintering habitat. Such an area is referred to as a burrowing owl management area, or BOMA. To develop and eventually implement this concept, technical teams have requested information and guidance regarding burrowing owl translocation and recommendations to ensure that BOMA's are consistent with state and federal conservation objectives for this species. The intent of this white paper is to provide these objectives for managing the translocation of burrowing owls, as well as specific guidelines for the design and management of BOMA's. These guidelines are based on the best available information to date, but guidance may change with new information in the future.

## GENERAL MANAGEMENT GUIDELINES FOR BURROWING OWL TRANSLOCATION

There has been a recent increase in the rate of burrowing owl displacement due to habitat loss resulting from urban and suburban development in central and southern Arizona. Displaced owls are currently being translocated to human-created artificial burrow systems by Wild At Heart. Various techniques, including passive and active translocation are being implemented.

### *Passive Translocation*

Passive translocation involves excluding owls from their burrows using a one-way box trap that allows owls to leave the burrow but prevents them from re-entering. This process is preferable if appropriate habitat and nearby burrows are available to accommodate displaced owls (Trulio 1995).

- ▷ If burrowing owls are moved due to development, they should be translocated as close as possible to the original site. Trulio (1995) suggested that if passive translocation is to take place, artificial burrows should be placed within 100m of the original burrow.
- ▷ Passive translocation should only be considered if the habitat to which the owls are translocated will remain undisturbed.
- ▷ Burrows should be excavated to ensure that all the owls have been removed and the burrow should be collapsed to prevent re-occupancy.
- ▷ Care should be taken to avoid burrow exclusion at nest burrows during the breeding season because adult owls need to access nest burrows to care for young.

### *Active Translocation*

When active translocation is unavoidable, owls must be removed from burrows by experienced personnel holding the appropriate State and Federal permits. Burrows are fully excavated using hand tools and all the contents (i.e., eggs, nestlings, and/or adult owls) are removed. Burrows are then collapsed to prevent re-occupancy. Owls are held in captivity at a designated facility for approximately two months. Captive housing is

necessary for breaking the owls' site fidelity and increases the likelihood that owls will occupy the site to which they are relocated (B. Fox, Wild At Heart, pers. com.). Translocation sites require  $\geq 12$ ha of appropriate burrowing owl habitat (i.e., open areas where burrows can be established  $> 300$ m from isolated, mature saguaros,  $> 1.6$ km from dense clusters of saguaros, and  $> 150$ m from dense patches of mesquite or palo verde; Clark 2007) and are evaluated for the presence of a year-round availability of prey (e.g., small mammals, songbirds, lizards, amphibians, and insects; G. Clark, Wild At Heart, pers. com.). The Arizona Game and Fish Department, Research Branch, is currently investigating translocation site characteristics and their influence on successful occupancy, reproduction, and survival rates of translocated owls (Grandmaison 2006). The results of this study will be summarized in a Standards and Guidelines document for burrowing owl translocation. Artificial burrows are constructed at each translocation site to provide long-term habitat for the owls. The number of artificial burrows installed is dependent on the amount of appropriate habitat, although a large number of burrows are built at each site to provide habitat for offspring (i.e., expansion or "satellite" burrows). Burrowing owls are released into a cluster of eight artificial burrows (i.e., hack site) that are enclosed for thirty days. Supplemental feeding is required during this period.

- ▷ If active translocation is required, the current procedures developed by Wild At Heart should be implemented for owl extraction, captive housing, and hacking (B. Fox, Wild At Heart, pers. com.).
- ▷ Translocation sites should include the eight-burrow hack site and no fewer than 32 expansion burrows, given space and labor constraints. Additional burrows can be added at a later date when funding and/or manpower become available.
- ▷ Results of an ongoing study by the Arizona Game and Fish Department will contribute to finalizing a set of Standards and Guidelines for establishing artificial burrow sites.

#### *Migratory Considerations*

Burrowing owls in Arizona are considered partially migratory, although their migratory habits are not well understood. Burrowing owls in northern Arizona are thought to migrate south during the winter (e.g., Brown 2001) while a greater proportion of owls from southern Arizona populations appear to be year-round residents (Ellis et al. 2004, Conway and Ogonowski 2005). Therefore, it is uncertain whether owls displaced from southern latitudes and relocated to northern latitudes will engage in migratory behavior to avoid weather extremes. Preliminary evidence from the translocation of owls from Maricopa County to a site near Kingman, AZ suggests that success rates are low (Arizona Game and Fish Department, unpublished data). Without reliable information regarding inter-regional translocation, a conservative approach is recommended.

- ▷ When municipalities accept displaced burrowing owls as part of BOMA conservation, these owls should have originated from similar latitudes, habitat, and elevation as the release site.

#### *Impacts to Resident Owls*

Translocation programs should consider the potential unintended demographic effect on resident owls. The burrowing owl is a semi-colonial species (Haug et al. 1993). Intraspecific aggressive displays are used to defend breeding territories (Thompson 1971), which range from 250m (Haug and Oliphant 1990) to 600m (Arizona Game and Fish Department, unpublished data) from the nest burrow. Crowding as a result of translocation can increase competitive and/or aggressive interactions among neighboring burrowing owls and can result in nest failure (Green and Anthony 1989). Therefore, spacing of translocation sites relative to resident burrowing owls should be considered.

- ▷ Maintain a distance of at least 600m between active release sites and resident burrowing owl colonies.

## BURROWING OWL MANAGEMENT AREAS (BOMA'S)

### *Prioritizing and Selecting Sites for Establishing BOMA's*

Prioritizing sites for BOMA's is dependent upon conducting standardized surveys to identify burrowing owl nesting sites. Priorities should be given to: 1) areas that will be developed, 2) areas with a high density of occupied burrows, and 3) areas that have suitable burrowing owl habitat (i.e., public and private lands within the Avra Valley, Southlands within the Tucson Basin, and blocks of suitable habitat along the Santa Cruz River as well as retired agricultural fields in Maricopa and Pinal Counties). If burrowing owls are detected, municipalities should investigate the potential establishment of BOMA's within these areas with the highest priority being those areas where ground disturbance will displace nesting burrowing owls.

Once identified, Municipal, State, Federal, and Tribal agencies as well as private conservation organizations and landowners should work towards obtaining easements or purchasing and conserving land in best burrowing owl habitat. Areas with existing populations or sources of burrowing owls should also be given conservation priority for the creation of BOMA's. (e.g., areas within Aubrey Valley, between Saint Johns and Springerville, agricultural fringe areas near Maricopa, etc.). In addition, large, contiguous areas of suitable habitat should be given priority for easements and land acquisition. However, a mosaic of habitats, largely consisting of open, treeless areas with low vegetation density, but also including areas of moderately dense grasses and creosote bush, are important for providing nesting and foraging habitat (Clayton and Schmutz 1999, Orth and Kennedy 2001).

Traditional nesting and wintering areas, such as the portions of the Avra Valley (Grandmaison and Urreztieta 2006), should be maintained as suitable habitat because burrowing owls are known to reuse nesting sites occupied in previous years (Rich 1984, Haug and Oliphant 1990, Plumpton and Lutz 1993).

The following guidelines will help municipalities prioritize areas for BOMA establishment. Development within suitable habitat, burrowing owl occupancy, and availability of suitable habitat should drive the planning process.

- ▷ The highest priority sites for BOMA establishment are occupied sites where ground disturbance may displace nesting burrowing owls in the near future.
- ▷ BOMA's should then be established at higher density occupied sites.
- ▷ Large, contiguous areas of suitable habitat should then be considered. This includes traditional nesting and wintering areas, even if unoccupied.

Additional recommendations related to BOMA creation include:

- ▷ BOMA's should consist of suitable nesting habitat (i.e., open, treeless areas with low vegetation density and presence of fossorial mammals).
- ▷ Identifying the ideal size for a BOMA will entail adaptive management (see *BOMA Monitoring* below). As a starting point, BOMA's should consist of  $\geq 12$ ha of land.
- ▷ BOMA's should be established away from heavily used roadways. Vehicle related mortality is considered a significant threat to burrowing owls (Konrad and Gilmer 1984).
- ▷ BOMA's should be located such that dispersal habitat exists nearby (e.g., additional nesting habitat and major washes or river corridors such as the Santa Cruz or Gila rivers).

### *Burrow Availability*

Burrowing owl survivorship is closely linked to burrow availability, and a high density of available burrows is preferred (Haug et al. 1993, Poulin et al. 2005, Davies and Restani 2006). During the breeding season, burrowing owls select a single nest burrow, but will also use numerous “satellite” burrows in the vicinity of the nest during the breeding and non-breeding season. Satellite burrow use may be related to predator avoidance (Desmond and Savidge 1999) and dispersal patterns (King and Belthoff 2001). As burrow availability increases, so does the ability of burrowing owls to escape predators. Longevity of artificial burrows is greater than natural burrows, which are susceptible to abiotic factors that degrade burrow stability such as flooding and collapse, and biotic factors such as digging by canids (Holmes et al. 2003).

- ▷ Installation of artificial burrows should be considered to increase satellite burrow availability and create stable burrows, thereby enhancing the suitability of BOMA’s or other natural colony areas.
- ▷ When adding artificial burrows to currently occupied habitat, burrow construction should be conducted during the non-breeding season to minimize disturbance to resident owls. Artificial burrows should be placed as close to the natural burrow(s) as possible, but no closer than 50m to avoid impacting the structural integrity of the existing burrow(s).
- ▷ If translocating owls to suitable unoccupied habitat, artificial burrows should form a clustered distribution within a BOMA. Artificial burrow clusters should consist of  $\geq 32$  burrows and should be  $> 600\text{m}$  from each other and  $> 200\text{m}$  from the BOMA edge. The number of clusters will depend on BOMA size.
- ▷ Artificial burrows should be installed such that precipitation during the monsoon season will not flood the burrow. Installing artificial burrows on slightly elevated terrain will help avoid flooding.
- ▷ Other design considerations have been implemented to reduce burrow damage resulting from canid digging (G. Clark, Wild At Heart, pers. com.).
- ▷ Artificial perches  $\sim 1\text{m}$  in height should be installed near burrows.

## BOMA MANAGEMENT

### *Human Dimensions*

The role of a BOMA is to provide nesting and/or non-breeding season habitat for burrowing owls.

- ▷ Human activity within BOMA’s should be limited, but allow for management of burrowing owl habitat. However, human activities can be identified and evaluated on a case-by-case basis.
- ▷ Educational exhibits and Watchable Wildlife platforms could be located on the edge of a subset of BOMA’s. Observation platforms should be placed at least 200m from the nearest active burrow at the time of establishment and within 50m of the BOMA boundary.

### *Maintaining Suitable Habitat*

All management prescriptions should take place outside of the breeding season, which generally occurs from mid-March to August. Burrowing owls are thought to be most susceptible to disturbance during the egg laying and incubation stages. Traditional burrowing owl habitat consists of open, treeless expanses (Haug et al. 1993), with a fossorial mammal component. The following maintenance applications are recommended for all BOMA’s and artificial burrow sites:

- ▷ Efforts should be made to avoid woody encroachment (see *Application of Prescribed Burning and Mowing* below).

- ▷ Within the BOMA, maintain open ground cover > 40% and native herbaceous ground cover < 40% with vegetation < 40cm tall on average (Klute et al. 1993). These parameters will need to be refined through additional research and adaptive management of BOMA sites.
- ▷ Where fossorial mammals are absent, artificial burrows can be installed and maintained to enhance burrow availability.

#### *Application of Prescribed Burning and Mowing*

Little data exists on the response of burrowing owls to prescribed burning. In north-central Oregon, however, evidence suggests that fire may create suitable habitat by reducing vegetation around potential nest sites (Green and Anthony 1989). Likewise, a habitat model in Argentina suggested that fire plays a key role in maintaining burrowing owl habitat by limiting woody plant encroachment (Machicote et al. 2004). Fire suppression can result in woody plant encroachment, a vegetation shift that likely degrades burrowing owl habitat. Mowing can also be used to maintain suitable burrowing owl habitat through the control of excessive grass growth and encroachment of woody vegetation (Plumpton and Lutz 1993, Fisher et al. 2007).

- ▷ Prescribed burns and regular mowing or weed removal should be conducted to maintain suitable conditions for burrowing owls. Such applications should take place outside of the breeding season, which begins in mid-March and ends in August.
- ▷ Care should be taken not to damage or destroy burrows when mowing. Maintain a 5m distance from known burrows when mowing with heavy equipment.

#### *Fossorial Mammals*

Western burrowing owls do not excavate burrows themselves, but rather utilize burrows constructed by burrow building animals. In Arizona, these burrow builders include Gunnison's prairie dogs, round-tailed ground squirrels, rock squirrels, pocket gophers, kangaroo rats, coyotes, kit fox, badgers, skunks, and desert tortoises (Brown 2001). Prior to extirpation, black-tailed prairie dogs provided burrowing owls habitat in southeastern Arizona (Osgood 1903). Maintaining or restoring healthy fossorial mammal populations in management areas will increase the availability of natural burrows as well as enhance prey species availability. The presence of small rodents, such as ground squirrels, may also reduce predation pressures on burrowing owls (Wellicome et al. 1997). Rodent control programs have been identified as a major factor in the recent and historical decline of burrowing owl populations in the western United States (Grant 1965, Desmond and Savidge 1998, Murphy et al. 2001). Use of pesticides reduces the food supply available for burrowing owls and introduces toxins that may have lethal or sublethal effects on the owls.

- ▷ Maintain or enhance populations of burrowing mammals within BOMA's. Habitat loss, road mortality, and animal control applications are manageable stressors affecting these populations.
- ▷ Avoid use of pesticides and insecticides in BOMA's.
- ▷ If pesticide use is unavoidable, do not spray pesticides or herbicides within 400 to 600m of burrowing owl nests during the breeding season (Haug and Oliphant 1987, James and Fox 1987) and select insecticides with the lowest toxicity to nontarget organisms (James and Fox 1987).

#### *Adaptive Management*

Integral to successful burrowing owl conservation is the development of a robust monitoring and adaptive management strategy. The following guidelines are suggested:

- ▷ Field monitoring efforts should entail interagency coordination. Currently, the Arizona Game and Fish Department, the Arizona Cooperative Fish and Wildlife Research Unit, and Northern Arizona University are conducting, or have conducted, burrowing owl research. Cohesion among these

efforts should be made to allow results to be directly comparable between studies. The AGFD Heritage Data Management System and the Raptor Management Database should act as the central depository for all statewide demographic and banding data (i.e., a stipulation to all handling permits statewide).

- ▷ Coordination and establishment of survey protocols should be agreed upon and used in all future burrowing owl surveys to allow for comparison among surveys and consideration of locations for BOMA establishment.
- ▷ Suitable habitat should be identified statewide in order to prioritize burrowing owl conservation. Considerations will include historic/current burrowing owl occupancy, habitat type, ground cover characteristics, land ownership, and proximity to known burrowing owl colonies.
- ▷ Adaptive management should guide BOMA establishment such that unknown parameters like the minimum effective size can be scientifically evaluated.
- ▷ Demographic parameters such as occupancy, reproductive success, reproductive output, and juvenile and adult survival should be monitored within BOMA's to assess their functionality.

#### SUMMARY OF MANAGEMENT GUIDELINES

##### *Passive Translocation*

- ▷ If burrowing owls are moved due to development, they should be translocated as close as possible to the original site. Trulio (1995) suggested that if passive translocation is to take place, artificial burrows should be placed within 100m of the original burrow.
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WORKING GROUP MEMBERS

Dennis Abbate, Arizona Game and Fish Department  
Marit Alanen, U.S. Fish and Wildlife Service  
Troy Corman, Nongame Arizona Game and Fish Department  
Cathy Crawford, Arizona Game and Fish Department  
Jamey Driscoll, Arizona Game and Fish Department  
Bob Fox, Wild At Heart  
David Grandmaison, Arizona Game and Fish Department  
Michael Ingraldi, Arizona Game and Fish Department  
Elissa Ostergaard, Arizona Game and Fish Department  
Scott Richardson, U.S. Fish and Wildlife Service  
Ray Schweinsburg, Arizona Game and Fish Department

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