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Chapter 3

The Status of the Cactus Ferruginous Pygmy-Owl in Arizona: Population Surveys and Habitat Assessment

In 1993, the Arizona Game and Fish Department (AGFD) began formal population surveys in an attempt to document the numbers and distribution of cactus ferruginous pygmy-owls (*Glaucidium brasilianum cactorum*) in Arizona. Surveys were initiated to gather information on this little-known subspecies which was considered for listing at the time. Prior to 1993, birders and avian biologists had conducted many informal surveys in a sporadic and opportunistic fashion. However, the information derived from those surveys was limited and often inaccessible, and contributed little to the overall understanding of the distribution and abundance of the species. From 1993 to 1997, even the more formal cactus ferruginous pygmy-owl surveys were limited in number and area covered and resulted in only a handful of cactus ferruginous pygmy-owl detections. With the listing of the cactus ferruginous pygmy-owl as an endangered species, significantly more surveys were conducted in 1998 and 1999 by the AGFD, licensed consultants, land management agencies, and agency contractors. The increased number of pygmy-owl detections during those two years resulted from this additional survey effort.

While there is a considerable amount of potentially suitable cactus ferruginous pygmy-owl habitat that remains unsurveyed, we have learned the following information about the distribution of cactus ferruginous pygmy-owls within Arizona: 1) despite increased survey efforts and an increased number of cactus ferruginous pygmy-owl detections, the Arizona population of cactus ferruginous pygmy-owls still appears small; 2) the currently known population of cactus ferruginous pygmy-owls occurs chiefly in desertscrub habitats rather than riparian habitats reported in historical accounts (see Chapter 2); 3) the population of cactus ferruginous pygmy-owls appears patchily distributed across suitable habitat with population pockets occurring in northwest Tucson, southern Pinal County, the Altar Valley, Organ Pipe Cactus National Monument, and the Tohono O'odham Reservation.

In this chapter, we discuss some of the difficulties and challenges of developing an effective and practical survey protocol including results and insights from previous surveys. We then describe important riparian and desertscrub habitats which represent occupied cactus ferruginous pygmy-owl habitats or habitats presumed suitable for cactus ferruginous pygmy-owls. We then briefly describe initial agency efforts to better characterize and describe suitable cactus ferruginous pygmy-owl habitat. Finally, we present our recommendations for future survey efforts.

1. Survey Protocol

In the last two decades, broadcast surveys have been promoted as a reliable and effective technique

to study the distribution and size of many small owl populations (Johnson et al. 1981, Lynch and Smith 1984, McGarigal and Fraser 1985, Smith et al. 1987, Ganey 1990, Stahlecker and Rawinski 1990, Noon et al. 1992, Wauer et al. 1993). Because of the lack of adequate information regarding the numbers and distribution of cactus ferruginous pygmy-owls in Arizona, the AGFD developed a broadcast survey protocol as they initiated formal cactus ferruginous pygmy-owl population surveys in 1993 (Felley and Corman 1993). This original protocol was developed based on the little information known at that time about the biology of cactus ferruginous pygmy-owls and similar survey protocols employed for other small owl species. As surveys progressed and the effectiveness of the protocol was evaluated, a revision of the AGFD protocol took place in 1996 (Abbate et al. 1996). The 1996 revisions included increasing the distance between call points and increasing the amount of time spent at each call point. Other slightly different protocols were utilized by contractors surveying for special projects in 1998. Adjustments to the original protocol were in response to changes in research objectives, management needs, and experience gained from previous survey experience.

Protocol development attempts to maximize cactus ferruginous pygmy-owl response to tapes by directing surveys to be performed during the highest known activity periods (i.e., dawn and dusk), and at the appropriate time of year (i.e., the courtship and nesting season) (Gilman 1909, Terres 1991, Wauer et al. 1993). There has been considerable discussion about the effectiveness of surveys outside the peak breeding season. The original survey protocol defined a survey season extending from September to April (Felley and Corman 1993) but, while there appears to be some calling activity in the early fall, the vast majority of recent cactus ferruginous pygmy-owl detections have occurred during the spring courtship and nesting period, with a decrease in calling and responsiveness observed through the remainder of the year (Richardson unpubl. data).

Another debated issue has been the recommended distance between calling stations for a survey. Results of initial response distance testing in Texas indicate that owls will respond to a taped call from a distance of at least 700 m (Chapter 5). However, current protocols for surveying in Arizona recommend call point distances ranging from 150 m to 400 m. While shorter distances between call points decrease survey coverage and thus present some logistical and economic concerns, they do address reduced responsiveness or ability to detect owls because of local demographic and physical factors. Many of the cactus ferruginous pygmy-owls found in Arizona occur in urbanized areas with significant background noises from automobiles, humans, dogs, etc. which reduce a surveyor's ability to detect an owl. Additionally, it has been suggested that, at least for the boreal owl (*Aegolius funereus*), the physiological state of individual owls, the amount of competition among males for nest sites, and mating success can all influence rates of detection (Hayward et al. 1992). In Arizona, low population densities of cactus ferruginous pygmy-owls, and perhaps reduced competition for nest sites, may be associated with lower rates of responsiveness. Thus, if call points are too far apart and/or the time spent at each point is too short, some owls may escape detection. The challenge has been to develop a protocol which balances the significant repercussions of not detecting an owl, when it could potentially be impacted by some activity, with increased costs and logistical difficulties resulting from a conservative survey protocol. Direct costs are associated with actually conducting surveys; there are also indirect costs if the protocol results in the delay of project implementation. Another question considered is the need for two protocols, one dealing with project clearance and another for population assessment and research activities.

In an effort to address issues regarding survey protocol and associated management issues, the U.S. Fish and Wildlife Service (USFWS) and the AGFD developed a survey protocol that was released for public comment in late 1998 (Appendix 3-1). This proposed survey protocol received significant review by a wide variety of public interests. Public comment is currently being evaluated and a finalized protocol is expected sometime in 1999. While economic interests such as development, grazing, and mining may be best served by a stable protocol that can be considered in long-term planning efforts, the cactus ferruginous pygmy-owl survey protocol must be adaptive enough to incorporate advances in our understanding of this species. For example, it is only within the past two years that radio telemetry has been utilized to help us understand aspects of cactus ferruginous pygmy-owl biology such as home range, territoriality, and habitat use. Telemetry will also allow us to test responsiveness of known owls to tape broadcasts. This new information must be utilized in order to develop the most effective survey protocol.

2. Responses of other bird species to broadcast surveys

The ferruginous pygmy-owl is known as the "terror of small birdlife" (Sprunt 1955). Judging from the numerous accounts describing the owl as mobbed by songbirds and hummingbirds (Gilman 1909, Sprunt 1955, Tyler and Phillips 1978, Abbate et al. 1996, Russell and Monson 1998), the occurrence of this owl is likely perceived as a threat by the local avifauna.

Mobbing is a behavior specifically directed against potential enemies during the reproductive season (Kruuk 1964, Hoogland and Sherman 1976, Shields 1984) and raids of neighboring songbird nests by cactus ferruginous pygmy-owls have been documented in Texas and Arizona (see Chapter 1). Mobbing was observed at all nest sites monitored in Arizona and involved a wide variety of species (Abbate et al. 1996, Richardson unpubl. data).

In addition to mobbing, birds also respond to pygmy-owls with vocalizations (i.e., alarm calls), movements, agitation, or some combination of the three. In the Tucson area, where cactus ferruginous pygmy-owls have been found, 25 species (14 of which are year-round residents) responded to broadcast calls with agitated behavior and/or alarm calls (Table 3-1). Among those species, the verdin (*Auriparus flaviceps*), Gila woodpecker (*Melanerpes uropygialis*), and black-tailed gnatcatcher (*Polioptila melanura*) were described as the birds most often reacting to cactus ferruginous pygmy-owls (Abbate et al. 1996). In the Coronado National Forest, where no pygmy-owl was found, several bird species responded with movement, vocalization, and/or agitation during 1997 surveys (Table 3-2). Of these, however, only two identified species exhibited agitated behavior and the bushtit (*Psaltriparus minimus*) alone is a local year-round resident.

If bird responses were species specific, they could indicate whether cactus ferruginous pygmy-owls are in the surveyed area. However, using these responses during broadcast surveys as an indicator of recent or present exposure to cactus ferruginous pygmy-owls in the area is tenuous. The residency status of responding birds is the first important consideration, as the owl is abundant in the tropics (see Chapters 1 and 4). For migratory species, such as most hummingbirds and warblers, agitated behavior or alarm calls in response to tape playing may only reflect exposure to

Table 3-1. List of species responding to broadcast calls of cactus ferruginous pygmy-owls with distress/alarm calls and/or agitated behavior in the Tucson area during surveys from 1994 to 1997 (data compiled from Collins and Corman 1995, Lesh and Corman 1995, Abbate et al.1996, Proudfoot and Beasom 1997, and Skinner unpubl. data).

Bird species	Local status (<4,000 ft elevation)	Documented predation by ferruginous pygmy-owls
Anna's hummingbird	Year-round resident	—
Ash-throated flycatcher	Summer resident	—
Bewick's wren	Winter resident [a]	Yes (Texas)
Bell's vireo	Summer resident	—
Black-tailed gnatcatcher	Year-round resident	—
Bridled titmouse	Year-round resident	—
Broad-billed hummingbird	Summer resident	—
Bushtit	Year-round resident	—
Cactus wren	Year-round resident	Yes (Arizona)
Cassin's kingbird	Summer resident	—
Curve-billed thrasher	Year-round resident	—
Gila woodpecker	Year-round resident	—
House finch	Year-round resident	Yes (Arizona)
House sparrow	Year-round resident	—
Hooded oriole	Summer resident	—
Lucy's warbler	Summer resident	—
Northern cardinal	Year-round resident	Yes (Texas)
Northern mockingbird	Year-round resident [b]	Yes (Texas)
Phainopepla	Year-round resident	—
Pyrrhuloxia	Year-round resident	Yes (Texas)
Ruby-crowned kinglet	Winter resident	—
Summer tanager	Summer resident	—
Verdin	Year-round resident	Yes (Arizona)
Vermilion flycatcher	Summer resident [c]	—
Western kingbird	Summer resident	—

[a] During the summer, the Bewick's wren occurs at higher elevations.
[b] As seasonal dispersal occurs, breeding populations may differ from winter populations below 4,000 ft (1,220 m). Many breeding individuals that breed below 4,000 ft may have wintered south of the Arizona border.
[c] During the winter, the vermilion flycatcher is local and sparse.

Table 3-2. List of species responding to broadcast calls of cactus ferruginous pygmy-owls during surveys at various locations on the Coronado National Forest during the spring of 1997.

Location of survey(s)	Type of habitat	Species responding	Type of response[a]
Providencia Canyon	Xeroriparian	ash-throated flycatcher	M, V
		Bewick's wren	M, V
		broad-billed hummingbird	M
		house finch	M?, V
		vermilion flycatcher	M
Finger Rock Canyon	Xeroriparian with occasional cottonwoods	ash-throated flycatcher	M, V, A
		broad-tailed hummingbird	M
Agua Caliente Canyon	Xeroriparian	flycatcher sp.	M, V
		gnatcatcher sp.	M
		hummingbird sp.	M?
		phainopepla	M?
		Wilson's warbler	M?
Sabino Canyon	Riparian	ash-throated flycatcher	A
		bushtit	M, A
		northern cardinal	M
		gnatcatcher sp.	A
		hummingbird sp.	M
Pima Canyon	Xeroriparian	hummingbird sp.	M
Sycamore Canyon	Riparian	broad-tailed hummingbird	M
		northern pygmy-owl	V
Santa Catalina State Park	Riparian	black-tailed gnatcatcher	M
		flycatcher sp.	V
		verdin	M, V
		common poorwill	V?

[a] M = response with movement towards the observer, V = response with vocalizations, A = response with agitated behavior, ? = movement or vocalization recorded, but not in obvious response to tape playing.

the owl in the tropics during the non-breeding season. Even when responding birds are year-round residents, however, it is not known whether they are reacting specifically to the owl's call based on personal exposure or if they simply perceive the call as fitting the characteristics of a potential predator.

Despite the questions surrounding the use of bird responses during unsuccessful surveys as an indication of owl presence, mobbing in particular is valuable to locate cactus ferruginous pygmy-owls. In fact, mobbing response is the primary tool used to detect cactus ferruginous pygmy-owls during research when the owls are not vocalizing or if a radio transmitter is not attached. Prior to the use of telemetry, most cactus ferruginous pygmy-owl locations associated with nest monitoring were the results of investigating areas where mobbing behavior by songbirds was observed. While monitoring owls during research, it is also very rare to go through a session without recording mobbing behavior. Therefore, mobbing response during broadcast surveys is a good tool to help locate this very cryptic species.

3. Population Surveys

As listed by Hunter (1988), detections of cactus ferruginous pygmy-owls during the 1970s and 1980s were scattered in various parts of south and central Arizona, occurring in both riparian and in desertscrub/xeroriparian habitats (Table 3-3). However, the survey effort of the last five years suggests a somewhat different pattern of distribution, with few owls detected in meso-riparian habitat. Cactus ferruginous pygmy-owls have been found in association with desertscrub and xeroriparian vegetation in four general areas: Organ Pipe Cactus National Monument, northwest Tucson/southern Pinal County, the Tohono O'odham reservation, and the Altar Valley. The only

Table 3-3. General location of detections from 1971 to 1988 (adapted from Hunter 1988).

Location	Time of documented presence	Status of individuals located
Northwest Tucson and	1976	individual
Marana/Red Rock	1980-1987	pair with young
Tanque Verde Ranch	1975	individual
Sabino Canyon Visitor Center	1971, 1976	pair with young
OPCNM	1977-1985	2+ pairs
	early 1980s	individual
	early 1980s	individual
lower San Pedro watershed	1985-1987	pair
	1987	individual
Salt River	1971	individual?
Gila River watershed	1978 [a]	individual
	1985 [a]	individual
Upper Santa Cruz watershed	mid-1970s [b]	individual
	1975 [c]	individual
Lower Sycamore Canyon	1986 [d]	individual

[a] Sightings of cactus ferruginous pygmy-owls at the Bonita Creek-Gila River confluence and Gila River-San Francisco River confluence may be questionable (T. Corman, pers. comm.). There are no historical (pre-1970) records even close to this area. One owl sighted is only described as a "small, tuftless owl at the entrance to a tree cavity." In retrospect, this bird could have been an elf owl (*Micrathene whitneyi*).

[b, c] These two records are from elevations reaching approximately 4,000 ft.

[d] The owl reported may have been a northern pygmy-owl (*Glaucidium gnoma*) (T. Corman, pers. comm.).

owls found in meso-riparian areas occurred in the Altar Valley. Surveys completed from 1993 through 1996 were conducted primarily by the AGFD. Survey areas were selected based on historic occurrences and thus focused primarily on riparian areas. Some historic locations, however, occurred in desertscrub and were surveyed. In addition, some desertscrub areas on Breeding Bird Atlas blocks were also surveyed. A few surveys were conducted by federal agencies within their jurisdictions including Organ Pipe Cactus National Monument and Saguaro National Park. These surveys detected very few owls (Table 3-4).

With the listing of the cactus ferruginous pygmy-owl as an endangered species in 1997, agencies and consultants increased the cactus ferruginous pygmy-owl survey effort significantly. Surveys were still focused on areas where owls had been detected in the past, but expanded to include areas of potentially suitable desertscrub where projects were planned to occur. In conjunction with the increased survey effort, experience gained by researchers and increased public awareness have resulted in more owls being found in recent years (Table 3-4). Even with the increased survey effort, there are still large areas of potentially suitable habitat that remain unsurveyed and, although we have detected an increasing number of birds, information on the natural history, distribution and habitat requirements of cactus ferruginous pygmy-owls still remains limited. The results of population surveys do not yet allow for an estimate of population size. For these reasons, surveys should remain a high priority in the next few years.

4. Description of Important Habitat Areas and Survey Effort

The cactus ferruginous pygmy-owl in Arizona has been documented in a variety of riparian and desertscrub habitats (Bendire 1888, Breninger 1898, Gilman 1909, Phillips et al. 1964, Hunter et al. 1987, Hunter 1988, Abbate et al. 1996). Some of the historic locations, particularly those in riparian habitat, have undergone considerable alteration since the time of

Table 3-4. Number of cactus ferruginous pygmy-owls detected (including young of the year) resulting from surveys conducted from 1993 to 1999 (data compiled from Felley and Corman 1993, Collins and Corman 1995, Lesh and Corman 1995, Abbate et al. 1996, Richardson unpubl. data, and T. Tibbitts pers. comm.).

Location	Year						
	1993	1994	1995	1996	1997	1998	1999
Northwest Tucson/southern Pinal County	1	2	6	12	10	20	39
Organ Pipe Cactus National Monument	1	0	1	3-6	2	9	8
Silverbell and Tucson mountains	ND	ND	0	0	0	1	0
Buenos Aires National Wildlife Refuge[b]	ND[a]	ND	0	ND	ND	3	10
Altar Valley (except Buenos Aires National Wildlife Refuge)	ND	ND	ND	ND	ND	0	21
Total	2	2	7	15-18	12	33	78

[a] No data.
[b] The Buenos Aires National Wildlife Refuge and the rest of the Altar Valley are distinguished.

noted pygmy-owl occurrence (see Chapter 2). Other areas, though, have developed or maintain potentially suitable habitat characteristics, such as vegetation structural diversity and nesting substrates. The following is a description of some of the important habitat areas that remain in Arizona and an indication of survey efforts in those areas. Due to limited manpower or inaccessibility, some of these areas have not yet been surveyed adequately, while others -not all of these are described here- have not yet been surveyed at all.

A map (Fig. 3-1) is included with the location of all survey areas. For several of these, information is provided in the text on recent vegetation changes and outstanding threats to the habitat. When determined by surveyors, qualitative estimates of cavity availability and woodpecker abundance are also reported.

Lower San Pedro

Lands considered to be suitable for cactus ferruginous pygmy-owl occupancy in the lower San Pedro River drainage (Fig. 3-1) primarily consist of a mixture of cottonwood (*Populus fremontii*), Goodding willow (*Salix gooddingii*), velvet mesquite (*Prosopis velutina*) and exotic tamarisk (*Tamarix* spp.)-dominated riparian vegetation.

The riparian habitat along the lower San Pedro River varies from vast expanses of gallery cottonwood/willow forest with a dense understory of tamarisk to decadent stands of cottonwood interspersed with monotypic stands of tamarisk. Extensive mesquite bosques are found in several areas near Cascabel and Mammoth and to the north around Cook's Lake. Located near the confluence of Aravaipa Creek and the San Pedro River, Cook's Lake is a 270-acre wetland surrounded by dense stands of cottonwoods, Goodding willow, netleaf hackberry (*Celtis laevigata* var. *reticulata*), buttonbush (*Cephalanthus occidentalis*), velvet mesquite, and velvet ash (*Fraxinus velutina*) and bordered on its eastern side by upland Sonoran desertscrub (Lesh and Corman 1995). The local occurrence of one of the largest breeding populations of the Southwestern willow flycatcher (*Empidonax traillii extimus*) for the state of Arizona (Sferra et al. 1997) is notable, since this endangered bird may be viewed as an indicator of riparian habitat health (S. Stoleson, pers. comm.). Bingham Cienega, another wetland near the town of Redington, is bordered by large cottonwoods, Goodding willows, Mexican elderberry (*Sambucus mexicana*), netleaf hackberry, and velvet ash. It is adjacent to a mesquite bosque and surrounded by hills supporting Sonoran desertscrub vegetation (Lesh and Corman 1995). Historic records of pygmy-owl occurrence (Hunter 1988, Table 3-3) have come from the lower San Pedro River in the vicinity of Dudleyville and from the mesquite bosques near the mouth of Aravaipa Canyon. The former location had a dense understory of tamarisk with a dispersed canopy of cottonwood trees. The latter habitat was dominated by large mesquite bosques. Elevation ranges from 1,920 ft (585 m) at Winkelman to 3,040 ft (927 m) at Cascabel.

Most of the area along the lower San Pedro River is privately owned with significant portions of Arizona State Trust Land in adjacent Sonoran Desert uplands. The Bureau of Reclamation and the Arizona Chapter of The Nature Conservancy currently administer large blocks of dense riparian habitat within the lower San Pedro near Dudleyville. Public lands administered by the Bureau of Land Management (BLM) along the river total approximately 2000 acres, including several hundred acres under conservation easements. In 1993, surveys were conducted near Winkelman, Mammoth, San Manuel, and Redington (Felley and Corman 1993). Area coverage totaled 59.1 km^2. Additional surveys were conducted in 1994 from Winkelman south to Aravaipa Creek, near Mammoth, and along

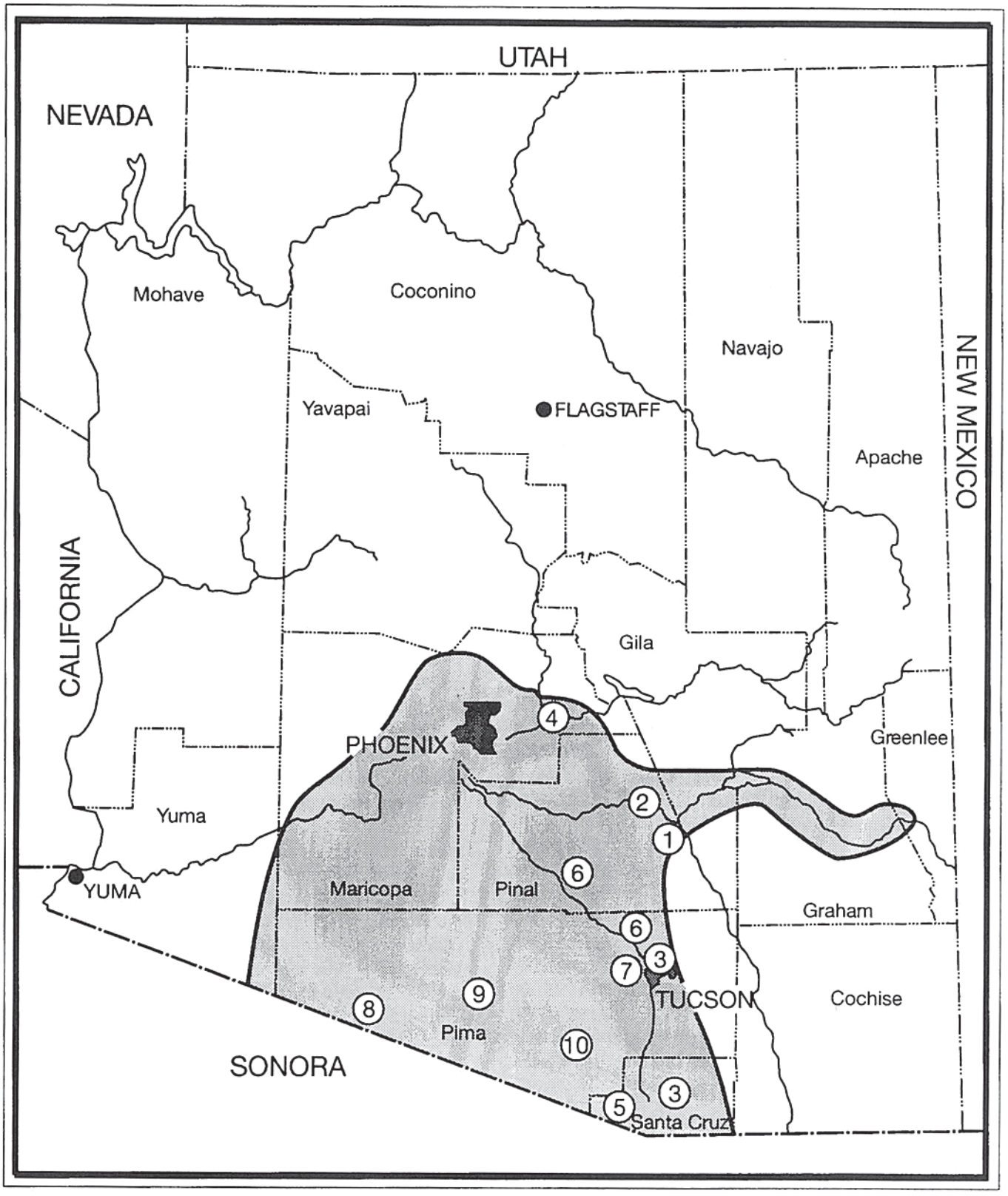

Figure 3-1. Location of survey areas. 1: lower San Pedro River, 2: middle Gila River, 3: Santa Cruz and tributaries, 4: Salt and Verde rivers, 5: Sycamore Canyon, 6: northwest Tucson and southern Pinal County, 7: Silverbell and Tucson mountains, 8: Organ Pipe Cactus National Monument, 9: Tohono O'odham Reservation, and 10: Altar Valley, including Buenos Aires National Wildlife Refuge. The shaded area corresponds to the distribution of the cactus ferruginous pygmy-owl in Arizona (Chapter 2).

Bingham Cienega (Collins and Corman 1995). In 1995, only Bingham Cienega and Cook's Lake were surveyed (Lesh and Corman 1995). On the public lands near Cascabel managed by the BLM, no surveys were conducted prior to 1999. One survey conducted in April 1999 resulted in no detections. Despite the survey effort, much of the habitat along the lower San Pedro, especially on private lands, has not yet been surveyed.

Habitat restoration is occurring on both public and private lands within the lower San Pedro River Basin through adjustments in livestock management practices, revegetation of the floodplain with native riparian trees, and construction of erosion control structures in the uplands. The BLM is actively pursuing a land acquisition process using Land and Water Conservation funds. Land acquisition, land exchange, and conservation easements continue to be the best habitat conservation programs along the lower San Pedro River. Despite substantial recharge from side drainages north of Cascabel, however, the growth of Sierra Vista and increasing groundwater pumping (Tellman et al. 1997) represent a threat to the riparian vegetation along the San Pedro River.

Middle Gila River

Upstream from Ashhurst-Haydn Dam to near Kelvin, the banks of the middle Gila River support regenerating cottonwoods and willows intermixed with extensive mesquite bosques. In several areas, extensive stands of tamarisk line both sides of the river, forming nearly impenetrable thickets. The middle Gila River is completely dependent on water releases from Coolidge Dam which withholds water from the San Carlos Reservoir. Land ownership patterns along this reach of the river consist primarily of private, AZ State Trust Lands and Bureau of Reclamation (BoR) lands. The BLM manages the BoR lands due to a cooperative agreement with this agency. On July 12, 1999, the entire length of the middle Gila River was designated as critical habitat for the cactus ferruginous pygmy-owl. This riparian corridor, however, has not been surveyed for cactus ferruginous pygmy-owls due to funding and personnel constraints.

Santa Cruz Watershed

The cactus ferruginous pygmy-owl was once described as a resident of the riparian habitat along Rillito Creek (Bendire 1888). However, changes in the vegetation along the Santa Cruz watershed since the turn of the century have been pronounced (see Chapter 2). The perennial reaches of the Santa Cruz once found at San Xavier and Tucson are now dry and deeply entrenched (Tellman et al. 1997). In Tucson, the banks of both the Santa Cruz and Rillito Creek are soil cemented. Perennial surface water is now found only in the upper Santa Cruz River where it receives wastewater from the Nogales treatment plant and in some of the river's tributaries (Tellman et al. 1997). The remaining floodplain riparian habitat is mostly confined to narrow, linear areas along major washes such as Cañada del Oro and Sutherland Washes near the western foothills of the Santa Catalina Mountains, and along Sabino Canyon Wash, Tanque Verde, and Rincon Creek east of Tucson (Fig. 3-1).

The Cañada del Oro Wash and connecting Sutherland Wash are large, sandy washes that flow only during heavy rainfalls. They are found in part in Santa Catalina State Park (Coronado National Forest), where they were surveyed in 1994, 1995, 1997, and 1999 at an elevation ranging from 2,640 ft (805 m) to 3,200 ft (976 m). The banks of both washes support mature riparian vegetation consisting primarily of velvet mesquite trees and desert willows (*Chilopsis linearis*). The vegetation also includes some walnut (*Juglans major*), and a few small cottonwoods. The shrub layer is composed of catclaw acacia (*Acacia greggii*), graythorn (*Ziziphus obtusifolia*) and desert broom (*Baccharis sarothroides*). In the uplands, the vegetation is dominated by saguaros (*Carnegiea gigantea*) and foothill palo verde (*Cercidium microphyllum*) but also includes ocotillo (*Fouquieria splendens*), prickly pear and cholla (*Opuntia* spp.), white bur sage (*Ambrosia dumosa*) and fairy duster (*Calliandra eriophylla*).

Sabino Creek is a perennial stream which originates on the Santa Catalina District of the Coronado National Forest. Owls were detected at the Sabino Canyon Visitor Center in the 1970s (Hunter 1988). Within the Forest's boundaries, riparian habitat along the creek is thin, yet continuous, and typically consists of ash, willow, mesquite, and cottonwood. Understory plants include hackberry. Cavities are numerous and woodpeckers are common. The area is open to the public and receives approximately one million visitors every year. Near its confluence with Tanque Verde in northeast Tucson, some of the vegetation has been cleared due to urban development. Original, unimpacted habitat along Sabino Creek and Tanque Verde consists of dense mesquite bosques with patches of large Fremont cottonwoods (Lesh and Corman 1995). Lower Sabino Creek and Tanque Verde were surveyed in 1993 and 1995. Sabino Creek was also surveyed on the Coronado National Forest in 1997.

Agua Caliente originates on the Santa Catalina District of the Coronado National Forest and runs southwest beyond the limits of the forest to its confluence with Tanque Verde in northeast Tucson. It consists of a rocky and sandy wash flanked with xeroriparian vegetation and occasional, thin patches of riparian habitat. The riparian vegetation along

Agua Caliente on the Coronado National Forest includes ash, walnut, Arizona sycamore (*Platanus wrightii*), and willow. Along the wash's lower segment, the riparian vegetation is comprised of Arizona sycamore, desert willow, eucalyptus (*Eucalyptus* spp.), and Fremont cottonwood, with mesquite bosques in some areas. Agua Caliente was surveyed in 1997.

Rincon Creek was surveyed in 1993 and 1998. Along the banks of Rincon Creek is a fairly narrow strip of riparian vegetation that consists typically of cottonwood, sycamore, velvet ash, and velvet mesquite. Downstream, these trees are replaced by mesquite groves. Land use varies from light grazing to large residential subdivisions.

Cienega Creek has perennial surface waters along a segment located in the Cienega Creek Preserve at an approximate elevation of 1,000 m (Abbate et al. 1996). Dense mesquite bosques occur locally, intermixed with Fremont cottonwood, desert willow, and other broadleaf riparian species. The creek also supports grasses, sedges, and other strictly water-dependent species. On the upper slope, the vegetation includes grasses, shrubs, and large cacti. While livestock grazing has been excluded from the preserve, trespass cattle can still be found regularly in the riparian area. Development outside is sparse. Cienega Creek was surveyed in 1996, 1997, 1998, and 1999. Cactus ferruginous pygmy-owl nest boxes were placed in this drainage in 1998, but were unused by cactus ferruginous pygmy-owls.

Arivaca Creek and its tributaries are located in the Buenos Aires National Wildlife Refuge in the Altar Valley (see Altar Valley section).

Lower Salt and Verde Rivers on Tonto National Forest

The cactus ferruginous pygmy-owl was once a common resident of the Salt River Valley (Breninger 1898). Its occurrence along the Salt River was noted until 1971 (see Chapter 2). The local decline of the owl coincided with the disappearance of the original riparian vegetation due to woodcutting and the construction of dams (see Chapter 2). Along the Verde River, there is no known record of cactus ferruginous pygmy-owls, yet their historical occurrence here is certainly possible in light of records from New River (Fisher 1893), Cave Creek (Johnson et al. unpubl. ms.), and Blue Point Cottonwoods (Johnson and Simpson 1971).

In May 1997, approximately 13,000 acres on the Tonto National Forest were surveyed for cactus ferruginous pygmy-owls, chiefly along the Salt and Verde rivers (Fig. 3-1). In 1998, 12,412 acres were surveyed by a contractor. In 1997, the survey area along the Verde River was from Horseshoe Dam to three miles below the dam, along a portion of the west bank of Bartlett Reservoir, and between Bartlett Dam and the Fort McDowell Indian Reservation. Along the Salt River, surveys were conducted between Stewart Mountain Dam and Granite Reef Dam. The confluence of the two rivers, which lies at an elevation of 1,500 ft (457 m), was also surveyed in 1993 and in 1994 (Felley and Corman 1993, Collins and Corman 1995). In 1998, riparian areas and adjacent uplands were surveyed along the Verde and Salt rivers, Sycamore Canyon just upstream from Horseshoe Dam, Cave Creek, and New River. However, the topography of the latter two areas surveyed (i.e., steep canyons) suggests that the historical records from Cave Creek and New River (Fisher 1893, Johnson et al. unpubl. ms.) did not originate from within the Forest boundaries. Additional areas surveyed in 1998 included the Bulldog Canyon-Usery Pass area and Hog Canyon.

Along the Salt and Verde rivers, the vegetation is in places characterized by mesquite bosques and small patches of cottonwood-willow and sycamore. The banks of the Verde River have several marshes with cattails (*Typha domingensis*). Tamarisk dominates an area near Granite Reef Dam. The mesquite bosques lack an understory and are largely degraded by off-highway vehicle use. Riparian vegetation is flanked by Sonoran desertscrub consisting predominantly of scattered mesquite and palo verde, with associations of triangle-leaf bur sage (*Ambrosia deltoidea*), cholla cactus, prickly pear, saguaro, creosote bush (*Larrea tridentata*), and occasional ironwood (*Olneya tesota*). This habitat is mostly open, with scattered patches of dense vegetation, and little vertical structural diversity. Near the confluence of the Salt and Verde rivers, the Salt River Recreation Area includes a picnic area, nature trails, and a large parking lot. Livestock grazing has been banned from the Tonto National Forest but still occurs on the Fort McDowell Indian Reservation along the Verde River and a section of the northern bank of the Salt River. According to Johnson and Haight (1998), habitat suitability in survey areas along the Verde River seems comparable to that along the Salt River.

Blue Point Cottonwoods (see Chapter 2) was described between 1969 and the early 1980s as one of the last remnants of the original floodplain landscapes in the Salt River Valley. The area was last surveyed in 1998. It consists of a marsh of open water lined with large stands of cottonwoods and a mesquite understory. The marsh is typically dry during the winter when water is held upstream. Trespass grazing represents the primary threat to the habitat.

Sycamore Canyon in the Atascosa/Pajarito Mountains

Sycamore Canyon, located in the Nogales District of the Coronado National Forest, was surveyed in 1994 and 1997. With intermittent surface waters,

it supports lowland riparian vegetation consisting primarily of Arizona sycamore, velvet ash, willow, walnut, and seepwillow (*Baccharis salicifolia*). Saguaros, junipers (*Juniperus* spp.), and oaks (*Quercus* spp.) occur on the slope of the canyon. Mesquite grows at the edges of the main drainage at the mouth of the canyon. The habitat supports a substantial number of woodpeckers while sycamores and saguaros provide many cavities.

Northwest Tucson and Southern Pinal County

This area is bounded on the south by Cortaro Farms Road, on the east by the Catalina Mountains and State Highway 79, on the west by I-10 and on the north by Florence and Coolidge (Fig. 3-1). It is a region of diverse desert scrub of varying quality. This area has been the most intensively surveyed area for cactus ferruginous pygmy-owl in the state. Surveys have been conducted formally since 1993 and have continued through 1999 (Table 3-4). The area contains most of the cactus ferruginous pygmy-owls detected since 1993. It contains a mixture of private, state, and BLM lands. Residential occupancy ranges from scattered ranches on hundreds of acres to densities as high as six residences per acre. Livestock grazing and recreational use occur throughout the area. There are large areas of natural desert characterized as Sonoran desertscrub. Density and diversity of vegetation are highest to the south. To the north, the vegetation becomes progressively more open and less diverse. Mesquite and foothill palo verde are dominant species. Saguaros and ironwoods are common and can become dominant in some localities, but are completely absent in others. The understory consists of a variety of cholla, prickly pear, hedgehog (*Echinocereus* spp.) and fishhook barrel cacti (*Ferocactus* spp.). Triangle-leaf bursage is the dominant understory shrub, but creosote and burroweed (*Isocoma tenuisecta*) are common. Desert hackberry (*Celtis pallida*), acacia species and desert willow increase along the numerous dry washes found in the region. Much of the survey work and most of the cactus ferruginous pygmy-owl detections have occurred in the bajadas of the Tortolita Mountains. Elevation ranges from 2,100 ft (640 m) to near 3,000 ft (915 m) in the areas surveyed. This site occurs in one of the fastest developing areas of the state with continued fragmentation and loss of habitat likely.

Silverbell and Tucson Mountains

The Silverbell and Tucson Mountains are located on the western edge of the Tucson Basin (Fig. 3-1). The area is characterized by the occurrence of potentially suitable desertscrub that has been surveyed for cactus ferruginous pygmy-owls in a relatively intense manner by both agency personnel and private consultants. Surveys have been conducted from 1995 through 1999. One owl was located in 1998 in the Tucson Mountains. Recreational, residential, mineral and agricultural uses all occur in the area. The density and diversity of the desertscrub vegetation vary across this region but are typical of the upper Sonoran desertscrub vegetation classification. Saguaros are common with velvet mesquite, foothill paloverde and ironwood making up the dominant tree species. A shrub species which is common in this area, but not as common in northwest Tucson, is jojoba (*Simmondsia chinensis*). The most common shrubs and cacti are the triangle-leaf bursage, creosote, acacia, prickly pear, cholla, and barrel cactus. Desert hackberry is common along the washes. Elevation ranges from 610 m to 915 m in areas surveyed. Because both county and national parks occur in this area, there is some level of habitat protection for a rather large area. However, much of the area is still subject to development and other potential impacts.

Organ Pipe Cactus National Monument

Cactus ferruginous pygmy-owls have been documented here since the late 1940s (Hensley 1954). Periodic surveys for cactus ferruginous pygmy-owls have likely occurred on the Monument since that time. More recently, annual surveys have been conducted since 1993 (Table 3-4). Owls have been detected every year since then, except 1994, and nesting was documented in 1998 and 1999. The surveyed areas are typical desertscrub in the drainages and bajadas of nearby mountain ranges. While overall precipitation is less than that of northwest Tucson and the Tucson/Silverbell Mountain areas, it is still characterized by many of the same species such as saguaro, ironwood, foothill paloverde, velvet mesquite, triangle-leaf bursage, creosote, prickly pear, and cholla. Livestock grazing no longer occurs on the Monument and recreation is the primary human activity for the area.

Tohono O'odham Reservation

Agencies and contractors have not generally been allowed on the Reservation to conduct surveys. However, some surveys have been conducted since 1997 to clear various planned and occurring projects on the Reservation. Breeding Bird Atlas surveyors have been conducting Atlas activities on the Reservation and have detected a number of cactus ferruginous pygmy-owls. The Reservation is a large block of relatively undisturbed desertscrub which is located between the two major areas where cactus ferruginous pygmy-owls have been found recently, Organ Pipe Cactus National

Monument and the Tucson Basin. Based on its proximity and the fact that cactus ferruginous pygmy-owls were detected in 1997 and 1998 (Johnson et al. unpubl. ms.), the Reservation represents a key habitat area that must be considered in the status of the cactus ferruginous pygmy-owl population in Arizona.

Altar Valley

The Altar Valley runs south from State Highway 86 to the Mexican border. It is bounded on the west by the Baboquivari Mountains and on the east by the Sierrita, Cerro Colorado and Las Guijas mountains (Fig. 3-1). The Buenos Aires National Wildlife Refuge is included in the Altar Valley and extends south to the Mexican border. It was surveyed in 1995, 1998, and 1999 (Table 3-4). The rest of the Altar Valley area was primarily surveyed only during 1998 and 1999. Owls have been detected throughout the area, the majority of which are occurring in desertscrub or desertscrub/desert grassland transition areas. Owls have also been detected in riparian habitat along Arivaca Creek and its tributaries.

The desertscrub habitat in the Altar Valley is less dense and less diverse than those previously described. There are far fewer saguaros and the tree species are primarily velvet mesquite and foothill paloverde. Existing desert grassland is characterized by scattered mesquites and Lehmann's lovegrass (*Eragrostis lehmanniana*). Most owls detected to date were found along washes lined with well-structured xeroriparian vegetation. In comparison with the uplands, vegetation diversity and density along washes with pygmy-owls are enhanced. Elevations are higher here, with owls being found right at 4,000 ft (1,220 m).

Arivaca Creek and Brown Canyon on Buenos Aires National Wildlife Refuge were surveyed in 1995 and at an elevation of 3,080 ft (939 m) to 3,980 ft (1,213 m) (Lesh and Corman 1995). Arivaca Creek and San Luis Wash were surveyed in 1998 and 1999. Along Arivaca Creek, the riparian vegetation is dominated by cottonwoods, netleaf hackberry, Arizona ash, and velvet mesquite. Vegetation in the San Luis tributary is similar, but less dense. In a few areas, mesquite form large bosques. Brown Canyon, to the north of Arivaca Creek, is lined with large Arizona sycamores, velvet mesquite, Emory oaks (*Quercus emoryi*), netleaf hackberry, and catclaw acacia. Owls were detected during surveys along Arivaca Creek in 1998, and along San Luis Wash in 1998 and 1999 (Table 3-4).

Livestock grazing and recreation are the primary human impacts, although residential development is increasing. Based on the number of owls found here in 1998 and 1999, additional survey work should be focused in this area.

5. Habitat Assessment

While we can describe, in general terms, the habitat in areas where cactus ferruginous pygmy-owls have been found in Arizona, we lack the numbers of owls and the research necessary to determine specific habitat needs. In addition, the range of vegetation types and diversity of areas where cactus ferruginous pygmy-owls are found in Arizona have made it difficult to identify what specific habitat characteristics these owls are selecting. In an effort to identify and prioritize areas for survey and management, the BLM and U.S. Forest Service, with input from the AGFD and USFWS, have developed habitat assessment protocols (see Appendix 3-2). These protocols were developed to rapidly assess habitat areas without having to conduct time-consuming, detailed habitat sampling. This type of assessment is an iterative process. Adjustments are being made based on new information gathered during ongoing research and also to address local differences in vegetative communities. Habitat assessment protocols will likely change in the future based on location and purpose, but are useful for agencies and others who need some type of quantitative assessment of cactus ferruginous pygmy-owl habitat.

5. Recommendations

Given the endangered status of the cactus ferruginous pygmy-owl and the associated regulatory requirements, as well as the urgent need to gain a better understanding of this owl's biology, survey efforts will likely continue to intensify. As a result, we will, hopefully, gain a better idea of the numbers and distribution of cactus ferruginous pygmy-owls in Arizona. Below are recommendations for future cactus ferruginous pygmy-owl survey efforts and habitat assessments:

- Ensure that all surveyors utilize the most recent approved protocol to maintain consistency and comparability of survey results. As mentioned above, a revised protocol is now being considered for release by the USFWS.
- Continue to update the survey protocol periodically with improved information on the ecology of cactus ferruginous pygmy-owls as it becomes available.
- Centralize all completed survey information from all sources, i.e., agencies, consultants, researchers, etc. Because the information is not centralized and difficult to find, it is currently not easy to assess survey coverage or intensity statewide.
- Survey potentially suitable habitat in areas around and between sites recently occupied by cactus ferruginous pygmy-owls. Some high

priority areas are northern Pima County and southern Pinal County in the Tucson Basin, the Tucson, Silverbell and Roskruge Mountain areas, the middle Gila River, the Altar Valley, BLM lands north of Organ Pipe Cactus National Monument, and the Tohono O'odham reservation.

- Conduct surveys in all suitable remaining riparian habitats in southern and central Arizona. Areas of specific potential include the Lower San Pedro River, the Gila River, the Salt River, the Verde River, Arivaca Creek, and the Santa Cruz River between Rio Rico and Amado.
- Conduct surveys (if proper vegetative components are present) within the range of potential housing development patterns (i.e., from very low density development up to high density development, in cluster and sprawl developments). Survey sites with other types and levels of human activities (recreation, livestock grazing, mining, etc.) to help clarify the levels and design of human activities tolerated by cactus ferruginous pygmy-owls.
- Continue to refine existing rapid habitat assessment protocols based on results of ongoing research.
- Conduct studies on habitat selection and use on a variety of scales.
- Investigate additional funding sources (agency, grants, foundations, etc.) to increase survey and habitat research efforts.
- Utilize telemetry to help document habitat use, dispersal parameters, broadcast responsiveness, home range size, etc. These contribute directly to developing better survey protocols and habitat assessment methodologies.

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Appendix 3-1: Proposed revised cactus ferruginous pygmy-owl survey protocols, with introduction and summary of changes since 1993. Please note that a survey protocol has been proposed for project clearance, another for large area search. The proposed protocols were developed by the Arizona Game and Fish Department (AGFD) and the U.S. Fish and Wildlife Service (USFWS).

3-1-1 Introduction and purpose of the protocols

Any survey protocol for this species must address two distinct needs. The first is the need to determine if cactus ferruginous pygmy-owls are present on those sites where an activity is proposed that would result in loss, modification, or disturbance of pygmy-owls or their habitat. The second is the need to survey the vast acreage of potential pygmy-owl habitat to gather information on distribution, occurrence, and numbers of pygmy-owls in Arizona.

A single protocol cannot address these two needs because of funding and personnel constraints, the potential ramifications if pygmy-owls are missed on project sites, and the area that can be covered by a surveyor. Therefore, we have included a separate protocol to address each need. The first is a conservative protocol developed to answer, with some degree of confidence, whether cactus ferruginous pygmy-owls occupy a project site where an impacting activity has been proposed. In Arizona, we know of so few individual pygmy-owls, that it is essential to locate and address potential impacts to any pygmy-owls that may occur on project sites.

The second protocol is to be used by researchers, land managers, and others to survey large areas of unsurveyed habitat. It is designed to allow a greater area to be surveyed with more effective use of limited manpower and funds. This will help us increase the area surveyed in order to answer key questions regarding distribution and occurrence of known and unknown cactus ferruginous pygmy-owl population centers in Arizona.

Issuance of permits by USFWS to survey for cactus ferruginous pygmy-owls is tied to appropriate use of these two protocols. Permits will be used only after attendance at a training session approved by AGFD and USFWS where the circumstances under which these protocols can be applied will be discussed.

3-1-2 Project clearance protocol

1. Permission to access a property for surveying must be obtained from all private property owners or those having management authority (public lands) prior to conducting surveys.
2. Surveys must be conducted in potential habitat from 1 hour before sunrise to 2 hours after sunrise, or from 2 hours before sunset to 1 hour after sunset, during the period of January through June. Recent data suggest peak calling activity occurs from February through April.
3. Sites must be surveyed for two consecutive years during the above protocol period. Each year, survey routes must be surveyed a minimum of 3 times, with no less than 15 days between surveys. One survey must be conducted between February 15 and April 15. These time frames are necessary to account for variations in annual weather patterns and the responsiveness of individual pygmy-owls. Surveys should not be conducted if wind or other factors reduce the detectability of calls.
4. Any acreage subjected to surface disturbance (including vegetation removal or disturbance) must have been surveyed for presence of pygmy-owls within the calendar year in which surface disturbance occurs. These surveys must have been conducted in suitable pygmy-owl habitat within 1500 ft of the acreage being disturbed.
5. Call points along a survey route in urban areas, sites with high noise disturbance (such as along roads or highways), or in riparian areas (due to tree density and noise) must be no more than 150 meters apart. In more remote areas that do not have the above types of disturbance, the distance between call points may be extended up to 400 meters, so long as complete coverage is maintained. Distance between survey transects must be no more than twice the distance between call points.
6. Conduct a 1-minute listening period at each call point prior to broadcasting any calls. This will allow the surveyor to detect any spontaneous calling and also to become familiar with features at the call point, such as large trees or saguaros, residences, water sources, etc., that may affect pygmy-owl presence or observation.
7. Following the initial listening period, broadcast calls for 30 seconds and follow this with a 90 second listening and observation period. Broadcast the call in all directions. Set the volume at an adequate level to get complete coverage along a survey route without causing distortion of the

call. Equipment used must be able to produce a minimum of 100 dB at 1 m from the speaker without distortion.

8. Repeat the calling/listening sequence for at least 10 minutes. Extend this sequence if disturbances such as dogs, air traffic or vehicles disrupt your call point.
9. Observe and listen for an additional 2-3 minutes before proceeding to the next call point.
10. If a cactus ferruginous pygmy-owl is heard or seen:

    a) End broadcasts unless additional responses are needed to pinpoint the location.
    b) Observe the pygmy-owl as long as possible without disturbing it (i.e. do not chase the bird or harass it with calls). Record all observations, use of cavities and prey observations are especially important. Listen for female or fledgling vocalizations or other evidence that there may be other pygmy-owls in the area.
    c) Flag the location of the bird, or your best estimate of where the bird was, with surveyor's tape and record the location on a map (tape will be removed when follow-up visits are completed).
    d) Record the date, time, type and duration of response (aural or visual), habitat characteristics of the site, and detailed directions to the site.

11. Complete the attached survey data forms for each route each time it is surveyed. Be sure to record survey date, time, weather conditions, moon phase, and responses of other birds. If a cactus ferruginous pygmy-owl is located, please fill out a detection form.
12. If an owl is located, fax a copy of your detection form and map to AGFD and USFWS within 24 hours of the detection. No later than 10 days after the completion of the 3rd survey, return all survey forms and detection forms to AGFD and USFWS:

    Arizona Game and Fish Department
    Nongame Branch
    2221 West Greenway Road
    Phoenix, Arizona 85023-4399
    (602) 789-3500 Fax (602) 789-3926

    United States Fish and Wildlife Service
    Arizona Ecological Services Field Office
    2321 W. Royal Palm Road, Suite 103
    Phoenix, Arizona 85021-4951
    (602) 640-2720 Fax (602) 640-2730

It is important that we receive all completed data forms, whether a pygmy-owl is detected or not. AGFD and USFWS will respect the rights of private property owners throughout implementation of this protocol.

3-1-3 Large area search survey protocol

1. Permission to access a property for surveying must be obtained from all private property owners or those having management authority (public lands) prior to conducting surveys.
2. Surveys must be conducted in potential habitat from 1 hour before sunrise to 2 hours after sunrise, or from 2 hours before sunset to 1 hour after sunset, during the period of January through June. Recent data suggest peak calling activity occurs from February through April; therefore, surveys should be conducted during this period if possible.
3. Sites should be surveyed for two consecutive years during the above protocol period. Each year, survey routes must be surveyed a minimum of 3 times, with no less than 15 days between surveys. One survey must be conducted between February 15 and April 15. These time frames are necessary to account for variations in annual weather patterns and the responsiveness of individual pygmy-owls. Surveys should not be conducted if wind or other weather factors reduce detectability of calls.
4. Call points along the survey transect must be spaced at no more than 480 meters (0.3 miles), unless a bionic ear or other listening-enhancement device is used, in which case distance between call points may be extended to 800 meters (0.5 mile). Call points in riparian areas must be no more than 150 m apart due to tree density and noise. Distance between survey transects should be no more than twice the distance between call points.
5. Conduct a one minute listening period at each call point prior to broadcasting any calls. This will allow the surveyor to detect any spontaneous calling and also to become familiar with features at the call point such as large trees or saguaros, residences, water sources, etc., that may affect pygmy-owl presence or observation.
6. Following the initial listening period, broadcast calls for 30 seconds and follow this with a 90 second listening and observation period. Broadcast the call in all directions. Set the volume at an adequate level to get complete coverage along a survey route without causing distortion of the call. Equipment must be able to produce a minimum of 100 dB at 1 m from the speaker without distortion.

7. Repeat the calling/listening sequence for at least 6 minutes. Extend this sequence if disturbances such as animals, air traffic, or other noises disrupt your ability to hear responses.
8. Observe and listen for an additional 2-3 minutes before proceeding to the next call point.
9. If a cactus ferruginous pygmy-owl is heard or seen:

    a) End broadcast unless additional responses are needed to pinpoint the location.
    b) Observe the pygmy-owl as long as possible without disturbing it (i.e. do not chase the bird or harass it with calls). Record all observations, use of cavities and prey are especially important. Listen for female or fledgling vocalizations or other evidence that there may be other pygmy-owls in the area.
    c) Flag the location of the bird, or your best estimate of where the bird was, with surveyors tape and record the location on a map (tape will be removed when follow-up visits are completed).
    d) Record the date, time, type and duration of response (aural or visual), habitat characteristics of the site and detailed directions to the site.

10. Complete the attached survey data forms for each route each time it is surveyed. Be sure to record survey date, time, weather conditions, moon phase, and responses of other birds. If a cactus ferruginous pygmy-owl is located, please also fill out a detection form.
11. If an owl is located, fax a copy of your detection form and map to AGFD and USFWS within 24 hours of detection. No later than 10 days after completion of the 3d survey, return all survey forms and detection forms to AGFD and USFWS:

    Arizona Game and Fish Department
    Nongame Branch
    2221 West Greenway Road
    Phoenix, Arizona 85023-4399
    (602) 789-3500 Fax (602) 789-3926

    United States Fish and Wildlife Service
    Arizona Ecological Services Field Office
    2321 W. Royal Palm Road, Suite 103
    Phoenix, Arizona 85021-4951
    (602) 640-2720 Fax (602) 640-2730

It is important that we receive all completed data forms, whether a pygmy-owl is detected or not. AGFD and USFWS will respect the rights of private property owners throughout implementation of this protocol.

3-1-4 Summary of changes from 1993 cactus ferruginous pygmy-owl survey protocol.

1993 Protocol	Proposed protocol	Reasons for proposed changes
Call point intervals of 100-150 yards.	Call point intervals for clearance protocol 150-400 meters. Call point interval for large area search protocol 480-800 meters.	Closer call points to increase chance of detection in areas with noise disturbance. Greater call point intervals to cover larger areas in a timely fashion. Distances based on surveyor's ability to detect a pygmy-owl, not on a pygmy-owl's ability to hear call.
Calling and listening period of 6-8 minutes at each calling point.	Calling and listening period 11-12 minutes at each call point.	Field observations on this and other owls indicate longer calling and listening periods can increase detections.
Survey period September to April.	Survey period January through June, with peak from February through April.	Seasonal monitoring and survey efforts show regular, consistent calling during this time period. Fall calling is inconsistent and generally not in response to survey tapes.
Survey frequency is one survey, one year.	Survey frequency is three surveys separated by at least 15 days with one survey between February 15 and April 15.	Field observation of seasonal and individual variation in responsiveness.
No requirement for resurvey if certain time period lapses.	Acreage to be disturbed must be surveyed within the same calendar year as the disturbance; surveys must be conducted in suitable habitat within 1500 ft of the site being disturbed.	Our data indicate increased use area post-dispersal, and dispersing juveniles, as well as adults, can cause an area to be occupied one year that wasn't the previous year.

Appendix 3-2: Cactus ferruginous pygmy-owl habitat assessment protocol (key and data collection forms) used by the Bureau of Land Management in desertscrub. A similar protocol is used by the Coronado National Forest. The habitat photo guide is not included. Text in italics is added for clarity.

3-2-1 Key

VEGETATION CHARACTERISTICS

1) Is non-native woody vegetation present within the ¼ section? **Y** (yes) or **N** (no).

2) Are saguaros or trees >6" dbh with cavities present within the ¼ section? Enter the score based upon total estimated number of suitable nesting trees **PER ACRE** within the ¼ section:

Score	# per acre
0	0 (Not suitable)
1	1-5 (Poor)
2	6+ (Moderate to Good)

3) Is there a moderate to high level of woody or perennial vegetation <18" tall present within the ¼ section? (see PHOTO GUIDE for reference only)

Score
0 (No)
1 (Yes)

4) Estimate the total number of woody **SPECIES** 18" - 6' tall within the ¼ section (diversity index) (See back of data collection form—*list of vegetative species below*)

Score	# spp. w/i ¼ section
0	<5 spp.
1	5-10 spp.
2	11-15 spp.
3	>15 spp.

5) Estimate the total number of canopy **SPECIES** >6' tall within the ¼ section (see back of data collection form) **Note: do not include saguaros:**

Score	# species w/i ¼ section
0	0 (no species)
1	1-4 spp.
2	>4 spp.

6) Does the vegetation structure appear to be **relatively equally distributed** between the understory (<18"), shrub (18"-6'), and canopy (>6')layers? (i.e., is there a significant proportion of vegetative biomass in each of these 3 categories, and how are they distributed relative to each other?):

Score	Description
1	Midstory shrubs are present in low density, with understory **and** canopy layers lacking in proportion to the others
2	Midstory shrub layer well developed but lacking in **either** an overstory or understory components in proportion to the others
3	All three layers well represented

7) Utilizing the **HABITAT PHOTO GUIDE**, identify the photo set that best represents the appearance of the vegetated landscape in the ¼ section.

Score	Vegetative Density
1	Low vegetative density
3	Moderate vegetative density
5	High vegetative density

These first 7 habitat questions have been identified as the most critical factors for CFPO occupancy. Therefore, the RAW SCORES of these 7 habitat components on the data form will be totalled and then multiplied by two to achieve the FACTORED SCORE. A factored score of 15+ indicates that these habitats have some characteristics of potential CFPO habitat that MAY warrant further investigation, while a habitat score below 15 indicates low quality habitat which exhibits few characteristics of potential CFPO habitat.

OTHER HABITAT FEATURES

8) Is there any development or surface disturbance (not including livestock grazing) present within the ¼ section? (Y/N)

9) Roads within and bordering the ¼ section are:

Score	Type of Road
0	Paved
1	Graded and improved
2	No roads or dirt two-track

10) If development is present within the ¼ section, which of the following categories best describes the dominant type of land use?

Score	Description
0	Commercial/Industrial and/or >1 residence per acre
1	One residence per acre
2	One residence per 3 or more acres and/or undisturbed or essentially undisturbed open space

11) Estimate the total % of the ¼ section that is developed, altered, or has some degree of ground disturbance.

Score	% "disturbed"
0	>50% disturbed
1	25-50% disturbance
2	0-25% disturbance

12) Is there a source of free-standing perennial water present and available?

Score	
0	Not present
1	Present and available

3-2-2 Data collection form

Personnel:_____ Survey Dates: _____

_____

Quad Name (7.5 min): _____ _____

_____

Legal Description: T ____ R _____Section _____ UTM _____

Allotment Name: _____

FOR EACH ¼ SECTION, PLEASE ANSWER THE FOLLOWING USING THE HABITAT ASSESSMENT FORM KEY PROVIDED:

VEGETATION CHARACTERISTICS	NE/4	NW/4	SE/4	SW/4
1) Non-native woody vegetation?(Y/N)				
2) Suitable nesting structure				
3) Vegetation <18" present				
4) # woody species present				
5) # canopy spp. >6' tall				
6) Vegetative structure/distribution				
7) Photo guide score				
TOTALS (raw score/factored score)	/	/	/	/

HABITAT FRAGMENTATION/WATER	NE/4	NW/4	SE/4	SW/4
8) Development? (Y/N) (see below)				
9) Presence of roads				
10) Dominant type of land use				
11) % of ¼ section developed				
12) Presence of water				
TOTALS				

GRAND TOTALS				

8) If development is present w/i this ¼ section, describe: _____

_____

13) Describe any impacts that livestock grazing may have within this section: _____

_____

CHECK (√) IF VEGETATIVE SPECIES IS PRESENT ON ¼ SECTION

SHRUB SPECIES PRESENT (<6')	**NE/4**	**NW/4**	**SE/4**	**SW/4**
Agave (*Agave* spp.)	___	___	___	___
Barrel cactus (*Ferocactus*)	___	___	___	___
Brittle bush (*Encelia farinosa*)	___	___	___	___
Buckwheat (*Eriogonum* spp.)	___	___	___	___
Burro bush/Cheeseweed (*Hymenoclea* spp.)	___	___	___	___
Canyon ragweed (*Ambrosia*)	___	___	___	___
Catclaw acacia (*Acacia greggii*)	___	___	___	___
Cholla (*Opuntia* spp.)	___	___	___	___
Chuparosa (*Anisacanthus thurberi*)	___	___	___	___
Creosote (*Larrea tridentata*)	___	___	___	___
Desert broom (*Baccharis sarothroides*)	___	___	___	___
Desert lavendar (*Hyptis emoryii*)	___	___	___	___
Greythorn (*Condalia* spp.)	___	___	___	___
Hackberry (*Celtis reticulata*)	___	___	___	___
Hopbush (*Dodonaea viscosa*)	___	___	___	___
Jojoba (*Simmondsia chinensis*)	___	___	___	___
Jumping bean (*Sapium biuncifera*)	___	___	___	___
Mesquite (*Prosopis* spp.)	___	___	___	___
Mormon tea (*Ephedra* spp.)	___	___	___	___
Ocotillo (*Fouquieria splendens*)	___	___	___	___
Palo verde (*Cercidium* spp.)	___	___	___	___
Prickly pear (*Opuntia* spp.)	___	___	___	___
Range ratany (*Krameria* spp.)	___	___	___	___
Saguaro (*Carnegiea gigantea*)	___	___	___	___
Saltbush (*Atriplex* spp.)	___	___	___	___
Triangle-leaf bursage (*A.tridentata*)	___	___	___	___
White bursage (*Ambrosia dumosa*)	___	___	___	___
Whitethorn acacia (*Acacia constricta*)	___	___	___	___
Wolfberry (*Lycium* spp.)	___	___	___	___
Yucca (*Yucca* spp.)	___	___	___	___
_____	___	___	___	___
_____	___	___	___	___
_____	___	___	___	___

CANOPY SPECIES PRESENT (>6')				
Catclaw acacia (*Acacia greggii*)	___	___	___	___
Cholla (*Opuntia* spp.)	___	___	___	___
Creosote (*Larrea tridentata*)	___	___	___	___
Cruxifixion thorn (*Canotia holocantha*)	___	___	___	___
Desert willow (*Chilopsis linearis*)	___	___	___	___
Graythorn (*Condalia* spp.)	___	___	___	___
Hackberry (*Celtis* spp.)	___	___	___	___
Ironwood (*Olneya tesota*)	___	___	___	___
Mesquite (*Prosopis* spp.)	___	___	___	___
Ocotillo (*Fouquieria splendens*)	___	___	___	___
Palo verde (*Cercidium* spp.)	___	___	___	___
Saguaro (*Carnegiea gigantea*)	___	___	___	___
Salt cedar (*Tamarix* spp.)	___	___	___	___
Whitethorn acacia (*Acacia constricta*)	___	___	___	___
_____	___	___	___	___
_____	___	___	___	___
_____	___	___	___	___