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Chapter 4:

The Ferruginous Pygmy-Owl in the Tropics and at the Northern End of its Range: Habitat Relations and Requirements

The habitat needs of the ferruginous pygmy-owl (*Glaucidium brasilianum*) are poorly understood. In the tropics, this common bird of prey inhabits many distinct vegetation communities or environments (e.g., Monroe 1968, Meyer de Schauensee 1970, Stiles and Skutch 1989, Sick 1993). A resident of woodlands and open forests, it is also found in the open, perched on telephone lines or fence posts (Ridgely 1976). At the northern edge of its range, the ferruginous pygmy-owl has been recorded in riparian woodlands and thickets (Bendire 1888, Breninger 1898, Oberholser 1974), live oak (*Quercus virginiana*)-mesquite (*Prosopis glandulosa*) forest (Wauer et al. 1993, Mays 1996, Proudfoot 1996), and Sonoran desertscrub (Monson and Phillips 1981, Millsap and Johnson 1988, Abbate et al. 1996). In this chapter, we describe some of the vegetation types associated with the ferruginous pygmy-owl, with an emphasis on those found to support the highest densities of the owl. We then explore key pygmy-owl habitat components suggested by descriptions of those plant communities.

1. Habitat associations and patterns of abundance

South America

Throughout the tropics, the ferruginous pygmy-owl occupies only lowlands (Meyer de Schauensee 1970, Davis 1972, Meyer de Schauensee and Phelps 1978, Hilty and Brown 1986). At higher elevations, it is replaced by congeneric species, such as least pygmy-owls (*G. minutissimum* complex), the northern pygmy-owl (*G. gnoma*), and the Andean pygmy-owl (*G. jardinii*). In South America, the ferruginous pygmy-owl occurs in a broad range of vegetation types (Table 4-1). As listed by Stotz et al. (1996: 170), vegetation types with the highest densities of pygmy-owls are arid and second-growth scrub. The ferruginous pygmy-owl is less common in forested areas, and in these areas chiefly occupies open deciduous forest, second growth, and edges (Hilty and Brown 1986, Stotz et al. 1996). Two representative examples of areas with high pygmy-owl population densities are the central llanos of Venezuela and the xeric coastal lowlands of western Ecuador.

Although they are found throughout much of Venezuela, ferruginous pygmy-owls are especially abundant in the central *llanos* (Fig. 4-1), an ecotonal area between the tropical deciduous forests to the north and the vast open savannas to the south (Troth 1979). This region consists of a mosaic of open marshes, wet meadows, and closed-canopy, partially deciduous forests along major watercourses. Much of the area is covered by an open woodland of scattered large trees, primarily of the genera *Enterolobium* and *Pithecellobium,* with a dense understory of mostly spiny shrubs including *Acacia*, *Anona*, *Mimosa*, *Randia*, and

Table 4-1. Habitat types occupied by the ferruginous pygmy-owl in some parts of its geographic range.

Geographic region	Types of habitat occupied	References
South America	"forest, scrub, arid woodland"..."towns, cerrado"	Meyer de Schauensee 1970
Brazil	"forest edges, cerrado, tree plantings"	Sick 1993
Columbia	"from dry forest and scrubby semiopen areas with trees and thickets to humid *terra firme* and *várzea* forest borders"	Hilty and Brown 1986
Panama	"scrubby and light woodland" and "open areas with scattered thickets and trees in lowlands"	Ridgely 1976
Costa Rica	"deciduous and evergreen woodland, savanna trees, semi-open, second growth, coffee plantations, suburban areas with large trees for nesting"	Stiles and Skutch 1989
Honduras	"arid woodlands," "arid interior highlands," and semiopen habitats	Monroe 1968
Mexico and northern Central America	"semiopen areas with hedges and scattered forest patches, open forest and edge, semiopen thorn forest, plantations..."	Howell and Webb 1995
Mexico	"mesquite thickets, river woods, scrubby second growth, forest edges"	Peterson and Chalif 1973

Figure 4-1. Vegetation type in Venezuela associated with high densities of ferruginous pygmy-owls. Note the open canopy and spiny thickets. Photograph by Scott Stoleson.

Zanthoxylum. These woodlands support dense populations of pygmy-owls nesting in cavities of the *Enterolobium* and *Pithecellobium* trees. Owls are also found, at lower densities, in more open areas that form seasonal marshes with emergent spiny-leafed palms (*Copernicia*), shrubby cactus (*Pereskia*) and spiny shrubs (*Anona*, *Randia*). Permanent water sources and major rivers are lined with closed-canopy forest, which tends to have a poorly-developed understory and very few pygmy-owls (Thomas 1979).

In western Ecuador, the local pygmy-owl, generally considered a morph of the ferruginous pygmy-owl (e.g., Meyer de Schauensee and Phelps 1978, but see König [1991] who treats it as a distinct species *G. peruanum*), is found most frequently in xeric coastal lowlands in riparian and arid thickets (Stotz et al. 1996). Riparian thickets in Ecuador are composed of dense stands of *Baccharis, Salix,* and *Tessaria* adjacent to watercourses. Arid thickets are dominated by spiny shrubs (*Acacia, Capparis*, *Cercidium*, *Parkinsonia, Prosopis*) and columnar cacti (*Armatocereus*, *Neoraimondea*) (Stotz et al. 1996). In both general aspect and genus-level floristics, these two habitats are very similar to riparian and xeroriparian areas historically or currently associated with ferruginous pygmy-owls in Arizona. Elsewhere in Ecuador, the pygmy-owl is chiefly associated with forest edges and shrubby second growth, but as these habitats are increasing with deforestation, the owl may be expanding its range within the country.

Western Mexico

In Sonora, the ferruginous pygmy-owl (subspecies *cactorum*) occurs in at least 50 localities, from the extreme southeastern border with Sinaloa northwest to the vicinity of Sonoita close to Organ Pipe Cactus National Monument in Arizona. The owl's altitudinal range is from near sea level to about 1,200 m; it has not been found in the extreme northeastern portion of Sonora, a region mostly above 1,200 m; nor has it been found in northwestern coastal areas or in the Gran Desierto west of Sonoita.

The ferruginous pygmy-owl is common locally in southern Sonora. Most of the records are from the tropical deciduous forest and its edges. The tropical deciduous forest extends from Costa Rica northward into Sonora in a narrow corridor predominantly at low elevations on the Pacific slope. In Sonora, this forest is characterized by deciduous trees that begin to lose their leaves in October following the summer rains. Until June of each year, the vegetation is leafless and temperatures are high. Characteristic plants include hecho (*Pachycereus pecten-aboriginum*), *Lysiloma* spp., *Pithecellobium* spp., *Tabebuia* spp., *Randia echinocarpa*, and guácima (*Guazuma ulmifolia*). Of 351 bird species recorded in the Alamos area, only 43 species have been found in more localities than the ferruginous pygmy-owl (Russell in press).

At the southwestern edge of the deciduous forest, pygmy-owls occupy tropical thornscrub, but more sparsely. At higher elevations (1,000 m to 1,200 m), where oaks may coexist with tropical deciduous forest plants, they reach their upper limits in Sonora. Cactus ferruginous pygmy-owls may also be found in riparian areas of tropical deciduous forest and in tall second growth. They are uncommon and local in desertscrub, which dominates the western half of Sonora, and in this vegetation type often occur many kilometers from water sources. Typical vegetation where the owl has been found in desertscrub includes columnar cacti, palo verde (*Cercidium*), and ironwood (*Olneya*). It is through this plant community that the ferruginous pygmy-owl ranges into Arizona.

Outside the tropical deciduous forest, the association between the ferruginous pygmy-owl and lowland riparian habitats in Sonora is somewhat uncertain. In the northern part of the state, much of the riparian habitat has disappeared but there is no historical evidence that it supported a large number of pygmy-owls. Stephens (1885) collected one owl from an organ pipe cactus near Caborca and another, presumably in desertscrub, 20 miles south of Caborca. He referred to the riparian community near Caborca as "timber," and so implied a community that no longer exists, but he did not mention *Glaucidium* in this area. Neff (1947) spent time in June and July of 1942 in the Altar-Caborca region. Although he described a "wilderness forest of giant mesquite", he did not mention the ferruginous pygmy-owl in his list of notable species seen. Throughout the rest of Sonora and at low elevations, riparian communities do not appear to support higher densities of ferruginous pygmy-owls than other vegetation types.

In Colima and Jalisco, the ferruginous pygmy-owl (subspecies *cactorum*) is described by Schaldach (1963) as abundant in low elevation thornscrub and thorn forest. Schaldach (1963) also mentions that it does not occur in the tropical deciduous forest of the region and is replaced at higher elevations by the northern pygmy-owl.

In Oaxaca, the ferruginous pygmy-owl (subspecies *ridgwayi*) is common in openings in tropical evergreen and tropical deciduous forests (Binford 1989). It is fairly common in arid tropical scrub and tropical semideciduous forests.

Texas

In southern Texas, ferruginous pygmy-owls (treated as subspecies *cactorum*, see Chapter 1) were once common along the lower Rio Grande in Tamaulipan thornscrub community with Texas ebony (*Pithecellobium ebano*), honey mesquite, and hackberry

(*Celtis* spp.) (Oberholser 1974, U.S. Fish and Wildlife 1994). However, urban and agricultural expansion from 1920 to 1970 resulted in the loss of more than 90% of this vegetation type (Oberholser 1974) and only small, possibly disjunct, populations may now exist. The largest known population is in the coastal sand plain of the historical Wild Horse Desert about 80 km south of Kingsville, with eolian sand as geologic substrate (Diamond and Fulbright 1990). The climate is "subhumid to semiarid east-coast subtropical," with rainfall peaking in May, June, September, and October and overall high humidity (Fulbright et al. 1990). The human history of the region included the establishment of large ranches under private ownership.

The coastal sand plain supports a mosaic of vegetation communities including dune fields and a prairie dotted with live oak woodlands and groves of honey mesquite trees (Fulbright et al. 1990). In Kenedy County, the once distinct live oak woodlands have merged with mesquite to form a nearly continuous patch of mixed live oak and honey mesquite forest (Wauer et al. 1993, Fig. 4-2). Within the forest boundaries, the vegetation is heterogeneous and varies from live oak with minimal ground cover to mixed live oak-honey mesquite woodland and mesquite savanna. An understory vegetation that includes thorny woody shrubs such as desert hackberry (*Celtis pallida*), catclaw acacia (*Acacia greggii*), and lime prickly-ash (*Zanthoxylum fagara*), occurs chiefly in association with mesquites (Archer 1989, 1990) and, in some areas, forms "nearly impenetrable thickets" (Wauer et al. 1993).

Wauer et al. (1993) and Mays (1996) recorded the highest numbers of ferruginous pygmy-owls in the mixed live oak-mesquite woodlands in Kenedy County. The owl also occurs, but at lower densities, in monotypic live oak forest and in the mesquite savanna. No pygmy-owl was detected on the prairie or in the pastures outside the forest (Wauer et al. 1993). Outside the continuous live oak-mesquite forest, the ferruginous pygmy-owl was recorded either in contiguous patches of forest or in mesquite bosque associated with large trees (Mays 1996).

Figure 4-2. Live oak (*Quercus virginiana*)-honey mesquite (*Prosopis glandulosa*) habitat in southeast Texas. Note the high density of understory plants and the semi-open canopy. Photograph by Jean-Luc Cartron.

Arizona

The ferruginous pygmy-owl (subspecies *cactorum*) ranges into south and central Arizona at elevations up to 1,200 m. Below 1,000 m, the dominant vegetational zone is lower Sonoran, with large cacti, velvet mesquite (*Prosopis velutina*), palo verde, and creosote bush (*Larrea tridentata*). Along rivers and creeks, floodplain riparian corridors typically consisted of cottonwood (*Populus fremontii*)-Goodding willow (*Salix gooddingii*) forests intermixed with mesquite bosques. Nearer the owl's upper elevational boundary, dominant or common riparian tree species also included walnut (*Juglans major*), sycamore (*Platanus wrightii*), and ash (*Fraxinus velutina*). Since the late 18th century, most of the original riparian vegetation has been cleared or altered by human activities (Chapter 2). At some locations, however, current vegetation structure and composition likely represent past conditions (Chapter 3).

Historical accounts suggest that the cactus ferruginous pygmy-owl was originally fairly common or common in riparian woodlands and thickets in Arizona (Bendire 1888, Fisher 1893:199, Breninger 1898, Swarth 1914:31). At present, however, this bird seems chiefly associated with Sonoran desertscrub, where it often gravitates along washes lined with dense xeroriparian vegetation composed of mesquite, palo verde, desert ironwood (*Olneya tesota*), desert hackberry, and catclaw acacia (Fig. 4-3) (Millsap and Johnson 1988, Lesh and Corman 1995). In the Altar Valley, pygmy-owls have been located in xeroriparian vegetation along washes within low-density desertscrub or mesquite grasslands (Chapter 3). In the Tucson area, which supports many of the known owls (Felley and Corman 1993, Lesh and Corman 1995), documented habitat occupancy is higher in low-density (one house per 3.3 acres or more) residential areas. While the vegetation near residences remains dominated by the native saguaro (*Carnegiea gigantea*), foothill palo verde (*Cercidium microphyllum*), ironwood, and velvet mesquite, it is often denser and more complex than on adjacent, undisturbed patches of Sonoran desertscrub due to supplemental irrigation.

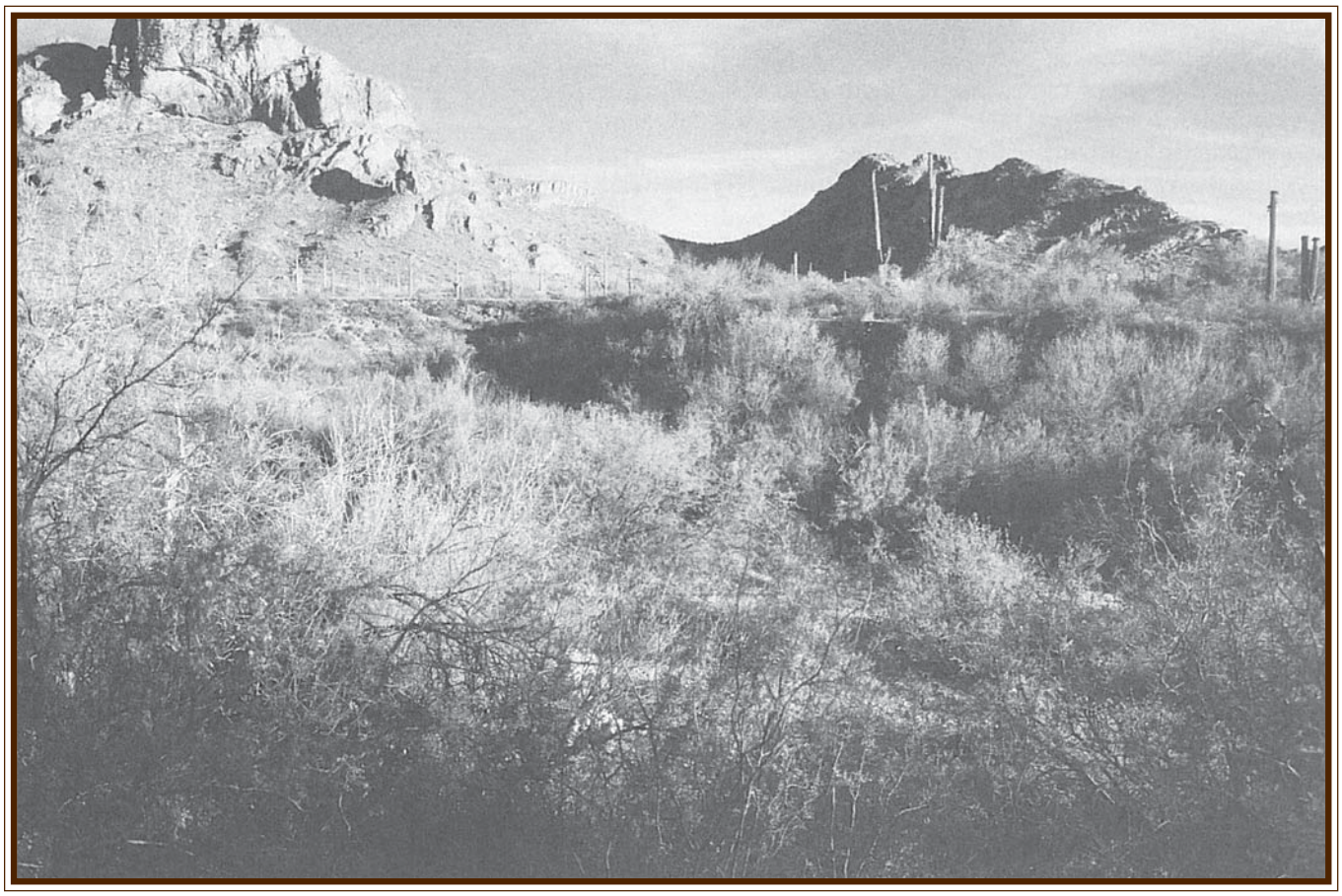

Figure 4-3. Cactus ferruginous pygmy-owl habitat in Arizona: xeroriparian vegetation along a wash. On the upland, saguaros provide cavities for nesting. Photograph by Jean-Luc Cartron.

Non-native plants, such as California pepper trees, Allepo pines, citrus, eucalyptus, and mulberry trees also enhance vegetation density and diversity. Under bushes or trees, drip irrigation may create small pools of water which are used by local wildlife. The presence of some sort of free-standing water was recorded at or near all known nest sites in residential areas (Abbate et al. 1996, Richardson unpubl. data).

Recent survey efforts have resulted in an increased number of owl detection in areas with little or no residential development. Statewide, there are now more known nests in non-residential areas than in residential areas (Richardson unpubl. data). However, the vegetation of these non-residential areas (i.e., well-structured upland desertscrub and xeroriparian vegetation) resembles in structure the vegetation of low-density residential areas. The influence of residential development on the quality of cactus ferruginous pygmy-owl habitat may only be determined through additional surveys and research.

2. Habitat preferences and requirements

Because fitness is a more accurate indicator of habitat quality than population density, one must exercise caution when examining patterns of owl population density. Higher population density in an area may indicate habitat preferences and requirements, but the relationship between habitat suitability and population density can be affected by habitat connectivity at a geographic scale, site fidelity regardless of quality, and the exclusion of a large proportion of the population from high-quality sites by a few dominant individuals (Willis 1974, Lidicker 1975, Wiens and Rotenberry 1981, 1985).

Foraging, protection, and the importance of the understory

Although different observers may characterize vegetation differently or determine vegetation types at different scales, habitat descriptions above (see also Table 4-1 for more descriptions of ferruginous pygmy-owl habitat in the tropics) are typically congruent. Habitat descriptions in the tropics and in Texas suggest the importance of thickets and woodlands with a dense understory that often consists of spiny shrubs. This pattern is consistent with Proudfoot's (1996) habitat use versus availability study: ferruginous pygmy-owls nested disproportionately in areas with moderate to dense understory. Although more work is needed to better understand the significance of the association, a dense understory may benefit the ferruginous pygmy-owl by providing a shelter from climatic stresses and potential predators for the juveniles (Abbate et al. 1996, Proudfoot 1996). Greater habitat complexity may also result in more foraging opportunities for the ferruginous pygmy-owl. Where vegetation diversity and structure are reduced, the presence of water may increase habitat quality by attracting more prey to the area. In 1997, an owl pair in Texas nested on the edge of a pasture near a water tank that attracted wildlife, including song birds (Proudfoot unpubl. data). In the Tucson area, drip irrigation or water dishes close to monitored nests attracted a variety of potential prey (Abbate et al. 1996, Richardson unpubl. data).

Cavity nesting and the importance of trees or saguaros

Because the ferruginous pygmy-owl is an obligate cavity nester, it requires trees or cacti large enough to contain a cavity, as well as cavity excavators. Thus, nest location may strongly reflect nest cavity availability. Historical records suggest that in riparian areas, mesquite, a hard wood less readily excavated by Gila woodpeckers and northern flickers, was less frequently used than softwood trees (Hunter 1988). With the loss and alteration of riparian areas in Arizona, saguaros may now provide the most available source of cavities for nesting; most recent nest sites have, in fact, been located in saguaro cavities (Abbate et al. 1996, Richardson unpubl. data). However, two nests monitored in 1999 were located in a eucalyptus and an Arizona ash (Richardson unpubl. data). The eucalyptus was an integral component of an exotic landscape, but the ash was in an ephemeral wash surrounded by uplands of mesquite/grassland vegetation with no available saguaros. The only cavities in the area were in the large trees along the wash. Within certain portions of the cactus ferruginous pygmy-owl's range in Arizona, riparian and xeroriparian vegetation communities may still contain the only available pygmy-owl nest sites.

The density of trees and amount of canopy cover preferred by ferruginous pygmy-owls remains unclear. Most of the above habitat descriptions suggest that the highest owl densities are found in semi-open or open woodlands, often in proximity to forests or patches of forest. Where the owl occurs in forested areas, it is more readily observed along the edge or in openings rather than deep in the forest itself (Binford 1989, Sick 1993). Hence, at a landscape level, this bird may prefer semi-open, transitional zones between dense stands of trees and open savannas or scrublands, and semi-open habitats dotted with thickets. Additional research is needed to examine this association.

4. The importance of riparian and desertscrub habitats in Arizona

Assessing the importance of riparian areas and desertscrub for maintaining or recovering the ferruginous pygmy-owl in Arizona is essential. As indicated, the ferruginous pygmy-owl is not consistently dependent on riverine ecosystems throughout its range. In fact, where the riparian vegetation forms a closed-canopy gallery forest, owl density may be low. In Sonora, Mexico, where riparian areas closely resemble those of Arizona, the association between riparian plant communities and the owl appears weak. One potential explanation is that in Sonora, as in other parts of the pygmy-owl's range, a significant portion of the land outside of floodplains is wooded, presenting the owl with a larger choice of suitable habitats. In the southwestern United States, however, riparian floodplains support most of the low-elevation woodland vegetation. These areas attract a disproportionate amount of wildlife (Carothers and Johnson 1975, Hubbard 1977, Pase and Layser 1977). Migrating passerines, for instance, exhibit a strong preference for riparian corridors over the adjacent uplands (Stevens et al. 1977).

In general, early accounts of the original riparian vegetation and descriptions of Blue Point Cottonwoods (Chapter 2) are congruent with descriptions of habitats where ferruginous pygmy-owls are most commonly found. Riparian areas where the owl was detected often included thickets (e.g., Bendire 1888), while cottonwoods and resident woodpeckers must have provided many cavities for nesting (see Breninger 1898, Gilman 1909). Riparian areas are linear and thus tend to have a high proportion of edge. Unless they have been completely invaded by tamarisk, these areas support a higher density of breeding birds than any other low to mid elevation vegetation community in the Southwest (Carothers et al. 1974, Johnson et al. 1977, Franzreb 1987). Riparian areas of the Southwest generally support a higher average number of reptile and amphibian species than nonriparian areas (Brode and Bury 1984, Jones 1988). They may also support higher diversity and densities of mammalian species than adjacent uplands (Stamp and Ohmart 1979, Frey and Yates 1996). Such an abundance and diversity of prey may be essential for a perch-and-wait predator like the ferruginous pygmy-owl. The continuous corridors of floodplain riparian vegetation once covering hundreds of miles in the Southwest may have supported the sizable pygmy-owl population suggested by Bendire (1888) and Breninger (1898)'s accounts. The very low number of owls found in riparian vegetation in recent years may reflect loss of habitat connectivity rather than lack of suitability.

Although the majority of recent cactus ferruginous pygmy-owl detections in Arizona have occurred in desertscrub, the literature suggests that this vegetation type has always been associated with low densities of this bird, even when it was considered common in riparian areas (Breninger 1898, Kimball 1921). In large, fairly pristine, desertscrub areas (e.g., Organ Pipe Cactus National Monument), records of the owl's occurrence are infrequent (Groschupf et al. 1988). In Sonora, Mexico, limited evidence indicates that cactus ferruginous pygmy-owls are uncommon in this vegetation type (Russell and Monson 1998). One possible explanation for the seemingly rare occurrence of the owl in desertscrub is that this habitat is of marginal quality (Johnson and Haight 1985, Taylor 1986). Alternatively, the low number of historical records in desertscrub may chiefly reflect the lack of early studies in desert areas. As mentioned, xeroriparian vegetation in Arizona resembles arid thickets in Ecuador where ferruginous pygmy-owls are common, and the tall columnar saguaros of the Sonoran Desert provide cactus ferruginous pygmy-owls with nesting cavities (Abbate et al. 1996).

Desertscrub may also play an important role at another level. Habitat connectivity is greater for desertscrub than for riparian vegetation. As stated, this habitat type represents the substrate through which the owl ranges from Sonora into Arizona, perhaps at times allowing the Arizona population to be replenished. Dispersing juvenile pygmy-owls traveled more than 15 miles through desertscrub of varying quality during radio tracking in 1998 (Richardson unpubl. data). Research is needed in Arizona to better understand the size and distribution of the remaining owl population and to further explore the relative importance of desertscrub and riparian areas.

Recently, cactus ferruginous pygmy-owls have been found in areas (i.e., desert grassland communities) of Arizona where the potential to detect them was perhaps initially considered to be low (see Chapter 3). These detections were chiefly the result of an increased survey effort. They indicate that intensified survey efforts in "marginal" habitats can result in increased owl detections and change our perception of the relative importance of vegetation communities utilized by pygmy-owls. For example, the recent identified nesting of cactus ferruginous pygmy-owls in xeroriparian vegetation along washes within mesquite grasslands raises questions regarding the value of these types of areas and their contribution toward the persistence of the owl in Arizona. As with nearly all aspects of the owl's ecology, more information is needed before we have a complete understanding of cactus ferruginous pygmy-owl habitat preferences.

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