

**GUIDELINES AND RECOMMENDATIONS
FOR BURROWING OWL
SURVEYS AND MITIGATION**

NEW MEXICO DEPARTMENT OF WILDLIFE

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(Note: Most of the following recommendations were developed by the New Mexico Burrowing Owl Working Group (2005), The California Burrowing Owl Consortium (1993), and The California Department of Fish and Game (1995))

The burrowing owl (*Athene cunicularia*) is considered a species of concern by the U.S. Fish and Wildlife Service and is protected by both the Migratory Bird Treaty Act and by New Mexico statute 17-2-14 (NMSA 1978). These guidelines are provided to assist in conducting burrowing owl surveys and mitigation during the preparation of environmental assessment reports and environmental impact statements. The guidelines also aid in the decision making process implemented when there is potential for any type of project to adversely affect burrowing owls or any of the resources that support them.

Project proponents should: 1) identify burrowing owl habitats and burrows; 2) choose and implement an appropriate survey method to confirm the presence of owls; and 3) determine and implement appropriate mitigation.

Step 1. Identify Burrowing Owl Habitat and Burrows

Seventy-five percent of New Mexico's ecological zones, as described by Dick-Peddie (1993), support or have the potential to support burrowing owls (Arrowood et al. 2001). These zones include: Chihuahuan desert scrub, closed basin scrub, desert grassland, Great Basin desert scrub, juniper savanna, lava beds, plains-mesa grassland, plains-mesa sand scrub, sand dunes, urban, and farmland (Arrowood et al. 2001). More specifically, burrowing owls generally are associated with dry, open, short-grass, treeless plains (Haug et al. 1993). Burrowing owls are also known to use areas that include shrubs such as creosote bush (*Larrea tridentata*), mesquite (*Prosopis* spp.), four-wing saltbush (*Atriplex canescens*), and rabbit-brush (*Chrysothamnus nauseosus*) (Martin 1973, Botelho and Arrowood 1996). Burrowing owls also inhabit human-modified landscapes, such as golf courses and parking lots.

Burrowing owls rarely dig their own burrows and, therefore, depend in part upon the presence of burrowing animals. In New Mexico, burrowing owls are associated with Gunnison's prairie dogs (*Cynomys gunnisoni*), black-tailed prairie dogs (*C. ludovicianus*), American badgers (*Taxidea taxus*), ground squirrels (*Spermophilus* spp.), rock squirrels (*S. variegatus*), foxes (*Vulpes* spp.), and coyotes (*Canis latrans*). Burrowing owls and prairie dogs are included as species of greatest conservation need in the western great plain shortgrass prairie vegetation type (Comprehensive Wildlife Conservation Strategy for New Mexico 2006). Burrowing owls can also utilize human-made structures, such as, storm drains, berms, roadsides, irrigation canals, and artificial burrows specifically constructed for the owls.

Occupancy of suitable burrowing owl sites can be verified by observing at least one burrowing owl, or owl molted feathers, cast pellets, prey remains, eggshell fragments, or excrement at or near a burrow entrance (The California Burrowing Owl Consortium 1993).

Step 2. Choose and Implement an Appropriate Survey Method to Confirm Owl Presence

The most suitable time to survey for burrowing owls in New Mexico is during the nest initiation and incubation phases (Table 1). Most burrowing owls are migratory in the state, although some over-winter in New Mexico, particularly males in southern New Mexico (Arrowood et al. 2001, Johnson et al. 1997). Migratory owls typically arrive on the breeding grounds by March and remain there until October.

Table 1. General breeding chronology of the burrowing owl in New Mexico.

Location	Pair Bonding/Nest Initiation	Egg Laying and Incubation	Chicks Fledge above Ground	Independence
New Mexico	March to April	Late April to early June	Early-Mid June	Mid-Late July

Surveys should not be conducted in certain weather conditions when owls are more likely to be in their burrows and not visible, such as temperatures above 30°C (86°F) and winds exceeding 20 km/hr (approx. 12 mph). Surveys also should be restricted to the early morning and evening hours, because above ground activity is often higher during these times (Conway and Simon 2003).

A single survey on a proposed project site is adequate to determine the presence or absence of active burrows. If owls are not observed, all active burrows should be inspected for indications of use by the presence of owl pellets, droppings, or feathers. If active burrows are found follow-up survey, utilizing the methods described below, should be scheduled to confirm the presence or absence and numbers of owls on a project site.

Burrowing owl surveys can be accomplished effectively by either walking or driving transects. Either the entire length of the transect or point count stations along the transect can be surveyed, and surveys can be conducted with or without broadcasting audio burrowing owl alarm (*quick-quick-quick*) and/or male territory (*coo-coo*) calls. Studies have shown that broadcasting calls increases detection probability of burrowing owls (Haug and Didiuk 1993, Conway and Simon 2003) and that trained surveyors can detect owls up to 300 m (Conway and Simon 2003). These methods might need to be modified depending upon the terrain and equipment being used, which, respectively, affect the distance owls and the broadcasted vocalizations can be heard.

If burrowing owl habitat is found at the project site, a 150-m buffer zone around the project should also be assessed for potential burrowing owl habitat. At the project site, use one of the following survey methods as recommended by the New Mexico Burrowing Owl Working Group (NMBOWG).

METHOD 1: Walking Surveys

Without Audio Calls

Transects should be established in suitable owl habitat. A single, straight line should be walked for the entire length of the transect (for specific protocol and comparison of line transect methodology see Emlen 1971 and 1977). Observers should record all owls observed along either side of the line. If a more thorough estimate of abundance in a specific area is desired, an observer should walk multiple parallel lines (or many observers walk parallel lines concurrently) that are approximately 50 m apart. All owls observed along either side of the transect line should be recorded. Data recorded should include: date and time of survey, weather conditions, dominant vegetation, burrow aspect, survey location (including GPS coordinates), number of owls observed, sex and age classes of owls (if determinable), and presence of prairie dogs and other burrowing animals.

With Audio Calls

Observers should proceed along a transect line, stopping at points approximately every 200 m to broadcast owl vocalizations and listen for responses. Distance between points will depend upon terrain and broadcast system, which, respectively, affect the distance owls and the broadcasted vocalizations can be heard. If the broadcast system and owl response calls, can be heard up to 200 m. then the observer should stop every 200 m. The distance between observation points can be shortened if necessary. If a more thorough estimate of abundance is desired, the observer should walk multiple parallel lines (or many observers walk parallel lines concurrently) to cover a greater proportion of the area. The lines should be spaced according to the same distance of audio coverage. At each observation point, the observer should scan for any owls with binoculars for the first two minutes, after which a territorial and/or alarm calls should be played for one minute. Finally, there should be two additional minutes of scanning after broadcasting. Scanning and broadcasting should be done in a 360° arc. All owls detected during this five-minute observation period should be recorded. Data recorded should include: date and time of survey, weather conditions, dominant vegetation, burrow aspect, survey location (including GPS coordinates), number of owls observed, sex and age classes of owls (if determinable), and presence of prairie dogs and other burrowing animals.

METHOD 2: Roadside Point-count Surveys

Without Audio Calls

Routes should be established along roads in the project site. Observers should stop the vehicle and pull off the side of the road at 0.5-mile (0.8 km) intervals (if project site is large enough). If visibility is impaired at a point, observers should continue until the next immediate suitable surveying spot is reached. All surveyors should exit the vehicle at each point and scan with binoculars in a 360° arc for a total of five minutes. All owls detected during this five-minute observation period should be recorded. Data recorded should include: date and time of survey, weather conditions, dominant vegetation, burrow aspect, survey location (including GPS coordinates), number of owls observed, sex and age classes of owls (if determinable), and presence of prairie dogs and other burrowing animals.

With Audio Calls

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Step 3. Determine and Implement Appropriate Mitigation

The objectives of these mitigation guidelines are to minimize the negative impacts to burrowing owls at a project site and preserve habitat that will support burrowing owl populations into the future. The mitigation process begins with the survey protocol to document the presence of burrowing owl habitat, and to determine if burrowing owls use the project site and the surrounding buffer zone. Occupied burrows should be determined based on survey information. If more than 30 days elapse between the initial survey and construction activities, project sites and buffer zones with suitable habitat should be resurveyed to ensure no burrowing owls have occupied these areas in the interim period. Resurveying the project site should be conducted no more than 30 days prior to initial project initiation. If ground disturbing activities are delayed or suspended for more than 30 days after the preconstruction survey, the site should be resurveyed. If burrowing owls are present on a project site, the following mitigation measures should be followed to minimize negative impacts to burrowing owls, nest burrows and burrowing owl habitat.

According to the California Burrowing Owl Consortium there are three definitions of negative impacts:

- Disturbance or harassment within 50 m of occupied burrows.
- Destruction of burrows and burrow entrances. Burrows include structures such as culverts, concrete slabs and debris piles that provide shelter to burrowing owls.
- Destruction and/or degradation of foraging habitat adjacent to occupied burrows (within 100 m).

If burrowing owls are found at a project site, measures to avoid or mitigate negative impacts should follow one of three general approaches. These approaches are listed below:

1. Design and implement project activities to spatially avoid negative impacts and disturbance to burrowing owls and their habitat.
 - No disturbance should occur within 50 m of occupied burrows during the non-breeding season (September through February) or within 75 m during the breeding season (March through August). Avoidance also requires that a minimum of 6.5 acres of foraging habitat be maintained in undisturbed habitat condition for each pair or unpaired burrowing owl.
 - No disturbance or destruction of any prairie dogs or other burrowing animals or their burrows, should occur within the owl avoidance areas.

2. Design and implement project activities to seasonally avoid negative impacts and disturbances to burrowing owls.
 - Occupied burrows should not be disturbed during the nesting period, from March 1st through August 1st.
 - No disturbance or destruction of any prairie dogs or other burrowing animals or their burrows, should occur within the owl avoidance areas.
 - When destruction of burrows is unavoidable, burrow destruction or ground disturbing activities should only occur during the season when migratory owls have left the breeding site. The unoccupied season can be expected to begin in September or October and end in February or March. However, burrowing owl occupancy always must be confirmed by survey data, regardless of season. Immediately prior to burrow destruction a video probe should be used to confirm that the burrow is unoccupied.
 - For any occupied burrows that are destroyed outside of the nesting season, any remaining, undestroyed, burrows should be enhanced (enlarged or cleared of debris) or new burrows should be created (by installing artificial burrows) at a ratio of 2:1 on the protected lands site. A minimum of 6.5 acres of foraging habitat should be maintained in an undisturbed habitat condition for each pair or unpaired resident bird.
 - To ensure compliance with the federal Migratory Bird Treaty Act and state laws and regulations, the U.S. Fish and Wildlife Service and New Mexico Department of Wildlife must be contacted to confirm that any construction activities resulting in destruction of burrows will not result in a taking of burrowing owls and, thus, violation of federal and state law.

3. Relocate burrowing owls that will be negatively impacted by project activities to protected areas of potential burrowing owl habitat.
 - If owls must be moved away from the disturbance area, passive relocation techniques should be used rather than trapping. At least one or more weeks will be necessary to accomplish this and to allow the owls to acclimate to alternate burrows. Passive relocation can be accomplished by use of one-way doors. Owls should be excluded from burrows in the immediate negatively impacted zone and within a 50-m buffer zone by installing one-way doors in burrow entrances. One-way doors should be left in place for approximately 48 hours to ensure that owls have left burrows before excavation. Prior to burrow destruction a video probe should be used to confirm that the burrow is unoccupied. If a video probe is not available burrows should be excavated with hand tools to ensure that the burrows are unoccupied. Two natural or artificial burrows should be provided for each burrow in the project area that will be rendered biologically unsuitable. Passive relocation should only be used during the non-breeding season,. This method should not be used once a pair of owls is at a burrow unless it is determined that the female does not exhibit a brood patch.
 - If removal or relocation is necessary, trapped burrowing owls should be released in a new location with suitable habitat in a soft release cage. Soft release involves placing owls in a cage with an artificial burrow and fed mice daily for three weeks. After three weeks one side of the cage is removed. More information on this technique is available from NMBOWG.
 - A minimum of 6.5 acres of foraging habitat should be maintained in an undisturbed habitat condition for each pair or unpaired resident bird. No disturbance or destruction of any prairie dogs or other burrowing animals or their burrows, should occur within the owl avoidance areas.
 - To ensure compliance with the federal Migratory Bird Treaty Act and state laws and regulations, the U.S. Fish and Wildlife Service (505-248-7882) and New Mexico Department of Wildlife (505-476-8000) must be contacted and federal and state permits must be obtained for handling of owls.

Links

Burrowing Owl Conservation Network

<http://burrowingowlconservation.org/>

Use of Artificial Burrows by Burrowing Owls at the HAMMER Facility on the U.S. Dept. of Energy Hanford Site

http://www.pnl.gov/main/publications/external/technical_reports/PNNL-15414.pdf

Users Guide to Installation of Artificial Burrows for Burrowing Owls

<https://wdfw.wa.gov/sites/default/files/publications/01199/wdfw01199.pdf>

Artificial Burrow Designs for Burrowing Owls

<https://placerlandtrust.org/artificial-burrow-designs-for-burrowing-owls-learning-as-we-go/>

Literature Cited

Arrowood, P. C., C. A. Finley, and B. C. Thompson. 2001. analysis of burrowing owl populations in New Mexico. *Journal of Raptor Research* 35: 362-370.

Botelho E. S., and P. C. Arrowood. 1996. Nesting success of western burrowing owls in natural and human-altered environments. *In* D. M. Bird, D. E. Varland, and J. J. Negro, editors. *Raptors in human landscapes: adaptations to built and cultivated environments*. Academic Press, Inc. San Diego, California.

California Department of Fish and Game. 1995. Staff report on burrowing owl mitigation. Unpubl. report. 10 p.

California Burrowing Owl Consortium (CBOC). 1993. Burrowing owl survey protocol and mitigation guidelines. Unpubl. report. 13 p.

Conway, C. J., and J. C. Simon. 2003. Comparison of detection probability associated with burrowing owl survey methods. *Journal of Wildlife Management* 67: 501-511.

Dick-Peddie, W. A. 1993. *New Mexico vegetation: past, present, and future*. University of New Mexico Press, Albuquerque. 244 pp.

Emlen J. T. 1971. Population densities of birds derived from transect counts. *Auk* 88: 323-342.

Emlen, J. T. 1977. Estimating breeding season bird densities from transects counts. *Auk* 94: 455-468

Haug, E. A., and A.B. Didiuk. 1993. Use of recorded calls to detect burrowing owls. *Journal of Field of Ornithology* 64: 188-194.

Haug, E. A., B. A. Millsap, and M. S. Martell. 1993. Burrowing owl (*Speotyto cunicularia*). *In* A. Poole and F. Gill, eds. *The birds of North America*, No. 61. The American Ornithologists' Union: The Academy of Natural Sciences; Washington, D.C.

Johnson, K., L. DeLay, P. Mehlhop, and K. Score. 1997. Distribution, habitat, and reproductive success of burrowing owls on Holloman Air Force Base. Unpubl. report by New Mexico Natural Heritage Program. 26 p.

Martin, D. J. 1973. Selected aspects of burrowing owl ecology and behavior. *Condor* 75: 446-456.

New Mexico Burrowing Owl Working Group (NMBOWG). 2005. Recommended burrowing owl survey and monitoring protocol. Unpubl. report. 5 p.