

## BURROWING OWLS OF THE TRANS-PECOS AND PANHANDLE REGIONS OF TEXAS



1. Adult burrowing owl at Rio Bosque Wetlands Park.

**A Unique Species:** The Western burrowing owl (*Athene funicular hypugaea*) is one of the state's most unique bird species. It's a small, migratory raptor (predatory bird) that resides in holes dug primarily by prairie dogs and other burrowing mammals. Its diurnal (active during daylight) behavior, long legs, and ground-dwelling life style are unique among North American owls. These owls are valuable predators of rodents, snakes, and insects; hence they benefit agricultural and urban areas.

Burrowing Owls are classified as "grassland specialists" found primarily in open

areas with short vegetation and bare ground. They inhabit grasslands, short-grass prairies and desert habitat as well as urban areas. As their name implies, these birds are capable of excavating their own burrows but usually select existing burrows or burrow "starts" excavated by mammals. Both male and female renovate and maintain burrows by digging. The owls face into the burrows and scratch backwards with their feet. They may also dig with their bills. The owl's nest burrow may be as long as 10-ft. All nest burrows have one or more turns and a mounded entrance, but the depth, size and convolutions depend on the animal that originally dug the burrow. The burrow may have several entrances that descend three to five feet before ending with a large "domed" chamber.



2. Three young owls peeking from their nest burrow.

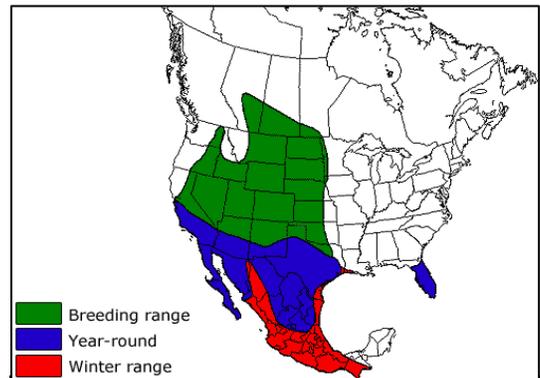
The owl is closely associated with burrowing rodent species, such as prairie dogs and ground squirrels that provide nesting and roosting sites for the birds. They will also occupy the dens of badgers, skunks, weasels and coyotes. When natural burrows are limited, this species will breed in urban habitats which may lead to problems for the owls or their young. The owls opportunistically live and nest in road and railway rights-of-way, parking lots, baseball fields, school yards, golf courses, and airports. They have also been found nesting on campuses, in storm drains, drainage pipes, and cement culverts, on banks, along irrigation canals, under asphalt or wood debris piles, or openings under concrete pilings or asphalt. The owls will also use artificial nesting structures built especially for them.



3. Nesting pair and young at an artificial nest burrow entrance.

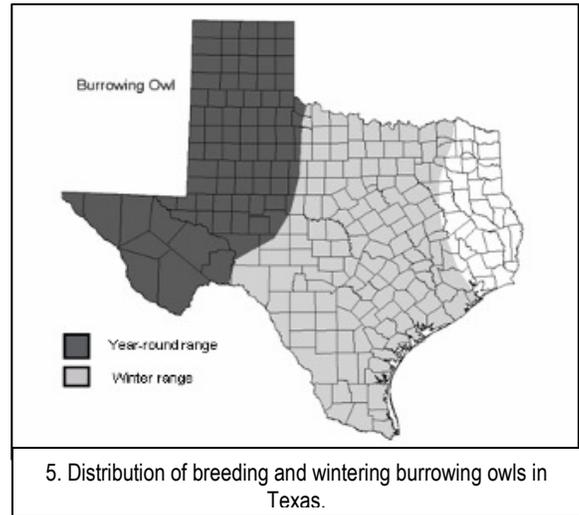
**North American Range:** There are two subspecies of burrowing owls in North America. The breeding range of the Western burrowing

owl extends from western and southern Canada into the western half of the United States and down into Baja California and central Mexico. The winter range is similar to the breeding range except that most owls from the northern areas migrate south.



4. Distribution of Burrowing Owls in North America.

**Distribution in TX:** Burrowing owls mainly breed in the Trans-Pecos and Panhandle (Rolling Hills and High Plains) ecological regions of West Texas but may winter throughout most of Texas. Data obtained from the Texas Breeding Bird Association shows the largest concentration of confirmed breeding owls is in the High Plains region. Some owls wander extensively during the winter while others migrate. Time of departure is from August through September and arrival time within the breeding range is in mid-March.

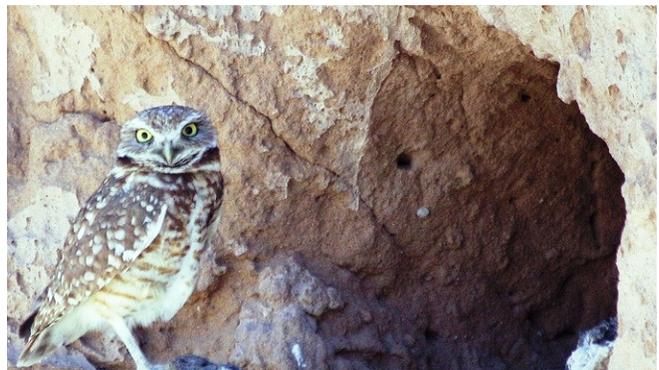


6. Adult owl guarding burrow and young.

**Description:**

Burrowing owls are a medium-size bird approximately 9 inches tall with a wingspan of 20-24 inches. This species exhibit sexual dimorphism; female owls are smaller and usually darker than males. The feathers are a sandy brown color above, while the breast area is beige with spotted bars. Its long legs, short tail, white eyebrows, along with its brilliant yellow eyes, and lack of ear tufts, are distinctive. Juvenile owls lack chest bars. The long legs are unique among owls and are adapted for its ground-dwelling life style. Burrowing Owls often live socially in loose colonies, with adults standing guard near nest burrows. The birds produce a variety of calls. The male gives the primary songs (mate attraction and territorial calls), described as “coo-coo.” Other calls include distress and warning calls (“chuck” and “chatter”) and mating calls. Their vocal repertoire also includes screams and raspy calls.

**Habitat:** Burrowing Owls characteristically inhabit open areas with short vegetation, bare ground, well-drained soil and areas with a level to gently-sloped incline. They use a wide array of arid and semi-arid environments including deserts, desert grasslands, scrub and shrub-lands that contain creosote bush, mesquite, four-wing saltbush, and rabbit-brush. They also inhabit juniper savanna, plains-mesa grasslands, and sand scrub, sand dunes, pasture, hay, farm and fallow fields. Their



7. Adult owl guarding young in at entrance its burrow in an arroyo.

presence is limited to areas where natural cavities or colonial burrowing rodents (black-tailed prairie dogs, ground squirrels) dwell. Nesting in areas of short vegetation allows the owls to see possible ground predators approaching the nest.



8. Juvenile with snake on the menu.

**Diet:** Burrowing Owls are generalist predators with unique feeding habits. This bird has the distinction of being the only daytime-feeding owl. These owls may actively feed during the day (diurnal) and night (nocturnal), especially during the breeding season; however most feeding activity occurs at dawn and dusk (crepuscular). Unlike other nocturnal owls, they feed primarily on arthropods (insects) and small vertebrates. The birds hunt small mammals, birds, reptiles and amphibians. Hunting methods include swooping down from a perch, hovering over open areas, running along the ground, and "hawking" (catching insects in flight). Prey is usually caught by sharp talons (claws); however, small prey items may be pounced on and crushed by their bills.

**Predators:** Mammalian predators include badgers, bobcats, weasels, skunks, coyote, domestic cats and dogs. Avian (bird) predators include golden eagles, hawks (Swainson's, ferruginous, red-tailed, and Cooper's), Merlin, prairie, and peregrine falcons, Northern harriers, great-horned and barn owls as well as American Crows. Snakes will also take owls. This bird has one remarkable predatory defense mechanism; they have the ability to perfectly mimic the rattling sound of a prairie rattlesnake.

**Breeding Biology.**

**Pair-bonding/Nest building:** Burrowing owls are thought to be seasonally monogamous (pairing between one female and one male), forming pair bonds mainly during the nesting season. Breeding occurs from mid-March through September. Before nesting, the male prepares the nest site by improving or enlarging the burrow. The owls transport a sufficient pile of dried horse or cow manure to the burrow entrance, shred the materials and carry it into the burrow. Nest chamber floors may be lined approximately 1-in deep with shredded dung. The tunnel and entrances are usually also lined. This practice may serve to provide egg insulation, camouflage the owls' scent from predators, absorb water to reduce flooding within the nest, or attract invertebrates which the owls catch and feed to their young. Nesting densities vary from ten pairs per 0.6-mi<sup>2</sup> in optimal habitat to one pair per 22-mi<sup>2</sup> in poor quality habitat



9. Pair bonding.

**Incubation.** The average clutch size is 6-7 eggs. Incubation lasts for 28-30 days. The female usually stays with the nest during incubation while the male stands guards at the nest. The male is the sole food provider during incubation and before the young emerge from the burrow.



10. Three burrowing owl nestlings.

**Nestlings/Fledglings.** The female joins in provisioning when the young (2-3 weeks old) emerge from the burrow for extended periods. The nestlings (baby birds) are tended to by both parents and fledge (acquire flight feathers) about 4 weeks after hatching. The fledglings are capable of flight at 6 weeks of age. Owl families often switch burrows every 10-15 days when the young fledge and they remain as a loose-knit group until early fall when the young begin dispersing to nearby burrows. The young feed primarily on insects and work on their predatory skills by pouncing on dead or live insects.



11. Adult and three nestlings at natural burrow in an arroyo.



12. Six burrowing owl nestlings at a natural burrow in an arroyo.

## Legal Status

Over the past century, black-tailed prairie dog populations have been reduced by 90-98% through eradication programs, habitat loss and fragmentation, and the Sylvatic plague. As the prairie dog numbers declined, so did burrowing owl numbers. Currently they are listed as a Species of International Conservation Concern, Endangered in Canada, Threatened in Mexico, and a Bird of National Conservation Concern by the U.S. Fish and Wildlife Service (USFWS). The owls are a Species of Concern in 9 U.S. states, 3 USFWS regions, 9 Bird Conservation Regions and rated as a Species of Regional Importance (Trans-Pecos) by Partners in Flight.

## Conservation of the Burrowing Owl. The widespread control of burrowing mammals is the leading

cause of decline for burrowing owls and the black-footed ferret, one of the most endangered species in the world that depends on prairie dogs for their survival. Of the 700,000,000 acres of prairie dog habitat that existed in 1900, less than 2,000,000 exist today. Natural burrowing owl habitat and populations of burrowing mammals are ultimately critical for the conservation of this species. With the preservation of native grasslands, prairies, and deserts and protection of burrowing mammals, we can retain this unique species for the viewing by future generations.



13. Group of juveniles in a burrowing owl family.

**Management Practices:** Today these birds often reside in close proximity to humans. You may see them nesting or wintering in urban areas like the arroyo behind your house in your neighborhood, the abandoned lot near the office, or the park where you jog. As our communities grow and habitat patches are developed, burrows are being destroyed. Note that this species is valuable to humans and the ecosystem. They consume small rodents such as mice and pocket gophers and prevent outbreaks of insects and invertebrates such as locusts, grasshoppers, beetles, crickets, scorpions, and earwigs.



14. Young owls almost ready to fledge.

### Practical Actions to Help Burrowing Owls:

- 1) Conduct activities outside the breeding season (March to September). Nesting areas and burrows should be protected from intensive disturbance during incubation. Excavation of an active nest burrow may destroy eggs, young owls, or even adults and is violation of the Migratory Bird Treaty Act.
- 2) Use caution when spraying pesticides; keep  $\geq 250$  meters away from nest sites; use the least harmful chemicals and encourage your county or municipality not to spray ditches close to owl nests. Learn to appreciate grasshoppers (most aren't pests).
- 3) Keep dogs on leashes, they often will dig out the nest and remove chicks.
- 4) Keep cats indoors or leashed; cats will kill owls.
- 5) Support a removal program for all feral dogs and cats on public lands

- 6) Support restriction of recreational off-road vehicle uses in burrowing owl habitat. Owl burrows may collapse. Compacted soils negatively affect habitat quality; noise may disturb the owls.
- 7) Support land use standards, natural open space planning, habitat stewardship, and habitat enhancement projects that benefit burrowing owls.
- 8) Provide artificial nest burrows whenever possible; they provide nesting habitat where mammal burrows are limited due to prairie dog eradication, or where owls have been evicted from natural burrows, and in reintroduction efforts.
- 9) Remember to observe owls from a respectful distance.
- 10) Participate in local organized efforts at monitoring reproduction of the owls.

**How You Can Help.** Play a role in the conservation and recovery of the Burrowing Owl. If you encounter an owl, the following positive actions may be taken:

- 1) Report any birds found nesting or near construction sites to your local USFWS agent or Texas Parks and Wildlife Biologist.



16. Adult perched on rebar.

- 2) Encourage developers, construction managers and businesses to provide protective barriers around the nest site and to mitigate lost owl habitat. Mitigation measures should include avoiding impacts if feasible, avoiding disturbance of owls during the breeding season, protecting sufficient foraging habitat, and enhancing existing habitat with artificial nest burrows where possible.
- 3) Provide posts or poles  $\geq$  four feet tall in or near Burrowing Owl habitat for hunting, perching and predator detection.
- 4) Encourage local golf courses and city parks to help restore Burrowing Owl populations by providing artificial nest burrows in suitable non-maintained areas  $>150$  feet from the

nearest irrigation system. The owls provide free pest control of small rodents and insects.

- 5) In agricultural farming areas, practice good cattle-grazing grass management and provide stable artificial burrows. Active owl burrows near trails and along canal banks in agricultural areas are susceptible to collapse from heavy farm equipment.
- 6) Maintain prairie dogs, ground squirrels and badger populations; they are the key to providing nesting burrows for burrowing owls.
- 7) Leave ditches un-mowed; keep whatever grassy areas you have and seed pastures, roadsides and right-of-ways with native grasses.
- 8) Plant new trees at least one mile from owl nesting areas.
- 9) Leave a small swath of crop or hay near owl nests for mice, one of their food sources.
- 10) Avoid cultivating over any active nests; nests will be destroyed and may bury the female inside.
- 11) Share the news of your owls with neighbors and people who use your land.
- 12) Join many of your neighbors in conservation easement agreements.



15. Burrowing owl at artificial burrow entrance.



17. Owl perched on a wooden post.

**Recommendations.** Installing artificial burrows is one conservation measure that may help maintain local Burrowing Owl populations. Only construct artificial nest burrows with the aid of a wildlife biologist to ensure success for the owls. Late September through early February is the optimal time for installation. Occupation is unlikely to occur until March when the owls return from migration and search for burrows. There are numerous ways to create artificial burrows. Research methods of constructing nest burrows appropriate to your ecological region and habitat type. Information is available on the internet or with your local wildlife agency.



18. Finished installation of an artificial burrow at the community college entrance.

**Criteria for Selecting the Right Site:**

- Approximately 55% (40-70%) bare ground and average shrub coverage of <15%;
- Slight rise in the landscape with good drainage;
- Ample foraging opportunities, generally 10-20 acres of Burrowing Owl habitat for each nesting pair of owls;
- Lack of disruptive human activities, such as construction, uncontrolled public access, or traffic;
- Locate nest burrows near existing owl populations if possible; building 2 nest boxes near each other at each nest site will allow the owls to move among them and choose burrows as needed; Nest burrow sites should be no closer together than 120 yards;
- 5 -10-yd<sup>3</sup> of soil are required to construct a single chamber mound.

**Example of materials and method used to construct a burrow.**

Materials include sections of 4" x

20' Schedule 40 PVC pipe (need 16' per burrow), 90-degree elbows for 4" pipe (need 2/burrow), 12" x 17" or 14" x 18" green plastic valve box, and 8" x 8" x 8" half cinder block (2 for each burrow). If your site has good drainage, the chamber and connecting pipes may be laid out on the ground surface and soil piled on top of them. If drainage is a problem, build the mound first, and then dig trenches for the chamber and pipes. This will ensure that the chamber is above the existing grade. The connecting pipes may be angled downward to prevent water getting into the pipes.



19. Layout of uninstalled artificial nest burrow materials.



20. El Paso Zoo crew installing artificial nest burrows.

Concrete or plastic irrigation valve boxes may be used for nest chambers. Nest boxes should have width and length dimensions of  $\geq 1.2$ -ft; ideally, the inside dimensions of the chamber should be between 144-ft<sup>2</sup> and 300 ft<sup>2</sup> of floor space. Four-inch tunnels (1.6 in<sup>2</sup>) diameter PVC pipe or corrugated pipe  $\geq 8$ -ft long should be set to make at least 1- 90-degree bend that will minimize light inside the nesting chamber. Two pipes will provide ventilation and escape routes should a predator enter the chamber. Once the pipe is in place, the ends should be inserted into concrete cinder blocks to anchor them and discourage digging attempts by coyotes and feral dogs. Erect a perch (4 - 6-ft tall post) 2 – 6-in near the mound. Provide fresh cattle dung near

nesting areas if dung is not available and mammalian predators occur in the area. Barbed wire or other materials may also be placed over the nest chamber to restrain digging attempts by predators.

## PHOTO CREDITS

### 1. Photo number 1

Provided: Lois Balin

Photographer: Joe Grossinger

Contact info: Lila & Joe Grossinger Photography

time/camera: Sony DSLR-A350.

Location: Rio Bosque Wetlands Park, El Paso

Date: 7/1/2009

Description: Adult burrowing owl at Rio Bosque Wetlands Park

### 2. Photo number 2

Provided by: Lois Balin

Photographer: Landis L. Hinesley

Contact info: DBA Nature's Image Photography

Time/Camera: 6:13 PM, Nikon D300 Camera

Location: Las Cruces, Dona Ana County, New Mexico

Date: August 2009

Description: Three young owls peeking from the nest burrow.

### 3. Photo number 3

Provided by: Lois Balin

Job title/contact info: Wildlife Biologist, lois.balin@tpwd.state.tx.us, 915 774-9603

Photographer: Joe Grossinger

Contact info: Lila & Joe Grossinger Photography

time/camera: Sony DSLR-A350.

Location: Rio Bosque Wetlands Park, El Paso

Date: 7/01/09

Description: Nesting pair at artificial nest burrow entrance

### 4. Diagram number 4

Provided by: Lois Balin

Title/contact: Wildlife Biologist, lois.balin@tpwd.state.tx.us, 915 774-9603

Wildlife and Ecosystem Protection, Species At Risk Burrowing Owl Fact Sheet

[mgj@gov.mb.ca](mailto:mgj@gov.mb.ca) <http://www.gov.mb.ca/conservation/wildlife/sar/fs/buowl.html>

### 5. Diagram number 5

Provided by: Mark Lockwood

Job Title: Texas Parks and Wildlife, Natural Resource Program, mark.lockwood@tpwd.state.tx.us

Range map of burrowing owl in Texas. Lockwood, M. W. and B. Freeman. 2004. The TOS Handbook of Texas Birds. Texas A&M University Press, College Station, Texas.

### 6. Photo number 6

Provided by: Lois Balin

Photographer: Landis L. Hinesley

Contact info: DBA Nature's Image Photography

Time/Camera: 6:35 PM, Nikon D300 Camera

Location: Las Cruces, Dona Ana County, New Mexico

Date: August 2009

Description: Adult owl guarding burrow and young

### 7. Photo number 7

Provided by: Lois Balin  
Photographer: James N. Stuart  
Camera: Canon EOS 40D  
Location: Rio Rancho, NM  
Date: May 2008  
Description: Adult owl guarding young in at entrance its burrow in an arroyo

**8. Photo number 8**

Provided by: Lois Balin  
Contact info: bail56@hur.midco.net  
Photographer: Chris Bailey  
Camera: Cannon EOS 400  
Location: Beadle County, South Dakota  
Date: June 2009  
Description: Snake is on the menu today.

**9. Photo number 9**

Provided by: Lois Balin  
Contact info: bail56@hur.midco.net  
Photographer: Chris Bailey  
Camera: Cannon EOS 400  
Location: Beadle County, South Dakota  
Date: June 2009  
Description: Pair bonding

**10. Photo number 10**

Provided by: Lois Balin  
Contact info: bail56@hur.midco.net  
Photographer: Chris Bailey  
Camera: Cannon EOS 400  
Location: Beadle County, South Dakota  
Date: June 2009  
Description: Three burrowing owl nestlings

**11. Photo number 11**

Provided by: Lois Balin  
Photographer: Michael Bruce  
Camera: Canon EOS Digital Rebel XTi.  
Location: Albuquerque, New Mexico  
Date: June 2009  
Description Adult and three nestlings at a natural burrow in an arroyo

**12. Photo number 12**

Provided by: Lois Balin  
Photographer: Landis L. Hinesley  
Contact info: DBA Nature's Image Photography  
Time/Camera: 7:02pm, Nikon D300 Camera  
Location: Las Cruces, Dona Ana County, New Mexico  
Date: August 2009  
Description: Six burrowing owl nestlings at a natural burrow in an arroyo.

**13. Photo number 13**

Provided by: Lois Balin  
Contact info: bail56@hur.midco.net

Photographer: Chris Bailey  
Camera: Cannon EOS 400  
Location: Beadle County, South Dakota  
Date: July 2009  
Description: Group of juveniles in a burrowing owl family

14. Photo number 14  
Provided by: Lois Balin  
Photographer: Landis L. Hinesley  
Contact info: DBA Nature's Image Photography  
Time/Camera: 7:02pm, Nikon D300 Camera  
Location: Las Cruces, Dona Ana County, New Mexico  
Date: August 2009  
Description: Young owls almost ready to fledge

15. Photo number 15  
Provided by: Lois Balin  
Photographer: Lois Balin  
Job title/contact info: Wildlife Biologist, [lois.balin@tpwd.state.tx.us](mailto:lois.balin@tpwd.state.tx.us)  
Time/camera: Canon EOS Digital Rebel  
Location: Rio Bosque Wetlands Park, El Paso, TX  
Date: May, 2009  
Description: Burrowing owl at artificial burrow entrance

16. Photo number 16  
Provided by: Lois Balin  
Photographer: James N. Stuart  
Camera: Canon EOS 40D  
Location: Rio Rancho, NM  
Date: May 2008  
Description: Adult perched on rebar

17. Photo number 17  
Provided by (Name): Lois Balin  
Photographer: Robert Walburger  
Time/Camera: 4:48 pm, Canon Rebel XSi  
Location: Southern Alberta, Canada  
Date: July, 2009  
Description: Owl perched on a post

18. Photo number 18  
Provided by (Name): Lois Balin  
Contact info: Urban Wildlife Biologist; [lois.balin@tpwd.state.tx.us](mailto:lois.balin@tpwd.state.tx.us)  
Photographer: Diana Dominguez  
Time/Camera: 10:08 a.m., Panasonic Lumex  
Location: Mission del Paso, El Paso Community College  
Date: February, 2009  
Description: Finished installation of an artificial burrow at the community college

19. Photo number 19  
Provided by (Name): Lois Balin  
Contact info: Urban Wildlife Biologist; [lois.balin@tpwd.state.tx.us](mailto:lois.balin@tpwd.state.tx.us)  
Photographer: John Sproul

Location: Rio Bosque Wetlands Park, El Paso, TX  
Date: May, 2008  
Description: Layout of uninstalled artificial nest burrow materials

**20. Photo number 20**

Provided by (Name): Lois Balin  
Photographer (Name): Lois Balin  
Job title/contact info: Urban Wildlife Biologist; [lois.balin@tpwd.state.tx.us](mailto:lois.balin@tpwd.state.tx.us)  
Time/ Camera: 8:00 a.m., Panasonic Lumex  
Location: San Elizario Independent School District Administration Building, TX  
Date: February, 2008  
Description: El Paso Zoo crew installing artificial nest burrows

**LITERATURE REVIEW**

Bates, C. California Partners in Flight Desert Bird Conservation Plan. Bureau of Land Management, Colorado River District, Lake Havasu City, AZ

Butts, Kenneth O. 1976. Burrowing Owls Wintering in the Oklahoma Panhandle. *The Auk*, Vol. 93: 510-516

Chipman, E.D. 2005. Behavioral Ecology of Western Burrowing Owls (*Athene cunicularia hypugaea*) in Northwestern Texas, B.S. A Thesis in Biology, Texas Tech University

Collins, C. T., and R. E. Landry. 1977. Artificial Nest Burrows for Burrowing Owls. *North American Bird Bander*, Vol. 2:151-154.

Conway, C.J., M.D. Smith. and L.A. Ellis. 2002. How to Install Artificial Nesting Burrows for Burrowing Owls, A Guide for Golf Course Superintendents and Grounds Crews

Conway, C.J. and C.A. Finley. 2005. DOD Legacy Project: Migratory Linkages of Burrowing Owls. USGS Arizona Coop. Research Unit, University of Arizona, Tucson

Damon L. Williford, Marc C. Woodin, Mary Kay Scorpio, and Graham C. Hickman. 2000. Rodents New to the Diet of the Western Burrowing Owl (*Athene Funicular Hypogea*). Department of Life Sciences, Texas A&M University-Corpus Christi, TX, United States Geological Survey, Texas Gulf Coast Field Research Station, Corpus Christi, TX 78412

Desmond M.J., J.A. Savidge, K.M. Eskridge. Correlations between Burrowing Owl and Black-tailed Prairie Dog Declines: a 7 Year Analysis. *J. Wildlife Management*, Vol. 64:1067–1075.

Desmond M.J., J.A. Savidge. 1996. Factors Influencing Burrowing Owl (*Speotyto cunicularia*) Nest Densities and Numbers in Western Nebraska. *Am. Midland Nat.*, Vol. 136:143-148

Desmond, M.J., J.A. Savidge, and T.F. Seibert. 1995. Spatial patterns of burrowing owl (*Speotyto cunicularia*) nests within black-tailed prairie dog (*Cynomys ludovicianus*) towns. *Canadian Journal of Zoology* 73:1375-1379.

Haug, E. A., and A. B. Didiuk. 1993. Detection of Burrowing Owls. *J. Field Ornithology*, Vol. 64:189

Hawks Aloft, Inc. New Mexico Burrowing Owl Working Group, P.O. Box 10028, Albuquerque, New Mexico 87184.

Lockwood, M. W. and B. Freeman. 2004. The TOS Handbook of Texas Birds. Texas A&M University Press, College Station.

Martin, D.J. 1973. Selected Aspects of Burrowing Owl Ecology and Behavior. Condor, Vol. 75:4 46-456.

The Nature Conservancy Species Management Abstract Western Burrowing Owl (*Athene cunicularia hypugaea*). 1999, Arlington, VA

North American Regional Studbook for the Burrowing Owl *Athene cunicularia*. Copyright 3 January 2009 by the Peoria Zoo.

Plumpton, D.L. and R. S. Lutz. 1994. Sexual Size Dimorphism, Mate Choice, and Productivity of Burrowing Owls. The Auk, Vol. 111, No. 3 (Jul., 1994), pp. 724-727, University of California Press

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American Breeding Bird Survey, results and analysis 1966-2005. Version 6.2 2006. USGS Patuxent Wildlife Research Center, Laurel, MD.  
<http://www.mbr-pwrc.usgs.gov/bbs>

Smith, B.W. and J. R. Belthoff. 2001. Effects of Nest Dimensions on Use of Artificial Burrow Systems by Burrowing Owl. J. Wildlife Management, Vol. 65, No. 2, pp. 318-326

Skrei, S. Texas Breeding Bird Atlas. 2006