

**CACTUS FERRUGINOUS PYGMY-OWL**  
*(Glaucidium brasilianum cactorum)*

**DRAFT**  
**RECOVERY PLAN**

January 2003

Region 2  
U.S. Fish and Wildlife Service  
Albuquerque, New Mexico

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## ACKNOWLEDGMENTS

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## EXECUTIVE SUMMARY

**CURRENT STATUS:** The cactus ferruginous pygmy-owl (CFPO) is federally listed as endangered in the State of Arizona as a distinct population segment. Critical habitat was designated on July 12, 1999. However, on September 21, 2001, the U.S. District Court vacated the final rule designating critical habitat for the CFPO and remanded it for revision consistent with the court order. Three general factors were identified as the basis for the listing of the CFPO: (1) present or threatened destruction, modification, or curtailment of the species habitat or range; (2) inadequacy of existing regulatory mechanisms; and (3) other natural or manmade factors affecting its continued existence. Only 41 adult CFPOs were known to exist in Arizona in 1999. More recently, 34 adult CFPOs were detected in 2000 and 36 in 2001. However, their total abundance and distribution in the state are unknown because much potential habitat has not been examined. CFPOs in Arizona are on the northern edge of the geographic range of the subspecies. They also occur in southern Texas and Mexico.

**HABITAT REQUIREMENTS AND LIMITING FACTORS:** CFPOs nest in holes in trees and cacti, and historically were reported most commonly in Arizona in cottonwood-mesquite forest and mesquite woodlands. Mesic riparian forests and the associated mesquite woodlands have been nearly eliminated in southern Arizona over the last 100 years, and the reduction of these forests and woodlands is thought to have caused a decline in CFPOs during that period. Remaining CFPOs in Arizona generally occupy xeroriparian and upland areas densely vegetated with trees and saguaro cacti.

**RECOVERY OBJECTIVES:** The objectives of this Draft Plan are to: (1) identify information needed to develop the population target(s) of Recovery Criterion 1; and (2) propose actions that will protect existing CFPOs and allow for expansion of the population and maintain management options for the future. These objectives relate to all three recovery criteria listed below.

**RECOVERY CRITERIA:** Section 3(6) of the Endangered Species Act (ESA) defines an endangered species as any species which is in danger of extinction throughout all or a significant portion of its range and, a threatened species as any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range section 3(19). Under section 3(15) of the ESA and our policy on distinct population segments (DPS) (USFWS 1996 [61 FR 4722]), we determined there to be four distinct population segments of the CFPO (Texas, eastern Mexico, Arizona, and western Mexico) and listed the CFPO - Arizona DPS only (USFWS 1997 [62 FR 10730]). This Draft Plan addresses the conservation and survival of the CFPO - Arizona DPS only; however, other CFPO populations (e.g., western Mexico) likely play an important role in the recovery of CFPOs in Arizona (e.g., demographic support and genetic interchange).

Downlisting, instead of delisting was chosen as an interim goal because of data limitations and potential uncertainties associated with the targets that will be developed for Criterion 1. These targets have yet to be developed and will be based on relatively new and potentially scant information; thus, we believe downlisting is the most conservative and biologically defensible strategy to take in this Draft Plan until more comprehensive information is available. The CFPO in Arizona should be considered for downlisting when the following three criteria are met:

1. The CFPO population in Arizona either reaches a size or achieves a rate of increase that ensures a high probability of persisting over the long-term. The target population size or rate of increase over a given period of time will be determined by population analyses to be conducted after essential, but currently missing, information has been collected.
2. CFPOs are successfully reproducing within Recovery Areas where appropriate habitat patches exist, and movement of individual CFPOs between population segments (i.e., Recovery Areas) within Arizona and between Arizona and Mexico is possible based on the availability of habitat and the capabilities of dispersing owls.

3. Threats to the persistence of CFPOs have been substantially reduced or eliminated within Recovery Areas, so that the CFPO is no longer in danger of extirpation overall or a significant portion of its range in Arizona.

This Draft Plan should be updated, revised, or appended whenever information warrants, but no more than five years should pass before it is re-evaluated. Revisions should be a part of the recovery planning process until more specific and quantitative recovery criteria are developed and met.

**ACTIONS NEEDED:** We identified five tasks that, if implemented, will result in achieving the objectives of the Draft Plan.

1. Estimate the number and define the distribution of CFPOs in Arizona, and define their general distribution and abundance in Sonora, Mexico.
2. Protect all currently known (since 1993) CFPOs in Arizona and those subsequently documented after this plan is finalized and the integrity of their territories, including adequate dispersal habitat. Identify and maintain an interconnected system of habitat extending from the northern portion of the historical range, south to areas in Mexico.
3. Continue to gather information essential to the management of CFPOs, including habitat requirements, population demographics, dispersal capabilities, and genetics.
4. Initiate the process for augmenting CFPO subpopulations at critically low population levels and establishing CFPOs in areas that appear suitable, but are presently unoccupied, or into areas that have been modified to enhance some habitat characteristic for CFPOs.

5. Develop an outreach and public education program to increase public awareness and understanding of the Draft Plan and to monitor and encourage its implementation.

**ESTIMATED COSTS:** (Dollars in 1,000s)

<b>Year (FY)</b>	<b>Priority 1*</b>	<b>Priority 2**</b>	<b>Priority 3***</b>	<b>Total</b>
1	720	20	325	1,065
2	720	20	250	990
3	720	20	250	990
4	730	20	185	935
5	760	20	195	975
<b>Totals</b>	<b>3,650</b>	<b>100</b>	<b>1,205</b>	<b>4,955</b>

\***Priority 1** - an action that must be taken to prevent extinction or prevent a species from declining irreversibly in the foreseeable future;

\*\***Priority 2** - an action than must be taken to prevent a significant decline in the population of concern or in the quality of habitat; and

\*\*\***Priority 3** - all other actions necessary to meet the recovery objectives.

Recovery costs, as summarized above, are only projected for the next five years. A revision of this recovery plan is expected within this period, as new information about the species becomes available.

**DATE OF RECOVERY:** A downlisting target date cannot be projected at this time.



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**Cactus Ferruginous Pygmy-owl (*Glaucidium brasilianum cactorum*)  
Draft Recovery Plan**

**PART I - INTRODUCTION**

The Endangered Species Act of 1973 (ESA), as amended, mandates that recovery plans be completed and implemented for listed species unless such a plan will not promote the conservation of the species. The ESA authorizes the Secretary of the Interior to appoint recovery teams for development of recovery plans. In accordance with section 4(f)(1)(B) of the ESA, the Secretary shall, to the maximum extent practicable, incorporate in each plan – (i) a description of such site-specific management actions as may be necessary to achieve the plan’s goal for the conservation and survival of the species; (ii) objective, measurable criteria which, when met, would result in a determination...that the species be removed from the list; and (iii) estimates of the time required and the cost to carry out those measures needed to achieve the plan’s goals and to achieve intermediate steps toward those goals. A recovery plan is, therefore, a blueprint for actions needed to improve the status of a listed species to the point where it no longer needs the protection of the ESA. Recovery is a process by which the decline of an endangered or threatened species is arrested or reversed, and threats to its survival are neutralized, so that the long-term survival in nature can be ensured (USFWS Guidelines 1990).

The Draft Recovery Plan (Draft Plan), described herein, contains actions necessary to develop objective, measurable criteria, outlines management actions deemed necessary for the survival of the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) (CFPO or owl) in Arizona, and includes time and cost analyses for proposed actions. The objectives and management actions outlined, if met and performed, could lead to downlisting and potentially delisting of the CFPO in Arizona. However, recovery criteria identified in this plan are not quantitative population targets. Because existing information about the CFPO in Arizona is

insufficient to conduct analyses (e.g., population viability analyses) needed to identify population targets, the Draft Plan focuses on identifying information needed to develop quantitative recovery criteria, and on actions that will preserve management options for the future.

The Cactus Ferruginous Pygmy-owl Recovery Team (Team) was appointed by the Regional Director of Region 2, U.S. Fish and Wildlife Service (Service) in September 1998 to develop a recovery plan for the CFPO. The Team consists of two groups, a 7-member Technical Group and a 29-member Implementation Group. The Technical Group is comprised of scientists from academia, Federal, State, and Tribal agencies, and researchers who are species experts and/or raptor biologists with a strong background in CFPO ecology, and conservation biology. The Implementation Group consists of representatives from affected parties including Tribal government, State agencies, counties, municipalities, and special interest groups (representatives from environmental groups, development, mining, ranching, private property rights, and other special interest groups). These stakeholders assisted the Technical Group and the Service in preparing this Draft Plan by attending meetings, providing input and reviewing various versions of this draft. The Team prepared this Draft Plan for the Service's Region 2 Director pending public review and comment.

Actions identified in this Draft Plan are not legal requirements; however, they are steps necessary to conserve the CFPO and, upon approval by the Regional Director, the recovery plan will direct our policy on conservation and management activities for the species. This Draft Plan will guide the Service and others in funding conservation actions, consultation with Federal agencies, and will help guide development of Habitat Conservation Plans (HCPs) and other planning efforts in so far as current or new information is determined to be reliable and meets appropriate, legal criterion to substantiate regulatory actions. In addition, this draft plan recognizes the limitations

of currently available information, and supports the focus of research efforts to obtain

information of critical importance in the areas of CFPO population goals, habitat needs and strategies to address human development where it conflicts with recovery efforts.

This Draft Plan has three main sections:

1. **Introduction:** This section reviews the status of and threats to the CFPO, and provides a synthesis of existing information on CFPOs. Conservation measures for CFPOs currently in place are also reviewed.
2. **Recovery Plan:** This section includes a rationale for the approach taken, the recovery criteria and objectives of the plan, and a narrative outline of management actions or tasks. Also included are descriptions of the eight Recovery Areas for the CFPO, and specific management actions recommended for the Recovery Areas.
3. **Implementation Schedule:** This section outlines the tasks identified in the Draft Plan, recommends lead participants for implementation, and estimates costs for each task.

## A. Status

### 1. Listing of the CFPO in Arizona

On May 26, 1992, we were petitioned to list the CFPO as an endangered species under the ESA. In accordance with the ESA, on March 9, 1993, we published a finding that the petition presented substantial scientific or commercial information indicating that listing of the CFPO may be warranted and commenced a status review of the subspecies (USFWS 1993 [58 FR 13045]). As



a result of information collected and evaluated during the status review, including information collected during a public comment period, we published a proposed rule on December 12, 1994 (USFWS 1994a [59 FR 63975]) to list the CFPO as endangered with critical habitat in Arizona, and threatened in Texas. After reviewing comments received in response to the proposed rule, we published a final rule on March 10, 1997 (USFWS 1997 [62 FR 10730]), listing the Arizona population of the CFPO as endangered without critical habitat. Part of the rationale for listing the CFPO in Arizona was that it was considered a distinct population segment (DPS). The population in Texas was not listed.

The ESA (section 3(15)) defines a species to include a DPS, which has the effect of authorizing listing of such entities. Our policy on DPSs (USFWS 1996 [61 FR 4722]) specifies that a population segment may be considered a DPS based on: (1) discreteness of the population segment; (2) significance of the population segment; and (3) the population segments conservation status in relation to the ESA's standards for listing. A population may be considered discrete if it is markedly separated from other populations of the same taxon as a consequence of physical, physiological, ecological, or behavioral factors. A population may also be considered discrete if it is delimited by international boundaries across which exist differences in control of exploitation, management of habitat, conservation status, or regulatory mechanisms. Therefore, based on the above criteria, we determined there are four distinct population segments (Texas, eastern Mexico, Arizona, and western Mexico) (USFWS 1997 [62 FR 10730]). This Draft Plan is specific to the listed CFPO - Arizona DPS. This Draft Plan addresses the conservation and survival of the CFPO - Arizona DPS only; however, other CFPO populations (e.g., western Mexico) likely play an important role in the recovery of CFPOs in Arizona (e.g., demographic support and genetic interchange). Other background information and data of CFPO populations in Texas and Mexico are included when appropriate.

In determining whether listing of the CFPO was warranted, we were required under section 4(a)(1) of the ESA to consider five listing factors: a) the present or threatened destruction,

modification, or curtailment of its habitat or range; b) overutilization for commercial, recreational, scientific, or educational purposes; c) disease or predation; d) the inadequacy of existing regulatory mechanisms; or e) other natural or manmade factors affecting its continued existence. A species can be listed if at least one of these five factors applies to the extent that the species is in danger of extinction throughout all or a significant portion of its range (endangered as defined in section 3(6) of the ESA), or likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range (threatened as defined in section 3(19) of the ESA). We determined that the following three factors applied to the CFPO - Arizona DPS to the extent that endangered status is appropriate (USFWS 1997 [62 FR 10730]).

*Factor 1 - The present or threatened destruction, modification, or curtailment of the species habitat or range.*

The CFPO is threatened by present and potential future destruction and modification of its habitat throughout a significant portion of its range in Arizona (Phillips et al. 1964, Johnson et al. 1979, Monson and Phillips 1981, Johnson and Haight 1985, Hunter 1988, Millsap and Johnson 1988).

*Factor 4 - Inadequacy of existing regulatory mechanisms.*

Although the CFPO in Arizona is considered nonmigratory, it is protected under the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703-712). The MBTA prohibits "take" of any migratory bird; however, unlike the ESA, there are no provisions in the MBTA preventing habitat destruction unless direct mortality or destruction of an active nest occurs. Other Federal and State regulations and policies such as the Clean Water Act (CWA), military policies (Barry M. Goldwater Range), National Park Service policy, and including the CFPO on the State of

Arizona's list of Species of Special Concern will not adequately protect the CFPO in Arizona from further decline. There are currently no provisions under Arizona statute addressing the

destruction or alteration of CFPO habitat.

*Factor 5 - Other natural or manmade factors affecting its continued existence.*

We identified other factors that may affect the CFPO, including: low levels of genetic variation, possible contamination from pesticides, and potential competition from other bird species that use cavities for nesting (e.g., European starlings [*Sturnus vulgaris*]).

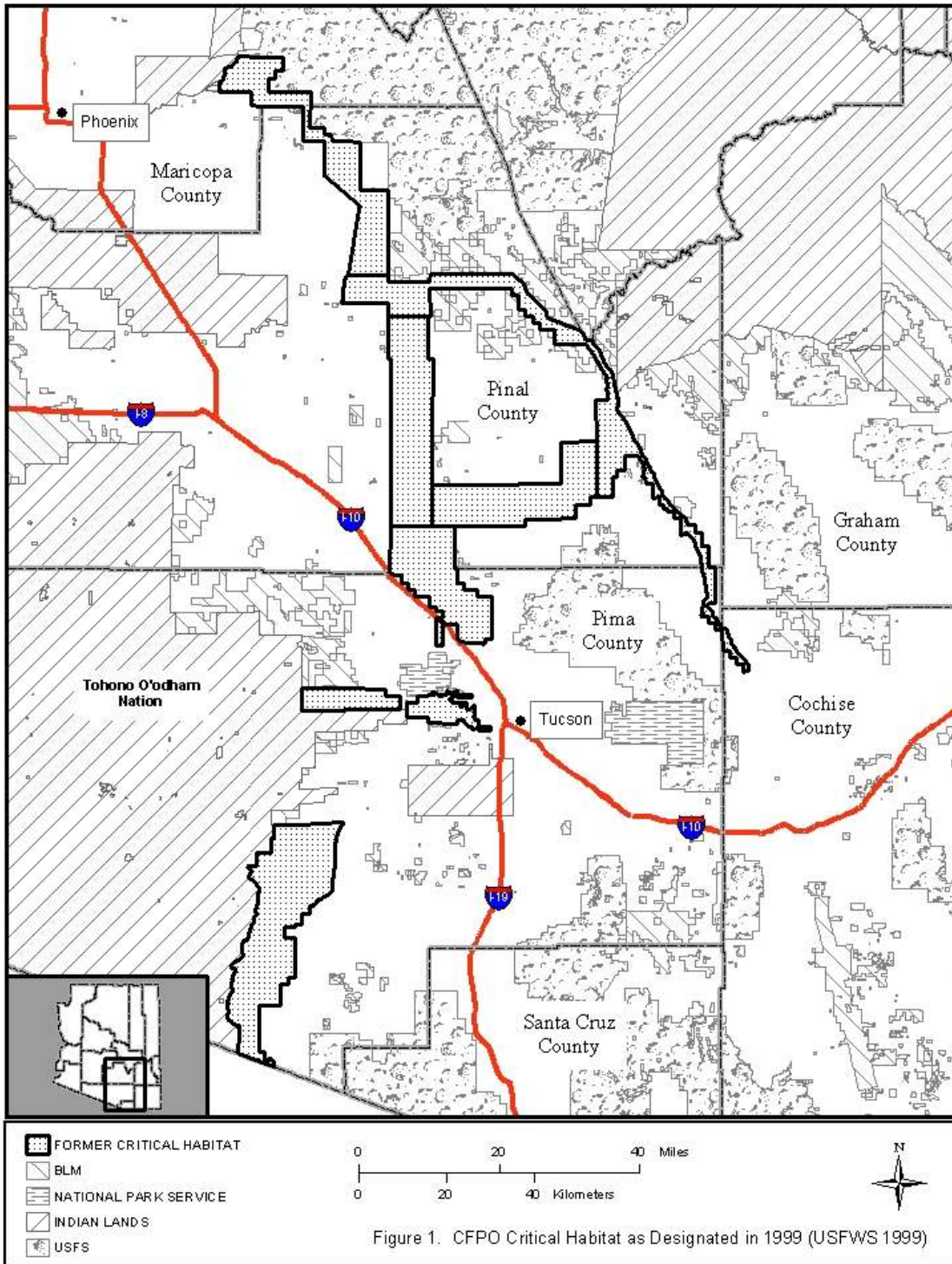
Although not used as the basis of listing, we identified several other potential threats to the CFPO in the final listing rule (USFWS 1997 [62 FR 10730]). This Draft Plan also addresses these threats where applicable.

- *Recreational Birding.* The CFPO is highly sought by birders who concentrate at several of the remaining known locations of CFPOs in the United States. Oberholser (1974) and Hunter (1988) suggest that recreational birding may disturb CFPOs in highly visited areas, affecting their occurrence, behavior, and reproductive success.
  
- *Predation and Disease.* Nest depredation was found to be a significant agent of mortality in Texas (Proudfoot 1996, Proudfoot and Johnson 2000), although it has not been documented in Arizona. Little information exists on the effects of depredation on CFPOs in Arizona, however, recent research indicates that predation likely plays a key role in CFPO population dynamics, particularly after fledging and as adults (AGFD unpubl. data). Trichomoniasis is a disease carried by CFPO prey, such as doves, finches, sparrows, and other seed-eating birds, that potentially could affect CFPO in Arizona.

## 2. Critical Habitat

Critical habitat is defined in section 3(5)(A) of the ESA as– (i) the specific areas within the geographic area occupied by a species, at the time it is listed in accordance with the ESA, on which are found those physical or biological features essential (I) to the conservation of the species and (II) which may require special management considerations or protection; and (ii) specific areas outside the geographic area occupied by a species at the time it is listed, upon determination that such areas are essential for the conservation of the species. "Conservation" means the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which listing under the ESA is no longer necessary.

We determined at the time of listing that designation of critical habitat was not prudent, primarily because we were concerned that publication of location maps and detailed locality descriptions would harm the species rather than aid in its conservation (USFWS 1997 [62 FR 10730]). However, on October 7, 1998, the Federal District Court for the District of Arizona issued an order stating: "There being no evidence that designation of critical habitat for the CFPO is not prudent, the Secretary shall, without further delay, decide whether or not to designate critical habitat for the CFPO...based on the best scientific and commercial information available." The court further ordered on November 30, 1998 "that within 30 days of the date of this Order, the Secretary shall issue the Proposed Rule for designating critical habitat for the CFPO...and that within six months of issuing the proposed rules, the Secretary shall issue final decisions regarding the designation of critical habitat for the CFPO." On December 30, 1998, we proposed as critical habitat approximately 295,650 hectares (ha) (730,565 acres [ac]) of riverine riparian and upland habitat within Pima, Cochise, Pinal, and Maricopa counties, Arizona (USFWS 1998 [63 FR 71820]). Public comments on the proposed designation were received until May 15, 1999, and final designation of critical habitat (Figure 1) was submitted to the court on June 30, 1999 and published in the *Federal Register* on July 12, 1999 (USFWS 1999 [64 FR 37419]).



We designated critical habitat on lands that formed an interconnected system of existing and potential habitat areas extending north from the United States- Mexican border to just east of Phoenix, Arizona. In an effort to map areas essential to the conservation of the species, we used data on known CFPO locations to identify important areas. These areas were connected based on topographic and vegetative features most likely to support resident CFPOs and/or facilitate movement of birds between known habitat patches. Facilitating movement of birds between habitat areas is important for dispersal and gene flow. Lands we felt were adequately protected, or where current management is compatible with CFPOs, and likely to remain so into the future, such as National Park lands (Organ Pipe Cactus National Monument and Saguaro National Park) and National Wildlife Refuges (Cabeza Prieta and Buenos Aires National Wildlife Refuges), were not designated as critical habitat. In addition, lands of the Tohono O'odham Nation were not designated. We are aware that lands important to the subspecies' continued existence in Arizona likely exist on the Nation. However, in 1999, the time given by the Court to designate critical habitat precluded us from adequately coordinating with the Nation to obtain CFPO locations and habitat information. In addition, we were unable to assess whether current tribal management is likely to maintain CFPOs into the future.

On January 9, 2001, a coalition of plaintiffs filed a lawsuit with the District Court of Arizona challenging the validity of the Service's listing of the Arizona population of the pygmy-owl as an endangered species and the designation of its critical habitat. On September 21, 2001, the Court upheld the listing of the pygmy-owl in Arizona but remanded the designation of critical habitat for preparation of a new analysis of the economic and other effects of the designation (National Association of Home Builders et al. v. Norton, Civ.-00-0903-PHX-SRB). The Court also vacated the critical habitat designation during the remand. The plaintiff's appeal of the listing decision is still pending. We are currently working on a proposal for critical habitat that will meet the directions of the court. Recovery actions outlined in this draft recovery plan will be assessed in relation to critical habitat if and when the designation of critical habitat becomes final.

## **B. Reasons for Decline**

Early naturalists considered the CFPO "not uncommon," "of common occurrence," and a "fairly numerous" resident of lowland central and southern Arizona, prior to the mid-1900s (Breninger 1898, Gilman 1909, Swarth 1914). Since then, their numbers have almost certainly decreased, with 34 known adult CFPOs documented in 2000 and 36 in 2001. The cause of their decline in Arizona is unknown, but may be attributed to factors described below. Because this subspecies is at the extreme northern limit of its geographic range, its numbers and distribution may fluctuate from year to year because of uncontrollable events (e.g., extended droughts, low temperatures). These fluctuations may be exacerbated by anthropogenic factors (e.g., urbanization, agriculture, elimination of riparian vegetation, damming of rivers, etc.) that eliminate or degrade their habitats. Without management action, the factors listed below may negatively affect CFPO recovery in Arizona and continue to contribute to their decline.

### **1. Habitat Destruction and Degradation**

Habitat destruction and degradation are considered major causes of wildlife extinctions (Wilson 1989). Furthermore, habitat loss, degradation, and fragmentation (i.e., the process by which a large and continuous block of habitat is transformed into much smaller and isolated patches by human activity [Noss and Csuti 1994]) are widely accepted causes contributing to the decline of birds of prey worldwide (Snyder and Snyder 1975, Newton 1979, Lefranc and Millsap 1984). Availability of nests and food, often considered limiting factors for raptor populations (Whitcomb et al. 1981, Temple 1986, Wilcove et al. 1986, Cline 1988, Watson and Landslow 1989), generally decline as habitat is destroyed or fragmented. Fragmentation has two main effects: (1) it reduces the total amount of habitat; and (2) it apportions remaining habitat into smaller, more isolated patches used less effectively by wildlife (Harris 1984, Wilcove et al. 1986, Saunders et al. 1991).

Loss and fragmentation of habitat are believed to be contributing reasons to the decline of CFPOs in the United States (Oberholser 1974, Johnsgard 1988, Millsap and Johnson 1988, Wauer et al. 1993, Tewes 1995). Early (Bendire 1892, Fisher 1893, Gilman 1909, Swarth 1914, Griscom and Crosby 1926, Friedmann et al. 1950) and more recent (Falls 1973, Davis and Russell 1979, 1984, and 1990) information suggest that indirect correlations exist between the decline in abundance of CFPOs and urban and agricultural expansion, such as that occurring in many portions of southern Arizona. Woodlands associated with watercourses and floodplains, once common in the southwest, likely supported a sizable population of CFPOs in Arizona in the past (see accounts of Bendire [1888] and Breninger [1898]). However, the CFPO has declined in Arizona to the degree that it is now relatively limited in distribution in the state (Johnson et al. 1979, Monson and Phillips 1981, Davis and Russell 1984, Johnson-Duncan et al. 1988, Millsap and Johnson 1988, Monson 1998).

Johnson et al. (1979) suggested that the destruction of riparian woodlands played a significant role in the decline of CFPOs in Arizona. It is estimated that between 85 to 90% of riparian bottomland forests and bosques (Spanish for woodlands) in the southwestern United States have been modified or lost; these alterations and losses are attributed to woodcutting, urban and agricultural encroachment, water diversion and impoundment, channelization, groundwater pumping, livestock overgrazing, and hydrologic changes resulting from various land-use practices (e.g., Phillips et al. 1964, Carothers 1977, Kusler 1985, Jahrsdoerfer and Leslie 1988, USFWS 1988, U.S. GAO 1988, Szaro 1989, Dahl 1990, State of Arizona 1990, Bahre 1991).

In the past, cutting trees for domestic and industrial fuel wood was so extensive throughout southern Arizona that, by the late 19th century, riparian forests within tens of miles of towns and mines had been decimated (Bahre 1991). Mesquite (*Prosopis* spp.) was a favored species for cutting because of its excellent fuel qualities. The forests of "giant mesquites" along the Santa Cruz River in the Tucson area described by Swarth (1905) and Willard (1912) fell to this threat (Johnson and Carothers 1982), as did the "heavy mesquite thickets" where Bendire (1888)



collected CFPO specimens along Rillito Creek, a tributary of the Santa Cruz River, in present-day Tucson. Cottonwoods (*Populus* spp.) also were harvested for fuel wood, fenceposts, and for bark for cattle feed (Bahre 1991). Some areas impacted by woodcutting may have the potential to regenerate to a condition suitable for CFPO occupancy or use.

In recent decades, riparian woodlands have continued to be modified and destroyed by agricultural development, urban expansion, and general watershed degradation (Phillips et al. 1964, Brown et al. 1977, State of Arizona 1990, Bahre 1991, Stromberg et al. 1992, Stromberg 1993a and 1993b). Diversion of surface water and pumping of ground water result in diminished surface flows in southwestern streams and rivers, with a concomitant reduction of riparian vegetation (Brown et al. 1977, Stromberg et al. 1992, Stromberg 1993a and 1993b). Channelization, a product of decreasing water tables, often alters stream banks and the fluvial dynamics necessary to maintain native riparian vegetation.

Currently, CFPOs occurring in Arizona occupy Sonoran desertscrub and semidesert grassland vegetation, often in areas where washes support dense and diverse xeroriparian vegetation. These vegetation types also have been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991); thus, a significant threat to CFPOs in Arizona today is the loss and fragmentation of upland and xeroriparian vegetation from large scale and commercial developments (USFWS 1997 [62 FR 10730], Abbate et al. 1999). The complete removal of vegetation and natural features required for many large scale and high-density developments may directly or indirectly impact CFPO survival, and continued large-scale development in the Tucson basin and elsewhere may affect the stabilization and recovery of this population (Abbate et al. 1999). However, the levels of impact are not the same in all areas and threats to CFPOs or their habitat in some locations are not the same as in others.

Information about populations of CFPOs in Mexico is limited. Based on personal observations and anecdotal information, Russell and Monson (1998) recorded no decline in numbers from

Sonora, Mexico. However, the first systematic surveys for CFPOs in Sonora were conducted in 2000 and 2001. The 2000 survey effort resulted in 279 confirmed detections and an additional 22 possible detections (Flesch and Steidl 2000). CFPOs were detected throughout the state of Sonora, from the international border south to Presa Alvaro Obregon, 19 miles from Ciudad Obregon. Twenty-six CFPOs were detected within six miles of the Arizona border (Flesch and Steidl 2000). While results are not yet available for the 2001 survey work, results were similar to 2000 regarding the numbers and distribution of owls in Sonora (A. Flesch, pers. comm.). In 2000, personnel from the Arizona Game and Fish Department (AGFD) documented, through the use of radio telemetry, the movement of a dispersing juvenile CFPO into Mexico from a nest just north of the international border (AGFD unpubl. data).

This information indicates that there is the potential for movement of owls across the international border, but the extent of this interaction remains unknown. Given the numbers of CFPOs detected just south of the U.S./Mexico border, we would expect more CFPOs to be documented along the U.S. side of the border. We do not know the distribution of CFPOs on the Tohono O'odham Nation, but surveys in Organ Pipe Cactus National Monument and the Altar Valley have not detected the numbers or densities of owls found in Mexico. Thus, questions remain about the degree to which CFPOs move across the border in either direction. Information about populations of CFPOs in Mexico and their interaction with Arizona's population is critical to understanding the degree of isolation of CFPOs in Arizona, and hence the kinds of management activities that are warranted.

## 2. Human Activity and Mortality

Direct and indirect human-caused mortalities (e.g., collisions with cars, glass windows, fences, power lines, domestic cats [*Felis domesticus*], etc.) are beginning to be documented in Arizona (Abbate et al. 1999, AGFD unpubl. data) and may be underestimated. Such incidences will probably increase as human interactions with owls increase (Banks 1979, Klem 1979, Churcher and Lawton 1987). This may be particularly important in the Tucson area where a relatively high

percentage of known Arizona CFPOs are located. CFPOs flying into windows, doors and fences, resulting in injuries or death to the birds, has been documented in Arizona. One CFPO flew into a closed window of a parked vehicle; it eventually flew off, but had a dilated pupil in one eye indicating possible neurological injury as the result of this encounter. In another incident, an adult owl was found dead near a woven-wire fence; apparently it flew into the fence and died (Abbate et al.1999). Personnel from the AGFD have also documented an incident of individuals shooting BB guns at birds perched on a saguaro containing an active CFPO nest. In Texas, two adult CFPOs and one fledgling were killed by a domestic cat. These owls used a nest box about 75 meters (m) (246 feet [ft]) from a human residence. In 2001, two CFPOs in northwest Tucson are suspected to have been preyed upon by domestic cats (AGFD unpubl. data). Free roaming cats can also affect the number of lizards, birds, and other prey species available to CFPOs (Churcher and Lawton 1987); however, very little research has been done in the Southwest on this potential problem.

Because CFPOs have been observed moving around the perimeter of golf courses, avoiding non-vegetated areas (Abbate et al. 1999, AGFD unpubl. data), roads and other openings may act as impediments to their movements. On one occasion, a radio-tagged dispersing juvenile stopped within 1.1 km (0.7 mi) of Interstate 10 (a four-lane, divided highway) where there were large openings and few trees or shrubs, and reversed its direction (Abbate et al. 1999). However, radio-tagged, juvenile CFPOs have been observed on several occasions crossing two-lane roads with light to moderately heavy vehicular traffic, where trees and large shrubs were present on either side (Abbate et al. 1999). Observations in Tucson in 2001 indicate that dispersing CFPOs are aware of and potentially assess traffic in areas where road crossings occurred and appeared reluctant to cross during times of high traffic volumes (AGFD unpubl. data).

In the United States, CFPOs are rare and highly sought by recreational bird watchers who concentrate at a few of the remaining known locations. In Tucson, the posting of a CFPO sighting on the Audubon Bird Hotline resulted in the inundation of the area by birders within a

few hours. Limited, conservative bird watching is probably not harmful; however, excessive attention and playing tape-recorded calls may constitute harassment and affect the occurrence and behavior of CFPOs (Oberholser 1974, Tewes 1995).

Human activities near nests at critical periods of the nesting cycle may cause CFPOs to abandon their nest sites. In Texas, 3 of 102 CFPO nests monitored from 1994-1999 were abandoned during the early stage of egg laying. Although unknown factors may have contributed to this abandonment, researchers in Texas associated nest abandonment with nest monitoring. In all three instances, alternative nests were established within one week (G. Proudfoot pers. obs.).

Some outdoor recreational activities (e.g., off highway vehicle [OHV] and motor bike use/racing, firearm target practicing, jeep tours, etc.) may disturb CFPOs during their breeding season (particularly from February through July) (G. Proudfoot pers. comm.). Disturbance during the breeding season may affect productivity; disturbance outside of this period may affect foraging and dispersal and, therefore survival (AGFD unpubl. data). Wildlife may respond to disturbance during the breeding season by abandoning their nests or young (Knight and Cole 1995). It has also become apparent that disturbance outside of a species' breeding season may have equally severe effects (Skagen et al. 1991). CFPO young that are actively dispersing appear to be more sensitive to noise and approaching humans than before or after dispersal. Anecdotal observations suggest that dispersal direction or distances were abruptly changed due to disturbance such as heavy equipment operation, off-road vehicles and target shooting (AGFD unpubl. data).

Application of insecticides and herbicides in Arizona occurs year-round, and these chemicals may pose a potential threat to the CFPO. The presence of CFPOs in proximity to residences, golf courses, agricultural fields, and nurseries may cause direct exposure to pesticides and herbicides.

Furthermore, ingestion of affected prey items may cause death or reproductive failure (Lincer 1975). Illegal dumping of waste also occurs in areas occupied by CFPOs and may be a threat to CFPOs and their prey; in one case, drums of toxic solvents were found within 1.6 km (1 mi) of a

CFPO detection (Abbate et al. 1999). At this point, the affect of pesticides and other toxins on CFPO survival is unknown. The safe application of pesticides has been a health and conservation issue for many years. There are state and federal safeguards currently in place that generally address both human and wildlife health and safety concerns. However, if additional study reveals that pesticides are a specific threat to the health and survival of CFPOs, appropriate actions to identify the problem source and develop solutions will be incorporated into the existing processes and legal mandates.

### 3. Predation

Little is known about the rate or causes of mortality in CFPOs; however, they are susceptible to predation from a wide variety of species. In Texas, eggs and nestlings were depredated by racoons (*Procyon lotor*) and bullsnakes (*Pituophis melanoleucus*), and adults were killed by great horned owls (*Bubo virginianus*), Harris' hawks (*Parabuteo unicinctus*), Cooper's hawks (*Accipiter cooperii*), and eastern screech-owls (*Otus asio*) (Proudfoot and Johnson 2000, G. Proudfoot unpubl. data).

Many of these same predators are suspected to have taken CFPOs in Arizona (Abbate et al. 2000, AGFD unpubl. data). CFPOs may be particularly vulnerable to predation and other threats during and shortly after fledging (Abbate et al. 1999). AGFD telemetry monitoring in 2002 indicated at least four of the nine young produced that year were eaten by predators prior to or shortly after dispersal during a year when tree species failed to leaf out due to drought conditions (AGFD unpubl. data). These observations, in conjunction with observations from previous years indicate cover near nest sites may be important for young to fledge successfully (Abbate et al.

1999, Wilcox et al. 1999, Wilcox et al. 2000). Nest depredation has not been recorded in Arizona, however, relatively few nests have been monitored (n = 39, 1996-2002). Additional research is needed to determine the effects of predation, including nest depredation, on CFPOs in Arizona and elsewhere.

Another factor that may affect CFPOs is interspecific competition/predation. In Texas, depredation of two adult female CFPOs nesting close to screech-owls was recorded. These incidences were recorded as “depredation by screech-owl” after examination of the CFPO corpses and assessment of circumstances (i.e., one CFPO attempted to nest in a box that was previously used as screech-owl roost site, the other established a nest in a box within 5 m of screech-owl nest site). Conversely, CFPOs and screech-owls were also recorded successfully nesting within 2 m (about 2 yds) of each other in the same tree without interspecific conflict. In Arizona, there have been four probable incidences of screech owl predation on CFPOs, three juveniles and one adult. Additionally, in Arizona, elf owls occur and nest regularly in the same areas as CFPOs. Elf owls also use saguaro cavities for nesting and may compete with CFPOs for nest sites. The relationship between CFPO and other similar cavity nesting species needs further study.

#### 4. Disease

Hematozoa (blood parasites) may cause neonatal bacterial diarrhea, marginal anemia, and septicemia (Hunter et al. 1987), reducing survival and recruitment of birds. However, no evidence of hematozoa in CFPOs in Texas (Proudfoot and Radomski 1997) or Arizona (Proudfoot et al. unpubl. data) has been recorded. Trichomoniasis also can cause mortality of raptors (e.g., Cooper's hawks in Tucson) (Boal et al. 1998) that ingest doves and pigeons, but the effects of this disease on CFPOs in Arizona is unknown. Most species of raptors in the Tucson area, including small owls such as screech-owls and elf owls, have had documented cases of trichomoniasis (AGFD unpubl. data). House finches and doves are prey items for CFPOs in Arizona and are carriers of trichomoniasis (Abbate et al. 1999). Recent investigations in Texas and Arizona have indicated the regular occurrence of avian parasites in the materials inside of CFPO nest cavities. The numbers of parasites may be high enough to impact nestling CFPOs. Hence, further study is needed in Arizona and Texas to assess the potential for diseases and parasites to affect CFPO populations. The West Nile Virus has been identified as the cause of a

number of unusual raptor mortalities in some areas of the eastern United States. This virus is expanding to the west and the potential for infecting CFPO warrants investigation and development of monitoring strategies.

## 5. Genetic Stochasticity

Low genetic variability can lead to a reduction in reproductive success and environmental adaptability. Caughley and Gunn (1996) note that small populations can become extinct entirely by chance even when their members are healthy and the environment favorable. The pairing of siblings or parents with their offspring is rare in raptors, only 18 cases have been recorded (Carlson et al. 1998). Four of the seven incestuous species listed by Carlson et al. (1998) include barn owls, burrowing owls (*Athene cunicularia*), screech-owls, and spotted owls (*Strix occidentalis*). In 1998 and 1999, two cases of sibling CFPOs pairing and breeding were documented (Abbate et al. 1999). In both cases, young were successfully fledged from these incestuous pairings. Additional cases of sibling pairings have been documented in 2001 and 2002 (AGFD unpubl. data). These unusual pairings may have resulted from extremely low numbers of available mates within range of dispersal, and/or from barriers (including fragmentation of habitat) that create dispersal bottlenecks and funnel dispersing owls into the same area. Further, because the CFPO is nonmigratory, there may be an additional limitation on the flow of genetic material between populations which may reduce the chance of demographic and genetic rescue through immigration from adjacent populations. Proudfoot and Slack (2001) found that average haplotype diversity among CFPOs in Arizona (e.g., Northwest Tucson) was low relative to CFPOs in Sonora, Mexico. They speculated that the lack of genetic diversity in CFPOs in Arizona may have been a product of "founder events" (i.e., a small number of owls emigrating to an area and starting a population).

## 6. Fires

Fires can affect CFPOs by altering their habitat (Abbate et al. 1999). In 1998, a car caught on fire on a one-lane dirt road within a few feet of dense vegetation and less than 1 km (0.6 mi) of an active CFPO nest site. This fire was quickly extinguished by the local fire department; however, as human activity increases in previously undisturbed desert vegetation, so do risks of wildfires, and potential danger to CFPOs and their habitat (Abbate et al. 1999). With the introduction of exotic plant species, such as fountain grass (*Pennisetum setaceum*), buffelgrass (*Pennisetum cilare*), Lehman's lovegrass (*Eragrostis lehmanniana*) and red brome (*Bromus rubens*), which accompanies urbanization and agriculture, fire is a management issue that must be considered in areas occupied by CFPOs.

A recent fire altered habitat near an active CFPO nest site (Flesch 1999) and although four mature saguaros in the area appear to have survived, post-fire mortality of saguaros has been recorded (Steenbergh and Lowe 1977 and 1983, McLaughlin and Bowers 1982). Flesch (1999) also noted that approximately 20 to 30% of the mesquite woodland within 50 m (164 ft) of the nest was fire- or top-killed, and ground cover was also eliminated until the summer monsoons. In 2002, two fires in the Altar Valley burned approximately 6300 acres in areas of mesquite grasslands. While no CFPO nesting territories were affected, dispersal habitat was within the burned areas, potentially affecting dispersal and connectivity. Careful use of prescribed fires in areas potentially suitable for CFPOs is necessary so that habitat is not lost or degraded (Flesch 1999). However, in fire-adapted communities such as semi-desert grasslands, periodic fire may improve the overall health of the system, benefiting CFPOs, if limiting habitat characteristics such as nest cavities and larger trees in drainages can be maintained. Currently, there is not enough information to determine whether fires have positive or negative effects on CFPOs.



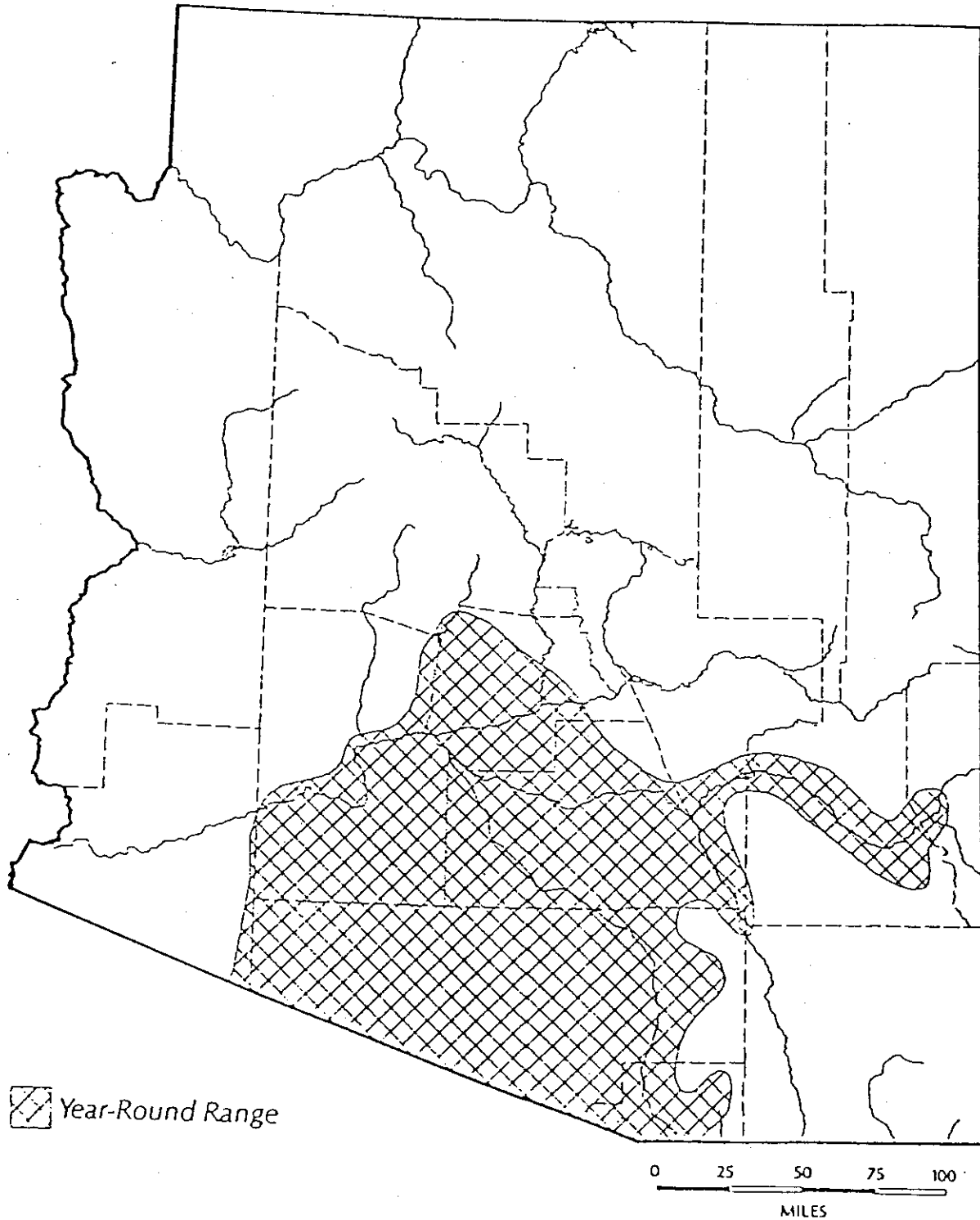
## **C. Data Needs**

Information is limited with regard to CFPOs in Arizona, including their abundance and distribution, population demographics, degree of isolation from populations in Mexico, the details of what constitutes habitat, and the influence of human activities. Recent studies on CFPOs in Arizona have focused primarily on surveys and monitoring of known nest sites (Abbate et al. 1996, 1999, Flesch 1999, Harris Environmental 1998, Harris Environmental et al. 1999). Some preliminary work on habitat evaluation and selection has begun (Wilcox et al. 1999, Wilcox et al. 2000), but have as yet been unable to clarify the overall needs of CFPOs. Existing information on CFPOs is presented below.

## **D. CFPO Distribution and Habitat**

### **1. Historical Distribution**

Historically (i.e., late 1800s and early 1900s), CFPOs occupied areas of south-central Arizona – from New River, about 56 km (35 mi) north of Phoenix, south to the U.S./Mexico border, west to Agua Caliente near Gila Bend and Cabeza Prieta Tanks, and east to Tucson, and rarely the San Pedro River (Bent 1938, Monson and Phillips 1981, Johnson et al. In review). The geographic area historically occupied by CFPOs includes portions of: Gila, Pima, Pinal, Maricopa, Graham, Santa Cruz, Cochise, Greenlee, and Yuma counties in Arizona (Figure 2).



**Figure 2. Historical Distribution of the CFPO in Arizona (Monson 1998).**

No CFPOs have been recorded in New Mexico (Hubbard 1978) or from the lower Colorado River valley of both the United States (Rosenberg et al. 1991) and Mexico (van Rossem 1945). In Texas, the CFPO occurred from Zapata southeast along riparian areas of the Rio Grande River to Rio Grande City, north to Falfurrias, northeast to Baffin Bay, and south along the coast of Laguna Madre to Brownsville (Oberholser 1974, Millsap and Johnson 1988, Proudfoot and Johnson 2000). Counties occupied were Cameron, Hidalgo, Kennedy, Starr, Willacy, and Zapata Counties. In western Mexico, the CFPO occurred in the States of Sonora, Chihuahua, Sinaloa, Nayarit, Jalisco, Colima, and Michoacan, and in eastern Mexico in the States of Coahuila, Tamaulipas and Nuevo Leon (Peters 1940, Friedmann et al. 1950, Sibley and Monroe 1990). The suspected distribution of the ferruginous pygmy-owl in Mexico is shown in Figure 3 (adapted from USFWS 1994a [59 FR 63975]).

## 2. Current Distribution in Arizona

Recent records (since 1993) suggest that CFPOs in Arizona may be limited to Pima and Pinal counties; however, this may be a bias of survey effort. The vast majority of past surveys have been in Pima and Pinal counties with limited survey effort elsewhere in the state (USFWS unpubl. records). The total number of CFPOs and their distribution in Arizona are unknown. Survey and monitoring work in Arizona has resulted in the documentation of 41 adult CFPOs in 1999, 34 adults in 2000 and 36 in 2001. Most of these CFPOs were distributed in three general areas; northwest Tucson (Tucson Basin), Organ Pipe Cactus National Monument, and the Altar Valley. Owls occupy the Tohono O'odham Nation, but we have no specific information on their numbers or distribution (Figure 4). Current boundaries of the range of the CFPO in Mexico are unknown, however, recent survey work in Mexico during 2000 and 2001 has helped define the distribution and indicates owls regularly occur along the U.S./Mexico border (Flesch and Steidl 2000).

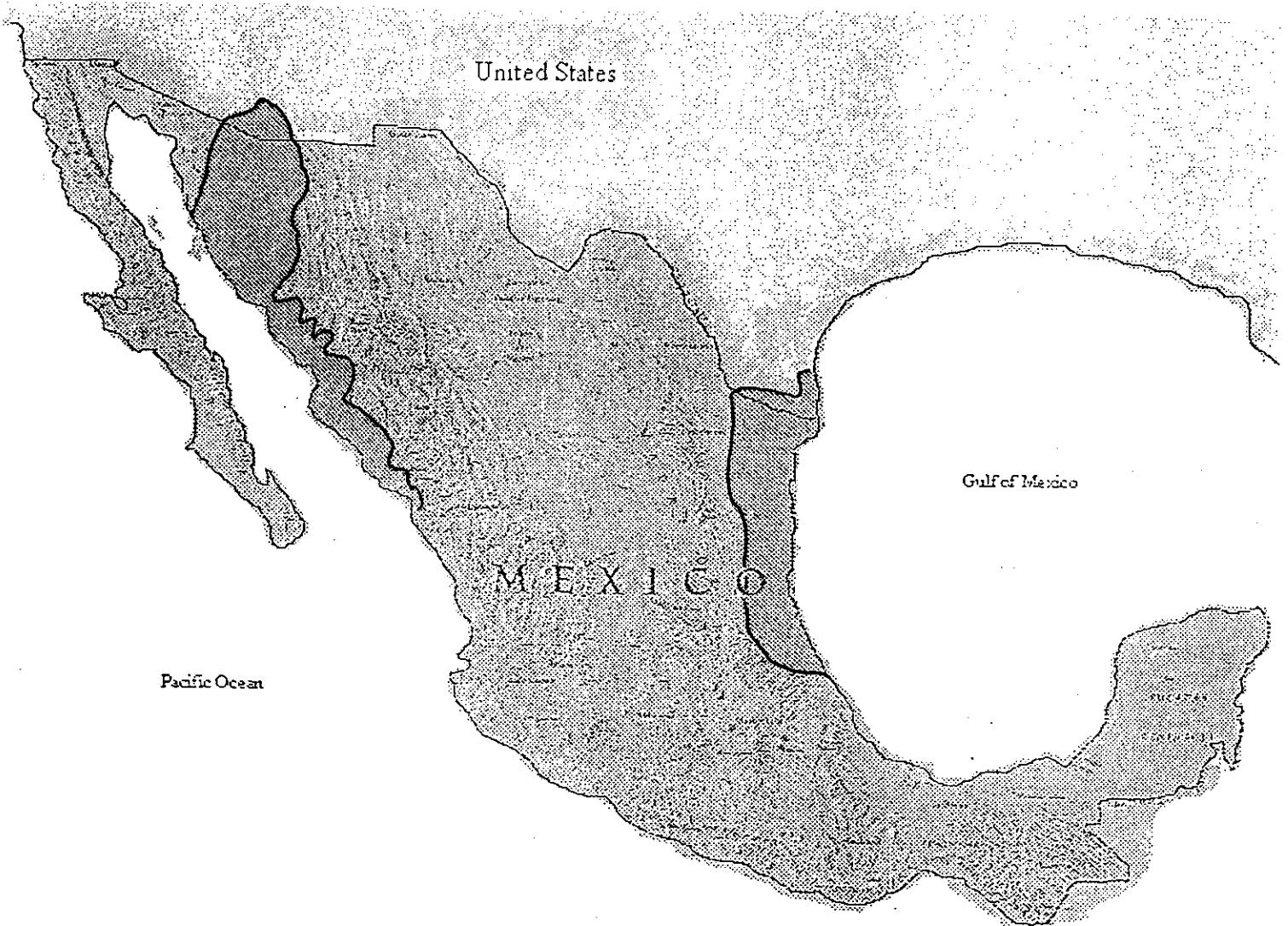


Figure 3. Historical range of the cactus ferruginous pygmy-owl in the U.S. and Mexico (adapted from USFWS 1994a).

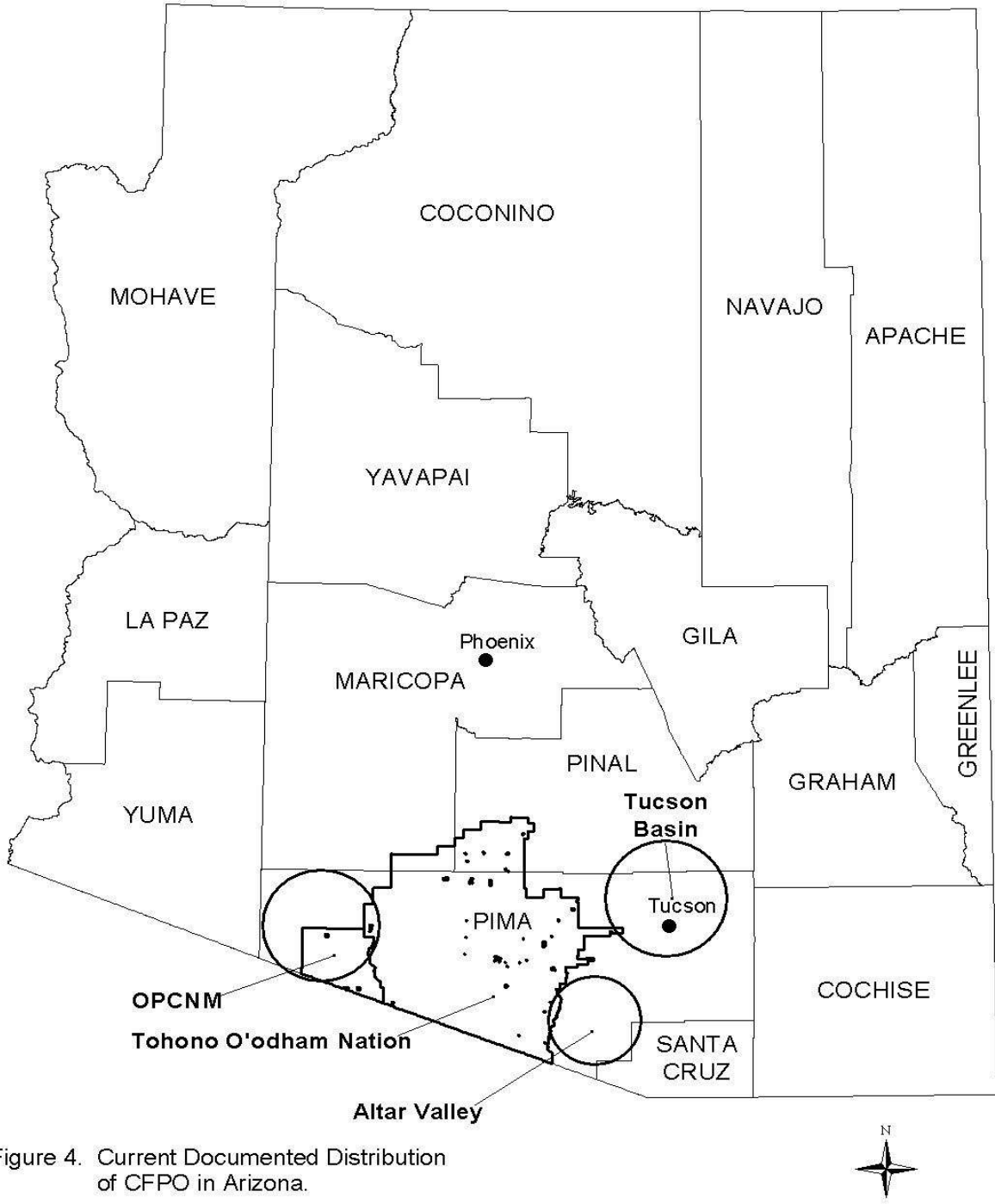


Figure 4. Current Documented Distribution of CFPO in Arizona.

### 3. Vegetation Communities

The historical and current known range of the CFPO contains various vegetation communities. In Arizona, CFPOs rarely occur below 300 m (1,000 ft) or above 1,220 m (4,000 ft) (Proudfoot and Johnson 2000). Historically, cottonwood-mesquite forest and mesquite woodland along the Gila and Salt rivers and major tributaries (Bendire 1892, Gilman 1909) were environments where CFPOs were documented (Johnson et al. 1987). Currently, most CFPOs are found in Sonoran Desertscrub communities (as described by Brown 1982) in southern Arizona. These communities include xeroriparian vegetation (dense thickets bordering dry desert washes) consisting of palo verde (*Cercidium* spp), mesquite, acacia (spp.), and saguaro (*Carnegiea gigantea*) (Johnson and Haight 1985, Millsap and Johnson 1988), often with ironwood (*Olneya tesota*) and/or exotic landscaping supported by irrigation (Abbate et al. 1996). Recently, CFPOs have also been located in semidesert and Sonoran savanna grasslands with xeroriparian washes (e.g., the Altar Valley). Dominant tree species in riparian areas include mesquite, ash, and hackberry (*Celtis* spp.). Uplands in these areas primarily consist of grasslands with dispersed mesquite trees, and very few, isolated saguaro cacti in some areas. In Texas, CFPOs use undisturbed live oak (*Quercus virginiana*)-mesquite (*Prosopis glandulosa*) forest of the historical Wild Horse Desert, and mesquite brush, ebony (*Pithecellobium* spp.), and riparian areas below 27th parallel (Oberholser 1974, Wauer 1993, Proudfoot and Johnson 2000).

In Mexico, the CFPO occurs in a wide variety of vegetation associations from sea level to 1,219 m (4,000 ft) in west Mexico and to at least 305 m (1,000 ft) in east Mexico (Friedmann et al. 1950). The CFPO occupies riparian forest in east Mexico (Sutton 1951), but is absent from tropical deciduous forest and higher vegetation zones in west Mexico, where it is replaced by *G. minutissimum* and *G. gnoma* (Schaldach 1963). The CFPO is a resident of Lower Sonoran and tropical zones, primarily in giant cactus associations, in western Sonora (van Rossem 1945). It also occurs in desertscrub, tropical thornscrub, and tropical deciduous forest (Russell and Monson 1998). Flesch and Steidl (2000) reported that CFPOs occurred in the greatest numbers and

highest frequencies within the Arizona Upland subdivision of Sonoran desertscrub. Densities were greatest in the Plains of Sonora and lowest in Sinaloa Thornscrub. Density of owls was relatively high in the Central Gulf Coast, but frequency of occurrence was low. Semidesert grasslands were second only to Arizona Upland for frequency of occurrence of CFPOs.

#### 4. Vegetative Structure

Information about the structure of vegetation used by the CFPO in Arizona is just beginning to be collected. Preliminary analyses of 18 perch sites and 3 nests sites suggest that CFPO use areas with relatively high levels of structural diversity in the suburban/rural interface in northwest Tucson (Wilcox et al. 1999). In the Altar Valley, Flesch (1999) described occupied sites as being associated with well developed wooded vegetation along one or more washes. Woodland patches were more structurally developed and of larger size than unoccupied sites. In Texas, radio-tagged CFPOs showed preference for areas dominated by trees greater than 25.4 centimeters (cm) (10 inches [in]) diameter at breast height (dbh) with moderate to dense (50-100%) understory during nesting (Proudfoot 1996). Nest sites were usually less than 91.4 m (300 ft) from open areas.

The density of trees and the amount of canopy cover preferred by CFPOs in Arizona has not been determined. However, preliminary results from a habitat selection study indicate that nest sites tend to have a higher degree of canopy cover than random sites (Wilcox et al. 2000). In addition, habitat descriptions of areas with the highest concentrations of CFPOs are most commonly characterized by semi-open or open woodlands, often in proximity to forests or patches of forests. Where they are found in forested areas, they are typically observed along edges or in openings, rather than deep in the forest itself (Binford 1989, Sick 1993), although this may be a bias of increased visibility. Total vegetation density may not be as important as the presence of patches of dense vegetation with a developed canopy layer interspersed with open areas. The physical settings and vegetation composition varies across the range of *G. brasilianum* and, while

vegetation structure may be more important than composition (Wilcox et al. 1999, Cartron and Finch 2000), higher vegetation diversity is found more often at nest sites than at random sites (Wilcox et al. 2000).

Both Sonoran desertscrub and semidesert grasslands in Arizona appear to be important as habitats for the CFPO. This species does not appear to be dependent on riverine ecosystems throughout its range. Where mesic riparian vegetation forms a closed-canopy forest, CFPO densities may be low. Cartron et al. (2000) identified thickets and woodlands with a dense understory that often consists of spiny shrubs as important structure for CFPOs. In Mexico, where mesic riparian areas closely resemble those found in Arizona, associations between riparian vegetation and the CFPO appear to be weak (Cartron et al. 2000). In Arizona, however, riparian systems generally support a much higher degree of wooded vegetation compared to uplands and as a result, attract a disproportionate amount of wildlife (Carothers 1977, Hubbard 1977, Pase and Laysen 1977). For example, migrating passerines tend to prefer riparian corridors over uplands (Stevens et al. 1977).

Historically in Arizona, riparian areas and thickets are where CFPOs were most often detected; however, these areas also included a high proportion of edge. In addition, it is difficult to determine extent of survey focus, and thus habitat selection for riparian vs. upland habitats from historical survey information. Riparian areas with abundant edges generally support a higher number of reptiles (Jones 1988) and mammalian prey species compared to adjacent uplands (Stamp and Ohmart 1979). An abundant and diverse prey base may be important for a perch and wait predator such as the CFPO (Cartron et al. 2000). The cryptic nature of CFPOs and their apparent inconsistency of response in Arizona to survey protocol techniques increases the difficulty of their detection and, thus, our ability to conduct research and monitoring. More research on habitat use and selection is necessary before substantial confidence can be given to predictions of habitat preference.



Although CFPOs occupy the same general area year-round (Phillips et al. 1964, Oberholser 1974), the size of area used and the composition of vegetation may vary among seasons (Proudfoot 1996). Tracking of ten radio-tagged adult males from incubation through dispersal of young (i.e., April 3-August 12) and three males post-dispersal (i.e., September 16-November 26, 1994) showed a 3.4-fold increase in average size of area used between nesting and post-nesting males (Proudfoot 1996). Also, nesting habitat contained considerably more understory vegetation than areas used post-nesting (Proudfoot unpubl. data). These alterations in areal expanse and habitat use may be related to seasonal variations in prey abundance and parental care (Proudfoot 1996, Proudfoot and Beasom 1997). In Arizona, observations have indicated that home range size and territory occupancy may sometimes be related to mortality within the breeding pair. For example, following the death of its mate, one male CFPO expanded its use area considerably during the breeding season. Additionally, one breeding female occupied three different breeding home ranges over three consecutive years, each time in response to the mortality of the breeding male (AGFD unpubl. data). Research on CFPO home ranges, particularly any differences in home range size based on vegetation types or breeding status, is necessary before the size of areas used by pygmy-owls can be well understood.

## **E. Natural History of the CFPO**

### **1. Nomenclature and Description**

Depending on the reference consulted, from 11-14 subspecies of *G. brasilianum* may be catalogued (Peters 1940, Clark et al. 1978, Howard and Moore 1991, Freethy 1992, and König and Wink 1995). Several closely related taxa are considered distinct species of *Glaucidium* by some and noted as subspecies of *G. b.* by others (e.g., *G. jardinii* and *G. nanum*) (Wetmore 1926, Burton 1984, Sibley and Monroe 1990). In March 1997, we recognized four subspecies (i.e., *G. b. brasilianum*, *G. b. cactorum*, *G. b. stranecki*, and *G. b. ridgwayi* [USFWS 1997 - 62 FR 10730]). Valid subspecies in the United States and Mexico are *G. b. cactorum* and *G. b. ridgwayi*, respectively. *G. b. cactorum* have shorter wings and longer tails than *G. b. ridgwayi*. Color

phases of *G. b. cactorum* are paler and grayer than *G. b. ridgwayi*; the tail in gray phases is banded with brown and buff or brown and rufous, and is distinctive from the dark brown and white tail of *G. b. ridgwayi* (van Rossem 1937).

Back and upper wing feathers of CFPOs are light brown, with conspicuous regularly spaced whitish spots on the upper wing and primary feathers. Both tail and primary feathers are dusky barred, and the dusky and light bars on the tail are evenly spaced. The head and nape are a somewhat paler brown than the back and have linear whitish streaks; each side of the nape is decorated with a black/dark brown blot bordered in white that resembles an eye. The face has a white “V” and disk (Monson 1998). The breast and flanks are heavily streaked with dark reddish brown to blackish marks; sometimes the streaks seem to merge and become almost solid reddish brown.

Males are usually darker brown than females (Proudfoot 1996, Pyle 1997). Males display homogenous dark brown color tones on the upper wing, crown, and back, which maintains moderate continuity with dark brown tail bands and contrasts the cinnamon-rufous tail bands. Differences in color tone between dark brown and cinnamon-rufous tail bands are very distinctive in males (Proudfoot 1996). Color tone differences between males and females may be described as males having a dominant dark brown color tone compared to a cinnamon-rufous color tone dominant in females.

Females display homogenous cinnamon-rufous color tones on the upper wing, crown, and back, which maintains moderate continuity with rufous tail bands and contrasts their dark brown tail bands. Dark brown tail bands are lighter on females than males and the contrast between cinnamon-rufous and dark brown tail bands is less dramatic.

The cere and bill are greenish yellow to grayish yellow, becoming lighter yellow towards tip; the iris is lemon yellow (Grossman and Hamlet 1964, Johnsgard 1988); the legs and feet are

feathered; tarsus and toes are greenish yellow (Johnsgard 1988, Monson 1998); and talons are dark brown (Grossman and Hamlet 1964).

Average mass recorded for 20 male and 7 female museum specimens were 66.3 grams (g) (2.3 ounces [oz]) and 73.0 g (2.6 oz), respectively; ranges were from 54-77 g (1.9-2.7 oz) and 62-84 g (2.2-3.0 oz), respectively (Proudfoot 1996). Mean mass from 54 males and 29 females banded in Texas were 65.0 g (2.3 oz) and 77.8 g (2.7 oz), respectively; ranges were from 57-79 g (2.0-2.8 oz) and 68-102 g (2.4-3.6 oz), respectively. Mean mass from 41 nestlings banded in Texas 4-7 days before fledging was 58.2 g (2.1 oz); range was from 30-70 g (1.1-2.5 oz).

## 2. Genetics

Recent analysis of mitochondrial deoxyribose nucleic acid (mtDNA) obtained from 95 pygmy-owls in Arizona, Texas, and the Mexican states of Sonora, Sinaloa, Nayarit, Michoacan, Oaxaca Chiapas, Yucatan, Tabasco, Veracruz, and Tamaulipas suggest that 2 distinct groups occur in the U.S. and Mexico (Proudfoot and Slack 2001). Phylogenetically, Arizona and Texas populations are unique, with no shared haplotypes. Populations from Sonora and Sinaloa, Mexico were distinct from remaining populations in Mexico and group closest to pygmy-owls in Arizona. In addition, although pygmy-owls from NW Tucson fall within the larger group from Arizona, Sonora, and Sinaloa, information suggests current separation between populations in NW Tucson and populations in the Altar Valley, Sonora, and Sinaloa. Similarly, populations from Texas and Tamaulipas, Mexico, constitute a distinct group (Proudfoot et al. unpubl. data). These results are congruent with earlier taxonomic studies that recognized birds from these regions as distinct subspecies (van Rossem 1937, Peters 1940, Phillips 1966, König et al. 1999). The separation of these two groups is probably the consequence of barriers to gene flow provided by the altitudinal

Sierra Madre Occidental, because pygmy-owls rarely occur above 1,300 m (4,000 ft) (Proudfoot and Johnson, 2000). Patterns of mtDNA variation provide strong evidence of two genetically distinct units, one in Arizona, Sonora, and Sinaloa (subspecies *cactorum*) and the other in Texas

and Tamaulipas, and regions of South-Central Mexico (subspecies *ridgwayi*). Although a haplotypic separation exists between the pygmy-owl populations of Arizona, Texas, and regions of South-Central Mexico, data do not indicate genetic isolation between the distinct populations in the US and those immediately across the border in northwestern or northeastern Mexico (Proudfoot et al. unpubl. data). However, if geographic isolation of the Arizona and Texas populations from Mexican populations resulted from urban and agricultural expansion (Oberholser, 1974, Monson and Phillips, 1981), the span of isolation was approximately 75 years (an extremely short time span in population genetic terms). In addition, if other genetic markers, such as microsatellites, show low level genetic variation, concern could be warranted. More information on genetic variation among existing groups of CFPOs in Arizona and Mexico is needed to better understand this aspect of CFPO interrelationships.

### 3. Ecology

The most complete and comprehensive account of CFPO ecology, natural history, and biology is that of Proudfoot and Johnson (2000). This publication addresses CFPO distribution, habitat use, food habits, vocalization, behavior, territoriality, predation, breeding, growth and development, disease and parasites, and mortality, with supplementary information for each section. Because this is a culmination of available literature and current studies, no other single publication addresses as many topics of CFPO biology. Therefore, a significant portion of the following information on CFPO ecology and natural history was derived from the aforementioned publication.

Information specific to the CFPO in Arizona is just beginning to be gathered. Research in Texas has provided useful insights into the ecology of this subspecies and information on aspects of CFPO life history such as breeding chronology, productivity, life span, etc. seem similar to Arizona. However, habitat and environmental conditions are somewhat different than in Arizona; thus, conclusions about habitat use or selection based on information from Texas must be tentative.

CFPOs are considered permanent residents throughout their range, and have been reported during winter months in Arizona by several biologists (e.g., Organ Pipe Cactus National Monument, R. Johnson, T. Tibbitts, pers. comm., AGFD, unpubl. data). Furthermore, C. E. Bendire collected CFPOs along the Rillito Creek at present-day Tucson on January 24, 1872, and records document CFPOs in Sabino Canyon on December 3, 1941 and December 25, 1950. Seasonal variation in density of CFPOs in Sonora, Mexico prompted Russell and Monson (1998) to suggest that some northern birds may be migratory. However, variation in responsiveness to broadcasted calls at different times of the year, and expansion in home range size post-nesting also may explain the appearance of a change in distribution or density (Gehlbach 1994, Proudfoot 1996, Proudfoot and Johnson 2000). Although CFPOs in Arizona do not appear to migrate, dispersing juveniles can make significant movements (e.g., from 2-50 km; Abbate et al. 1999, AGFD unpubl. data). The possibility of migration should be the topic of further research.

CFPOs are primarily diurnal with crepuscular tendencies (i.e., most activity occurs during daylight hours, with significant peaks at dawn and dusk) (Proudfoot 1996, Proudfoot and Beasom 1997, Proudfoot and Johnson 2000). However, prey deliveries have been observed at all times during the 24-hour day. Night activity was drastically reduced 4-7 days before initiation of fledging (Proudfoot and Johnson 2000).

Observations in Arizona (primarily from northwest Tucson) from 1996 through 1998 indicate that reptiles, birds, mammals, and insects were 44, 23, 6, and 3%, respectively, of CFPO prey deliveries recorded; 24% were unidentified (Abbate et al. 1999). It is likely that use of insects was underestimated in these Arizona observations because of the speed at which they are consumed and the difficulty in observing such small prey items. In Texas, insects, reptiles, birds, and small mammals were approximately 58, 23, 11, and 9%, respectively, of prey remains analyzed (Proudfoot and Beasom 1997). However, seasonal and annual variations in diet occur and biomass and caloric value of each prey class is required before assigning energetic significance. Therefore, additional research may be required before management guidelines

related to prey selection are developed (Proudfoot and Beasom 1997). Research activities related to prey studies in Arizona, such as pellet analysis and videography, are being initiated pending funding and resource availability.

Hunting behavior generally consists of sudden perch-to-prey strikes; however, CFPOs also hunt by inspecting tree and saguaro cavities for other nesting birds, and possibly bats. Aerial capture of winged prey (e.g., birds and bats) is unknown. Flight is considerably noisier than most other owls. Ears are symmetrical, hence, vision must play a pivotal role in acquiring food.

Territorial and advertisement calls of CFPO vary only by slight deviations in decibels (dB) and frequency, the territorial call being a little faster and considerably louder. Both calls contain a series of interrupted single notes with upward inflections (toots). Each series (hereafter referred to as a bout) may contain 10-50 notes, 5-6 notes every 2 seconds (Burton 1984, Johnsgard 1988, Proudfoot and Beasom 1996). With 5-10 second intervals between each bout, CFPO may call in sessions that last from 5 minutes to 5 hours. Longer sessions usually occur during courtship-incubation. The number of notes with a bout is highly variable, depending on nesting status, time of day, time of year, and individual characteristics. Observations of 100 notes or more have been documented (AGFD unpubl. data). Similar to most owls, the male's call is lower in tone than female's (G. Proudfoot and S. Richardson, pers. obs.). Females may extend the utterance of each note to create a sound similar to a dripping faucet. The pitch of male territorial-advertisement calls are approximately 1,400 hertz (htz) (Stillwell and Stillwell 1954). Because CFPO vary their dB output, it is sometimes difficult to obtain an accurate fix on their location based on vocalization.

In Arizona, noticeable spontaneous calling begins in February, peaks from March-April, and tapers off by early June. Peak calling occurs from April-May in Texas, with incline and descent similar to Arizona birds. In Texas, spontaneous calling is infrequent from July through March;

however, responses to broadcasted conspecific calls during this period were not reduced (Proudfoot and Beasom 1996). Sporadic calling was recorded throughout the year at Organ Pipe Cactus National Monument, with increased activity in spring (T. Tibbitts pers. comm.).

Social interactions occur during breeding, among established pairs, and within family units from fledging through dispersal. Males establish territories using territorial-advertisement calls to repel neighboring males and attract females. Usually, CFPOs nest as yearlings (Gryimek 1972, Abbate et al. 1999), and both sexes breed annually thereafter. Territories normally contain several potential nest-roost cavities from which responding females select a nest. Hence, cavities/ha may be fundamental criteria for habitat selection. In Texas, males may defend areas with radii from 335-610 m (1,100-2,000 ft) (Proudfoot and Johnson 2000). At Organ Pipe Cactus National Monument, Arizona, CFPO territories were approximated from 91-274 m (300-900 ft) in diameter, and varied from nearly circular to nearly triangular. Seasonal responsiveness of CFPOs to broadcasted conspecific calls suggests territories are maintained post-nesting (Proudfoot and Beasom 1996).

In Texas, the area used by nine radio-tagged adult males monitored from before to after incubation ranged from 1.3-23 ha (3.2-57 ac). An unmated adult male monitored during the same period used 110 ha (271.6 ac). From fledging through dispersal, five radio-tagged families (i.e., two adults [one male and one female] and three fledglings/family) used from 9.3-59.4 ha (22.9-146.9 ac). From October-November, two radio-tagged males and one yearling used 112.5, 72.8, 19.6 ha (278.4, 179.8, and 48.4 ac), respectively (Proudfoot 1996). In Arizona, CFPOs monitored during nesting used from 2-20.2 ha (5-50 ac), and an unpaired male used approximately 87.8 ha (217 ac) (Abbate et al. 1999).

Historically, CFPOs in Arizona used cavities in cottonwood, mesquite, ash trees, and saguaro cacti for nest sites (Millsap and Johnson 1988). Of the nests located in Arizona from 1996 to 2002, one nest in an ash tree and one in a eucalyptus tree were the only non-saguaro nest sites

recorded (Abbate et al. 2000). In Sonora, Mexico, oak, Montezuma bald cypress (*Taxodium mucronatum*), and large cacti (Russell and Monson 1998) are used for nest sites; in Texas, live oak, mesquite, cottonwood, ash (*Fraxinus* spp.), and palm (genus unknown) (Oberholser 1974) are used. Nest cavities range from 2-12.2 m (6.5-40 ft) above ground level, but 4-6 m (13-20 ft) is common (Oberholser 1974, Johnsgard 1988, Proudfoot 1996). Closest distance between conspecific nests (n = 44) in Texas was 741 m (2,431 ft). No statistically significant differences were recorded in entrance height, or directional orientation of nest cavities in Texas (Proudfoot and Johnson 2000).

In both Texas and Arizona, observations indicate that the female incubates the eggs and attends hatchlings, while the male provides food to the female and young. In Texas, studies noted that males provided all of the food collected for the females and their young for approximately the first week following hatching (Proudfoot 1996, Proudfoot and Johnson 2000). In Arizona, the majority of hunting activity and prey captures by male CFPOs were conducted away from the immediate nest site and, consequently, out of sight of nest observers (Abbate et al. 1996). However, the male would then deliver the food item to the female near the nest for delivery to the young during the nestling and fledgling stages.

Females display a distinctive central brood patch from 5-7 days before initial laying to about 21 days post-fledging. Incubation patches were not recorded on males (Proudfoot and Johnson 2000). Average clutch recorded was 3.5 (n = unknown) and 4.8 (n = 36) by Mueller (1986) and Proudfoot (1996), respectively. One clutch per year is typical. Incubation and brooding are conducted by the female only (Proudfoot and Johnson 2000). However, observations in Arizona indicate that the male may participate in these activities on a limited basis (Abbate et al. 1999). Incubation lasts from 23-28 days (Scherzinger 1977, Proudfoot 1996). In Texas, fledging occurs from 21-29 days after hatching. However, no CFPO nestlings that fledged at less than 24 days lived greater than one day post-fledging. Fledging usually occurs during crepuscular hours. Dispersal from natal sites occurs from 7-8 weeks post-fledging in both Arizona and Texas. First dispersal of fledglings from Arizona and Texas were July 24 and August 14, respectively. In



Texas, 15 radio-tagged fledglings dispersed from 16-29 km (10-18 mi) before being recaptured to remove failing transmitters. Fledglings often travel greater than 1 km (0.6 mi) the first day. Direction of dispersal appears to be random (Proudfoot and Johnson 2000). This stage of the CFPO life cycle needs further study.

In Texas, juveniles usually remained within 100 m (300 ft) of adults until dispersal, which occurred approximately 63 days postfledging. In Texas, 6 CFPO banded as nestlings and recaptured as nesting adults dispersed from 1.9 to 17.3 km from natal sites and 20 juveniles monitored with radio telemetry during dispersal were from 1.2 km [0.75 mi] to 30.5 km [19 mi] from their natal sites before being recaptured to remove failing transmitters (Proudfoot and Johnson 2000). One banded juvenile in Arizona was observed in 1998 approximately 3.9 km (2.4 mi) from its nest site following dispersal. Five young monitored with radio telemetry during 1998 were recorded dispersing from 3.5 km (2.17 mi) to 10.4 km (6.5 mi) (mean 5.9 km [3.6 mi]) (Abbate et al. 1999). In 1999, 6 juveniles in Arizona dispersed from 2.3 km (1.4 mi) to 20.7 km (12.9 mi) (mean 10 km [6.2 mi]) (Abbate et al. 2000). In Arizona, the maximum total distance traveled by a dispersing juvenile was 99 km (62 mi)(AGFD unpubl. data). Juveniles typically dispersed from natal areas in July and did not appear to defend a territory until September. They appear to fly from tree to tree instead of long flights and have moved up to 1.6 km (1 mi) in a night. Once a dispersing male CFPO settles in a territory, they rarely make additional movements. Spring surveys have found male juveniles in the same general location as observed the preceding fall (Abbate et al. 2000). However, unpaired female disperser may make additional movements into the subsequent breeding season (AGFD unpubl. data).

Little information is available on life expectancy. Three pairs banded in Texas during April 1994 nested in the same areas for four years; two adults banded in 1994 were recaptured in 1999. Of 57 pairs monitored in Texas from 1993-1998, two adults succumbed to predation during the nesting season (Proudfoot and Johnson 2000). To establish a recruitment standard for this species and determine population stability, long-term life history studies are needed.

## **F. Current Management**

### **1. Endangered Species Act Protection**

Section 9 of the ESA prohibits the “take” of any listed animal or plant species. Take is defined as harass, harm, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. “Harass” is defined as actions that create the likelihood of injury to a listed species by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering. “Harm” includes significant habitat modification or degradation that results in death or injury to a listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). Sections 7 and 10 of the ESA provide regulatory mechanisms for actions affecting the CFPO on public and private lands, respectively. Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to carry out programs for the conservation of endangered and threatened species. Through section 7(a)(2), all Federal agencies are required to ensure that any action they authorize, fund, or carry out in the United States is not likely to jeopardize the continued existence of any listed species or result in destruction or adverse modification of its critical habitat (50 CFR 402.01(a)). Section 10(a)(1)(B) of the ESA gives the Service the authority to issue permits to non-Federal and private entities for the taking of listed species, as long as such taking is incidental to, and not the purpose of, carrying out otherwise lawful activities, and the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild (16 U.S.C. 1539). A section 10(a)(1)(B) permit is only issued if the applicant institutes appropriate conservation measures for habitat maintenance, enhancement, and protection, coincident with the action.

Since the CFPO was listed on March 10, 1997, we have reviewed hundreds of proposals for activities that could adversely affect the CFPO. During this period, several large grazing consultations have been completed with Federal agencies (i.e., Bureau of Land Management

[BLM] and USDA Forest Service). We have completed many section 7 consultations with other Federal agencies (e.g., Corps, Environmental Protection Agency [EPA], Federal Highways Administration, various branches of the military, and others) on their projects, or actions they authorize. These projects have included commercial and residential developments, public works projects, mining operations, and other types of activities. The Service has issued one section 10(a)(1)(B) permit for a 65 ha (160-ac) residential development project in December 1998 and several others are in development. Additionally, we provide technical assistance for hundreds of projects without a tie to a federal agency, primarily single-family residences.

## 2. Migratory Bird Treaty Act Protection

The Migratory Bird Treaty Act of 1916 (16 U.S.C. 703-712) (MBTA) was signed into law to implement a treaty with Great Britain (on the behalf of Canada). Since then, treaties have also been concluded with Mexico, Japan, and Russia. Congress subsequently amended the MBTA to include virtually all birds in North America, including the ferruginous pygmy-owl (*G. brasilianum*) (50 CFR 10 rev 4/5/85). The MBTA specifies “Unless and except as permitted by regulations...it shall be unlawful at any time, by any means or in any manner, to...take, capture, kill, attempt to take, capture, or kill, possess...any migratory bird, any part, nest, or egg of any such bird...including in the terms of conventions...” (16 USC section 703). The definition of “take” under the MBTA is limited to a bird, nest, or egg(s) compared to the broader protection measures under the ESA which also include habitat modification or degradation. Although the MBTA provides some level of protection to migratory birds (e.g., their active nests, and eggs from taking), it was never intended to address habitat issues.

### 3. Arizona State Statute

AGFD maintains a list entitled “Wildlife of Special Concern in Arizona” that serves as a policy guide for wildlife management; however, from a state statutory perspective, it is non-regulatory and clearly distinct from lists of species protected under the ESA. The CFPO is included on this list (AGFD 1996). The Arizona list provides a mechanism through which the state can allocate resources for the protection, study and management of specially designated species. Some level of regulatory protection for the CFPO is provided by ARS Title 17. These general Arizona wildlife rules make it unlawful “...unless otherwise prescribed...for a person to...take, possess, transport, buy, sell or offer or expose for sale wildlife, except as expressly permitted...”

### 4. Interagency Cooperation and Conservation Measures

The implementation of recovery tasks identified in this Draft Plan is not the sole responsibility of the Service. Although we must provide leadership in the recovery of listed species, other Federal, State, and local agencies, Native American Nations, and private citizens also play a vital role. Under sections 7(a)(1) and 7(a)(2) of the ESA, Federal agencies shall carry out their programs for the conservation of endangered and threatened species and ensure their actions, authorizations, and funding are not likely to jeopardize their continued existence or adversely modify their critical habitat. The Service has involved a wide variety of affected groups in this recovery planning process, including the development of the implementation tasks identified in this Draft Plan. The following is a brief summary of the responsibilities of various Federal, State, County, and Tribal governments and actions they have carried out to date regarding management for the CFPO.

Little was done to protect the CFPO prior to its listing, although efforts to establish and protect riparian zones in Arizona probably helped maintain some of the vegetation communities important to the CFPO. Conservation efforts since listing have focused primarily on gathering information about the current abundance and distribution of CFPOs in Arizona.

## **U.S. Fish & Wildlife Service (Service)**

As an agency within the Department of the Interior, the Service is charged with protecting endangered and threatened species and restoring them to a secure status in the wild.

Responsibilities of the Service's Endangered Species program include listing, reclassifying, and delisting species under the ESA; providing biological opinions to Federal agencies on their activities that may affect listed species; overseeing recovery actions; providing for the protection of important habitats in National Wildlife Refuges; providing grants to States to assist with their endangered species conservation programs; and international coordination.

### **Ecological Services**

The Arizona Ecological Services Field Office (AESFO) funded surveys within the historical range of the CFPO in Arizona during 1998 and 1999. In addition, studies to determine habitat characteristics and movement of CFPOs within occupied sites in northwest Tucson and the Altar Valley have been, in part, funded by the Service. AESFO, together with AGFD revised the survey protocol and landowner guidance that assists landowners in assessing their risk of take of a CFPO on their lands. The AESFO is also developing, in cooperation with AGFD, a database to manage survey results and standardize survey forms, and reporting methods. AESFO provides partial funding support for AGFD activities through section 6 ESA grants. AESFO has funded much needed habitat assessments and surveys in Sonora, Mexico. The AESFO is the lead for completing the Draft Plan for the CFPO. These actions have provided and will continue to provide needed information, and will assist Federal, State, and local jurisdictions, and others in recovery actions.

AESFO assists various Federal agencies (e.g., BLM, Corps of Engineers [Corps], Environmental Protection Agency [EPA], USDA Forest Service, etc.) in section 7 consultations to ensure their programs provide for conservation of the CFPO as required under the ESA. We also cooperate

with the State of Arizona, private landowners, and local jurisdictions to develop HCPs to minimize and mitigate impacts to the CFPO and aid in the recovery of this and other Federally listed species (e.g., Pima County's Sonoran Desert Conservation Plan [SDCP]).

### **Buenos Aires National Wildlife Refuge (BANWR)**

The Refuge has funded surveys and habitat assessment studies within the approximately 40,500 ha (100,000 ac) Refuge. Cattle have been removed from all riparian areas on the Refuge, and roads have been closed where a CFPO was recently sighted. Prior to conducting controlled burns, surveys will be conducted in washes and riparian areas. Refuge personnel are assisting AGFD and researchers monitoring CFPO sites. Efforts to survey other areas within the Refuge will increase as funding allows.

### **Cabeza Prieta National Wildlife Refuge**

Only a small percentage of the roughly 348,000 ha (860,000 ac) Refuge has been surveyed since 1993. During 1993-1994, areas in and around the Bryan Mountains/Monreal Well, Agua Dulce Mountains, and Growler Peak were surveyed. Daniel's Arroyo, Adobe Well, and the Cabeza Prieta Mountains/Cabeza Prieta Tanks were surveyed. No CFPOs were detected during these surveys. Additional surveys were contracted in 2000, resulting in the documentation of two territorial males at two locations. The Refuge will continue to survey for CFPOs pending adequate funding.

### **Bureau of Land Management (BLM)**

The BLM is responsible for managing the nation's public lands and resources in a combination of ways that best serves the needs of the American people. BLM balances recreational, commercial, scientific, and cultural interests (i.e., multiple use) and it strives for sustained yields of renewable and non-renewable resources, including range, timber, minerals, recreation, watershed, fish and

wildlife habitat, wilderness and natural, scenic, and cultural values. In Arizona, the BLM administers 7.4 million ha (18.3 million ac) of public lands and resources and another 7 million subsurface ha (17.3 million subsurface ac). Seven field offices throughout the state provide on-the-ground field management. No specific guidelines or management plans have been developed for the CFPO on lands administered by the BLM, although BLM has developed criteria for grazing in CFPO habitat as a result of section 7 consultations.

### Phoenix Field Office

BLM conducts surveys prior to any significant actions taken in CFPO habitat. Surveys are conducted in various areas with high potential for CFPO occurrence (Coffee Pot, Vekol Valley, Table Top, Maricopa Wilderness). A series of monitoring sites are planned north and west of the Gila River, between Agua Caliente and New River, in an attempt to determine northern and western distribution.

### Tucson Field Office

In 1998, BLM developed a habitat assessment form to help evaluate the quality of habitat on public lands of the Tucson Field Office. Prepared primarily for the Sonoran Desert, this form was used during the 1998 and 1999 field seasons to map habitats with the highest potential for CFPO occurrence. In 1999, approximately 24,300 ha (60,000 ac) of public lands were inventoried for the presence of CFPO, based on results of habitat assessments. These were primarily livestock grazing allotments located northwest of Tucson. The BLM will continue to survey areas with potential for CFPO occupancy in Northwest Tucson as funding allows. In addition, a riparian habitat assessment form is being completed which will assist in determining habitat quality for CFPO along the Middle Gila and the Lower San Pedro Rivers, as well as other, smaller drainages with riparian habitat. CFPO inventories will be conducted on these areas as staffing and funding allow.

Lands along the Lower San Pedro River administered by BLM have not been surveyed to date. Historical records of CFPO have come from the area around Dudleyville in Pinal County, but there have been no recent records. Public lands in the Cascabel area were surveyed for CFPOs in 1999, but no detections were made. BLM plans on repeating CFPO surveys in the future based on the habitat assessment scores mentioned above.

A new national monument was designated northwest of Tucson by President Clinton in 2000. BLM was given the responsibility for managing the Ironwood National Monument. Ironwood National Monument contains approximately 129,000 acres. Much of this area is suitable CFPO habitat and is situated in key areas providing connectivity between CFPO population segments in Arizona. Limited surveys have been conducted in portions of the monument. A management plan for the Monument is being developed.

#### Safford Field Office

BLM conducted surveys along several portions of the Gila River determined to be potentially suitable for CFPOs. Much of the public lands which the Safford Field Office manages lie above 1,219 m (4,000 ft), the threshold thought to be the upper limit of CFPO habitat. Also, while there have been reports of CFPO from Bonita Creek and along the lower portions of Aravaipa Canyon (west), these records have not been substantiated. Contingent upon funding and staffing, areas of public land near the confluence of Aravaipa Creek and the San Pedro River may be surveyed in the future.

#### San Pedro Riparian National Conservation Area

BLM has not conducted surveys for CFPOs within the San Pedro Riparian National Conservation Area. Approximately 32 km (20 mi) of the San Pedro River in the area fall under 1,219 m (4,000 ft) elevation, and CFPO occupancy is possible, although there has never been a documented



record of a CFPO within the Conservation Area. BLM intends to survey portions of the northern section determined to be suitable for CFPOs in the future. Upland areas adjacent to the San Pedro River contain areas of well developed Sonoran desertscrub and high saguaro densities.

## **National Park Service**

As an agency within the Department of the Interior, the purpose of the National Park Service is “...to conserve the scenery and the natural and historic objects and the wildlife wherein and to provide for the enjoyment of future generations” (16 USC 1:1916). This mandate, is combined with the National Park Service’s mission and responsibilities as a Federal agency to protect, conserve, and contribute to the recovery of candidate, threatened, endangered species.

### **Organ Pipe Cactus National Monument (OPCNM)**

The Monument is approximately 134,000 ha (331,000 ac) in size. Since 1990, personnel have periodically surveyed and monitored CFPO locations on the Monument. Recent research projects have analyzed habitat characteristics at several occupied sites to determine use patterns and habitat selection characteristics on the Monument. Geographic Information System (GIS) was used in this effort to overlay CFPO locations with vegetation maps to determine trends. Data are limited, but about 54% of the sites are on upper-bajada associations with numerous saguaros and trees; 36% are in large xeroriparian areas and 10% are somewhere in between (Tibbitts and Dickson 1999).

No site closures or restrictions have been implemented in known territories. However, as various activities are likely to be proposed for these areas, the need for closures and/or restrictions will be addressed.

## Saguaro National Park

Saguaro National Park is comprised of two geographical units, totaling approximately 37,000 ha (91,000 ac). Park staff conducted surveys prior to listing with only one detection in the east unit. In the past, there have been several unverified records from both units. The Park conducted over 300 surveys during 2001 and 2002 and will continue to conduct annual surveys as dictated by habitat quality, adjacent owl locations and project clearance needs.

## **USDA Forest Service**

The mission of the Forest Service is to provide a continuous flow of natural resource goods and services to help meet the needs of the Nation and to contribute to the needs of the international community. The Coronado National Forest covers approximately 0.7 million ha (1.7 million ac) of land in Southeastern Arizona. Twelve Ecosystem Management Areas, consisting of isolated mountain ranges, separated by desert grassland or desertscrub, are organized into five Ranger Districts: Douglas Ranger District, Nogales Ranger District, Sierra Vista Ranger District, Safford Ranger District, and Santa Catalina Ranger District.

Surveys and habitat assessments have been conducted for the CFPO on the Santa Catalina and the Nogales Ranger Districts, the only districts believed to support suitable environments for the owl, based on vegetative communities present and elevation. Approximately 8,100 ha (20,000 ac) were surveyed from 1994 through 1999, and 115 habitat assessments were conducted. No CFPOs were found during any of these surveys with the exception of one suspected vocalization (no visual confirmation) on the Santa Catalina Ranger District. In addition, in 1999, a juvenile CFPO was documented dispersing into an area managed by the Forest Service. The transmitter failed soon after this movement and it is unknown whether this owl remained on Forest Service land.

The Tonto National Forest covers about 1.2 million ha (3.0 million ac) of the Salt and Verde river watersheds in central Arizona. The southern portion of the forest, approximately 364,500 ha (900,000 ac) is Sonoran Desert, dominated by saguaro/palo verde/ironwood/mesquite vegetation. Potential habitat for the CFPO is found on four of the six Ranger Districts on the Forest: Cave Creek, Globe, Mesa, and Tonto Basin. Known historical locations for CFPOs were on New River and the Blue Point area on the lower Salt River.

Surveys for CFPOs have been conducted in the most promising areas on the Mesa and Cave Creek districts. Over 8,100 ha (20,000 ac) have been surveyed since 1994. New project areas within potential habitat are surveyed to current protocol standards.

All Forest programs, activities, and projects are reviewed for possible effects on endangered, threatened, proposed, and sensitive species. The purpose of the reviews is to ensure that Forest Service actions do not contribute to the loss of viability for any native or desired non-native plant or animal, and to comply with the ESA.

## **Department of Defense**

### **Barry M. Goldwater Range (BMGR)**

The mission of the approximately 702,000 ha (1.8 million ac) BMGR is to provide an armament and high-hazard testing and training area for aerial gunnery, rocketry, electronic warfare and tactical maneuvering and air support, and other defense related purposes. According to the Sikes Act, the natural resources mission on military installations is to provide for the conservation and rehabilitation of natural resources and provide for sustainable multipurpose use of the resources consistent with the military purposes of the range. In 1999, the land withdrawal for the BMGR was renewed and several key areas, totaling nearly 40,000 ha (100,000 ac), were not included in the renewal. Part of this area (Sand Tank Mountains) has been included in the designation of the Sonoran Desert National Monument.

Since 1994, approximately 9,600 ha (24,000 ac) of potentially suitable habitat for CFPOs has been surveyed. Given the size of the area, much of the potentially suitable habitat on the Range has not been surveyed. However, the majority of the habitat of the highest potential has been surveyed to some degree, with some areas having been surveyed on multiple occasions. The 1994 survey effort included establishment of six permanent transects which were to be surveyed every two years. Due to the change in management jurisdiction resulting from the renewed withdrawal legislation, three of the six transects now fall outside the Air Force's jurisdiction. Although several unconfirmed sightings of CFPOs have been recorded on the BMGR, none of these have been verified. Additional areas will be surveyed as time and funding permits.

### **U.S. Army Corps of Engineers (Corps)**

The Corps is responsible for the issuance of permits for the discharge of dredged or fill material into the navigable waters of the United States under section 404 of the Clean Water Act (CWA) (Federal Water Pollution Control Act). The Corps has consulted with, and continues several on-going consultations with the Service on various projects, primarily in Pima County.

### **U.S. Environmental Protection Agency (EPA)**

The EPA's mandate is to protect human health and to safeguard the natural environment. The EPA is responsible for administering certain provisions of the CWA, including the issuance of permits for pollutants under the National Pollution Discharge Elimination System (NPDES Permits, section 402 of the CWA). The EPA has consulted and is currently consulting with the Service on several proposed development projects located in the northwest Tucson area.

### **Arizona Game & Fish Department (AGFD)**

The AGFD is a State agency charged with protecting and managing Arizona's wildlife and their habitats. This is accomplished through conserving, enhancing, and restoring Arizona's diverse wildlife resources and habitats through aggressive protection and management programs, and

providing wildlife resources and safe water craft and off-highway vehicle recreation. AGFD's Heritage Fund and Nongame Wildlife Checkoff provides for more non-traditional wildlife management activities in the areas of sensitive species and habitats, urban wildlife, public access, environmental education, and community grants.

In the early 1980's , the CFPO was identified by the AGFD, Arizona State Parks, and the Arizona State Lands Department through the Arizona Natural Heritage Program as a "sensitive element" and efforts were initiated to gather information regarding the species. The CFPO was placed on the AGFD's list of threatened native wildlife in 1988. Although this action carried no protective authority, it did bring attention to the status of this subspecies within the state. The AGFD began formal surveys for CFPO in 1993 in an effort to gather more information on the status and distribution of the owl in Arizona. In 1996, AGFD activities expanded to include nest monitoring. Substantial information was obtained on the breeding biology and food habits of CFPOs during that year. Ongoing activities include surveys, monitoring, habitat assessment, banding, and telemetry. Information being gathered is used by the AGFD to evaluate projects proposed by various entities to ensure that CFPO needs are being considered during project design and implementation. AGFD also provides technical assistance to other agencies and groups addressing issues pertaining to CFPO management and protection.

### **Army National Guard**

The Army National Guard is conducting surveys in three areas considered suitable for CFPOs; Florence, Buckeye, and Marana. The Florence site is approximately 10,117 ha (25,000 ac) and is used primarily as an artillery training area. The Buckeye site is about 600 ha (1,500 ac) and is located at the southern end of the White Tank Mountains west of Phoenix. The Marana site, between Picacho Peak and Tucson, contains part of the Santa Cruz River drainage. Surveys will be conducted over two seasons with repeat surveys at three to five year intervals, with the exception of Florence where annual surveys are ongoing.

## **Arizona State Land Department**

The Arizona State Land Department was established in 1915 to manage the Land Trust (Trust) given to Arizona by the Federal Government at statehood. The mission of the Land Department has been to manage the Trust and generate revenues for 14 distinct beneficiaries. By law, all uses of the land must benefit the Trust, a fact which distinguishes it from the way public land is managed.

The Arizona Preserve Initiative (API) became law in 1996, and allows the Land Commissioner to identify lands with high conservation quality and offer those lands for sale or lease for conservation purposes. In 1998, Arizona voters approved Proposition 303, establishing a \$220 million fund to assist in the lease or purchase of State Trust lands for conservation purposes. The Land Department is working with State and local governments, conservation organizations, and other interests to develop conceptual statewide plans on urban land which can identify areas possessing suitable or desirable conservation values. Although still in their infancy, these plans have the potential of identifying and conserving habitat for a variety of species including the CFPO. Ultimately, State Trust land, through any of the aforementioned mechanisms, could be leased or purchased for preservation while allowing the Land Department to fulfill its fiduciary duty to generate revenue for the Trust. An example of this occurred in 2000 when 2400 acres of Trust lands were leased for conservation purposes in conjunction with a section 7 consultation. Additionally, they are reviewing API applications for land in Pima County which may result in the conservation of habitat for the CFPO.

## **Pima County**

In 1999, the Pima County Board of Supervisors adopted the concept of the Sonoran Desert Conservation Plan (SDCP). The goal of the plan was to combine protection of environmental and cultural resources with long-range planning designed to maintain these resources as the county

grows. As part of this effort, Pima County provided funding that initiated a series of studies to advance knowledge of the CFPO in three areas; (1) a broad survey effort in Pima County; (2) a genetic investigation; and (3) telemetry and habitat assessments at occupied sites. At that time, this effort was the most comprehensive study effort focused on CFPOs, and provided much needed information that will be used not only for the County's SDCP, but also other conservation efforts for the CFPO.

Within the past three years, Pima County has acquired and manages a number of land parcels to mitigate impacts to CFPOs or further the conservation of CFPOs within the county. It is likely that Pima County will acquire or assist in the acquisition of additional conservation lands as it implements the SDCP and other projects.

### **Tohono O'odham Nation and other Native American Lands**

To date, surveys to locate CFPOs and identify habitat have focused on State, Federal, and private lands. Large tracts of tribal lands in southern Arizona have not been surveyed. However, these tribal lands may not be exposed to the same level of development as non-reservation lands. Many biologists believe that the majority of CFPOs existing in Arizona reside on the Tohono O'odham Nation, about 56 km (35 mi) west of Tucson, Arizona. The Tohono O'odham Nation is about 1.2 million ha (3 million ac) and may have many large tracts of land suitable for CFPOs. Since 1999, the Tohono O'odham Wildlife and Vegetation Management Program has been surveying for CFPOs in areas proposed for ground-disturbing projects. If CFPOs are detected in the area, the Nation works with the US Fish and Wildlife Service to minimize the effects of the project on owls. Other tribal lands, including the Gila River Indian Reservation, the Ak Chin Indian Reservation, and lands managed by the Pascua Yaqui tribe may also contain CFPO habitat, but only limited survey and habitat evaluation work has occurred and has primarily been project specific.

Some Native American Nations are sensitive about allowing CFPO surveys on their lands. Cultural sensitivity is a major concern for the Tohono O’odham and other Native Americans. The spiritual power of animals, especially owls, cause a reluctance to allow surveys that might disturb the owl. Although these beliefs make it difficult for the Service to include the Tohono O’odham Nation and other Native American lands in this Draft Plan, attempts have been made to keep an ongoing dialog between representatives of the Team, Service, and Tohono O’odham Attorney General’s office. The Tohono O’odham Nation is represented in both groups of the Team and assisted the Service in preparing this Draft Plan. At this time there are no formal or informal agreements between the Tohono O’odham or any other southern Arizona tribes and the Service concerning the CFPO. The Nation has prepared a short-term conservation plan addressing CFPOs. The plan presents a project evaluation and mitigation strategy to be used in conjunction with projects on the Nation requiring ground disturbance.

On July 5, 1997, the Secretaries of the Interior and Commerce issued a Secretarial Order 3206 entitled “American Indian Tribal Rights, Federal-Tribal Trust Responsibilities and the Endangered Species Act.” This Secretarial Order clarified the responsibilities of the Departments, when actions taken under the authority of the ESA and associated implementing regulations affect, or may affect, Indian lands, tribal trust resources, or the exercising of American Indian tribal rights. The Order acknowledges the trust responsibility and treaty obligations of the United States toward Native American tribes and tribal members and its government-to-government relationships under the ESA. This will be accomplished in a manner that harmonizes the Federal trust responsibility to tribes, tribal sovereignty, and statutory missions of the Departments, and strives to ensure that Native American tribes do not bear a disproportionate burden for the conservation of listed species, so as to avoid or minimize the potential for conflict and confrontation.

## **G. Strategy for Recovery**

In listing the CFPO as endangered, we identified three main factors as problems: present or threatened destruction of habitat (Listing Factor 1), inadequacy of existing regulatory mechanisms



for protection (Listing Factor 4), and other natural or manmade factors (Listing Factor 5). Therefore, the strategy of this Draft Plan, outlined below, focuses on reducing these threats so that they are no longer a problem, and providing a mechanism for protecting CFPOs and their habitat in Arizona. Other potential threats, such as disturbance by human activity (e.g., birding), diseases, and predation are serious concerns, and we call for assessments of their role in the dynamics of CFPO populations in Arizona.

The general strategy of this Draft Plan is to:

- 1.01 Estimate the number (with reasonable confidence levels) and define the distribution of CFPOs in Arizona, determine the general distribution and abundance of CFPOs in Sonora, Mexico, and maintain a data management system for information obtained.
- 1.02 Protect all currently known (since 1993; this date was selected because it represents the initiation of formal surveys utilizing a survey protocol. Prior to this date, detections primarily were reported as anecdotal information with no verification) CFPOs in Arizona and those subsequently documented after this plan is finalized and the integrity of their home ranges. Identify and maintain an interconnected system of habitat extending from the northern edge of the historical range (i.e., Phoenix) south to areas occupied by CFPO populations in Mexico. Protection of known sites could be accomplished through the use of tools such as section 7 consultations, habitat conservation planning under section 10, safe harbor agreements, conservation acquisitions and the development of conservation easements.
- 1.03 Initiate the process for evaluating and implementing the establishment or re-establishment of CFPOs in historical areas that appear suitable, but are presently unoccupied, or into areas that have been modified to enhance some habitat characteristic for CFPOs.

- 1.04 Develop an outreach and public education program to increase public awareness and understanding of the Draft Plan and to monitor and encourage implementation.

## H. The Current Situation

The listing of the CFPO in 1997 caused southern Arizonans to consider endangered species issues to an extent previously not experienced. Issues surrounding the implementation of the ESA could potentially affect individual citizens on a personal level. For example, CFPOs may now need to be considered in relation to residential development, community and resource management planning, as well as the construction of schools, churches, roads and other projects. In the five years since the listing and the during the four years this draft plan has been in development, controversy surrounding these issues has been common.

In 2001, a lawsuit filed by the National Association of Home Builders resulted in the 1999 designation of CFPO critical habitat being remanded so that the economic analysis could be redone. The use of a DPS to list the CFPO was also upheld in the same ruling. We are currently working on the redesignation of critical habitat and the portion of the lawsuit regarding the use of a DPS is under appeal.

Major planning efforts in the form of Habitat Conservation Plans related to CFPO issues are currently underway. These include very large, multi-species plans such as Pima County's Sonoran Desert Conservation Plan, smaller area plans such as the Town of Marana and the Altar Valley plans, and project level plans. Such planning efforts have proven complex and controversial due both to potential economic impacts and the limited knowledge of CFPO life history needs.

Issues and concepts discussed in this draft plan have resulted in disagreements and differences of opinion among a variety of public entities, as well as within the Recovery Team. These issues include development guidelines, extent and location of Recovery Areas, habitat values, and recovery responsibilities. The Service and the Recovery Team recognize the controversial nature of these issues. The draft plan identifies where such differences exist, and provides the rationale for how we plan to address these issues. We acknowledge that some recommendations within this plan were developed in the absence of sufficient data. This lack of information is, unfortunately, unavoidable given the number of known CFPOs in Arizona is so small and research is just beginning to provide information. It has been the recommendation of the Recovery Team, and the Service agrees, to use the best information available, base decisions on sound biological principles, and be conservative with regard to recommendations when information is lacking. We emphasize the need to continually evaluate the effectiveness of the activities outlined in this plan and to consider new information as it becomes available. We recommend that this plan be revised and updated accordingly.

While the Service supports conservative approaches in the realm of recovery guidance and advice, there is a substantial difference in the biological standards for advice and the legal standards of regulation. The scientific rigor required of the Service prior to restricting or eliminating public pursuits seldom provide for regulation in the absence of adequate scientific information. Therefore, the Service strongly endorses the recommendations of this draft plan to research unknown or little understood aspects of CFPO biology. Until more is known about the CFPO, we will approach our section 7 and section 10 responsibilities on a case by case basis, evaluating actions based upon the best, known scientific information and as much advice and direction from this plan as possible.

## **PART II - DRAFT RECOVERY PLAN**

### **A. Rationale for Approach**

The underpinnings of most recovery plans for endangered species are the recovery criteria – the conditions that must be achieved before protection under the ESA is no longer necessary for the subject species. Criteria for recovery usually are stated in quantitative terms so that assessing whether the criteria have been met can be done in an objective manner (USFWS 1992). For example, many plans consider their subject species "recovered" when a specific number of individuals or populations is distributed over a specified area (e.g., USFWS 1993). Other plans consider their subject species "recovered" when populations in identified areas remain stable or increase after a specified period of monitoring (e.g., USFWS 1994b, USFWS 1995). Underlying many recovery criteria are models that assess the likelihood of persistence of populations of various sizes and distributions under different conditions. These models collectively are called population viability analyses (PVAs) (see Boyce 1992 for a review of PVAs).

Conducting a PVA requires a considerable amount of information about the subject species. Ideally, a PVA should include accurate data on population size and distribution; age and sex structure; survival and reproductive rates by age class; population genetics; dispersal capabilities; amounts, distribution and quality of habitat; and environmental and demographic stochasticity (Reed et al. 1998). Beissinger and Westphal (1998) listed 23 variables that are required for the most complex PVAs. Of course, not all of this information is available for most endangered species, and PVAs often are conducted by estimating some of the variables, or simplifying the models. However, inaccurate information in a PVA can significantly affect the outcome of the modeling process (e.g., Taylor 1995). Thus, recovery criteria based on models which incorporate inaccurate information can be seriously flawed. For this reason, Reed et al. (1998) and

Beissinger and Westphal (1998) cautioned against relying too heavily on PVAs as the foundation for recovery options, especially if the assumptions of the models and the information upon which they are built have not been validated in field studies.

Much of the information needed to conduct a PVA on the CFPO in Arizona is lacking. For example, little is known about their abundance and distribution, population demographics, connectivity with populations in Mexico, and the details of what constitutes habitat (see above review). Conducting a PVA on the CFPO, given our current level of knowledge, could easily lead to grossly inaccurate results. The inability to conduct a meaningful PVA makes identifying quantitative recovery criteria for the CFPO difficult because there is no easy way to generate management targets (e.g., number and distribution of individual owls or necessary rates of increase). Recovery criteria will continue to be refined and management efforts should focus on protecting existing, known owls and adequate potential habitat to allow for the expansion of population segments.

Identifying quantitative recovery criteria, and management of CFPOs in general, are further complicated by the fact that the CFPO in Arizona is on the northern edge of its range. At the periphery of a species range, population densities are usually lower than core populations (Brown 1984, Caughley et al. 1988, Lesica and Allendorf 1995, Curnutt et al. 1996), and may be subject to naturally occurring shifts in abundance and distribution due to uncontrolled and uncontrollable environmental fluctuations (e.g., weather). Peripheral population also tend to be isolated from continuous core populations and often occur in less suitable environments (Lawton 1993), consequently gene flow and variability may be reduced (Mayr 1963, Lesica and Allendorf 1995). Thus, peripheral populations may be more prone to extirpation and extinction due to demographic or stochastic events (Lesica and Allendorf 1995).

However, because peripheral populations may be exposed to different selective pressures than core populations, they often become more resistant to environmental change than core

populations (Lomolino and Channell 1995, Channell and Lomolino 2000a, 2000b). In addition, because peripheral populations are often isolated from core populations, peripheral populations may become genetically distinct because of genetic drift and divergent natural selection (Lesica and Allendorf 1995). Many researchers consider peripheral populations the most active areas of speciation (Simpson 1944, Carson 1959, Levin 1993). Furthermore, resistance to environmental change and genetic distinction may allow peripheral populations to persist when core populations are extirpated (Lomolino and Channell 1995, Channell and Lomolino 2000a, 2000b). Hence, protection and management of peripheral population may be important to the survival and evolution of a species.

## **B. Recovery Criteria and Objectives**

The Recovery Criteria are directed towards downlisting (i.e., reclassification of status from endangered to threatened) instead of delisting (i.e., the removal of a species from the endangered species list) primarily because of the lack of information and the potential uncertainties associated with models that will be used to identify the targets of Recovery Criterion 1. These models will be based on relatively new and potentially scant information, and we believe downlisting is the most conservative and biologically defensible strategy to take in this Draft Plan, until more comprehensive information is available. This plan provides quantifiable recovery goals (i.e., stable and increasing populations) specified below. When the data necessary to complete additional analyses are available, the plan will be revised to identify precise numbers of CFPOs and/or vital rates necessary for recovery. The CFPO in Arizona should be considered for downlisting when the following three criteria are met:

### **RECOVERY CRITERION 1**

- The CFPO population in Arizona either reaches a size or achieves a rate of increase that ensures a high probability of persisting over the long-term. The target population size or rate of increase over a given period of time will be determined by population analyses to be conducted after essential, but currently missing, information has been collected as outlined in this draft recovery plan (Task 3.0). This recovery criterion is meant to address the specific numbers and population trends of CFPOs needed for recovery once the information is available.

### **RECOVERY CRITERION 2**

- CFPOs are successfully reproducing within Recovery Areas where appropriate habitat patches exist, and movement of individual CFPOs between population segments (i.e., Recovery Areas) within Arizona and between Arizona and Mexico is possible based on the availability of habitat and the capabilities of dispersing owls. The objective of this criterion is to expand the distribution of CFPOs in Arizona and is not related to specific numbers of owls.

### **RECOVERY CRITERION 3**

- Threats to the persistence of CFPOs have been substantially reduced or eliminated within Recovery Areas, so that the CFPO is no longer in danger of extirpation over all or a significant portion of its range in Arizona.

## OBJECTIVES

The objectives of this Draft Plan are to: (1) identify information needed to develop the population target(s) of Recovery Criterion 1; and (2) propose actions that will protect existing CFPOs, provide adequate habitat for expansion of population segments, and maintain management options for the future. These objectives relate to all three recovery criteria listed above. This Draft Plan should be updated, revised, or appended whenever information warrants, but no more than five years should pass before it is re-evaluated. Revisions should be a part of the recovery planning process until more specific and quantitative recovery criteria are developed and met.

## TASKS

The following outline describes the activities that, if implemented, will result in achieving the objectives of the Draft Plan. Under each task are "action steps" or "subtasks" which identify the activities needed to meet that task. The number format used does not necessarily indicate their priority or a chronological sequence; recovery task priority is given in Part III (Implementation Schedule). Some of the tasks or subtasks listed are currently on-going.

Task 1.0     Estimate the number and define the distribution of CFPOs in Arizona, and define their general distribution and abundance in Sonora, Mexico.

Surveys for CFPOs in Arizona are ongoing, but much potential habitat remains unexamined. Surveys of all potential habitat, in Arizona and in Sonora, Mexico, will help identify the severity of management problems. For example, if CFPOs in Arizona are very low in number and isolated from populations in Mexico, relatively drastic management efforts (e.g., captive breeding/reestablishment) might be warranted. On the other hand, if they are common in parts of southern Arizona and in Sonora and exchange of individuals among population segments has



been documented, management might focus on protecting and enhancing existing CFPOs and habitat.

- Subtasks: 1.1 Estimate the number and define the distribution of CFPOs in Arizona (e.g., survey areas not yet surveyed and resurvey areas where CFPOs have been found previously).
- 1.2 Determine the general distribution and abundance of CFPOs in Sonora, Mexico (e.g., survey areas not yet surveyed along a wide band adjacent to the U.S. - Mexican border).
- 1.3 Evaluate and test the survey protocol and revise as appropriate.
- 1.4 Maintain a dialogue with the Tohono O'odham Nation to coordinate and conduct surveys and other studies on the Nation's lands.
- 1.5 Maintain and improve a data management system for information on CFPO surveys.

To effectively develop and implement this Draft Plan, information about surveys must be organized and maintained in a central location. A detailed examination of data collected to date revealed many inconsistencies in data recording, and many referenced surveys were without supporting data sheets. Inconsistencies ranged from missing data to lack of an adequate map depicting the areas surveyed. To alleviate this problem, a comprehensive data set should be produced to maintain the best available information for current and future management of CFPOs. Work has been initiated in cooperation with AGFD's Heritage Data Management System to establish a data entry protocol and a centralized data repository. Support should be

directed towards maintaining this system once it is functional and every effort made to ensure quality data collection and entry. The following guidelines are recommended:

Subtasks: 1.5.1 Create a database to archive all data from surveys, including locations of CFPOs

1.5.2 Maintain this database.

1.5.3 Revise forms and protocols for data collection as needed.

Standardized data sheets, if completed by all permitted biologists, would ensure consistency in the information collected. The following is recommended:

1. survey forms be complete and legible;
2. each year, an electronic (spreadsheet; program to be identified) copy of all surveys be submitted within 30 days of the end of the survey period;
3. within 24 hours of detection of a CFPO, legal descriptions (to nearest quarter section) and UTM coordinates of detection sites be submitted to the central repository with survey forms; and
4. a legible copy of the 7.5 minute USGS topographic map containing the survey route(s) and survey stations, be submitted with each survey form, regardless of whether CFPOs were detected.

Task 2.0 Protect all currently known (since 1993) CFPOs in Arizona and the habitat they occupy. Identify and maintain an interconnected system of habitat extending from the northern portion of the historical range, south to areas potentially occupied by CFPO populations in Mexico.

An interconnected system of habitat (i.e., Recovery Areas) providing protection for known CFPOs in Arizona and habitat for an expanded number of breeding pairs of CFPOs in Arizona should be established. Such a system will allow for the movement of dispersing CFPOs between populations within Arizona and between Arizona and Mexico. Even though we listed the CFPO in Arizona as a DPS (i.e., because of levels of threats, habitats occupied, quality of information, and differences in land management and threats in Mexico), we consider movement of CFPOs across the International Border as important to the recovery of the CFPO in Arizona. This movement is important because most of the range of this subspecies is in Mexico and maintaining connectivity between populations at the northern portion of its range and more continuous populations in Mexico may be necessary genetically and biologically, for the long-term persistence of CFPOs in Arizona. Similarly, protecting habitat to connect known CFPO sites will promote dispersal over a significant portion of their historical range. This movement between subpopulations is necessary to achieve the recovery criteria.

Recovery Areas were based on the locations of CFPOs (as determined by surveys conducted to date) and on the most recent historical locations. The primary reason for selecting the proposed Recovery Areas was to maintain the potential for CFPOs to be distributed over a high proportion of their historical range. Species whose recovery plans include significant portions of their historical range have better chances of persistence than species whose ranges are restricted (Abbitt and Scott 2001). Furthermore, Noss (1993) identifies guidelines for maintaining viable populations and noted that 1) species well distributed across their native range are less susceptible to extinction than species confined to small portions of their range and 2)

interconnected blocks of habitat are better than isolated blocks; corridors and linkages function better when habitat within them resembles that preferred by the target species. Given our current understanding of CFPO habitat, specific areas chosen for inclusion in the Recovery Areas were those with conditions that had the best chance of supporting breeding pairs of CFPOs or promoting movement of dispersing individuals. Recovery Areas were identified as a connected system of habitat that would provide for the expansion or creation of subpopulations that would act to stabilize the population as a whole in the long-term. This is accomplished by movement and dispersal among subpopulations as they experience local fluctuations in population levels or even local extinction (Noss 1993), and potentially by management activities designed to establish new populations or enhance existing populations. Total size of Recovery Areas needed for recovery of the CFPO is not known with certainty because a quantitative population target for downlisting cannot be identified at this time. We recognize that areas that are not currently known to be occupied must be included in RA's. Unless the distribution of CFPOs is expanded beyond the currently documented locations, recovery is not likely to occur. The areas identified in this draft plan should be adequate to maintain management options for the future. We emphasize that we expect the size and potentially the distribution of Recovery Areas to be adjusted as information about whether they function as planned becomes available.

## **RECOVERY AREAS**

We have identified eight Recovery Areas (RAs), forming a network of habitat for the CFPO extending from the United States - Mexico border to central Arizona (Figure 5). There has been some disagreement among Team members as to the types of areas that should be included to promote CFPO recovery. One point of view contends that historical records show a preference by CFPOs for mesic riparian habitats and that recovery efforts should be focused on the protection, enhancement and restoration of wet riparian systems. The other point of view, held by a majority of the Technical Group of the Recovery Team, acknowledges the historical records

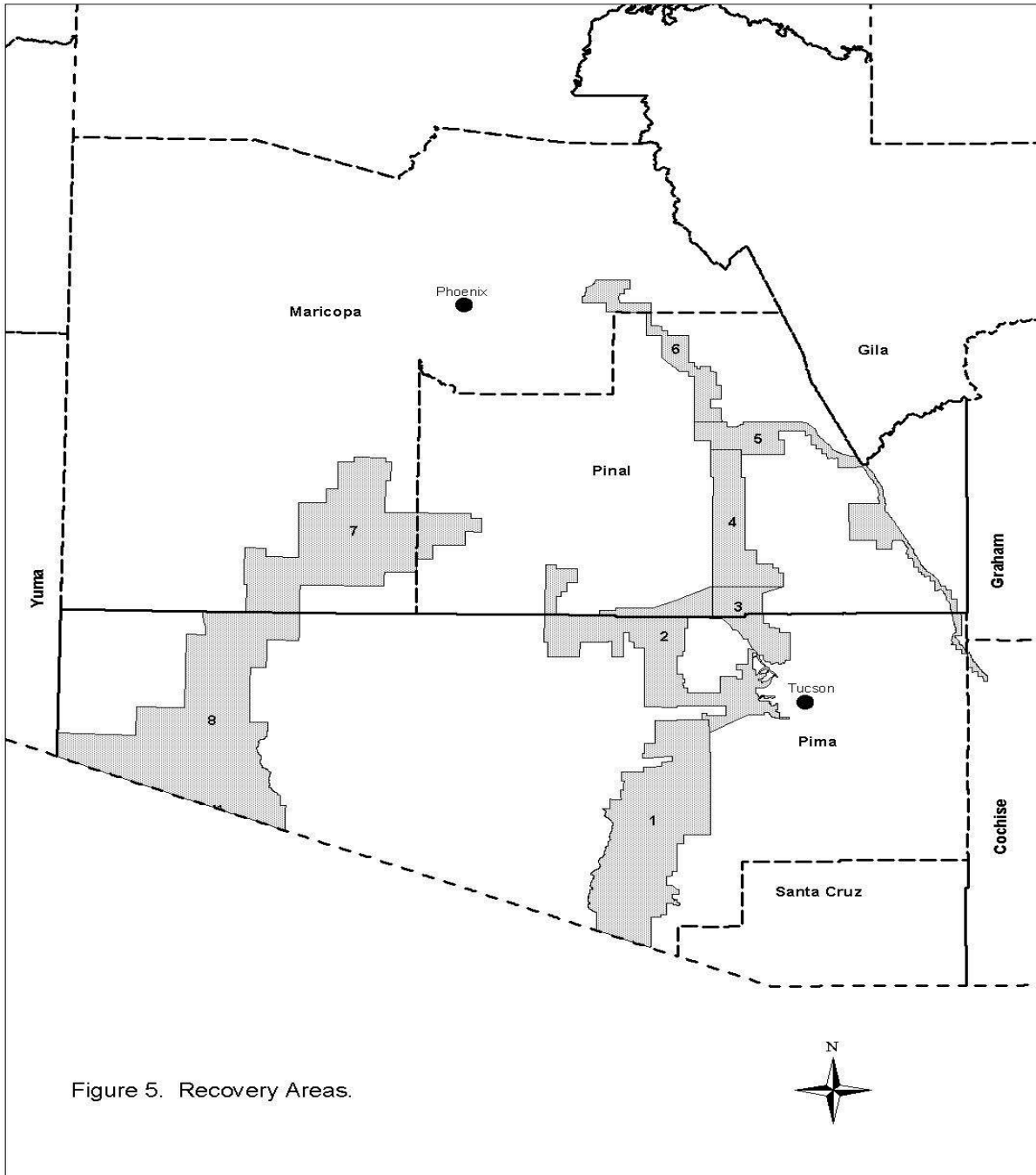


Figure 5. Recovery Areas.

and agrees that recovery efforts in wet riparian systems should be initiated. However, this view contends that the primary focus of recovery efforts should be in areas similar to where the species is currently known to occur; upland and xeroriparian environments in Sonoran desertscrub and semidesert grassland biomes. There is also disagreement as to whether areas of Arizona Upland desertscrub in the northern Recovery Areas should be included because there are no historical records of CFPO in these areas.

As presented earlier in this plan, most historical records documented the occurrence of CFPOs in mesic riparian systems. Many of these records can be considered reliable because of the collection of skins or eggs. However, these early naturalists were often limited in their scope of coverage by climate, other work duties, and threats to their safety (Hensley 1954). Most early naturalists traveled and worked along river systems and in other areas where there was water and avoided the harsher upland environments (Davis 1982). Documented historical excursions into the upland communities of portions of southern Arizona (Roy Johnson, unpubl. data) often occurred during the cooler winter months when spontaneous vocalization by CFPOs is reduced, thus limiting the possibility of detection. The majority of the Team felt that CFPO probably occurred in these upland areas, likely in lower numbers than within the riparian systems, but that the documentation of CFPOs in these areas was under-represented in the historical record.

Given the limitations of historical data, we felt we should use historical information to provide background and perspective, but we relied more heavily on what current information revealed about what CFPOs need as habitat. Only one occupied site, out of the approximately 85 documented since 1993, has been found in what could be considered mesic riparian vegetation (Abbate et al. 1996, Abbate et al. 1999, Abbate et al. 2000, AGFD unpubl. data). However, the plan recognizes the important role riparian vegetation communities have played and can play in CFPO recovery by including them within several Recovery Areas.

Presently, CFPOs are found in Arizona upland Sonoran desertscrub and semidesert grassland vegetation types. Habitat used for dispersal by marked CFPOs has occurred in Arizona Upland desertscrub, semidesert grassland and xeriparian wash vegetation communities (Abbate et al. 1999, Abbate et al. 2000, AGFD unpubl. data). Therefore, when designating the RAs, we attempted to include areas likely to support owls by maximizing the amount of Arizona Upland desertscrub and xeriparian wash vegetation and included mesic riparian vegetation where historical information, current conditions and connectivity to adjacent habitats indicated it was appropriate. We reduced the amount of Lower Colorado River vegetation, which is generally lacking in adequate vegetative structure and nesting substrates.

We also attempted to minimize inclusion of private lands, and where possible identified boundaries of RAs based on township-range-section lines for ease in legal description. The role of each Recovery Area varies depending on its size and type of vegetation it supports. Recommendations for management also vary among Recovery Areas, depending on the level and types of human activity currently taking place, or expected in the future.

The Team offered the following discussion regarding the consideration of the RA's in central Arizona. The lack of historical records does not mean that owls were not present historically or that they are currently absent in the RAs north of Tucson. Most of those areas have not been surveyed recently and early survey efforts were not extensive or regular in nature. CFPOs continue to be located in areas where they were not recorded historically. The expansion of known subpopulations, establishment of new subpopulations and dispersal within and among subpopulations is fundamental to the natural long-term sustainability of the overall Arizona CFPO population and these areas may be beneficial for this purpose. Lastly, due to the lack of information about CFPOs, we have been unable to develop quantitative recovery criteria. Hence, we do not know what the targets for recovery will be. This situation should promote

conservative biological strategies; thus, the plan includes the protection of areas we feel will be adequate to meet quantified Recovery Criteria once they are developed. These areas may play an important role in recovery.

The RAs in the central part of the state (parts of RA 4, RA 5, RA 6 and RA7) should be extensively surveyed as soon as feasible to determine if they are occupied by CFPOs. If owls are absent, we propose that the areas be used as sites for establishing subpopulations that will contribute to the long-term sustainability of the CFPO in Arizona (see Task 4.0). Augmenting and establishing subpopulations will accelerate our ability to answer important questions about habitat use by CFPOs. Removing northern RA's could be recommended if the areas have proven to be unable to support natural or experimental populations of CFPOs, or the southern RA's have been shown to support enough owls for long-term persistence.

The RA's identified in this draft recovery plan are provided to help focus recovery efforts. It is not intended that entire recovery areas be set aside in perpetuity. Once detailed habitat analyses to identify appropriate habitat patches have been completed, corridors between patches delineated, and appropriate buffers established to allow for reproduction and dispersal, it is expected that RA boundaries would be modified accordingly. The large size of the proposed RA's has been criticized by some, based partly on the assumption that the social costs of including lands in RA's will be high. We emphasize that inclusion of land in RA's does not automatically restrict the use of that land for other human-related purposes (e.g. grazing or development). RA's identified primarily as areas to allow movement of CFPOs should have minimal social costs relative to restrictions on other human uses of the land. For example, when compared to existing development, the economic cost of maintaining movement corridors during new development should be relatively low. Even in RA's identified primarily as potential



breeding habitat, restrictions on other land uses will not be uniformly high. If breeding owls are absent in an area, and it has not been identified as a potential site for introduction of experimental populations, then other land uses of that area are an option.

Within some Recovery Areas, however, we have identified portions that are in need of special management because of current or potential threats to the recovery of the CFPO. These areas are called Special Management Areas (SMAs). Management guidelines for each SMA are specified in the section entitled “Guidelines for Activity Inside Recovery Areas” below. The following is a description and the purpose of each Recovery Area.

The Service solicits information and comments on this approach to recovery. We recognize that much is yet to be learned about CFPO life history, but we also wish to ensure that all possibilities receive fair consideration. Given that this draft plan calls for extensive efforts to improve scientific knowledge, and that much of that information would be needed to support regulatory actions, we nonetheless believe this approach is prudent to help guide planning efforts within the historical range of the CFPO.

### **Recovery Area 1 (RA 1)**

RA 1 lies just north of Mexico, is bordered on the west and north by the Tohono O'odham Nation, and extends east to include the Buenos Aires National Wildlife Refuge (BANWR) and the Sierrita Mountains (Appendix A - Figure 6). Vegetation in the area is dominated primarily by semidesert grassland and secondarily by Arizona Upland Sonoran desertscrub (Appendix A - Figure 7). In the grasslands of the Altar Valley, xeroriparian washes extend from the Baboquivari, San Luis, and Sierrita Mountains to Altar and Brawley washes. Uplands primarily consist of grasslands with dispersed mesquite trees and isolated saguaros in some areas, mostly at

<b>Table 1. Area of vegetation types within each proposed recovery area in hectares(acres).</b>									
<b>Vegetation Type</b>	<b>RA_1</b>	<b>RA_2</b>	<b>RA_3</b>	<b>RA_4</b>	<b>RA_5</b>	<b>RA_6</b>	<b>RA_7</b>	<b>RA_8</b>	<b>Total ha(ac)</b>
<b>Az.Upland Sonoran</b>	45,158	82,877	33,735	55,252	60,830	38,782	162,302	150,880	629,816
<b>Desertscrub</b>	(111,539)	(204,707)	(83,326)	(136,472)	(150,250)	(95,793)	(400, 885)	(372,672)	(1,555,545)
<b>Lower Colorado River</b>		39,845	2,391		2,656	266	15,938	87,924	149,020
<b>Sonoran Desertscrub</b>	-	(98,417)	(5,905)	-	(6,561)	(656)	(39,367)	(217,174)	(368,080)
	121,660		266				266	266	122,457
<b>Semidesert Grassland</b>	(300,500)	-	(656)	-	-	-	(656)	(656)	(302,468)
<b>Madrean Evergreen</b>	10,094								10,094
<b>Woodland</b>	(24,932)	-	-	-	-	-	-	-	(24,932)
<b>Chihuahuan</b>					531				531
<b>Desertscrub</b>	-	-	-	-	(1,321)	-	-	-	(1,321)
	797	4,516	266		2,391				7,969
<b>Agriculture</b>	(1,968)	(11,154)	(656)	-	(5,905)	-	-	-	(19,683)
	177,708	127,238	36,657	55,252	66,408	39,048	178,505	239,070	919,887
<b>Totals</b>	(438,940)	(314,278)	(90,544)	(136,544)	(164,028)	(96,449)	(440,908)	(590,502)	(2,272,120)

<b>Ownership</b>	<b>RA_1</b>	<b>RA_2</b>	<b>RA_3</b>	<b>RA_4</b>	<b>RA_5</b>	<b>RA_6</b>	<b>RA_7</b>	<b>RA_8</b>	<b>Total ha (ac)</b>
<b>BLM Lands</b>	8,766 (21,652)	54,720 (135,159)	2,391 (5,905)	22,313 (55,114)	14,610 (36,086)	1,859 (4,593)	106,519 (263,101)	68,799 (169,933)	279,977 (691,543)
<b>National Forest Lands</b>	-	-	-	-	-	15,141 (37,398)	-	-	15,141 (37,398)
<b>State Lands</b>	96,956 (239,481)	40,376 (99,729)	17,001 (41,991)	31,876 (78,734)	30,813 (76,109)	21,782 (53,801)	1,328 (3,281)	1,063 (2,624)	241,195 (595,751)
<b>Private</b>	26,563 (65,611)	21,782 (53,801)	17,266 (42,647)	1,063 (2,624)	20,985 (51,833)	266 (656)	531 (1,312)	4,781 (11,810)	93,237 (230,296)
<b>National Parks, Monuments &amp; Recreation Area</b>	-	10,360 (25,588)	-	-	-	-	-	136,270 (336,586)	146,629 (362,175)
<b>National Wildlife Refuges</b>	45,423 (112,195)	-	-	-	-	-	-	28,157 (69,548)	73,580 (181,743)
<b>Military Reservation</b>	-	-	-	-	-	-	70,127 (173,214)	-	70,127 (173,214)
<b>Totals</b>	177,708 (438,940)	127,238 (314,278)	36,657 (90,544)	55,252 (136,472)	66,408 (164,028)	39,048 (96,449)	178,505 (440,908)	239,070 (590,502)	919,887 (2,272,120)

the northern end of RA 1. Dominant tree species in riparian zones include mesquite, ash, and hackberry. Much of RA 1 is State Trust, Federal holdings (BANWR and BLM), and dispersed private ownership (Appendix A - Figure 6).

The vegetation in RA 1 is suitable for nesting and dispersal of CFPOs, although nesting opportunities are likely greater along the washes because of a higher incidence of large trees that may provide cavities for nesting. Therefore, the primary purposes of RA 1 are to maintain breeding habitat and to allow movement of CFPOs from the northern Recovery Areas into Mexico and the Tohono O'odham Nation. A secondary purpose of this Recovery Area is to

potentially serve as a site for the experimental use of nest boxes as a technique for augmenting habitat for the CFPO. Preliminary observations suggest that nest sites might be a limiting factor for CFPOs in the Altar Valley due to the general lack of saguaros and large trees. We recommend that the BANWR be used as a site for an experiment on the effectiveness of nest boxes for CFPOs in Arizona.

Situated in the Altar Valley, RA 1 is important for conservation of CFPOs because it supports owls and provides conditions that allow movement of dispersing individuals. Since 1999, this recovery area has accounted for 43% of known CFPOs in Arizona (Harris Environmental Group, Inc. 1998; Flesch 1999; Abbate et al. 2000). The primary activities in this Recovery Area that may require management actions are controlled burning and grazing as the majority of the land base currently is under some form of grazing regime. Secondary management issues in this Recovery Area are residential and commercial development (e.g., some building is anticipated in the near future, particularly in the northern portion of RA 1), recreational activities, and border crossing management. We have identified the northern portion of RA 1 as the “Altar Valley SMA” (Appendix A - Figure 21).

Owner	Ac	Vegetation Type	Ac
BLM Lands	21,652	Az.Upland Sonoran Desertscrub	111,539
State Lands	239,481	Semidesert Grassland	300,500
Private	65,611	Madrean Evergreen Woodland	24,932
National Wildlife Refuges	112,195	Agriculture	1,968
Totals	438,940	Totals	438,940

Owner	Ac	Vegetation Type	Ac
BLM Lands	11,495	Az.Upland Sonoran Desertsrub	4,779
National Wildlife Refuge	-	Lower Colo. River Sonoran Desertsrub	-
Private	23,378	Semidesert Grassland	30,224
State Lands	129	Agriculture	-
Totals	35,003	Totals	35,003

### **Recovery Area 2 (RA 2)**

RA 2 extends west from the west side of the Tucson Basin to the Tohono O'odham Nation, north into Pinal County, then east to the northwestern end of RA 3 (Appendix A - Figure 8).

Connections between RA 2 and RA 1 and RA 3 have been identified to provide for dispersal between recovery areas. Dominant vegetation types in RA 2 are the Arizona Upland Sonoran desertsrub and Lower Colorado River Sonoran desertsrub (Appendix A - Figure 9). This Recovery Area also includes some retired agricultural lands. Much of RA 2 is under Federal administration (e.g., BLM Ironwood Forest NM and Saguaro - West NP), but there is some State Trust land and private lands, particularly in the northern portion of RA 2.

An important purpose of this Recovery Area is to allow for movement of CFPOs between RA 1 and RA 3. Movements between recovery areas are necessary for the maintenance and expansion of CFPO subpopulations. Suitable vegetation also exists for nesting. A single confirmed detection of a pygmy-owl of unknown status has occurred in the recovery area. No individual activity can be identified as a dominant management issue, but the area is influenced by agriculture, grazing, development, recreation, and border crossing management. We have identified the northern portion of RA 2 as the "Silverbell SMA" (Appendix A - Figure 23).

Owner	Ac	Vegetation Type	Ac
BLM Lands	135,159	Az.Upland Sonoran Desertscrub	204,707
State Lands	99,729	Lwr. Colo.R. Sonoran Desertscrub	98,417
Private	53,801	Agriculture	11,154
National Parks, Monuments & Recreation Area	25,588		
Totals	314,278	Totals	314,278

Owner	Ac	Vegetation Type	Ac
BLM Lands	8,783	Az.Upland Sonoran Desertscrub	1,937
National Parks and Monuments.	-	Lwr. Colo.R. Sonoran Desertscrub	20,408
Private	17,050	Semidesert Grassland	-
State Lands	646	Agriculture	4,133
Totals	26,478	Totals	26,478

### **Recovery Area 3 (RA 3)**

The southern boundary of RA 3 is located in northwest Tucson, and extends northwest into Pinal County where it connects with RA 4 (Appendix A - Figure 10). RA 3 is bounded by La Cholla Boulevard to the east, Cortaro Farms Road to the south (except for a 1/4 section south around Thornydale Road), and the Tortolita Mountains to the northeast. It generally is bounded to the southwest by Interstate 10. The dominant vegetation type is Arizona Upland Sonoran desertscrub (Appendix A - Figure 11). This Recovery Area contains stands of mesquite, palo verde, ironwood, acacia, and saguaros, and is considered to be among the most contiguous and highest quality habitat available for CFPOs, based on current information (Wilcox et al. 1999, Wilcox et al. 2000). The southern portion of this Recovery Area is almost entirely under private ownership, the central portion is primarily State Trust land, and the northern portion is a mixture of private ownership, State Trust, and lands administered by the BLM (Appendix A - Figure 10).

Since 1999, RA 3 has accounted for 35% of the known CFPOs in Arizona and 40% of the known nests. Therefore, the primary purposes of this area are to provide and protect breeding habitat for known CFPOs and for the establishment of new breeding pairs. RA 3 also is designed to allow movement of CFPOs to the southwest to RA 2 and north to RA 4 (Appendix A - Figure 10).

The Tucson Basin is growing rapidly and much of the natural vegetation in the southern portion of RA 3 has been altered by residential and commercial development. Additional developments are planned for the area and will require management action. Other activities that may influence the CFPO or its habitat are grazing and recreation. We have identified the southern portion as the “Northwest Tucson SMA” and several corridors in the central and northern portion of this Recovery Area as the “Tortolita Fan SMA” (Appendix A - Figure 24).

<b>Table 7. Recovery Area 3</b>			
Owner	Ac	Vegetation Type	Ac
BLM Lands	5,905	Az.Upland Sonoran Desertscrub	83,326
State Lands	41,991	Lwr. Colo.R. Sonoran Desertscrub	5,905
Private	42,647	Semidesert Grassland	656
		Agriculture	656
Totals	90,544	Totals	90,544

<b>Table 8. Tortolita Fan Special Management Area</b>			
Owner	Ac	Vegetation Type	Ac
BLM Lands	9,946	Az.Upland Sonoran Desertscrub	29,837
National Forest Lands	-	Lwr. Colo.R. Sonoran Desertscrub	1,292
Private	17,695	Semidesert Grassland	129
State Lands	3,617	Agriculture	-
Totals	31,257	Totals	31,257

<b>Table 9. Northwest Tucson Special Management Area</b>			
Owner	Ac	Vegetation Type	Ac

BLM Lands	24,412	Az.Upland Sonoran Desertscrub	28,416
National Forest Lands	-	Lwr. Colo.R. Sonoran Desertscrub	387
Private	4,908	Semidesert Grassland	-
State Lands	-	Agriculture	517
Totals	29,320	Totals	29,320

**Recovery Area 4 (RA 4)**

RA 4 extends from the northern end of RA 3 north to RA 6, which contains part of the Gila River (Appendix A - Figure 12). The recovery area is primarily State Trust and BLM lands with the remainder in private holding. Vegetation in RA 4 is entirely Arizona Upland Sonoran Desertscrub (Appendix A - Figure 13). While owls have been found in the southern end of the RA, little of the overall area has been surveyed. The primary purposes of RA 4 are to maintain breeding habitat for known owls, provide additional breeding habitat for the expansion of the existing local population, provide connectivity for movement of CFPOs to potential breeding habitat along the Gila River and south into RA 3, and to provide areas for population augmentation as described in Task 4.0 of this document. Grazing and development are the activities in RA 4 that may require management action.

Owner	Ac	Vegetation Type	Ac
BLM Lands	55,114	Az.Upland Sonoran Desertscrub	136,472
State Lands	78,734		
Private	2,624		
Totals	136,472	Totals	136,472

**Recovery Area 5 (RA 5)**



RA 5 encompasses the Gila River from near Florence, Arizona to its confluence with the San Pedro River at Winkelman, and extends southeast to encompass the middle and lower portions of the San Pedro River (Appendix A - Figure 14). Ownership is mixed, but is dominated by private holdings and State Trust land. Vegetation generally is classified as Arizona Upland Sonoran Desertscrub (Appendix A - Figure 15), but riparian woodlands exist along river corridors.

Vegetation features resembling those in which CFPOs occurred early in the 1900s are still present along portions of the Gila and San Pedro rivers in this Recovery Area. In addition, adjacent uplands appear similar, from the standpoint of vegetation composition and structure, to areas currently occupied by CFPOs. Further, observations of CFPOs have been reported as recently as 1987 in RA 5 (Hunter 1988, AGFD files). The primary purposes of this Recovery Area are to protect potential breeding habitat and serve as a potential site for reestablishment of CFPOs as described in Task 4.0 of this document. The documentation or establishment of a subpopulation of CFPOs in this area is necessary to meet the Recovery Criteria. No single activity can be identified as a dominant management issue, but this Recovery Area is influenced by agriculture, grazing, development, and mining.

**Table 11. Recovery Area 5**

Owner	Ac	Vegetation Type	Ac
BLM Lands	36,086	Az.Upland Sonoran Desertscrub	150,250
State Lands	76,109	Lower Colo. River Sonoran Desertscrub	6,561
Private	51,833	Chihuahuan Desertscrub	1,312
		Agriculture	5,905
Totals	164,028	Totals	164,028

**Recovery Area 6**

RA 6 extends north from the Gila River to the Salt River east of Phoenix (Appendix A - Figure 16). Almost all of RA 6 is administered by the USDA Forest Service (Tonto National Forest), or the State Land Department. Vegetation is primarily in the Arizona Upland Sonoran Desertscrub, but RA 6 also encompasses the last remaining riparian woodlands along the Salt River (Appendix A - Figure 17). Although recent surveys failed to detect any CFPOs along the Salt River (Johnson and Haight 1998), this area still appears to provide suitable conditions for the CFPO and may be one of the most suitable in central Arizona (Johnson and Simpson 1971). Therefore, this Recovery Area serves to protect potential breeding habitat along the Salt River and in upland desertscrub elsewhere in the RA, provides connection between the northern edge of the subspecies' historical range in Arizona and potential breeding habitat in RA 5, and serves as a potential site for reestablishment of CFPOs as outlined in Task 4.0 of this document. The documentation or establishment of a subpopulation of CFPOs in this area may be necessary to meet the Recovery Criteria. No single activity in RA 6 can be identified as a dominant management issue, but it is influenced by grazing, development, military operations, and recreation. The Superstition SMA was identified in RA 6 (Appendix A - Figure 25).

**Table 12. Recovery Area 6**

Owner	Ac	Vegetation Type	Ac
BLM Lands	4,593	Az.Upland Sonoran Desertscrub	95,793
National Forest Lands	37,398	Lower Colo. River Sonoran Desertscrub	656
State Lands	53,801		
Private	656		
Totals	96,449	Totals	96,449

**Table 13. Superstition Special Management Area**

Owner	Ac	Vegetation Type	Ac
BLM Lands	3,746	Az.Upland Sonoran Desertscrub	33,066
National Forest Lands	904	Lower Colo. River Sonoran Desertscrub	-

Private	27,899	Semidesert Grassland	-
State Lands	517	Agriculture	-
Totals	33,066	Totals	33,066

### Recovery Area 7

RA 7 encompasses portions of the eastern (Air Force) part of the Barry M. Goldwater Range and the Sonoran Desert National Monument. Within the monument are the South Maricopa and Table Top Wilderness areas. These areas were included because they are potentially suitable as nesting habitat, improve connectivity to potential populations within the Tohono O’odham Nation, and capture a large percentage of the historical range. Nearly the entire area is comprised of Federal lands with inherent protections for endangered species (Appendix A - Figure 18). Vegetation in RA7 is largely composed of Arizona Upland Sonoran desertscrub with some Lower Colorado River Sonoran desertscrub (Appendix A - Figure 19). Recreational activities, grazing and military training activities are the primary management concerns in this Recovery Area.

Owner	Ac	Vegetation Type	Ac
BLM Lands	263,101	Az.Upland Sonoran Desertscrub	400,885
State Lands	3,281	Lower Colo. River Sonoran Desertscrub	39,367
Private	1,312	Semidesert Grassland	656
Military Reservation	173,214		
Totals	440,908	Totals	440,908

### Recovery Area 8 (RA 8)

RA 8 encompasses Organ Pipe Cactus National Monument, a portion of the Cabeza Prieta National Wildlife Refuge west of the monument up to the Yuma County line, and a block of

BLM lands between the monument and the Barry M. Goldwater Range. Much of this area is located just north of the International border between the United States and Mexico, to the west of the Tohono O'odham Nation (Appendix A - Figure 20). Vegetation in RA 8 is a mixture of Arizona Upland Sonoran desertscrub and Lower Colorado River Sonoran desertscrub (Appendix A - Figure 21). Breeding CFPOs have been located in RA 8, and since 1999, have accounted for approximately 21% of the known CFPOs in Arizona. Therefore, the primary purposes are to protect existing CFPO sites and breeding habitat, and to serve as link to habitat and breeding CFPOs in Mexico and adjacent RAs. Recreational activities and border crossing management are the primary management concerns in this Recovery Area. No SMAs are identified in RA 8.

**Table 15. Recovery Area 8**

Owner	Ac	Vegetation Type	Ac
BLM Lands	169,933	Az.Upland Sonoran Desertscrub	372,672
State Lands	2,624	Lower Colo. River Sonoran Desertscrub	217,174
Private	11,810	Semidesert Grassland	656
National Parks, Monuments & Rec Area	336,586		
National Wildlife Refuges	69,548		
Totals	590,502	Totals	590,502

**The Tohono O'odham Nation**

The Recovery Areas described above surround and often border the lands of the Tohono O'odham Nation, a federally recognized, sovereign Indian Nation. Because of its special status as a sovereign nation, we have not designated a Recovery Area (with specific management recommendations) on the Nation's lands. However, in this section we briefly discuss how the Nation currently links the eight Recovery Areas identified in this plan and how this connectivity is likely to persist in the future. We believe that the Nation has an important role to play in the recovery of CFPOs. Therefore, this discussion is followed by an overview of a strategy that, if implemented, would provide the Nation with valuable information needed for development of a long-term management and conservation strategy for the CFPOs on its lands.

CFPOs are known to occur on the Nation's lands, but information is lacking on the distribution and abundance of the subspecies within this vast portion of south-central Arizona. Based on its proximity to known CFPOs in Sonora, and the widespread occurrence of large tracts of "potentially suitable" Sonoran desertscrub vegetation, it is biologically feasible to assume that the subspecies exists on the Nation's lands in meaningful numbers. Therefore, we believe that the Nation's involvement in the conservation effort for CFPO is critical for continued existence of the subspecies in Arizona. We recognize that what is presented below does not obligate the Nation to any activity for recovery of the subspecies. However, we hope that the Nation will consider our suggestions and become an active partner in the conservation and preservation of CFPO in Arizona.

The main body of the Nation is bordered by Recovery Area 8 to the west; Recovery Areas 1 and 2 to the east; and Sonora, Mexico to the south (Figure 5). This portion of the Nation encompasses approximately 2.7 million acres. Development has been very limited on the Nation's lands in the past and this trend will likely continue into the foreseeable future - most of the Nation is undeveloped and probably will remain so. Vegetation on approximately 1.9 million acres of this portion of the Nation is classified as Arizona Upland Sonoran desertscrub, some of which appears suitable for CFPOs. Given the above, the Nation currently provides connectivity between areas occupied by the subspecies in Recovery Area 8, Recovery Areas 1 and 2, and Sonora, Mexico and should continue to link these areas into the future.

As previously noted, very little information regarding the CFPO on the Tohono O'odham Nation currently exists. However, the Nation's lands constitute a large portion of the historical range of CFPO in Arizona, and we believe that evaluation of the status of CFPO on the Nation is critical to understanding the overall status of the subspecies in Arizona. A considerable amount of information is needed to evaluate the status of CFPO on the Nation. It is beyond the scope of

this document to fully develop the process to gather and evaluate this information. Instead, we provide a generalized overview of such a process that is consistent with, and may facilitate, activities identified under Task 1.0 of this document .

The Recovery Team believes that the initial step in gathering data on CFPO on the Nation should be to use existing vegetation and soils maps, coupled with verification on-the-ground, to identify areas that may be suitable for the CFPO. Once these “suitable” areas have been identified, they should be systematically surveyed to determine presence/absence of CFPOs. We recommend a multi-year, phased survey approach. Initially, all of the “suitable” areas should be surveyed using a technique that provides coarse-resolution coverage, such as the Large Area Survey Protocol developed by AGFD and USFWS (USFWS 2000). This will identify general areas where CFPO are present and where more focused surveys should be conducted to better define occupied areas and identify individual territories. We recommend a technique similar to the AGFD/USFWS Project Clearance Survey Protocol (USFWS 2000) for “fine-resolution” follow-up surveys in areas where CFPO are initially detected. Once the first rounds of coarse- and fine-resolution surveys have been completed, the Nation should have information with which it can begin to understand the distribution and abundance of the subspecies on its lands. Areas where no CFPO are detected during the initial “coarse-resolution” surveys should be resurveyed during subsequent years following the aforementioned approach. Surveys in these “suitable” areas where no CFPO are initially detected should continue for several years to assure thorough coverage and allow for the opportunity to discover additional occupied areas.

By implementing a survey effort such as the one identified above, the Nation can obtain information that will allow an understanding of the distribution and abundance of CFPO on its lands. This information will allow the Nation to make better informed decisions about land use and anticipate and minimize or avoid regulatory conflicts for development projects on its lands.

After the Nation has identified areas on its lands where CFPO occur, we recommend that it conduct further research into the population ecology and life history of the subspecies. Specific data that currently are lacking are identified in this document. It is likely that studies on the Nation addressing these identified data gaps would provide information needed to better understand the species and further develop, refine, and implement recovery and conservation strategies throughout its historical range in Arizona.

Given the extensive area of the Nation that is “potential habitat” for CFPO and the fact that many areas are remote and difficult to access, the survey effort suggested above would require considerable human and financial resources. Any subsequent follow-up studies would also require extensive effort and considerable costs. Therefore, we recommend that the Nation work with governmental entities, conservation groups, and others to explore opportunities to fund such work and develop management strategies on the Nation to benefit CFPOs and their habitat. Training opportunities should also be provided so that Tribal members could conduct surveys and research as deemed appropriate by the Nation.

We recognize that the Nation may want to maintain CFPO locations and other site-specific information as confidential. However, should the Nation undertake the efforts suggested above, we encourage it to make generalized information regarding the distribution and abundance of CFPO on its lands, and any information it generates on the life history and ecology of CFPO, available to USFWS and the Recovery Team for further recovery planning objectives.

Subtask 2.1 Proposed guidelines for development, capital improvements, livestock grazing, and recreational activities.

### **Guidelines for Activities Inside Recovery Areas**

## Development and Capitol Improvements

Development (e.g., residential housing, and commercial complexes) in Recovery Areas should proceed considering the guidelines outlined below. Capitol improvements such as non-residential development projects (e.g., road construction, drainage projects, or flood control facilities) should be planned in consideration of these same guidelines, with the understanding that the extensive linear nature of many capitol improvement projects potentially promotes fragmentation of habitat.

- Development activities should not occur within 400 m (0.25 mi) of an active nest site during the most sensitive periods of the breeding season (February 1 through July 31). Development planned to occur within 100 m (330 ft) of any known CFPO nest site should be evaluated on a site-specific basis, but significant modification of habitat within this area should be avoided year round.

### *Rationale:*

For most raptor species, the periods during which they are the most sensitive to disturbance are courtship and nesting (Richardson and Miller 1997). Disturbances during these periods potentially interrupt pair formation and nest site selection, and can cause abandonment of the nest, eggs or young. Typically, human activities near nests of sensitive species are restricted during the nesting season to avoid these types of impacts. Although information on the sensitivity of CFPOs to human disturbance is limited, restriction of human activities near nests is an accepted management technique for raptor species. Therefore, we recommend seasonal restrictions on human activities near active CFPO nests.

The 400 m (0.25 mi) distance is based on distances typically recommended for other raptor species (Richardson and Miller 1997). Observations in Arizona of CFPOs responding to



disturbances appear to support this recommendation. One observation occurred when a male CFPO shifted its core advertising area approximately 500 meters to the south, apparently in response to the construction of a single family dwelling being initiated on the parcel that this owl had been using since the previous fall. This owl ultimately nested, with the nest being approximately 500 meters from the area of disturbance. In another instance, a breeding pair of CFPOs shifted their nest site approximately 400 meters to the north of where they had nested the previous year. Late in the nesting season of the previous year, a high-density subdivision was constructed within 200 meters of the pair's nest site. The new nest site was approximately 550 meters from this new source of disturbance. A third observation was made of an unpaired male CFPO moving approximately 500 meters to the east of an area where he had been advertising. This movement occurred shortly after 10 acres were cleared of vegetation. This clearing occurred within 90 meters of the area this male owl had been using (AGFD unpubl. data). While it is impossible to know for sure that these disturbances were the only factors causing these owls to shift their use areas, it is likely that they did contribute to it. The proximity of the disturbances to the owls and the resulting movements are consistent with the guidelines we are proposing.

- Year-round restrictions should be considered for human activities within 100 m (330 ft) of any CFPO nest.

*Rationale:*

The area within 100 m (330 ft) is where many activities associated with nesting and fledging take place (Abbate et al. 1996, Abbate et al. 1999, G. Proudfoot pers. obs.). For example, perches used for defense of the nest and prey exchanges between CFPOs are usually located within this distance, as are the trees and shrubs used by fledglings for protection and feeding. Non-breeding, resident CFPOs also concentrate their activities in this area. Significant noise or habitat

disturbance within this area may cause nest abandonment. Observations have indicated that nest sites can be used in subsequent years (AGFD unpublished data). It is important, therefore, that the area immediately surrounding nest sites be protected from significant habitat alterations. The size of this protected area is recommended because it protects necessary habitat elements, while allowing some flexibility for activities that may be less significant. Each proposed activity within the 100 m (330 ft) area should be evaluated on a case-by-case basis to determine the significance of the activity.

- Guidelines within Recovery Areas may be more restrictive if areas are considered to be especially important (i.e., Special Management Areas [SMAs]). We have identified five SMAs in four individual Recovery Areas.
- Development in Recovery Areas should be configured so that the highest quality CFPO habitat is protected and connectivity to adjacent habitat is maintained. Because of the significance of habitat within SMAs, development within these areas should be subject to more detailed analyses. Development within SMAs (except the Silverbell [Appendix A - Figure 23] and Superstition [Appendix A - Figure 25] SMAs) should be carried out so that there is relative certainty that CFPO will be able to meet all of their life history needs. Specifically, consideration should be given to spatial needs, breeding requirements, dispersal patterns, home range and landscape level movement requirements, and habitat conditions needed for foraging and predator avoidance. These considerations and levels of disturbance should be evaluated at the project level, and implemented in a manner that disturbs the least amount of the highest quality CFPO habitat within a project area and results in habitat being distributed in a uniform and connected fashion across the landscape. The disturbed lands could include a variety of development options ranging from dispersed, low-density development to clustering higher-density development, as long as the resultant open space was connected to allow movement within the project area and throughout the SMA. Additional disturbance, beyond the footprint of construction,

from lights, noise, and traffic, should be considered during the assessment of impacts for large projects (e.g., malls, ball fields). Implementation of this guideline should also strive to maintain, where possible, relatively large blocks of nesting habitat, and as noted above, habitat for the movement of CFPOs within and among Recovery Areas. Maintaining adequate habitat for dispersal and nesting in proximity to known nest sites is needed for expanding, maintaining and establishing subpopulations that are essential to the long-term maintenance of CFPOs in Arizona.

- SMAs should be the focus of acquisition of conservation lands and other management and conservation activities in order to maintain the suitability of these areas for CFPOs. We stress that conservation efforts should take place within the SMA where the activity, for which the conservation effort is proposed, is occurring. We also suggest that relatively high conservation values be placed on areas within SMAs that are deemed especially important to maintaining habitat or movement corridors for CFPOs (e.g., the southern portion of the Northwest Tucson SMA) (Appendix A - Figure 26). Land acquisition is an important tool for maintaining and conserving Recovery Areas, particularly in SMAs. On private lands we recommend setting aside land within SMAs in perpetuity through fee title, the use of voluntary conservation easements, and other landowner incentives (e.g., mitigation banks). These land conservation measures have been used successfully in other parts of the United States for conservation of lands/habitat for endangered species.

The Service's Partners for Wildlife or Safe Harbor Agreements may also provide some limited short-term benefits to the CFPO, particularly in areas where movement corridors are important. In addition, regional planning efforts and conservation plans, such as the SDCP currently under development by Pima County and efforts by the Town of Marana, and in Altar Valley, as well as other planning efforts including HCPs can be instrumental in implementing this Draft Plan and providing conservation for the CFPO. There are a

number of avenues through which funding for various planning and conservation efforts can be obtained which should be considered and pursued.

*Background and Rationale:*

Current information suggests that CFPOs can live and breed successfully in areas which have undergone some degree of development, but apparently they cannot tolerate all types of development. We base this statement on the general lack of detections and successful reproduction of CFPOs in high density developments.

In addition, a general analysis of the levels of disturbance within the home ranges of breeding pairs in northwest Tucson was conducted by the Team. The objective of this analysis was to assess what level of disturbance might still allow successful reproduction by CFPOs. Home ranges occupied by non-breeding individuals were also examined. The levels of disturbance within these sites were measured by placing a transparency with an outline of a circle, approximating the size of a CFPO home range (113 ha [280 ac]), over a 1:1,200 scale aerial photo. The home range size used in this analysis was based on the maximum home range documented with telemetry during research in Texas (Proudfoot 1996). Year-round home range data based on telemetry is not yet available in Arizona. The circle was centered on the nest site of each pair of CFPOs, with two exceptions. For two home ranges, the circle was shifted slightly to avoid areas of high density (2-3 houses per ha [4-6 houses per ac]) that were not used based on several years of observations and locations obtained via radio telemetry (AGFD unpubl. data). A circle was used to characterize home ranges because monitoring suggests that the home ranges of CFPOs in this area are roughly circular and habitat quality was relatively homogenous in the analysis area.

Once the circle was overlaid on the aerial photo, all areas of vegetative disturbance were blackened, including buildings, roads, corrals, graded areas, turf areas, parking lots, etc. within

the estimated home range. The transparency was then placed on a grid paper where the total number of squares inside the circle was counted. The blackened squares were then counted and divided by the total number of squares within the circle to give the percentage of the disturbed area within the circle (home range). The mean percent disturbance for the nine breeding home ranges analyzed was 23%. Disturbance levels ranged from 11% to 34%.

Concurrent to this general analysis by the Team, a local consulting firm conducted an analysis of the level of disturbance within the general areas where CFPOs had been located within northwest Tucson. While this analysis is not based on actual owl locations, it does describe the general vicinity where CFPOs have been found with regard to levels of disturbance. This analysis had a mean level of disturbance of 32% and ranged from 12% to 52% (Westland Resources 2001).

In 2002, the AGFD conducted a more sophisticated analysis of the same breeding home ranges considered by the Team. This analysis used GIS techniques and improved photo imagery. This analysis resulted in a mean level of disturbance of 33% for the home ranges analyzed. The range of disturbance was 16% to 54%. The 95% Confidence Interval was from 22% to 44% disturbance (AGFD unpubl. data).

The above analyses represent the information currently available from which to determine potential disturbance thresholds for the CFPO. It is limited in scope and cannot be tied to important life history parameters such as productivity, mortality or site fidelity due to the small sample size. In addition, it does not address important life history elements such as dispersal or prey availability. We anticipate that this information will be forthcoming and expect the above analyses to be modified over time as additional research is conducted. The Team recommends, and the Service concurs, that the best available information related to CFPO life history requirements be used in addressing potential impacts to CFPOs within the Recovery Areas.

Concern has also been expressed that, given our lack of long-term data, allowing any development to occur in areas of existing disturbance is not justified until we know more. While the data are limited in this regard, a comparison of the productivity of nests in disturbed (northwest Tucson) versus undisturbed (Altar Valley, Organ Pipe Cactus N.M., Pinal County) areas of Arizona shows comparable rates of activity and productivity (See Table 17). The sample of nests available for comparison is small and covers only three years (AGFD unpubl. data). Comparisons are, therefore, not statistically meaningful, but the information does show our current level of knowledge. The objective of this draft plan is to, at a minimum, maintain the conditions resulting in current levels of CFPO productivity in developed areas.

**Table 16. Productivity and Persistence of CFPO Nesting Territories in Southern Arizona, 1999 - 2001\***

	<b>Northwest Tucson (n=10)</b>	<b>Organ Pipe Cactus National Monument (n=5)</b>	<b>Pinal County (n=3)</b>	<b>Altar Valley (n=12)</b>
Nests/Year	3.3 (Range 3-4)	1.6 (Range 1-3)	1.0 (Range 0-2)	4.0 (Range 1-6)
Young/Year	12.6 (Range 11-16)	2.5 (Range 0-5)	3.3 (Range 0-5)	9.0 (Range 4-12)
Young/Nest	3.8 (Range 3.6-4)	1.3 (Range 0-1.6)	3.3 (Range 0-5)	2.5 (Range 2-4)
Nest Activity**	0.42	0.33	0.50	0.44

\* AGFD unpublished, preliminary data

\*\* Mean percent of years each nest site was active

We strongly recommend that the effects of development on CFPOs be monitored as projects are implemented so that the effectiveness of these guidelines can be evaluated. As new information becomes available, recommendations should be reassessed and revised, if necessary, to provide protection for existing CFPOs and maintain sufficient habitat to recover the CFPO in Arizona.

### Specific Guidelines for the Silverbell and Superstition SMAs

The Silverbell and Superstition SMAs were created in areas that currently, or in the near future, are likely to present challenges to the movements of CFPOs. It is necessary to maintain or create conditions that promote or allow movement of CFPOs through these areas and maintain breeding

habitat where it is present. Connectivity which allows the movement and dispersal of CFPOs among subpopulations is necessary to accomplish the Recovery Criteria related to population numbers and distribution throughout the historical range. Guidelines for these SMAs are outlined below under the guidelines for their respective RAs.

### Specific Guidelines for Recovery Area 1 (RA 1)

The Altar Valley SMA is located within RA 1 and is bounded on the south by Fresno Wash, on the east by the line dividing Range 10 and 11 East, on the west by Highway 286, and on the north by the Tohono O'odham Nation (Appendix A - Figure 22). This SMA was established to address the issue of increasing residential and commercial development at the north end of Altar Valley. Such development has the potential to reduce the amount of breeding habitat available to CFPOs, as well as increase the fragmentation of habitat and the number of barriers to movements at local and landscape levels. Projects and actions within this SMA should consider the need to maintain adequate breeding habitat to allow for the protection of known owls and to expand the number of breeding home ranges in order to achieve recovery. Disturbance should be configured in a manner that allows for movement within and among existing and potential CFPO home ranges and allows for dispersal of juveniles from nest sites to adjacent, available breeding habitat. The best available biological information should be used to determine the levels and extent of disturbance that will allow for CFPOs to meet these important life history requirements.

While the entire area within RA 1 is important for the protection and recovery of CFPOs, we believe the lands within the Altar Valley SMA warrant special consideration due to the threat of habitat modification and increased human activity levels. Development levels should be assessed using the best available information to avoid the reduction of available nesting habitat and the loss of connectivity within RA 1 and also to adjacent Recovery Areas. Specific details should be determined during project evaluation and consultation based on the characteristics of the site and

project proposal. CFPO sites do occur outside of this SMA and should be protected, and connectivity to the SMA maintained.

### Specific Guidelines for Recovery Area 2 (RA 2)

To help facilitate movement of CFPOs between the Tohono O’odham Nation and RA 3, efforts should be made to protect existing areas of suitable habitat and restore parts of this linkage which have been impacted by agricultural, development, mining, and other activities. For example, agricultural fields in this area could be restored to provide habitat through which CFPOs can move. Lands in the area should be acquired from willing sellers through mitigation, conservation easements, or grants. Improvements could also occur under Safe Harbor agreements. Restoration might include planting mesquite trees and other appropriate native vegetation. Washes in the area should also be enhanced to provide movement corridors for CFPOs. Trees adjacent to and in the median of Interstate 10 in this area (specifically between the Red Rock [exit 226] and where Guild Wash crosses Interstate 10) (Appendix A - Figure 23) should also be retained and enhanced where possible (within safety constraints) to facilitate the movement of CFPOs through the area. Even though there is some potential for mortality as CFPOs cross the Interstate, the lack of connectivity between and within Recovery Areas is, in our view, a much greater threat to the recovery of CFPOs in Arizona. In order to reduce the potential for mortality along large roads or highways, we recommend the use of measures that would direct owls to cross such roads out of the path of traffic. Such measures could include the planting of tall trees immediately adjacent to the roadway or on the shoulders and/or medians. These measures would act to raise the flight path of owls crossing the roadway, decreasing the potential for any mortality. If safety constraints preclude the enhancement of vegetation adjacent to the freeway, we recommend investigating alternative highway designs or enhancement/establishment of habitat connectivity in some other manner (e.g., raised medians, over-passes, etc.).

#### *Interstate 10 Corridor (between mile post 241.5-244.5)*



While RA 2 contains areas of potential breeding habitat, the portion of RA 2 that falls within the area of sections 8 and 16 north and east of the Santa Cruz River and the west half of sections 9 and 15 (falls within RA 3), Township 12S Range 12E, was designated primarily as a habitat connection between the east and west sides of Interstate 10 (Appendix A - Figure 8). It will be especially important to utilize creative alternatives and management activities related to habitat connections in this area. Existing habitat connections from the eastside to the westside of the interstate are extremely limited in the area of northwest Tucson and Pinal County. This area represents the most viable connection based on the distance between existing CFPO habitat to the east and west, and was intended for the protection and restoration of a habitat connection between known CFPO population segments east and west of Interstate 10. Some parts of this area have been significantly degraded, from the perspective of CFPO habitat, by human activities such as agriculture and capitol improvements. Therefore, CFPO breeding habitat is not present, nor is it practicable to recreate breeding habitat in this area. However, with relatively less time and effort, habitat connections could be established in this area. For example, agricultural fields that exist in this area could be restored to provide habitat through which CFPOs can move. Lands in this area should be acquired through fee title, conservation easements, or grants, and restoration might include planting mesquite trees and other appropriate native vegetation. Safe Harbor agreements could also be used to promote restoration. Trees adjacent to and in the median strip of Interstate 10 in this area should also be retained and enhanced where possible (within safety constraints) to facilitate the movement of CFPOs through the area. Arizona Department of Transportation (ADOT) projects in this area could enhance the Interstate 10 right-of-way (ROW) or utilize other design elements such as over-/underpasses to benefit habitat connectivity in this area. Because the Santa Cruz River is located in RA 2, flood control and restoration efforts or other projects related to the river could also contribute to the restoration of habitat in this SMA.

Because the primary purpose of this segment of RA 2 is to provide connectivity and because some parts of this area do not currently contain CFPO habitat, the guideline for minimizing habitat alteration does not need to be as restrictive as it is for existing CFPO breeding habitat. In order to create and/or protect opportunities for connectivity in this area, we recommend that areas of existing CFPO habitat that remain undeveloped and areas restored to promote movement of CFPOs be configured within a project, and in relation to adjacent projects, so as to create broad, contiguous areas of vegetation running east-west that facilitate CFPO movement across Interstate 10.

Determination of the extent and location of habitat protection or restoration should be conducted on a project-by-project basis during section 7 and section 10 consultations conducted under the requirements of the ESA. The ability to establish effective habitat linkages is dependent on individual project characteristics that should be evaluated on a case-by-case basis.

### ***Silverbell SMA***

To protect existing vegetation along Interstate 10, the Silverbell SMA should be established from Interstate 10, exit 226, south to where Guild Wash intersects Interstate 10 (Appendix A - Figure 23). This SMA provides a linkage from the Santa Cruz River west and south of the Interstate with the SMA in RA 3. There is a high potential of future development along the Interstate 10 corridor which may block movement of CFPOs among Recovery Areas. In order to create and/or protect opportunities for connectivity, we recommend that areas of existing CFPO habitat remain undeveloped and areas restored to promote movement of CFPOs within a project, and in relation to adjacent projects, so as to create broad, contiguous areas of vegetation oriented to facilitate CFPO movement across Interstate 10.

Determination of the extent and location of habitat protection or restoration should be conducted on a project-by-project basis during section 7 and section 10 consultations conducted under the requirements of the ESA. The ability to establish effective habitat linkages is dependent on individual project characteristics that should be evaluated on a case-by-case basis.

### Specific Guidelines for Recovery Area 3 (RA 3)

Based on the number of CFPOs found in RA 3 (29% to 44% of the known Arizona CFPO population since 1998) and their productivity (see Table 17), we feel the segment of the CFPO population found in RA 3 is essential to the survival and recovery of the overall CFPO population in Arizona. Research has not been conducted over a long enough period of time to define meaningful trends in population numbers, but the apparent trends found in RA 3 are mirrored in other RA's indicating population impacts may be widespread. However, the amount of existing habitat alteration and the immediate threats to CFPO breeding and dispersal habitat in this RA dictate the need for the careful evaluation of activities proposed for this area. If future surveys find that CFPOs are common and widespread and the Recovery Criteria can be accomplished in other parts of Arizona, then the status of RA 3 can be re-evaluated.

#### *Northwest Tucson SMA*

All areas within RA 3 are important and contribute to the recovery of CFPOs by providing breeding habitat and connection to other Recovery Areas. However, certain portions of RA 3 have increased significance because of the distribution of CFPO sites and the need to maintain a linkage between these sites. Therefore, we have identified the Northwest Tucson SMA within the southern portion of RA 3. This SMA is located south of sections 19-24, Township 11S, Range 12E and sections 19-21, Township 11S, Range 13E (or the 13600 N street alignment) (Appendix A - Figure 23). This area should be subject to no ground disturbance which would

preclude the ability of CFPOs to meet their life history requirements as determined by the best available scientific information. Configuration of open space to promote nesting and dispersal is essential. This area is designated as a SMA primarily because of the number of known CFPO sites. In addition, this SMA is important for recruitment and recovery because it contains habitat not currently known to support owls but that is close to several known nests. Conservation of areas suitable for expanded nesting opportunities is vital to the continued existence of this subpopulation. This area currently is subject to substantial habitat fragmentation from existing development, and the remaining habitat is threatened by ongoing and expected development. When more information is available regarding the impacts of development on CFPOs, more specific guidance on recommended development levels may be included in future versions of this recovery plan. Until that time, case by case analysis of projects will be required using all existing information.

#### ***High Conservation Value Area Within the Northwest Tucson SMA***

Within the Northwest Tucson SMA, urbanization has resulted in significant loss and fragmentation of CFPO habitat. In addition, projections indicate that this area will continue to be under intense development pressure from a variety of activities. Because this area supports a high density of nesting CFPOs and because dispersal pathways are limited within RA 3 (the remaining suitable dispersal corridors are used consistently on an annual basis), it is imperative to protect the remaining areas of native desert vegetation. Without such protection, it may become impossible for new owls (e.g., dispersing juveniles) to move into this area to replace owls lost to mortality or other factors, or for resident owls (both adults and fledglings) to move out of the area. The movement of CFPOs within and among RA's is essential to achieving the Recovery Criteria related to the distribution of the CFPO population in Arizona.

In order to promote the protection of existing habitat within the urbanizing areas of the Northwest Tucson SMA, the area shown in Appendix A - Figure 26 is identified as an area where additional conservation credits should be given for conservation activities. This area contains a high density of active CFPO nesting home ranges and dispersal pathways threatened by ongoing developments. The boundaries for this area were identified by outlining the area with the highest level of existing development and the highest density of nesting owls; the boundaries are roughly Naranja and Camino del Norte to the north, La Cholla on the east, Cortaro Farms Road on the south, and Hartman Lane/Blue Bonnet Road to the west. The conservation value of this area should be assessed and implemented in conjunction with the other guidelines and objectives outlined for RA 3 and the Northwest Tucson SMA.

#### ***Tortolita Fan SMA***

In addition to the Northwest Tucson SMA, we have identified the adjacent Tortolita Fan SMA which forms a continuous corridor of habitat extending north from Northwest Tucson to the northern boundary of RA 3 (Appendix A - Figure 24). This SMA has had documented exchange of dispersing juvenile CFPOs between breeding CFPOs in Pinal County and in northwest Tucson. Breeding habitat and known breeding sites also characterize this SMA. This SMA provides a connection between CFPO sites in northwest Tucson and CFPO sites in southern Pinal County, as well as to adjacent Recovery Areas. This SMA also provides recruitment areas adjacent to existing productive CFPO nest sites. Protection of habitat and connectivity is further enhanced by areas running east-west along important wash systems. Projects and actions proposed within this SMA should be designed in such a way that CFPO requirements for breeding and dispersal, as determined from the best available scientific information, are maintained or enhanced.

#### ***Areas in RA 3 Outside of SMAs***

Areas within RA 3 that are outside of SMAs nonetheless contain habitat important to the recovery of CFPOs. Riparian vegetation and other high-quality CFPO habitat should be protected and north-south corridors for movement maintained. This does not mean that only the washes and movement corridors are to be protected. An appropriate combination of quantity and quality of habitat needs to be protected to maintain the potential for breeding and movement of CFPOs. Specific details should be determined during project evaluation and consultation based on the characteristics of the site and project proposal. Conservation efforts should be focused on lands inside SMAs, particularly the Northwest Tucson SMA. Other management activities such as open space acquisition, land trades, conservation easements, and other conservation efforts should also concentrate in the nearest SMA. The SMA areas outlined are an important "backbone" of connected habitat that should be expanded to include areas outside of the SMAs where possible through management or conservation activities.

#### Specific Guidelines for Recovery Area 6 (RA 6)

To help facilitate movement of CFPOs along the Gila River near Florence, Arizona in RA 6, efforts should be made to restore parts of this linkage which have been impacted by agricultural, development, or other activities. For example, agricultural fields that are located between Highway 79 near the Florence State Prison and the diversion dam on the Gila River could be restored to provide habitat through which CFPOs can move. Lands in this area should be acquired through mitigation, conservation easements, or grants. Restoration might include planting mesquite trees and other appropriate native vegetation. Restoration activities could also be accomplished through Safe Harbor agreements. Washes in the area should also be enhanced to provide movement corridors for CFPO. Maintaining connectivity is essential to the maintenance of subpopulations discovered through surveys or established through augmentation. The protection or establishment of a subpopulation of CFPOs in RA 6 helps to achieve the Recovery Criteria.

### Specific Guidelines for Recovery Area 7 (RA 7)

To help facilitate movement of CFPOs between Florence Junction, Arizona and the Tonto National Forest, efforts should be made to maintain and restore habitat, through which CFPOs can move, in the Superstition SMA (Appendix A - Figure 25). Breeding habitat in this SMA is limited, although it is potentially present along some washes. However, land in this SMA is under increasing pressure from development as the Phoenix metropolitan area continues to expand eastward. Lands in this area should be acquired through mitigation, conservation easements, or grants. In particular, washes and upland vegetation should be protected in this SMA to provide connectivity between areas of breeding habitat. The determination of the extent and location of habitat protection or restoration in this area should be conducted on a project-by-project basis during section 7 and section 10 consultations conducted under the requirements of the ESA. The conservation and restoration of breeding and dispersal habitat with RA 7 is important to the maintenance or establishment of a CFPO subpopulation in the northern portion of its historical range needed to meet the Recovery Criteria.

### **Livestock Grazing and Prescribed Fire**

Within the areas currently occupied by CFPOs, livestock grazing and fire affect semidesert grasslands, Sonoran desertscrub, and riparian vegetation in different ways (see review below), but the relationships between grazing, fire, and habitat conditions for CFPOs in these communities have not been formally investigated and are not well understood. Therefore, we recommend that the following general guidelines for grazing and fire be applied to all Recovery Areas. We believe these guidelines generally promote habitat conditions likely to favor CFPOs in all three vegetative communities and recommend they remain in effect until more specific management guidelines can be developed for each community.

- Grazing and fire throughout all Recovery Areas should be managed to maintain or create the structure and composition of vegetation currently found in occupied CFPO habitats. At a minimum, increases in the total number of cattle within any allotment should be discouraged until the relationship between grazing and the CFPO is better understood. For fire, known nest sites should be protected during prescribed burning so that the nest structure and associated vegetation within 100 m are maintained. Activity levels associated with burning should consider sensitive seasonal time periods such as nesting, fledging, and dispersal.

#### Livestock Management in Semidesert grasslands, Sonoran Desert, Uplands, and Xeroriparian Areas

These vegetative communities should be maintained by managing season of use and utilization levels of perennial, palatable shrubs and grasses at a level which promotes the health of the ecosystem and habitat components favored by CFPO. This level of utilization should avoid degradation in composition and vigor of understory vegetation, and should not preclude regeneration of any strata of vegetation.

We recommend that the level of utilization be determined as follows:

- Develop an informal “CFPO resource management team” consisting of wildlife biologists, range conservationists, livestock operators, Natural Resources Conservation Service (NRCS) representatives, recreation specialists, representatives from the State Land Department (when State Trust Land is involved), etc. to assist in determining appropriate utilization levels within allotments containing potential CFPO habitat. While the NRCS currently recommends utilization limits on state and private lands, information on the habitat requirements of the CFPO is not currently being considered in this process.



An interdisciplinary resource management team (as described above) could serve an advisory role in incorporating such information. There currently exists an annual coordinated resource management meeting between the Arizona Game and Fish Department and Federal agencies such as the US Forest Service and the Bureau of Land Management. At these resource management meetings, Federal and state biologists could coordinate how best to organize the above-mentioned specialists into an interdisciplinary resource management team. These CFPO resource management teams should be based on geographical boundaries in potential CFPO habitat. The task of the team would be to recommend levels of livestock utilization and human-use disturbance on each allotment within their respective geographic boundary. The Resource Team would be charged to:

1. Prioritize allotments based on agency mandates and needs. Allotments occupied by CFPOs should be given the highest priority, but all allotments with potential habitat should be evaluated. Since this Draft Plan will be revised or updated in approximately five years (or sooner if necessary), it is understood that many allotments in southern Arizona will not be addressed during the initial implementation phase.
2. Schedule Resource Team field reviews of livestock management units if needed. The highest priority for reviews should be to evaluate on-going grazing practices in Recovery Areas occupied by CFPOs to determine how grazing may be affecting the vegetation in the unit.
3. Develop guidelines to achieve good or higher condition and stable or upward trends on grazing allotments containing potential CFPO habitat within Recovery Areas. Conservation practices examined could include prescribed burns, changes in grazing systems, fencing, water developments, mechanical or chemical treatments, etc.

4. Review existing monitoring techniques and results and relate documented changes in vegetation to effects on CFPO habitat. Identify key monitoring areas to determine progress and monitor habitat change.
  
5. Restrict or redirect activities which concentrate cattle or create other disturbances near active CFPO sites (determined on an annual basis through surveys and monitoring) during the breeding season, if such activities can be documented as being detrimental to CFPOs.
  
6. Review grazing systems (stocking rates, season of use, rotation schedule, etc.) within all habitat types and provide workable recommendations on how livestock concentrations can be managed without stressing or unduly disturbing CFPOs, particularly during the pair-formation and nesting seasons. Resource teams will coordinate with the rancher, State Land Department, and responsible public land management agency to provide effective and cost-efficient alternatives to current livestock concentration activities, if it is determined to impact CFPOs.
  
7. Coordinate with ranchers and land management agencies to conduct research within Recovery Areas and other areas occupied by owls to determine grazing utilization levels compatible with the ecological requirements and continued sustainability of the CFPO and their habitat. This research should also determine what effects, if any, timing (season of use and duration) and intensity of grazing systems have on CFPO habitat. Additionally, research should investigate whether ephemeral grazing systems have any negative impacts on CFPO occupancy. Comparative studies should be performed to determine preferred vegetative structure and CFPO prey availability on grazed and ungrazed reference areas. Ungrazed areas such as Organ Pipe Cactus National Monument or Buenos Aires

National Wildlife Refuge can be compared to adjacent BLM or State Trust lands which are currently grazed.

8. Develop implementation measures to achieve changes in livestock management if research indicates that changes are necessary.
9. Conduct research to determine the effects of fire on CFPO habitat. This research should investigate the role of frequency, intensity, and seasonality of fire as they relate to habitat for the CFPO, and should examine vegetative recovery and rates of succession following fire. The goal of this proposed research should be to determine if fire management prescriptions can be developed which will benefit the CFPO and their habitats, and meet other land management objectives.

### Riparian Areas

- Hydric- and mesic-riparian areas having, or capable of supporting, riparian woody species such as cottonwood, willow, ash, hackberry, etc. should have appropriate grazing utilization levels which allow for the maintenance and regeneration of native riparian vegetation. Where conditions necessitate, complete exclusion of livestock within mesic riparian areas may be warranted until management objectives are met. This guideline should be implemented through the CFPO resource management team described above.

### Use of Prescribed Fire

- Prescribed fire is commonly used in semidesert grasslands to promote grasses and decrease mesquite and other shrubs in upland areas. We recommend that when fire is used as a management tool in Recovery Areas, mesquite and other trees and shrubs along riparian and xeroriparian systems and all saguaros be protected. Adjacent, unique

vegetation communities such as ironwood and Sonoran desertscrub which are not fire-adapted should be protected. The use of prescribed fires within Recovery Areas should promote the overall health of the system, while maintaining important CFPO habitat components needed to meet life history requirements such as nesting and dispersal. In fire-adapted communities, the careful use of prescribed fire should enhance the health of the ecosystem, benefitting CFPOs. This guideline for use of fire in Recovery Areas should be implemented through the CFPO resource management team described above.

*Background and Rationale:*

There are conflicting and complex views on the relationship between current grazing practices and fire management on current or historical CFPO habitat within semidesert grassland, Sonoran desertscrub, and riparian communities. This is particularly true in semidesert grasslands. Historians and biologists maintain that livestock grazing, fire suppression, and drought have played a significant role in changing the vegetation of southeastern Arizona over the last 200 years (Glendening 1952, Mehrhoff 1955, Humphrey 1958, Humphrey and Mehrhoff 1958, Branson 1985, Bock and Bock 1988, Brown and Archer 1989, Robinette 1990, Bahre and Shelton 1993, Bock and Bock 1993). Past grazing practices may have been partly responsible for the increase in mesquite and other upland shrubs, trees, and cacti which are used by CFPOs, and current grazing practices in some areas may help maintain habitat for the CFPO for reasons described above (G. Drennen, D. Tersey, BLM range specialists, pers. comm.). Available CFPO occupancy information in Arizona related to grazed areas for 1999 indicates 8 of 16 monitored nest sites or defended territories were located on grazed sites within semidesert grassland or Sonoran Desert habitats. In 2000, 7 of 22 sites fell within grazed areas and 11 of 23 sites were grazed in 2001 (AGFD, unpubl. data).

In semidesert grasslands, one of the most dramatic changes that has taken place during this period is the invasion of shrubs, particularly mesquite (Haskell 1945, Bock and Bock 1988,

Bahre and Shelton 1993). Historical records suggest that the spread of mesquite has been lateral, from drainages and riparian zones where it was fairly common historically into semidesert grasslands and uplands (Brown and Archer 1989). Larger plants, such as mesquite, hackberry and ash, found in drainages adjacent to semidesert grasslands are used by CFPO for nesting or roosting cover (Flesch 1999, Wilcox et al. 2000).

Sonoran Desert areas, which are currently occupied by CFPOs, historically did not contain large tracts of semidesert grasslands, and probably remain at or near historical climax-community conditions. However, there may have been an increase of mesquite and other Sonoran Desert shrub vegetation in these communities as well as some loss of the grassland communities (Bahre 1987, G. Drennen and D. Tersey BLM pers. comm.). Additionally, exotic grasses such as red brome, fountain grass and buffelgrass have increased in some Sonoran desert communities.

Historically, CFPOs were commonly found in desert riparian and xeroriparian areas throughout southern and central Arizona (Johnson et al. 1979). Alteration and/or destruction of these desert riparian areas, in part due to livestock grazing, has been well documented (Krueper 1993, 1996, Fleischner 1994, Ohmart 1994, 1996, Belsky et al. 1999). Conversion of these riparian habitats from mesic systems dominated by a diversity of native riparian trees to a more xeric community precipitated an increase of mesquite and other shrubs at the expense of native riparian tree species (Ohmart 1994), and may have contributed to the reduced distribution of CFPOs within southern Arizona (Johnson et al. 1979).

### Semidesert Grassland

Factors mentioned above could have promoted the increase of mesquite and other shrubs in grasslands communities in several ways (Bock and Bock 1988, Bayre and Shelton 1993). First, intense grazing in the latter half of the 19<sup>th</sup> century and the early 20<sup>th</sup> century reduced the abundance of grass and fine fuels, thereby reducing the ability of rangelands to carry fire. A

reduction in the frequency and intensity of fire allowed mesquite to grow in places where fire had previously prevented its occurrence. Currently, in some semidesert grasslands, fire is regularly used as a management tool to promote grasslands and to discourage the establishment of mesquite. In some instances, saguaros may still be found in some of these fire management areas, indicating that under a carefully controlled fire regime, regeneration of saguaro cactus may possibly continue (M. McGibbon pers. comm.). However, there is evidence that intense fires kill or critically weaken saguaro cacti in the Sonoran desert biome (Steenberg and Lowe 1977, 1983, McLaughlin and Bowers 1982, Wilson et al. 1996). Second, grazing is believed to have increased the dispersal of scarified mesquite seeds via manure, which enhanced the establishment of mesquite in upland areas. Third, soil was compacted under historical (1880s through 1920s) heavy grazing regimes throughout the West, and likely continues to be compacted under present grazing regimes in some locations of the desert southwest, thereby reducing the capacity of the upper layers of the soil to retain moisture (Lusby 1970, Rauzi and Smith 1973, Gifford and Hawkins 1978, Dunne 1989, Belnap 1990, Chaney et al. 1990, Rutman 1999). Reduced moisture near the soil surface discouraged the growth of grasses and favored the growth of deep-rooted mesquite trees. Finally, excessive grazing reduced the amount of cover of perennial grasses and thus reduced competition for mesquite seedlings. Perennial grasses, when healthy and dense, can help prevent the establishment of mesquite.

### Sonoran Desert

In contrast to semidesert grasslands, Sonoran Desert vegetative communities are characterized by large shrubs and stem-succulents. These communities historically did not have a significant component of grasses or other fine fuels to support frequent fires (i.e., mean fire intervals exceeded 250 years [Abbott and McPherson 1999]). With the introduction of non-native grasses, such as red brome (*Bromus rubens*) and buffleggrass (*Pennisetum ciliare*), fire has become more frequent in the Sonoran Desert (Wilson et al. 1996, Abbott and McPherson 1999). Increased fire frequency and intensity has the potential to negatively affect the CFPO because many of the dominant plants used by CFPOs, such as saguaro, palo verde, and ironwood are not tolerant of

fire. However, the extent of such risk to the CFPO has not been quantified. Although the exact relationship between livestock grazing and CFPO occupancy has not been studied, grazing has been documented to impact components of CFPO habitat in Sonoran Desert vegetation. Specifically, Abouhaider (1989, 1992) documented that livestock grazing significantly reduced saguaro establishment on a recently grazed portion of Saguaro National Monument compared to an area that had not been grazed since 1958. Similarly, Tibbitts and Dickson (1999) noted that areas in Organ Pipe National Monument have recovered since livestock grazing ceased in the mid-1970s with some areas being occupied by “more dense, lush desert scrub vegetation, possibly of higher quality as CFPO habitat.”

Livestock grazing may impact regeneration of saguaros and other desert plants in a number of ways. Cattle forage directly on shrubs and small trees, such as mesquite and palo verde, that act as nurse plants for young saguaros. The resulting reduction in foliage cover may reduce the overall area suitable for seedling establishment (Abouhaider 1989). Additionally, trampling by livestock impacts saguaros by directly damaging roots near the surface or by exposing soils to erosion through reduction of cryptogamic crusts and other cover. Such erosion may result in small saguaro seedlings washing away during storm events (Abouhaider 1989).

Some authors have suggested that livestock grazing could be used to maintain Sonoran Desert communities by reducing non-native grasses and thus fire-risk (Abbott and McPherson 1999). Given the findings of Abouhaider (1989, 1992), however, this recommendation does not seem prudent in CFPO habitat, and other methods for controlling fire should be pursued. Wilson et al. (1996) concluded that “using grazing to reduce fuel buildup further reduces the chances that young saguaros may survive (Abouhaider 1992). Clearly fire management alternatives are needed to reduce further degradation of Sonoran Desert ‘keystone’ species.”

Fleischner (1994) reviewed 13 studies in Arizona and the western United States and concluded that heavy grazing tended to remove the vegetative cover used by prey species of raptors such as

lizards and small mammals. In the Sonoran Desert of western Arizona, Jones (1981) found that the abundance and diversity of lizards was higher on ungrazed sites than on grazed sites. Medin and Clary (1989) found that the density of small mammals declined by more than 30% and diversity by almost 50% on grazed sites versus ungrazed sites in Nevada. While there have been no specific studies which determine grazing influences on prey densities within the eastern Sonoran Desert, similar results could be inferred from the aforementioned studies.

### Riparian Areas

Ohmart (1994) describes desert riparian vegetation as “tropical deciduous woodlands with subtropical affinities.” These areas were also documented as historical breeding sites for the CFPO (Johnson et al. 1979, Johnson et al. 1987). Grazing is thought to be partly responsible for the decline in both hydric and mesic riparian areas (those areas requiring large and moderate amounts of available moisture, respectively) in southern Arizona (Johnson et al. 1987, Krueper 1993, Ohmart 1996). With the destruction in hydric riparian vegetation in southern Arizona, some habitat for CFPOs may have been eliminated, leaving adjacent xeroriparian zones as the only sites with larger-structured vegetation. For example, the Rillito River in Tucson formerly supported a well developed mesoriparian community that was historically occupied by CFPOs, but that has now been lost or degraded. Currently in the Tucson area, CFPOs only occupy upland desertscrub and xeroriparian vegetation communities.

### Range Assessment

Climate, soils, and disturbance regime generally are considered to be the primary factors determining plant distribution, density and diversity (Ruyle 1999). Range site potential is a tool used by specialists to measure rangelands with different soil and vegetation characteristics, and thus measure different potential capacities for vegetative productivity. Total production was originally a determination of forage available, but has now been expanded to mean total vegetative production. Range site potential can be determined through comparative studies of



vegetative climax communities, composition and production (Ruyle 1999). The climax community is defined as “the plant species assemblage that most nearly achieves long-term steady productivity, structure and composition on a given site. This plant community is primarily an expression of environmental influences and specific plant tolerances of those influences like soil moisture or fertility or competition from other species (Ruyle 1999).” Range site condition is used to determine domestic livestock carrying capacity and to determine the ecological health of the ecosystem being evaluated.

Excluding the detrimental effects to riparian areas, the relationship between grazing and habitat suitability for CFPOs within semidesert grassland and Sonoran Desert vegetation is not clearly understood. Since there are so few CFPOs currently known in Arizona, it is imperative that managers attempt to maintain and promote vegetative components which benefit this species and the ecological integrity of its habitat. Using the USDA - Soil Conservation Service guidelines and maintaining rangelands in “good” (51-75% of current vegetative component compared to the potential plant community composition) to “excellent” (76-100% of potential plant community composition) condition through sound grazing practices and stocking levels may be a viable interim grazing strategy until more information can be collected. This interim approach is supported by two lines of evidence.

First, sites in Arizona which support breeding CFPOs and are currently grazed are in “good” condition, based on the evaluations of two BLM range conservationists (G. Drennen and D. Tersey, pers. comm.). Secondly, the largest known population of CFPOs in the United States occurs in southern Texas, on privately owned cattle ranches where grazing programs have been in existence for well over 100 years (G. Proudfoot pers. comm.). The vegetation and climate in southern Texas are different than in southern Arizona, but the presence of CFPOs on the Texas ranches suggests that grazing and maintaining habitat for the owl are not mutually exclusive. Therefore, it may be possible that in Arizona, under proper management conditions, cattle and CFPOs may coexist successfully.

There is little information available to identify the level of utilization which is compatible with CFPO occupancy and use within semidesert grasslands, Sonoran Desert or riparian habitats in Arizona or Sonora, Mexico. Grazing studies within semidesert grasslands on the Santa Rita Experimental Range south of Tucson have shown that utilization rates of 40% “maintained the perennial grasses over a 10-year period” (Martin and Cable 1974) but did not project whether that level of utilization could be maintained into perpetuity through long-term cyclical weather patterns. Further, the authors mentioned that areas receiving use below the 40% utilization average tended to have the highest perennial grass production. Holechek et al. (1998) have shown that utilization levels of 30-35% may result in “favorable” economic, vegetative and general wildlife response, but did not include what effects these utilization rates may have upon prey populations of small mammals, lizards, or nongame birds which make up the majority of the CFPOs diet.

To help promote CFPO habitat, each grazing allotment supporting potential CFPO habitat within Recovery Areas should be evaluated on a site-specific basis to determine what level of utilization is appropriate. Public lands outside Recovery Areas that contain habitat for CFPOs (as determined by the approved habitat assessment scoring process) that are within dispersal distance for the CFPO should be subject to the same utilization evaluation. This determination should be made using the best scientific data available plus the expertise of range conservationists, ranchers, and wildlife biologists.

Ascertaining whether vegetation on a site can or should be modified through grazing to create or maintain habitat for the CFPO should be based on existing vegetative components as well as the range or ecological site potential. Range site potential can help determine what vegetation could develop on a site based upon soil, climate, slope, topography, aspect, precipitation, and other biotic and abiotic conditions. Recommended annual utilization levels, and season and duration of use, cannot accurately be determined on a site-specific basis within the context of this plan due to the tremendous variation in habitats, site potential and other stochastic events within the range of the CFPO.

## Recreation Activities

Within the Arizona Upland / Lower Colorado River deserts, the human population has more than doubled between 1970 and 1990, and now totals greater than 5 million (Nabhan and Holdsworth 1999). There is no sign that the human population growth in this region will decline during the next few decades. With such an increase in human population, recreational activities and resultant impacts on natural resources are inevitable. Nabhan and Holdsworth (1999) maintain that recreation-related damage is now considered the second most pervasive impact upon threatened and endangered wildlife species in the western United States.

Several studies have shown that recreational activities affect birds through indirect impacts of habitat modification and also by direct impacts due to presence of humans. Uncontrolled recreational activities may degrade or simplify plant communities, increase animal mortality, displace and disturb wildlife, distribute refuse and increase nest abandonment and cause an unnaturally high level of predation (Boyle and Samson 1985, Hocking et al 1992, Knight and Cole 1995). Wildlife responses to recreational disturbance are influenced by many factors including type of activity, timing, frequency, and behavior of the recreationist.

Besides perceived direct harassment by playing of taped recordings of the bird's vocalizations, there is no information available which documents direct recreational impacts on CFPO populations. However, there is a clear link between the species richness and relative abundance of small passerine birds (potential prey items for the CFPO), and levels of recreational disturbance. Saab (1998) found that overall relative bird abundance and species richness was reduced by recreational activities along the Snake River, Idaho. She determined that long-term effects of grazing, recreational activities and habitat fragmentation on populations and communities can change the abundance, distribution and demographics of small landbird populations, or change the interactions and species composition of bird communities. This undoubtedly would affect prey availability and distribution within the territory of a CFPO.

CFPOs are found near areas used for a variety of recreational purposes. These activities range from birdwatching and hiking to more intense uses such as un-managed target shooting, off-highway vehicle use, bike races, and events or activities that concentrate human activity and large numbers of people. Human activities associated with recreation may disturb the CFPO especially during the nesting season, or possibly result in direct mortality (Cartron and Finch 2000).

Recreational activities also contribute to an increase threat of fire within suitable CFPO habitat.

The following guidelines are recommended:

- Information regarding the location of CFPO sites should be restricted to personnel involved in their research and management. Specific CFPO locations should not be made available to the general public, birding hotlines, ecotourism groups, or other entities.

*Rationale:*

Intense birdwatching and tape playing may negatively affect CFPOs, particularly during nesting and dispersal. Recent experiences in Tucson indicate a real potential for birders and photographers to impact CFPOs. Restricting recreational activities near CFPO sites should reduce disturbance of the few known CFPOs. Many of the known CFPO sites are located on private property. Release of CFPO locations could potentially result in trespass by birders and recreationists, impacting the cooperation and access granted for research and monitoring by private landowners.

- The Service and AGFD should coordinate the effort to reduce recreational impacts on known CFPOs. Coordinated resource management teams should be notified of the sensitivity of the subject. Educational outreach to birding groups and others should take place to avoid the identification and advertising of CFPO locations.
- Recreational activities which concentrate large numbers of people or vehicles (e.g., hike-a-thon, motor cross rally, 4 wheel drive rally (i.e., OHV), cross country races,

mountain bike races, etc.) should not be allowed within 400 m (0.25 mi) of active CFPO sites during the most sensitive portion of their breeding season (February 1 - July 31).

- Public land management agencies should consider restrictions on special use recreational permits where appropriate.
- Public land management agencies should consider special closure stipulations for public access where appropriate.
- Other activities such as the intensive or frequent discharge of firearms (e.g., target practicing) should be restricted within 400 m (0.25 mi) of active CFPO sites during the most sensitive portion of their breeding season (February 1 - July 31).

*Rationale:*

Dispersed recreational activities, such as hiking, hunting, biking or “4-wheeling” (OHV) by individuals or small groups, probably do not represent a significant impact on CFPOs. However, large groups or numbers of vehicles concentrated for a day or several days may disrupt nesting CFPOs and cause habitat degradation. Furthermore, many CFPO sites are located in or adjacent to washes which often are used as travel routes for recreational enthusiasts, thereby increasing the potential for disturbance.

### **Illegal Border Crossings**

The movement of people and vehicles across the U.S./Mexico border into the United States at points other than designated border crossing areas has resulted in considerable resource damage in potential CFPO habitat throughout southern Arizona. Border crossings occur as people enter the U.S. trying to find jobs, but crossings are also related to the smuggling of drugs and other contraband across the border. The U.S. Border Patrol conducts activities in areas where

crossings occur in an effort to reduce these illegal border crossings. The primary impact of these border crossings and associated management activities is the direct and indirect loss and alteration of vegetation.

- Areas being impacted as a result of border crossings and associated management activities should be evaluated and potential prevention and restoration activities developed. The evaluation of impacts and development of alternatives should be coordinated with the appropriate land management and enforcement agencies. Border crossing issues could be assessed and activities implemented through the CFPO resource management team discussed in the “Grazing and Fire” section or a group of similar composition. Involved entities should include OPCNM, Cabeza Prieta and Buenos Aires NWRs, the Tohono O’odham Nation, BLM, State Land Department, U.S. Border Patrol and affected ranchers and other private landowners. Analysis of impacts and recommendations for solutions should draw on the experience of personnel in OPCNM, BANWR, and other areas who have experience and a focus on resource protection.

*Rationale:*

Border crossing activities have reached such a high level that vegetation and other natural resources are being impacted. Trails and roads are being created, trash is accumulating, toxins and pollutants are being introduced into the environment, and the potential for wildfires is increased. Dry washes are often used as travel corridors by individuals crossing the border. The enhanced cover of these wash areas is advantageous to individuals traveling through the area. However, the improved structure and diversity of vegetation in wash areas is also what makes these areas important for the CFPO, concentrating the potential impacts in areas that are the most significant to the pygmy-owl. Individuals crossing the border often take vehicles into areas where there are no roads in order to avoid detection. Border Patrol agents often need to take vehicles into areas off of designated roadways to accomplish their management directives.

These off-road incursions often result in long-term damage to vegetation and soils. Border crossing activities increase the change for wildfires as a result of campfires, vehicle exhausts, etc.

Impacts from border crossings occur across a very large area, often in remote locations. There is inherent danger in dealing with this issue. The issue is further complicated because of the multi-jurisdictional nature of the issue. We acknowledge that a solution to this issue is unlikely, however, it is imperative that all affected agencies and entities coordinate efforts if we are to effectively reduce impacts associated with this issue.

#### Subtask 2.2 Include all new CFPO sites in Recovery Areas.

Recovery Areas were designated to include all known CFPOs in Arizona outside of lands governed by Indian Nations (as of the date of this Draft Plan), habitat linkages to provide for movement of owls and gene flow among Recovery Areas, and habitat that potentially will support the establishment of new and/or larger populations. However, if additional CFPOs are located outside the Recovery Areas identified in this Draft Plan, management of the habitat within their home ranges should follow the guidelines listed in this Draft Plan regarding buffers from human activity and habitat disturbance. These management actions will be implemented through the ESA section 7, section 9, and section 10 processes. In addition to protecting these sites, appropriate management measures should be taken to maintain sufficient habitat that promotes connectivity between newly discovered CFPO sites to adjacent sites. These sites should be incorporated into Recovery Areas on a formal basis during subsequent revisions to the Recovery Plan.

#### Subtask 2.3 Modify guidelines if new information dictates the need for change.

Adaptive management and ecosystem management have become common themes in conservation literature (Holling 1978, Lee and Lawrence 1986, Walters 1986, Walters and Holling 1990, Boyce 1992 and 1993, Noss and Cooperrider 1994). Adaptive management is the process of linking management with monitoring within a research framework (Noss and Cooperrider 1994). It is learning by doing, and on-going monitoring and research are important ways of learning how to efficiently manage ecosystems.

This Draft Plan is based on the best scientific information available. However, many important aspects of the CFPO's ecology and management have yet to be studied and are not well understood. Continued research identified in this Draft Plan in conjunction with adaptive management is a crucial component. We recommend that if information becomes available that invalidates an approach recommended in this draft plan, or provides new management options, that the new information immediately be incorporated during section 7 consultations and section 10 planning efforts. Mechanisms for informing the public of changes resulting from adaptive management could include directly contacting consultants, permit holders, and agency biologists involved in CFPO issues, publishing changes in local newspapers and the *Federal Register*, and dissemination of new information through the committee recommended in Subtask 5.1 of this document. Other changes in management activities, less critical to the long-term survival of CFPOs in Arizona, should be incorporated into the next draft of the Recovery Plan.

#### Subtask 2.4 Evaluate the effectiveness of Recovery Areas.

The effectiveness of the Recovery Areas should be monitored closely so that they can be modified if necessary. Monitoring and adaptive management are especially critical in implementing this Draft Plan because of the limited information upon which it is based. Potential modifications to Recovery Areas include adding or deleting areas as is warranted. For example, areas might need to be added to the Recovery Areas when new recovery criteria are developed, or when additional CFPOs are discovered. Conversely, areas currently in Recovery Areas could be deleted if they are found to be unnecessary for meeting the recovery criteria.



Task 3.0 Continue to gather information essential to the management of CFPOs in Arizona, including habitat requirements, population demographics, dispersal capabilities, and genetics.

Because many aspects of the CFPO ecology are unknown at this time and because the Recovery Criteria are dependent on obtaining additional information, we have identified the following research/monitoring priorities. It is important to emphasize that as new information becomes available, management activities should be revised as appropriate. This adaptive process must continue as long as new information is forthcoming. The subtasks outlined below can be completed with standard research methods or with existing modeling frameworks.

Subtasks:

- 3.1 Monitor the cumulative effects of development in all Recovery Areas, with focus on Recovery Area 3.
- 3.2 Monitor CFPO sites to assess productivity and site fidelity.
- 3.3 Monitor movements of adult CFPOs to assess habitat use and/or selection, attributes of home range, and migratory status.
- 3.4 Develop a habitat suitability index for CFPOs in Arizona at both coarse and fine spatial scales.
- 3.5 Evaluate the influence of livestock, recreation, development, roads, fire, and other anthropogenic activities on CFPOs.

- 3.6 Monitor movements of fledgling CFPOs to assess dispersal patterns, environments used during dispersal, and rates of survival of first-year CFPOs.
  - 3.7 Maintain a banding program for CFPOs in Arizona, Texas, and Mexico to gather information on population demographics (e.g., rates of survival for breeding males and females), and recruitment.
  - 3.8 Determine the genetic relationships among populations of CFPO (i.e., Arizona, Texas, eastern Mexico, and western Mexico).
  - 3.9 Develop refined maps of vegetation and soils for Arizona that can be used in the identification of habitat for CFPOs.
  - 3.10 Continue to gather information on various aspects of the life history of the CFPO (e.g., diet, susceptibility to disease and predation, nesting chronology).
  - 3.11 Conduct a PVA when sufficient demographic, abundance, and distribution information on the CFPO in Arizona and Mexico is obtained.
- Task 4.0 Initiate the process for augmenting existing imperiled CFPO population segments and establishing CFPOs in areas that appear suitable, but are presently unoccupied, or into areas that have been modified to enhance some habitat characteristic for CFPOs (e.g., establishing nest boxes).

We recommend using the measures outlined below due to the small known population size of the CFPO in Arizona, the imminent threats to known CFPOs and the need to facilitate research and gather information to guide management activities.

Subtask 4.1 Evaluate whether adding nest boxes enhances habitat quality for the CFPO within its historical range in Arizona.

It is possible that the lack of nest sites may restrict the number of breeding pairs of CFPOs in some areas in Arizona where cavities are scarce due to limited occurrence or loss of mature vegetation. Nest boxes established in Texas were readily used by CFPOs and promoted nesting by CFPOs in new areas (Proudfoot 1996). The evaluation of nest boxes as a technique should be considered, and initial efforts to increase nesting by CFPOs should be conducted on public lands.

Subtask 4.2 Determine whether productivity and survival rates are higher when nest boxes are used compared to cavities.

Subtask 4.3 Initiate the process for augmenting the number of CFPOs in Arizona by techniques that enhance the natural reproduction and dispersal of existing CFPOs, or by captive breeding. Coordinate with the AGFD to initiate and complete their 12-step process for re-establishing nongame and endangered wildlife

Another factor that may prevent population growth of CFPOs in Arizona is the absence of potential mates. The likelihood that dispersing juveniles from known territories will encounter other CFPOs is small, if the number of breeding territories is low. The use of augmentation methods described below could provide dispersing birds with mates, or establish new pairs, thus reducing the threat of inbreeding and leading to population expansion. These methods depend on the assumption that habitat for CFPOs exists in Arizona, but is unoccupied, because emigrants have not reached it. The methods also could be used in conjunction with techniques that may enhance the quality of habitat (e.g., establishment of nest boxes).

Recent genetic research suggests that CFPO in NW Tucson may be isolated from other CFPO populations in Arizona and Mexico (Proudfoot and Slack 2001). The low level of genetic variation and absence of shared haplotypes between the NW Tucson population and the remainder of CFPOs in Arizona and Mexico may be indicative of natural divergence of the NW Tucson population from the rest of the CFPO in Arizona and Mexico. Given the low numbers of CFPO known to occur in NW Tucson, their potential isolation from source populations, the fact that inbreeding is known to occur, and the pressure from urbanization, the concern has been raised that this portion of the population may be close to extirpation. Low numbers and productivity have been documented in other Arizona subpopulations as well. To meet Recovery Criterion 2, CFPOs should be successfully reproducing Recovery Areas where appropriate habitat patches exist. Augmentation may be the only viable means to achieve this goal given the

small, isolated nature of the subpopulations and the lack of sufficient numbers of unrelated mates. It is unlikely that there are currently enough CFPOs occurring within any Recovery Area to act as a consistent source population without intervention.

At the present time, we do not have a complete understanding of the factors, and their interactions, that limit the existing population of CFPOs in Arizona. Given the low numbers of known CFPOs, and the low likelihood that the Northwest Tucson/Pinal County population would increase sufficiently in the foreseeable future to naturally repopulate the northern RA's, it is recommended that a small-scale augmentation effort be implemented as soon as possible. It is likely that augmentation efforts in this area would need to be tied to an HCP as using a non-essential, experimental population (section 10 (j)) is not possible as CFPOs already occupy this part of the state. This effort should use the facilitated dispersal method (least intensive) described below and would have three primary goals; (1) increase the Northwest Tucson population and help reduce potential effects of inbreeding (by providing mates for currently unpaired birds); (2) to determine if habitat in northern recovery areas is indeed suitable but currently unoccupied and; (3) establish new CFPO breeding territories and expand their distribution within their historic

range. It is recommended that potential release sites be identified based on what is currently known about habitat selection and that all potential sites be surveyed intensively to identify any existing CFPOs prior to any augmentation efforts. A small-scale effort such as this would not accrue prohibitive costs and would provide valuable information that is currently lacking.

Implementing augmentation would bolster the gene pool of the NW Tucson subpopulation and would promote the function of the various CFPO subpopulations as source populations for adjacent recovery areas and subpopulations. Once corridors outlined in the Recovery Plan are established, movements by CFPOs and the associated gene flow potentially will allow CFPOs in Arizona to function as a metapopulation which would contribute to the long-term survival and recovery of the CFPO.

Secondarily, mesoriparian areas in RA's 6 and 7 should be considered for the reestablishment of breeding subpopulations of CFPOs. This recommendation is based on the idea that CFPOs used wet riparian habitat in the Phoenix (Salt River) and Gila River region (Breninger 1898, Gilman 1909).

Currently, some areas of mesoriparian vegetation occur in a condition that is likely to be able to support CFPOs. The longest stretch of apparently suitable cottonwood-mesquite remaining is on the Verde River, starting at Needle Rock (approx. 5 mi. downstream [S] from Bartlett Dam) and continuing approximately 5 miles S to the Ft. McDowell Indian Reservation, then approx. 10 mi. S through the Reservation and the final approximately 2 mi. on the Salt River Indian Reservation to the confluence of the Verde with the Salt. Thus, there is 15+ mi. of apparently suitable cottonwood-mesquite along the Verde.

Starting below Stewart Mtn. (storage) Dam on the Salt River there is apparently suitable cottonwood-mesquite for approximately 10 mi. to the confluence with the Verde, then

approximately 3 more mi. to Granite Reef (diversion) Dam. There are 3 historical records from along this stretch from about half-way between the two dams (between 1933 and 1951 from Blue Point Cottonwoods). The mesquite along the Salt rivals the Verde in stature and probably acreages but cottonwood-willow forest is more plentiful along the Verde.

Most of the land that is not on reservations, i.e., the 5 mi. above Ft. McDowell and all but the mouth of the Verde in the 13 mi. from Stewart Mtn. (storage) Dam to Granite Reef (diversion) Dam are on the Tonto National Forest. Recreational activities along the Verde are mostly on Indian lands and seem more compatible with CFPO occupancy. Off-road vehicles and other invasive activities are much more prevalent along the Salt on Tonto National Forest.

The focus of implementation in the Gila/San Pedro system should be the confluence of the San Pedro with the Gila. Some of the best cottonwood-mesquite occurs for several miles up the San Pedro from this point. There are also some mesquite bosques scattered along the Gila with some widely scattered cottonwood groves. Upstream from the confluence to about Christmas might provide CFPO habitat but downstream from the confluence to Ashurst Hayden Diversion Dam has more suitable mesquite and cottonwood growth.

Population augmentation is a complicated process. Consideration must be given to the following issues: genetic compatibility, development of a workable augmentation plan, source of CFPOs for augmentation, identification of release sites, determination of release methods, measures of success that can be quantified, and impacts of augmentation on landowners. It will be especially important to work with landowners in order to provide certainty regarding the application of ESA issues, reduce impacts and gather support.

## **Available Techniques**

The following techniques may be used to enhance the number of CFPOs, if they are determined to be necessary and feasible. Conditions or information that may trigger the use of these techniques are: (1) if CFPOs in Arizona are found to be genetically distinct from those in Texas and Mexico (see Proudfoot and Slack 2001); and (2) if the population of CFPOs in Arizona is very small and isolated.

### **Facilitated Dispersal**

Much of the mortality of juvenile raptors occurs between fledging and the following breeding season, due in part to increased exposure to accidents and predation during dispersal. Fragmentation of habitat due to anthropogenic sources (e.g., urban development, agriculture, etc.) may make dispersal to suitable sites more difficult. Thus, the process of facilitated dispersal may assist juveniles in reaching suitable environments while reducing the dangers associated with dispersal.

At seven weeks post-fledging, juvenile CFPO could be captured on natal sites and moved into suitable areas within the known historical range of CFPO, or within Recovery Areas. Sites for release would be chosen based on similarity of vegetative structure and diversity to occupied CFPO habitat, availability of suitable cavities/nest boxes, and evaluation of prey base. Selection of sites within established parks, refuges, and other protected areas would promote long-term viability of these new populations, and reduce conflicts with private landowners.

### **Relocation of Mexican CFPOs into Arizona**

If genetic analyses confirm that CFPOs from northern Mexico are genetically similar to those in Arizona, relocation of CFPOs from Mexico could increase the population size in Arizona, and add diversity to the gene pool. As described above, birds obtained from different locales in

Mexico could be released in the same general location to increase the likelihood of pair formation, enhance genetic diversity and establish new breeding territories. König (1993) reported on the successful reestablishment of pygmy-owls (*Glaucidium passerinum*) in the Black Forest of Germany through release of mature birds.

### **Captive Propagation**

The Service's policy regarding captive propagation states that this technique "should be considered only after all other techniques to maintain or improve a species' status in the wild have failed or are determined as likely to fail."

Notwithstanding the Service's position on captive propagation, Scott and Carpenter (1987) list the following potential benefits of reestablishment:

- increasing numbers in small populations,
- increasing genetic diversity,
- reducing inbreeding depression, and
- establishing new populations

L. Kiff (pers. comm.) suggested that naive individuals from a captive background would probably settle into any area that satisfies their ecological and physiological requirements. In addition, L. Kiff (pers. comm.) was optimistic that CFPOs could be successfully bred and released on a large and effective scale. Captive ferruginous pygmy-owls at the Arizona Sonora Desert Museum (ASDM) have bred successfully (Karen Krebs, Collections Manager, pers. comm.), and a pair at the Johannesburg Zoo, South Africa, is known to have hatched three chicks in captivity. Other facilities which currently have ferruginous pygmy-owls in captivity include:



Palm Desert, California (two birds unknown sex), Omaha, Nebraska (two birds unknown sex), and Antwerp (one female and two birds unknown sex) (Anita Cramm, Curator of Birds, Phoenix Zoo, pers comm.).

## **Fostering**

A proven technique available for recovery efforts is known as "fostering." Although there are many variations of the technique, juvenile birds hatched in captivity are commonly placed in nests of wild conspecifics or are raised by a captive foster parent then released by hacking. Fostering has been applied to eggs (doubleclutching), as well as chicks, and even between species (crossfostering). Crossfostering between species has been successful for some species; however, some young birds may become imprinted on the foster species or fail to bond with conspecific partners (Cade and Temple 1995).

## **Double Clutching**

Another successful fostering method for diurnal raptors is "double clutching." This technique involves removing the first clutch of eggs from the nest shortly after completion and relying on the adults to lay a second clutch. Proudfoot's work in south Texas has shown that CFPO will renest within a couple of weeks after nest depredation. Eggs obtained could be artificially incubated or placed in the nests of captive CFPOs, and the young produced could be released via hacking.

Task 5.0 Develop an outreach and public education program to increase public awareness and understanding of the Draft Plan and to monitor and encourage its implementation.

Subtask 5.1 Form a committee or group to oversee public outreach, dissemination of new information, implementation of the Draft Plan,

progress, updates, funding issues, and other public needs as related to the Draft Plan or recovery of this subspecies. This committee should be composed of representatives from all interested stakeholders.

Issues addressed by stakeholders as coordinated by this committee should include the following:

- Public participation forums to discuss the objectives and impacts of the Draft Plan.
- Development of educational materials and programs.
- Development of an implementation outreach plan.
- Contact affected landowners to discuss issues and incentives related to Draft Plan implementation.
- Investigate sources of funding for Draft Plan implementation.
- Develop an implementation monitoring program.

*Rationale:*

The community and affected stakeholders must continue to have an active role in the implementation of this Draft Plan. The development of a standing stakeholder committee to interact with agencies and other groups on implementation issues will allow interested parties to maintain an active role in plan implementation. Such a committee will provide an outlet for new and pertinent information and a place to voice concerns and suggestions. The committee will provide the opportunity for direct interface with implementing agencies and groups. Trust, partnership, and common purpose must be established amongst government agencies, ranchers, farmers, developers, conservationists, urbanites and other private property owners within

southern Arizona and the Sonoran Desert region. It is absolutely necessary to involve the individual landowners and land managers, on whose property some management activities will take place, in the process of recovery.

### **C. Ecosystem Management**

An integral portion of any recovery strategy must address the conditions and factors that contributed to the listing under the ESA. Specifically, the Service is directed under section 2(b) of the ESA that the primary purpose is "...to provide a means whereby the ecosystem upon which the endangered species and threatened species depend may be conserved."

A shift must be made from relying on reactive management to relying on preventative management (Angermire and Karr 1994). Ecosystem management as defined by Grumbine (1994) is "the integration of scientific knowledge of ecological relationships within a complex sociopolitical and values framework toward the general goal of protecting native ecosystem integrity over the long-term." Ecological integrity in the recovery of any species is key because of the close relationship between the decline of ecosystems and the listing of endangered species. Incorporating an ecosystem approach into recovery efforts thereby means protecting the processes and functions of ecosystems important for the conservation of the species.

This Draft Plan is specific to the CFPO and so activities promoting ecosystem management are difficult to define. We have incorporated as many conservation measures as possible that not only specifically benefit the CFPO in Arizona but also the ecosystems upon which they depend. However, there is a lack of knowledge of many aspects in the ecology of this species at this time, and the relationship between the CFPO and the ecosystem is not well understood. To the extent possible, the recovery strategy in this Draft Plan is based on principles of conservation biology and ecosystem management. Many of the tasks outlined in this Draft Plan will benefit the ecosystem as a whole and better define the relationship between the CFPO and the ecosystem upon which it depends (e.g., research tasks identified in this Draft Plan will investigate predator/prey relationships, impacts of human activities and influences, and interspecific

relationships such as nest site competition and habitat use). Whereas this Draft Plan specifically addresses the recovery of a single species (the CFPO), many of the conservation measures we have recommended may also benefit other species that are Federally listed in southern Arizona. For example, we have recommended a network of upland and riparian vegetation communities within the historical range of the CFPO that are also used by a wide variety of other species. Protection of occupied habitats and their linkages will serve to maintain and enhance biodiversity in these blocks for a variety of plant and animal species and their ecosystems. Large blocks minimize edge effects, increase the likelihood that ecosystem functions will remain intact, and facilitate management that will be advantageous for other plant, fish, and wildlife species. We acknowledge that some of the guidelines presented in this Draft Plan may not be favorable for other species. To the best of our knowledge, the guidelines in this Draft Plan do not significantly conflict with other approved Recovery Plans within the range of the CFPO in Arizona. However, we recommend that land managers and regulatory agencies address recovery for the variety of species and ecosystems in Arizona.

## **D. Implementation**

As stated above, the implementation of these recovery tasks cannot solely rest with the Service. Federal agencies, as part of their responsibilities to conserve listed species, must utilize their authorities to carry out programs for the conservation of endangered and threatened species under section 7(a)(1) of the ESA. In addition, in order for the recovery goal and criteria specified in this Draft Plan to be met, a variety of public and private groups must be involved in the implementation of the plan and subsequent adaptive management process. Thus, we recommend the establishment of a regional cooperative public and private team that enlists the participation of all stakeholder groups and interested parties (Task 5.0). This group would develop a participation plan, coordinate education, and public outreach efforts, including community participation in research and information gathering where appropriate. Development of economic incentives for conservation and recovery will be vital to success and ensure that adaptive management is practiced.

Implementation of this plan will cause varying degrees of economic and social impacts. The following recommendations are made for reducing the extent of these impacts, and all implementing entities are encouraged to consider these during the development of strategies and activities.

- Because many of the impacts stem from our lack of knowledge regarding CFPOs and the need to be conservative in our approach for protecting and recovering CFPOs, we recommend that the tasks outlined be initiated and completed as quickly as possible. This will provide needed information and reduce future impacts associated with uncertainty.
- Where possible, focus efforts on public, State, and private lands with willing participants.
- Explore funding sources which would reduce the financial burden of recovery placed on private landowners. Funding sources could include Arizona State Heritage funds, bond monies, tax incentives, Federal programs, mitigation banks, and grants.
- Develop landowner incentives for participation, such as transfer of development rights, land trades, mitigation banks, conservation easements, tax incentives, and programs such as the Service's Safe Harbor, Partners for Wildlife programs, and others.
- Target areas which may already be unsuitable for economic development.
- Tie implementation efforts to existing plans and ongoing planning efforts in order to reduce confusion and the proliferation of additional rules, ordinances and guidelines. Other planning efforts (e.g., SDCP) may eliminate the need in the covered area for a participation plan (Task 5.0).

- Where private lands play an integral part of implementation, seek cooperative solutions to implementation where private uses can be maintained to the greatest extent and landowners are active participants in implementation.
- Seek out opportunities for land exchanges which will either augment public land holdings, or serve to reduce development of private in-holdings within designated critical habitat or Recovery Areas identified in this Draft Plan. In some cases, retention of small blocks of public lands which are surrounded by private lands may be warranted in order to retain high quality habitat and decrease relative total development. In other cases, moderate or low quality habitats may be identified as disposal lands which could then be exchanged for higher quality lands facing habitat alteration or development.

## **E. Conclusion**

The potential to restore the CFPO in Arizona depends on the ability of Federal, State, county, and local jurisdictions to work with private organizations and landowners. For example, the SDCP currently being developed by Pima County has the potential to play a critical role in implementing some of the proposed conservation activities in Pima County. It is also critical to involve the individual landowners on whose property some management activities will take place. The cooperation of ranchers, for example, will be invaluable in assessing the effects of different grazing regimes on the habitat of CFPOs. Finally, the general public should be kept informed about implementation of the Recovery Plan and its consequences through outreach programs. An informed public will foster the highest level possible of understanding and cooperation.

This Draft Plan is based on the best scientific information currently available. However, many important aspects of the CFPO's ecology and management have yet to be studied or well understood. Continued research identified in this Draft Plan in conjunction with adaptive

management is a crucial component. As new information is gathered it should be updated or revised as necessary.

### **PART III - IMPLEMENTATION SCHEDULE**

If implemented, recovery tasks and actions outlined in this draft plan should contribute to the recovery of the CFPO by specifically addressing those factors that led to the listing of the owl as an endangered species. Recovery tasks related to each of the three listing factors are summarized below.

*Factor 1 - The present or threatened destruction, modification, or curtailment of the species habitat or range.*

Subtask 1.1 - Estimate the number and define the distribution of CFPOs in Arizona; 1.4 - Maintain a dialogue with the Tohono O'odham Nation to coordinate and conduct surveys and other studies on Nation lands; 1.5 - Maintain and improve a data management system for information on CFPO surveys; 2.1 - Implement guidelines for development, capital improvements, livestock grazing, and recreational activities; 2.2 - Include all new CFPO sites in Recovery Areas; 2.3 - Modify guidelines if new information dictates the need for change; 2.4 - Evaluate the effectiveness of Recovery Areas; 3.1 - Monitor the cumulative effects of development in Recovery Areas with focus on RA 3; 3.3 - Monitor movements of adult CFPOs to assess habitat use and/or selection, attributes of home ranges, and migratory status; 3.4 - Develop a habitat suitability index for CFPOs in Arizona at both coarse and fine scales; 3.5 - Evaluate the influence of livestock, recreation, development, roads, fire, and other anthropogenic activities on CFPOs; 3.6 - Monitor movements of fledgling CFPOs to assess dispersal patterns, environments used during dispersal, and rates of survival of first-year CFPOs; 3.9 - Refine maps

of vegetation and soils for Arizona that can be used to assist in the identification of habitat for CFPOs; 3.10 - Continue to gather information on various aspects of the life history of the CFPO; 4.1 - Evaluate whether adding nest boxes enhances habitat quality for CFPOs within its historical

range in Arizona; and 5.1 - Form a committee or group to oversee public outreach, dissemination of new information, implementation of the draft plan, progress, updates, funding issues, and other public needs as related to the draft plan or recovery of the subspecies..

*Factor 4 - Inadequacy of existing regulatory mechanisms.*

Subtask 1.1 - Estimate the number and distribution of CFPOs in Arizona; 1.4 - Maintain a dialogue with the Tohono O'odham Nation to coordinate surveys and other studies on the Nation's lands; 2.1 - Implement guidelines for development, capital improvements, livestock grazing, and recreational activities; 2.2 - Include all new CFPO sites in Recovery Areas; 2.3 - Modify guidelines if new information dictates the need for change; 2.4 - Evaluate the effectiveness of Recovery Areas; 3.1 - Monitor the cumulative effects of development on Recovery Areas with focus on RA 3; and 5.1 - Form a committee or group to oversee public outreach, dissemination of new information, implementation of the draft plan, progress, updates, funding issues, and other public needs as related to the draft plan or recovery of the subspecies.

*Factor 5 - Other natural or manmade factor affecting its continued existence.*

Subtask 3.1 - Monitor the cumulative effects of development in Recovery Areas with focus on RA 3; 3.2 - Monitor CFPO sites to assess productivity and site fidelity; 3.3 - Monitor movements of adult CFPOs to assess habitat use and/or selection, attributes of home ranges, and migratory status; 3.5 - Evaluate the influence of livestock, recreation, development, roads, fire, and other antropogenic activities on CFPOs; 3.6 - Monitor movements of fledgling CFPOs to assess dispersal patterns, environments used during dispersal, and rates of survival of first-year CFPOs;



3.7 - Maintain a banding program for CFPOs in Arizona, Texas and Mexico to gather information on population demographics and recruitment; 3.8 - Determine the genetic relationships among populations of CFPOs in Arizona, Texas, eastern Mexico and western Mexico; 3.10 - Continue to gather information on various aspects of the life history of the CFPO; 4.1 - Evaluate whether adding nest boxes enhances habitat quality for CFPOs within its historical range in Arizona; 4.2 - Determine whether productivity and survival rates are higher when nest boxes are used compared to cavities; and 5.1 - Form a committee or group to oversee public outreach, dissemination of new information, implementation of the draft plan, progress, updates, funding issues, and other public needs as related to the draft plan or recovery of this subspecies.

The table that follows is a summary of the scheduled actions and costs for this recovery program. It is a guide to meet the recovery criteria. This table indicates the scheduling priority for each task, which parties are responsible for performing these tasks, and the estimated costs to perform them. Implementation of these actions is subject to availability of funds.

1. **Priority 1** - An action that must be taken to prevent extinction or to prevent the species from declining irreversibly in the foreseeable future.
2. **Priority 2** - An action that must be taken to prevent a significant decline in species population/habitat quality, or some other significant negative impact short of extinction.
3. **Priority 3** - All other actions necessary to meet the recovery objectives.

Obviously, it is impossible to accurately predict the costs of many tasks. For example, the costs to carry out recommended research activities can vary widely depending on the study design, the duration of the study, the entity conducting the activities, and other factors. Cost estimates were determined from typical costs associated with agency or group that would typically be involved with implementing specific tasks. For example, university and state wildlife agency personnel

have typically been involved in conducting CFPO research activities and costs are estimated based on past contracts and grants used by these entities. Surveys conducted by private entities typically cost more than those conducted by public agencies. Costs for implementing guidelines via section 7 and section 10 of the ESA are typically the responsibility of the Service and include personnel time and other associated costs. These are estimates and are expected to change based on the current situation at the time the activities are implemented.

#### Acronyms Used in the Implementation Schedule

AGFD =	Arizona Game and Fish Department
ASLD =	Arizona State Lands Department
ASP =	Arizona State Parks
BLM =	United States Bureau of Land Management
FWS =	United States Fish and Wildlife Service
IMADSES =	Instituto de Medio Ambiente y el Desarrollo Sustentable del Estado de Sonora (The Institute of Environment and Sustainable Development of the State of Sonora, Mexico)
MC =	Maricopa County
NPS =	National Park Service
PLC =	Pinal County
PMC =	Pima County
TAMU =	Texas A & M University
TBD =	To be determined
TON =	Tohono O'odham Indian Nation
FS =	USDA Forest Service
Continual =	Task will be implemented on an annual, periodic, or continual basis

## Cactus Ferruginous Pygmy-owl Implementation Schedule

Priority Number	Task Number	Subtask Number	Task Description	Task Duration (years)	Responsible Party(s)	Total Cost (\$1,000s)	FY 1	FY 2	FY 3	FY 4	FY 5
	<b>1.0</b>		<b>Estimate the number and define the distribution of CFPOs in Arizona, and define their general distribution and abundance in Sonora, Mexico.</b>								
1		1.1	Estimate the number and define the distribution of CFPOs in Arizona (e.g., survey areas not yet surveyed and resurvey areas where CFPOs have been found previously).	5	AGFD, ASLD, ASP, BLM, PMC, PLC, MC, FWS, NPS, FS	1,000	200	200	200	200	200
3		1.2	Determine the general distribution and abundance of CFPOs in Sonora, Mexico (e.g. survey areas not yet surveyed along a wide band adjacent to the U.S. - Mexican border).	3	FWS, IMADSES	150	50	50	50	0	0
3		1.3	Evaluate and test the survey protocol and revise as appropriate	continual	AGFD, FWS	25	5	5	5	5	5
2		1.4	Maintain a dialogue with the Tohono O'odham Nation to coordinate and conduct surveys and other studies on the Nation's lands.	continual	FWS, TON	0	0	0	0	0	0
		1.5	Maintain and improve a data management system for information on CFPO surveys.								
3		1.51	Create a database to archive all data from surveys, including locations of CFPOs.	1	AGFD, FWS	10	10	0	0	0	0
3		1.52	Maintain this database.	continual	AGFD, FWS	50	10	10	10	10	10
3		1.53	Revise forms and protocols for data collection.	continual	AGFD, FWS	0	incidental	incidental	incidental	incidental	incidental
	<b>2.0</b>		<b>Protect all currently known (since 1993) CFPOs in Arizona and the habitat they occupy. Identify and maintain an interconnected system of habitat extending from the northern portion of the historic range, south to areas potentially occupied by CFPO populations in Mexico.</b>								
1		2.1	Implement guidelines for development, capital improvements, livestock grazing, and recreational activities.	continual	AGFD, ASLD, ASP, BLM, PMC, PLC, MC, FWS, NPS, FS	1,250	250	250	250	250	250
3		2.2	Include all new CFPO sites in Recovery Areas.	1	FWS	0	0	0	0	0	0
1		2.3	Modify guidelines if new information dictates the need for change	continual	AGFD, ASLD, ASP, BLM, PMC, PLC, MC, FWS, NPS, FS	50	10	10	10	10	10
3		2.4	Evaluate the effectiveness of Recovery Areas	1	FWS	50	10	10	10	10	10
	<b>3.0</b>		<b>Continue to gather information essential to the management of CFPOs in Arizona, including habitat requirements, population demographics, dispersal capabilities, and genetics.</b>								
1		3.1	Monitor the cumulative effects of development in Recovery Areas with focus on RA 3.	continual	AGFD, PMC, PLC, MC, FWS	50	10	10	10	10	10
1		3.2	Monitor CFPO sites to assess productivity and site fidelity.	continual	AGFD, ASLD, ASP, BLM, PMC, PLC, MC, FWS, NPS, FS	125	25	25	25	25	25

### Cactus Ferruginous Pygmy-Owl Implementation Schedule (continued)

Priority Number	Task Number	Subtask Number	Task Description	Task Duration (years)	Responsible Party(s)	Total Cost (\$1,000s)	FY2001	FY2002	FY2003	FY2004	FY2005
1		3.3	Monitor movements of adult CFPOs to assess habitat use and/or selection, attributes of home range, and migratory status.	continual	AGFD, All agencies	125	25	25	25	25	25
1		3.4	Develop a habitat suitability index for CFPOs in Arizona at both coarse and fine scales.	5	AGFD, All agencies	50	0	0	0	10	40
1		3.5	Evaluate the influence of livestock, recreation, development, roads, fire, and other anthropogenic activities on CFPOs.	continual	AGFD, All agencies	500	100	100	100	100	100
1		3.6	Monitor movements of fledgling CFPOs to assess dispersal patterns, environments used during dispersal, and rates of survival of first-year CFPOs.	5	AGFD, All agencies	250	50	50	50	50	50
1		3.7	Maintain a banding program for CFPOs in Arizona, Texas, and Mexico to gather information on population demographics (e.g., rates of survival for breeding males and females), and recruitment.	continual	AGFD, FWS, IMADSES, TAMU	0	incidental	incidental	incidental	incidental	incidental
3		3.8	Determine the genetic relationships among populations of CFPO (i.e., Arizona, Texas, eastern Mexico, and western Mexico).	1	PC, TAMU	40	40	0	0	0	0
3		3.9	Refine maps of vegetation and soils for Arizona that can be used to assist in the identification of habitat for CFPOs.	5+	PC, TBD	750	150	150	150	150	150
1		3.10	Continue to gather information on various aspects of the life history of the CFPO (e.g., diet, susceptibility to disease and predation, nesting chronology).	continual	AGFD, All agencies	0	incidental	incidental	incidental	incidental	incidental
3		3.11	Conduct a PVA when sufficient demographic, abundance, and distribution information on the CFPO in Arizona and Mexico is obtained.	1	FWS	10	0	0	0	0	10
	<b>4.0</b>		<b>Initiate the process for augmenting existing imperiled CFPO population segments and establishing CFPOs in areas that appear suitable, but are presently unoccupied, or into areas that have been modified to enhance some habitat characteristic for CFPOs (e.g., establishing nest boxes).</b>								
2		4.1	Evaluate whether adding nest boxes enhances habitat quality for CFPOs within its historical range in Arizona.	5	AGFD, FWS, ASLD	100	20	20	20	20	20
2		4.2	Determine whether productivity and survival rates are higher when nest boxes are used compared to cavities.	5	AGFD, FWS, ASLD	0	incidental	incidental	incidental	incidental	incidental
1		4.3	Initiate the process for augmenting the number of CFPOs in Arizona by techniques that enhance the natural reproduction and dispersal of existing CFPOs, or by captive breeding. Coordinate with AGFD to initiate the 12-step process for re-establishing nongame and endangered wildlife.	5	AGFD, FWS	250	50	50	50	50	50
	<b>5.0</b>		<b>Develop an outreach and public education program to increase public awareness and understanding of the Draft Plan and to monitor and encourage it's completion.</b>								
3		5.1	For a committee or group to oversee public outreach, dissemination of new information, implementation of the Draft Plan, progress, updates, funding issues, and other public needs as related to the Draft Plan or recovery of this subspecies. This committee should be composed of representatives from all interested stakeholders.	continual	FWS	120	50	25	25	10	10

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