CACTUS FERRUGINOUS PYGMY-OWL AND NONGAME BIRD SURVEYS ON THE CABEZA PRIETA NATIONAL WILDLIFE REFUGE, 2001

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INTRODUCTION

Cactus ferruginous pygmy-owls (*Glaucidium brasilianum cactorum*, hereafter "pygmy-owl") are the northernmost subspecies of *G. brasilianum* and have occurred from lowland central Arizona and southern Texas south to Michoacan, Nuevo Leon, and Tamaulipas, Mexico (Johnsgard, 1988; USFWS, 1997). Historically, pygmy-owls were described as "quite common," "not uncommon," and "fairly numerous" in cottonwood (*Populus fremontii*) forests, mesquite (*Prosopis* sp.) - cottonwood woodlands, and mesquite bosques along the Salt, Verde, Gila, and Santa Cruz rivers of Arizona (Bendire, 1888; Fisher, 1893; Breninger, 1898; Gilman, 1909; Swarth, 1914). Historical records in desertscrub and xeroriparian vegetation exist (Phillips et. al, 1964; Brandt, 1951) but occurrence in these vegetation communities was thought to be less common and predictable (Johnson and Haight, 1985; USFWS, 1997). This pattern was likely a failure of early naturalists' to search upland areas adequately and/or because of lower densities. Currently, pygmy-owls are not uncommon in semidesert grasslands and desertscrub vegetation with saguaros in neighboring Sonora, Mexico (Flesch and Steidl, in preparation).

In Arizona, pygmy-owls are federally listed as endangered and have declined to near extirpation (Monson and Phillips, 1981; Millsap and Johnson, 1988; USFWS, 1997), with fewer than 20 confirmed records between 1971 and 1988 (Hunter, 1988). Extensive surveys from 1993 to 1995 resulted in only 7 detections at 5 locations (Lesh and Corman, 1995). More recently in 1999, increased survey effort in Arizona has produced detections at up to 21 sites (Flesch, 1999; Abbate et al., 2000) and 13 documented nests in 2001 (S. Richardson, AZ Game and Fish Dept., personal communication). Despite increased numbers in recent years, no pygmy-owls have been detected west of Organ Pipe Cactus National Monument since 1955 (Monson and Phillips, 1981). The goals of this program were to determine the distribution pygmy-owls on Cabeza Prieta National Wildlife Refuge (CPNWR), describe vegetation in survey and occupied areas, and list all other species of birds detected on the refuge.

METHODS

Study area and site selection: Within CPNWR, we concentrated efforts within 10 km of a road where we believed pygmy-owls were most likely to be detected. In neighboring northwestern Sonora, we have found higher densities of pygmy-owls in vegetation types with affinities to the Arizona Upland Subdivision of the Sonoran Desert (Turner and Brown, 1982) and in upper bajada and valley bottom

topographic formations (Flesch and Steidl, in preparation). We prioritized areas on the basis of both major vegetation type and topographic formations. We specifically targeted upper bajadas with a combination of saguaros (*Carnegiea gigantea*) and arborescent desertscrub of desert ironwood (*Olneya tesota*) and mesquite (*Prosopis velutina*).

Owl survey techniques: We used recorded, conspecific territorial calls to elicit responses from pygmy-owls. We used the large area search (research) survey protocol recommended by the USFWS Arizona Ecological Services Field Office (USFWS, 2000). We surveyed during evenings (1 hour before and 1 hour after sunset) early mornings (1 hour before and 2 hours after sunrise), and nights (full moon +/- 2 days). At each station, we listened for spontaneous, unsolicited calling for 2 minutes prior to broadcasting. We then used alternating 30 and 90 second broadcasting and listening/observing periods for at least 8 minutes followed by a 1 minute listening/observing period. We spent a minimum of 11 minutes at each station except when a pygmy-owl was detected. All transects were surveyed once except the area around Charlie Bell Well which was surveyed twice.

We placed stations in wash channels a minimum of 400 - 500 m apart. When an owl was detected, we generally located the next station 600 m from the previous to reduce the probability of detecting the same bird more than once. We stopped broadcasts following detections but remained at or near stations for several minutes to refine locations. We mapped all stations on USGS 7.5" topographic maps, recorded start and end UTM coordinates and elevations, and estimated wind speed (Beaufort scale), percent cloud cover, and temperature. For each owl, we estimated distance to initial point of detection, compass direction, sex (based on vocalization), vegetation type (upland, riparian, or undetermined), the station closest to the detection point, and whether initial detection was aural or visual. We also recorded the elevation, UTM coordinates, and time until detection for each pygmy-owl. We used simultaneous detection, distance, and direction to differentiate among multiple owls and to estimate numbers. We did not survey during rain or when wind speed consistently exceeded approximately 20 kph. We worked under Federal Fish and Wildlife Permit #TE027485-0 (to Aaron Flesch), the Regional Director's Blanket Subpermit #TE676811-1 (all other surveyors), and Special Use Permit #00-0103.

Nongame bird surveys and response: We recorded all other species of birds detected at and between survey routes in conjunction with pygmy-owl surveys. Identifications were made aurally and visually throughout the morning, evening, and night. We listed all species for each survey area and divided species into 2 groups, possible breeders or migrants/winter residents. We also recorded species of birds that were agitated in response to the broadcast pygmy-owl calls.

Habitat sampling: We measured vegetation and environmental characteristics along survey transects at macrohabitat and landscape scales using rapid assessment techniques. Major vegetation communities were classified using definitions in the literature and transitional areas between types were noted (Shreve, 1951; Brown and Lowe, 1980; Brown, 1982). Topographic formations were defined as follows: valley bottoms were the lowest major primary drainages in a landscape, flats-lower bajadas included lowlands below or within the lower half of outwash plains, upper bajadas are in the upper half of a ranges' outwash plain and contact mountains at the upper end, and mountains were rocky upland areas with drainages often forming canyons.

At each calling station we measured canopy height, noted dominant plants and understory/shrubs, recorded presence of vegetation formations, and estimated vegetation volume. The dominant 2 or 3 woody or succulent canopy and understory plants were determined on the basis of both density and height. We listed vegetation formations (bosque, desertscrub, thornscrub, riparian scrub, gallery woodland, savannah, grassland, agriculture, and cienega) in order of cover at each station. We estimated average and maximum canopy height to the nearest meter and considered columnar cacti only when dominant. We estimated vegetation volume in 5 height strata (0-1 m, 1-3 m, 3-6 m, 6-12 m, and 12+m) to the nearest 10% when values were between 20 and 80% and to the nearest 5% otherwise. We measured vegetation in the riparian area and both sides of uplands at each station. We considered vegetation visible within 400 m of wash channels in all measurements.

We used rangefinders to measure the width of the riparian vegetation association on both sides of washes. We recorded presence or absence of water, directional orientation, and the width of unvegetated wash channels at all stations by using a rangefinder and compass. With USGS 1:24,000 topographic maps, we counted the number of washes within 1 km of transects. We recorded distance to the nearest saguaro with cavity potential (>3 m tall and 20 cm diameter) at each station in 4, 90° quarters determined by a perpendicular line across washes. Similarly, we recorded trees with cavity potential (>6 m tall and 30 cm diameter) and measured their height. Vegetation was also measured at points were owls were detected but were not completed along all transects.

RESULTS

Owl surveys: Between March 6 and March 10, 2001 we surveyed 196 stations along 24 transects totaling 73,630 m (Table 1). Average transect length was 3,068 m (SE = 169.1 m, range 1,210 – 5,610 m). Mean

number of stations per transect was 8.2 (SE = 0.46, range 4 - 16) and mean distance between stations was 433 m (SE = 7.8). Fifty-four percent of routes were surveyed during mornings with the remainder surveyed during evenings/nights. Four surveys were aborted or repeated due to wind and rain.

Survey effort was divided among valley bottoms (37,830 m), upper bajadas (33,800 m), and canyons (2,000 m). We surveyed portions of 10 different USGS 7.5" topographic maps (Table 1 & Maps 1 – 13). Survey areas included portions of Growler and San Cristobal Washes, the Charlie Bell Well area, a 16 km section of Daniels Arroyo, Davidson Canyon, Deer Hollow Wash, a 9 km section of the Camino del Diablo west of Papago Mountain, and several washes around Papago Well. Mean elevation for all surveys was 322 m (SE = 11.0) and ranged from 120 to 495 m above sea level. All transects were surveyed once except for the Charlie Bell Well area which was surveyed twice.

We detected 2 male pygmy-owls on the evening of March 8, 2001 near Papago Well. The owls were detected 2.2 km apart and heard simultaneously from station 6. The first pygmy-owl responded in the 10^{th} minute at station 2 whereas the second bird was calling on arrival within 300 m of station 6. The same 2 owls were detected again during surveys of neighboring washes. The owls were approximately 1.2 and 1.5 km from initial points of detection and both responded after the first broadcast (Table 2). Both pygmy-owls were initially detected aurally and then confirmed visually.

Nongame birds and responses: We observed 38 species of birds in addition to pygmy-owls; 28 possible breeding species and 10 migrants or winter residents (Table 3). Greatest species richness occurred along Daniels Arroyo were 32 species were observed. Western screech owls were heard in all survey areas except Davidson Canyon and Deer Hollow Wash. Red-tailed hawks and great horned owls were found at 3 sites. Species found within all survey areas included black-tailed gnatcatcher, northern mockingbird, and black-throated sparrow. American kestrel, northern cardinal, and Bewick's wren were found at only 1 site.

Bird responses to pygmy-owl broadcasts ranged from none to agitated. Gila woodpeckers, black-tailed gnatcatchers, verdins, and phainopeplas responded most frequently with agitated calls and/or movement toward the caller. Response frequency was greatest in the Papago Well area and in Davidson Canyon. We also recorded several agitated responses along Daniels Arroyo and a few around Charlie Bell Well. Bird responses were extremely limited along Growler and San Christobal Washes.

Vegetation and habitat: All survey areas were within the Lower Colorado River Valley Subdivision of the Sonoran Desert (Brown, 1982). Upper bajadas around the Agua Dulce Mountains (including Papago Well and Davidson Canyon) and Charlie Bell Well approached Arizona Upland structure in some areas. Valley bottoms along Growler and San Christobal Washes had the least developed vegetation structure and channel width (Table 4). Average channel width along San Christobal Wash was only 1.8 m (SE = 0.54) and we found no channel or flow indicators along Growler Wash west of Growler Peak. Width of riparian vegetation associations ranged from 0 to 70 m (mean = 11, SE = 5.15) along Growler and from 10 to 155 m (mean = 63, SE = 13.3) along San Christobal and were dominated by creosote (*Larrea tridentata*) and mesquite. Uplands had low vegetation volume and were dominated by creosote and bursage (*Ambrosia dumosa* and *deltoidea*). Saguaros were found in low densities at San Christobal but did not occur within 400 m of Growler Wash. In comparison, channel and riparian vegetation width and saguaro density were greater along Daniels Arroyo than at the other 2 valley bottoms and riparian vegetation was dominated by woody species other than creosote (Table 4).

Upper Bajada and canyon areas around Charlie Bell and Papago Wells all had higher densities of saguaros than other survey areas (Table 4). Width of riparian vegetation associations ranged from 5 to 50 m and averaged 18.6 m (SE = 5.34) at Charlie Bell and 29.1 (SE = 6.55) around Papago Well. Paloverde (*Cercidium* sp.), desert ironwood, mesquite, and catclaw acacia (*Acacia greggii*) dominated riparian vegetation and average height exceeded 2 m. Upland vegetation was dominated by creosote and often comprised of woody microphyllous and succulent elements such as paloverde and saguaro.

Points where pygmy-owls were detected initially near Papago Well had wider than average stands of xeroriparian woodland or desertscrub, of greater average height (Table 4). Paloverde, desert ironwood, mesquite, and creosote dominated occupied xeroriparian areas and large saguaros occurred in association with xeroriparian vegetation. An open association of creosote and saguaro dominated upland vegetation and several saguaros contained cavities. Occupied areas harbored desertscrub, riparian scrub, and open, linear stretches of woodlands along washes. Initial points of pygmy-owl detection were both located in woodland or desertscrub vegetation associated with 1 or more washes.

DISCUSSION & RECOMMENDATIONS

The 2 pygmy-owls we report constitute the only known records west of Organ Pipe Cactus National Monument since 1955. On April 10, 1955 G. Monson detected a pygmy-owl near Cabeza Prieta Tanks in

neighboring Yuma County (Phillips et. al., 1964; Monson and Phillips, 1981). This remains the westernmost record on the coastal plain in both the U.S. and Mexico. Interestingly, we failed to find pygmy-owls within 30 km of CPNWR in neighboring Sonora (Flesch and Steidl, in preparation). Additionally, there are no documented reports of pygmy-owls within 20 km of CPNWR in Sonora since January 1894 (Mearns, 1907).

Desertscrub vegetation around the Agua Dulce Mountains has affinities to the Arizona Upland Subdivision of the Sonoran Desert. This relatively lush area of desertscrub is isolated by large creosote dominated flats which are unsuitable for pygmy-owls to the east, west, and north. After scouting the region from Mexico Route 2, directly south of the Agua Dulce Mountains, it is apparent that the region is connected to Arizona Upland vegetation in the vicinity of Sonoyta, Sonora. This connection likely provides a corridor facilitating dispersal into CPNWR.

Minimal road access on CPNWR limited our ability to survey areas potentially occupied by pygmy-owls. There are likely additional occupied pygmy-owl sites around the Agua Dulce Mountains on CPNWR. Agitated songbird responses in Davidson Canyon suggest past occupancy and other drainages in the area harbor vegetation similar to that around Papago Well. Given the probability of additional occupied sites, we recommend scouting the region from the air, identifying and prioritizing suitable vegetation patches, and then accessing and surveying these patches. Access from Mexico Route 2 should be considered and may reduce travel time. Furthermore, because of suitable vegetation structure along Daniels Arroyo, we recommend an annual survey between Chico Shunie Arroyo and the Growler Pass access road.

Table 1: Summary of cactus ferruginous pygmy-owl survey data from Cabeza Prieta National Wildlife Refuge, March 2001.

Table 2: Dates, locations, and time until detection for 2 cactus ferruginous pygmy-owls, Cabeza Prieta National Wildlife Refuge, March 2001.

owl #	date	Location	UTM E	UTM N	Elevation (m)	time until response (min)
1 (initial)	3/8/01	3 km NE of Papago Well	286700	3555200	305	10
2 (initial)	3/8/01	0.8 km E of Papago Well	284800	3553700	280	1
1 (second)	3/10/01	3.9 km NE of Papago Well	288000	3554600	317	1
2 (second)	3/9/01	1.7 km SE of Papago Well	285180	3552454	280	1

Table 3: Species list and breeding status for all bird species detected in Cabeza Prieta National Wildlife Refuge, March 2001.

Bird Species	Growler Wash	San Christobal Wash	Charlie Bell Well area	Daniels Arroyo	Davidson Canyon & Deer Hollow	Papago Well area
Red-tailed Hawk			X	X		X
Northern Harrier	M					
American Kestrel			X			
Gambel's Quail	X		X	X	X	X
Mourning Dove	X	X	X	X	X	X
Great-horned Owl	X	X		X		
Western Screech Owl	X	X	X	X		X
Ferruginous Pygmy Owl						X
Common Poorwill	X		X			X
Costa's Hummingbird	X		X	X		X
Gila Woodpecker			X	X	X	X
Ladder-backed Woodpecker					X	X
Gilded Flicker			X	X	X	X
Ash-throated Flycatcher			X	X	X	X
Say's Phoebe				M		
Black Phoebe				M		
Horned Lark	X		X			
Raven sp.	X		X	X	X	X
Verdin			X	X	X	X
Cactus Wren			X	X	X	X
Rock Wren		X	X	X		
Bewick's Wren				X		
House Wren				M		
Ruby-crowned Kinglet				M		
Black-tailed Gnatcatcher	X	X	X	X	X	X
Northern Mockingbird	X	X	X	X	X	X
Curve-billed Thrasher				X		X
Phainopepla	X		X	X	X	X
Loggerhead Shrike				M		M
Lucy's Warbler				X		
Nothern Cardinal				X		
Canyon Towhee				X		X
Brewer's Sparrow	M		M	M		
Black-throated Sparrow	X	X	X	X	X	X
Sage Sparrow	M					
Black-chinned Sparrow				M		
Lark Bunting	M			M		M
White-crowned Sparrow				M		
House Finch		X	X	X	X	X
Species Richness	16	8	21	32	14	23

X = possible breeding species

M = migrant or winter resident

Table 4: Habitat and vegetation data for cactus ferruginous pygmy-owl survey areas and detection points, Cabeza Prieta National Wildife Refuge, March 2001.

Location	Topographic formation	Width of channel		Width of riparian veg association		Distance to saguaros		Height riparian vegetation		Dominant riparian species	Height upland vegetation		Dominant upland species
		mean	se	mean	se	mean	se	mean	se		mean	se	
Growler	Valley Bottom	0.0	n/a	11.0	5.15	0.0	n/a	1.6	0.18	*Larrea, Prosopis, Ambrosia*	1.2	0.13	*Larrea, Ambrosia*
San Christobal	Valley Bottom	1.8	0.54	62.9	13.30	346.7	16.11	2.0	0.13	*Prosopis, Larrea*	1.1	0.04	*Larrea, Prosopis*
Daniels Arroyo	Valley Bottom	22.9	3.53	115.2	30.10	101.7	9.64	2.1	0.14	*Cercidium, Prosopis, Acacia*	1.1	0.04	*Larrea, Ambrosia*
Charlie Bell area	Upper Baj./Canyon	3.2	0.19	18.6	5.34	53.2	8.40	2.6	0.20	*Cercidium, Olneya*	1.3	0.09	*Larrea, Ambrosia, Cercidium*
Papago Well area	Upper Bajada	4.2	1.21	29.1	6.55	57.4	6.78	2.2	0.14	*Cercidium, Prosopis, Acacia*	1.2	0.08	*Larrea, Carnegiea, Fouquieria*
Owl 1	Upper Bajada	2.0	n/a	40.0	n/a	63.3	n/a	3.0	n/a	*Cercidium, Olneya, Prosopis*	2.0	n/a	*Larrea, Carnegiea*
Owl 2	Upper Bajada	3.0	n/a	45.0	n/a	38.8	n/a	3.0	n/a	*Cercidium, Larrea, Prosopis*	1.8	n/a	*Larrea, Carnegiea, Opuntia*

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Map Legend:

Calling station.

Beginning or end of survey transect.

Location of ferruginous pygmy-owl.

23 Survey number; correspond to numbers in Table 1.