

# Biology of Ferruginous Pygmy-Owls in Texas and Application of Artificial Nest Structures

Glenn A. Proudfoot, Sam L. Beasom (deceased), and Felipe Chavez-Ramirez



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# BIOLOGY OF FERRUGINOUS PYGMY-OWLS IN TEXAS AND APPLICATION OF ARTIFICIAL NEST STRUCTURES

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**Abstract:** Ferruginous Pygmy-Owls occur in a wide range of habitats extending from southwestern U.S. into southern South America. Although the Ferruginous Pygmy-Owl is a highly prized species for birdwatchers and is an important factor in maintaining ecotourism in South Texas, little is known about their biology or how to manage this species. This management bulletin reviews the current literature of the Ferruginous Pygmy-Owl's history and current status, summarizes ongoing research regarding its biology and natural history, and profiles recommendations for constructing, establishing, monitoring, and maintaining artificial nest structures. It is our intent that this bulletin will encourage conservation of Ferruginous Pygmy-Owls through active management and community cooperation. Such efforts will help maintain a viable population of Ferruginous Pygmy-Owls in South Texas.

## INTRODUCTION

The Ferruginous Pygmy-Owl is a small bird whose geographic range extends from the southwestern U.S. into southern South America. Within this



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As a much desired species for birdwatchers, Ferruginous Pygmy-Owls contribute significantly to the economy in southern Texas through ecotourism.

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range, they occur in tropical, subtropical, and cold temperate lowlands, in which vegetation communities range from semiarid desert scrub to lush tropical rain forest. In Texas, the Ferruginous Pygmy-Owl occurs in the mesquite, ebony, and oak communities south of the 27th parallel.

Because of its small size, long tail, and atypical behavior, the Ferruginous Pygmy-Owl may easily be mistaken for a song bird. When disturbed, it jerks its tail up and down and from side to side, similar to some flycatchers.

Until the recent studies conducted on Ferruginous Pygmy-Owls in Texas (Proudfoot, 1996; Proudfoot and Beasom, 1996; 1997; Proudfoot and Radomski, 1997; Proudfoot et al., 1998) and Arizona (Abbate et al., 1996; W. Richardson pers. comm.), life history information, especially breeding biology, was limited. Currently, studies are addressing nest activity, nestling development, mortality, site fidelity, habitat requirements, and dispersal of young in Arizona and Texas. For the most comprehensive account of this species's natural history see Proudfoot and Johnson (*In Press*).

In this bulletin, we present an overview of the current knowledge on the biology of Ferruginous Pygmy-Owls. Coupled with nest box management strategies developed in Texas, we hope to provide the impetus toward advancing conservation and management of this species.

## TAXONOMY AND DESCRIPTION

Although it is generally accepted that pygmy-owls are within the Family Strigidae, the number of species recognized is under debate and varies from 11-24, depending on literature consulted. In the U.S., there are only 2 species, the Ferruginous Pygmy-Owl and the Northern Pygmy-Owl. These 2 species are usually separated geographically by elevation, however, their ranges overlap in some areas.

### Identifying Features

The back and upper wing feathers of pygmy-owls are light brown, with conspicuous regularly spaced whitish spots on the upper wing and primary feathers. Both tail and primary feathers are duskily barred. Head and nape are light brown and have linear whitish streaks; each side of the nape is decorated with a black spot that is bordered in white, which resembles an eye. The face has a white “v” and disk (Monson, 1998). Breast and flanks are heavily streaked with dark reddish brown marks. The rufous coloration and streaked “v” spotted crown are 2 of the characteristics used to distinguish Ferruginous Pygmy-Owls from the slightly smaller Northern Pygmy-Owl.

Males are usually darker brown than females (Proudfoot, 1996; Pyle, 1997). Males have homogenous dark brown color tones on the upper wing, crown, and back. They have alternating dark brown and cinnamon-rufous colored tail bands.

Females have a homogenous cinnamon-rufous color tone on the upper wing, crown, and back. They have alternating dark brown and cinnamon-rufous tail bands; the dark brown bands are lighter on females than males.

The iris of a pygmy-owl’s eye is lemon yellow and its bill is greenish yellow to grayish yellow. Talons are dark green, turning to yellowish gray at the tips (Karalus and Eckert, 1974); toes are greenish yellow (Johnsgard, 1988; Monson, 1998).

The Ferruginous Pygmy-Owl is about 4 inches tall when perched. Including the tail length, they are about 5.5 to 6 inches long (Proudfoot, 1996). Average weight of 54 male and 29 female Ferruginous Pygmy-Owls captured in Texas was 2.3 ounces and 2.7 ounces, respectively. Average weight of 41 nestlings captured 4 to 7 days before fledging was 2.1 ounces.

Nestlings may display enough variation in plumage to be sexed at 4 weeks of age, however, this has not been scientifically verified and is based on observer (G.A.P.) experience. Fledglings can be distinguished from adults by the lack of white streaks



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**Information on nestling development and survival may aid conservation through better management planning.**

and eye-like spots on the crown and nape, respectively. However, these characteristics are only effective for the first 4 weeks postfledging.

### DISTRIBUTION AND LEGAL STATUS

Historically, the range of the Ferruginous Pygmy-Owl included semitropical lowlands in southern Arizona and southern Texas and extended south along the Atlantic and Pacific slopes through Mexico, throughout Central and South America to Chile and Argentina (Oberholser, 1974; Monson and Phillips, 1981; American Ornithologists’ Union, 1957; 1983; 1998). The Ferruginous Pygmy-Owl is considered the most common small owl species in lowland areas of the American tropics (Enriquez-Rocha et al., 1993).

Prior to 1920 in Texas, Ferruginous Pygmy-Owls inhabited the mesquite brush, ebony, and riparian areas of the Lower Rio Grande Valley. However, by the early 1970’s over 90% of this habitat was cleared for urban and agricultural expansion, which drastically reduced the size of the known population (Oberholser, 1974). Today, small breeding populations of Ferruginous Pygmy-Owls may occur in suitable habitats found in Brooks, Cameron, Hidalgo, Kenedy, Starr, and Willacy counties, Texas (Proudfoot, *In Press*).

In 1994, acting under petition submitted by several environmental organizations, the U.S. Fish and Wildlife Service (USFWS) proposed listing the Ferruginous Pygmy-Owl as threatened in Texas and endangered in Arizona with critical habitat in Arizona (USFWS, 1994). However, in the final

## Breeding Biology of Ferruginous Pygmy-Owls in Texas

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| • Laying season  | April 2 to June 2                        |
| • Egg-laying interval  | 1 egg every 32 to 39 hours               |
| • Average clutch size  | 4.8 eggs/nest                            |
| • Incubation period  | About 28 days                            |
| • Hatching interval  | 1 egg hatches every 20 to 26 hours       |
| • Hatching efficiency<br>(eggs hatched/eggs laid)            | Nest boxes: 72%<br>Natural cavities: 78% |
| • Average egg weight   | About 1/4 ounce                          |
| • Nestling development                                       | Nestlings gain about 1/3 ounce/week      |
| • Fledging (when young leave the nest)                       | Occurs 23 to 29 days after hatching      |
| • Fledging weight  | About 2 ounces                           |
| • Fledging efficiency<br>(number hatched/number fledged)     | Nest boxes: 78%<br>Natural cavities: 70% |
| • Productivity<br>(number of eggs laid/number of fledglings) | Nest boxes: 56%<br>Natural cavities: 54% |
| • Fecundity<br>(number of young fledged/nest attempt)        | Nest boxes: 2.8<br>Natural cavities: 2.6 |

ruling published in 1997, the USFWS altered the proposed rule to endangered in Arizona, withholding proposed critical habitat in Arizona and listing in Texas (USFWS, 1997). The USFWS stated that information obtained during the public comment period (e.g., information obtained by CKWRI researchers documenting locations of more than 100 individuals through banding and radio tracking) suggested listing in Texas was unwarranted, and listing critical habitat without additional information was not prudent (USFWS, 1998). However, on 30 June 1999, acting under Federal Court order, the USFWS listed 730,565 acres of riverine, riparian, and upland areas within Pima, Cochise, Pinal, and Maricopa counties in Arizona as critical habitat.

Critical habitat is defined in Section 3 of the Endangered Species Act (ESA) as: (I) — (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with ESA, on which are found those physical or biological features essential to the conservation of the species and (ii) that may require special management

consideration or protection; and (II) specific areas outside the geographic area occupied by a species at the time it is listed, upon determination that such areas are essential for conservation of the species. The term “conservation” means the use of all methods and procedures necessary to bring an endangered or threatened species to the point at which listing under ESA is no longer necessary.

### LIFE HISTORY

#### Behavior During the Breeding Period

Ferruginous Pygmy-Owls typically form pairs during the fall of their first year-after-hatching and are presumed monogamous thereafter. Nesting occurs during spring, between March and June in Arizona and Texas.

In Texas, male Ferruginous Pygmy-Owls call from habitual perches throughout the year. However, noticeable increases in calling begins in late February, peaks in late April and early May, and

tapers off in June. Because variations in calling coincide with fluctuations in nesting, calling may play a significant role in Ferruginous Pygmy-Owl nesting behavior. Possibly, males call to identify their territory and advertise mate potential and possible nest site locations to unmated females.

Females may inspect several cavities within an established territory before selecting a nest site for her eggs. Nest sites are usually at the edge of clearings in forested areas. Once a suitable nest site is selected, egg laying begins in early April, with peak nesting in late April to mid-May. The female incubates 2 to 7 eggs.

For the first week after the eggs hatch, the male is the sole provider of food for the female and young at the nest. During this stage, the male usually approaches the nest cavity and calls the female out to receive prey. She will either eat the prey or return with the food to feed the nestlings (Proudfoot and Beasom, 1997). Three weeks later, both adults forage, however, only the female feeds the young.

Once fledged, young Ferruginous Pygmy-Owls move to areas of thick understory for about 3 weeks until they develop adequate flying skills. Fledglings

remain dependent on adults for about 2 months after which fall dispersal begins. Dispersal of young coincides with the seasonal full tail molt in adults (Proudfoot, 1996).

### **Nesting Habitat**

Throughout their range, Ferruginous Pygmy-Owls nest in a wide variety of habitats, from arid saguaro cactus desert to tropical rain forests. In Texas, pygmy-owls occupy the live oak-honey mesquite forest in the historical Wild Horse Desert and mesquite brush areas, which contain mature trees with suitable nest cavities.

The most common pygmy-owl nest site is an abandoned or appropriated woodpecker nest cavity with an entrance diameter of 2 to 2.5 inches. However, pygmy-owls occasionally nest in cavities formed from decaying, wind damaged limbs. Cavities in both sturdy and dilapidated (snags) trees are used as nest sites. The above ground entrance height of pygmy-owl nest cavities may range from 6 to 40 feet. Size of areas used during the nesting period range from 23 to 147 acres.

### **Prey Items of Ferruginous Pygmy-Owls in Texas**

#### Insects

Cicada  
Click Beetle  
Cone-nosed Blood Sucker  
Dragonfly  
Grasshopper  
Lightning Bug  
Praying Mantis  
Round-headed Katydid  
Walking Stick

#### Amphibians

Narrow-mouth Toad

#### Reptiles

Four-lined Skink  
Great Plains Skink  
Ground Skink  
Keeled Earless Lizard  
Rose-bellied Lizard  
Six-lined Racerunner  
Texas Horned Lizard  
Texas Spiny Lizard  
Texas Spotted Whiptail

#### Birds

Audubon's Oriole  
Bewick's Wren  
Black-crested Titmouse  
Blue Grosbeak  
Brown-crested Flycatcher  
Buff-bellied Hummingbird  
Eastern Meadowlark  
Golden-fronted Woodpecker  
Hooded Oriole  
Nashville Warbler  
Northern Cardinal  
Northern Mockingbird  
Pyrrhuloxia  
Summer Tanager

#### Mammals

Common Evening Bat  
Hispid Cotton Rat  
Hispid Pocket Mouse  
House Mouse  
Mexican Free-tailed Bat  
Northern Pygmy Mouse

## Food Habits

Pygmy-owls hunt from a perch and by inspecting tree cavities. They have been observed taking Brown-crested Flycatchers and Golden-fronted Woodpeckers from nest cavities, but sudden perch-to-prey strikes are most common. Aerial capture of winged prey (e.g., birds and bats) is unknown. Because their ears are symmetrical, vision appears to play a pivotal role in locating and acquiring food.

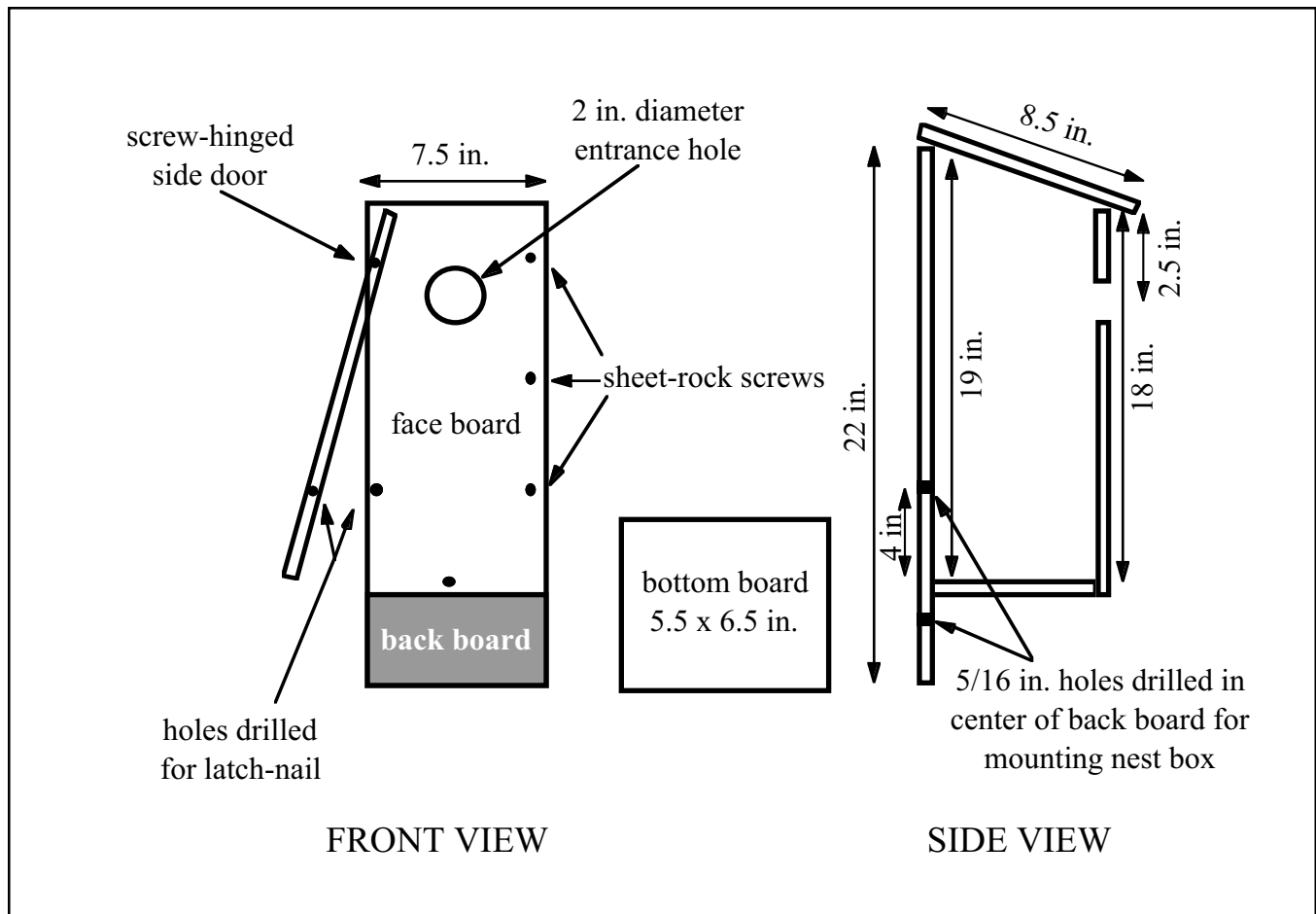
To obtain information on pygmy-owl food habits, we incorporated visual observation and video footage from micro-video cameras that were mounted in active nest boxes. Prey deliveries to nest boxes were recorded for every hour of the mean solar day during brood-rearing, but night activity was drastically reduced 4 to 7 days before initiation of fledging to minimize disturbance. Additionally, prey remains from nest cavities were identified.

We cataloged 39 species in the diet of pygmy-owls, suggesting they are generalists and opportunistic predators. Furthermore, by recording hispid cotton rats in their diet, we confirmed anecdotal accounts that indicated pygmy-owls often kill prey much larger than themselves. Additional research is needed to determine the significance of each prey Class in the diet of pygmy-owls.

## NEST BOX MANAGEMENT

In October 1992, we established 40 nest boxes in areas of the Wild Horse Desert known to be occupied by Ferruginous Pygmy-Owls. Our approach was to use nest boxes of varying configurations in 8 groups of 5, which allowed us to determine if pygmy-owls would use artificial nest structures and evaluate their possible preferences for different nest box configurations. In this initial study, pygmy-owls used 37% (3 boxes/8 groups) of the nest boxes, suggesting that nest boxes may be a viable management tool. Based on these findings, we expanded our nest box project and conducted studies to learn how to increase pygmy-owl use of nest boxes. Additionally, we located 33 pygmy-owl nests in natural cavities and obtained information on entrance orientation, height above ground, depth of cavity, and surrounding habitat composition, all of which proved beneficial in the nest box studies. Application of our findings has resulted in the use of 50 nest boxes by pygmy-owls since 1994.

Results from our studies suggest pygmy-owls will accept wide variations in orientation (North, South, East, West) of nest box entrances and placement height (6 to 40 feet). We found that tree age





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**Artificial nest structures are used by Ferruginous Pygmy-Owls and can be incorporated into management plans for promoting the conservation of this species.**

class did not affect nest box usage; pygmy-owls used nest boxes in young and old growth stands. However, the amount of understory in proximity to the nest site appeared to be important in nest site selection as most nest sites were in areas with 50 to 100% understory cover. When we established nest boxes in groups of 3 (within a 30 yard radius) to provide a selective opportunity, usage increased by more than 100% over single nest box placement.

## **NEST BOX RECOMMENDATIONS**

The following recommendations are provided to aid in establishing and maintaining a pygmy-owl nest box program. These recommendations are based on the information obtained during our research in South Texas.

1. We recommend using nest boxes in areas dominated by trees greater than 6 inches in diameter with moderate to dense understory cover. Specifications on nest box construction should follow those outlined in this bulletin.
2. Nest boxes should be placed at least 10 to 12 feet above ground.
3. We recommend mounting boxes on galvanized pipe rather than trees. A 6.5 foot end-post can be driven into the ground about 4 feet and a 10 foot section of 2 inch thin wall conduit inserted into the end-post to a depth of 8 inches; a bolt is used to connect the end-post and thin wall conduit. This system may reduce nest depredation and injury to trees is eliminated.

4. Nest boxes mounted on poles should be established a minimum of 5 feet from any structure (trees/branches) that would allow predators (raccoons) to access nests.
5. We suggest establishing 3 nest boxes per site, placed 20 to 30 feet apart, in suitable pygmy-owl habitat.
6. Because pygmy-owls are highly territorial, nest sites should be placed about 0.5 mile apart.
7. Nest boxes attached to trees are accessible to predators; galvanized metal flashing can be used to skirt the tree to deter predators. Flashing should be at least 4 feet above ground level.
8. Because predators may remember nest locations, resulting in increased predation rates over time, nest boxes that are not on poles or trees skirted with metal flashing should be moved every 2 to 3 years.
9. Nest boxes should be cleaned out every fall and a handful of cedar wood shavings should be added to provide nesting material. The old nest material should be removed from the area to avoid attracting scent-tracking predators such as raccoons and snakes.
10. To increase the life of nest boxes, paint the exterior with drab gray-brown enamel. Do not paint the interior. We suggest obtaining mismatched enamel paints from local supply stores and mixing them. One solid coat should last at least 5 years.



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**In addition to attaching nest boxes to trees, nest boxes can be attached to poles (see recommendation nos. 3 and 4).**

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