

BIOLOGICAL OPINION SUMMARY
Effects of the Management Plan for Cactus Ferruginous Pygmy-owl
at the Site of the Proposed CAVSARP Groundwater Recharge System
in the Avra Valley, Pima County, Arizona

Date of opinion: December 12, 2000

Project: Effects of the Management Plan for Cactus Ferruginous Pygmy-owl at the Site of the Proposed CAVSARP Groundwater Recharge System in the Avra Valley, Pima County

Location: Pima County, Arizona

Listed species affected: endangered cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) with critical habitat. Concurrence requested with no affect for endangered Pima pineapple cactus (*Coryphantha robustispina* var. *scheeri*) and endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*).

Biological opinion: No Jeopardy

Incidental take statement:

Anticipated take: *Exceeding this level may require reinitiation of formal consultation.*
No incidental take is anticipated. Measures to minimize the impacts of the proposed project were included as part of the proposed action following negotiation between the applicant, the applicant's consultants, and the Service.

Conservation recommendations: *Implementation of conservation recommendations is discretionary.* The EPA should continue to actively participate in regional planning efforts, such as Pima County's SDCP, and other conservation efforts for the CFPO. We request copies of any reports regarding implementation of the project. We are especially interested in reports that include an analysis of the effectiveness of the mitigation measures.

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December 27, 2000

Mr. Terry Oda, Chief
Clean Water Act Standards and Permits Water Division
Environmental Protection Agency
75 Hawthorne Street
San Francisco, California 94105-3901

Subject: Biological Opinion on the Effects of the Management Plan for Cactus Ferruginous
Pygmy-owl at the Site of the Proposed CAVSARP Groundwater Recharge System in
the Avra Valley, Pima County Arizona

Dear Mr. Oda:

This responds to the Environmental Protection Agency (EPA) August 4, 2000, request for formal consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.) on the effects of the Management Plan for cactus ferruginous pygmy-owl at the Site of the Proposed CAVSARP Groundwater Recharge System in the Avra Valley, Pima County Arizona on the endangered cactus ferruginous pygmy-owl (CFPO)(*Glaucidium brasilianum cactorum*) with critical habitat. Concurrence with no effect determinations for the Pima pineapple cactus (*Coryphantha robustispina* var. *scheeri*) and the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*) were also requested. Concurrences are included as an appendix to this opinion.

The proposed action involves compliance with a general National Pollutant Discharge Elimination System permits under section 402 of the Clean Water Act (CWA). The general permit (Part I.B.3.e) requires demonstration that the project meets the requirements of the Endangered Species Act. This permit will facilitate the development of the CAVSARP groundwater recharge system. This part of the project includes the construction and operation of 11 recharge basins covering 109 ha (270 ac). Also included as part of the project to minimize its

effects are set-asides of land, planting native vegetation, and wildlife fencing. The project will be operated by the City of Tucson (Tucson Water).

This biological opinion is based on information provided in the November 1999 biological assessment (BA)(SWCA 1999); February 2000 supplemental BA (SWCA 2000a); August 2000 management plan (SWCA 2000b); correspondence between the Service and the applicant; numerous telephone and personal communications; field investigations; correspondence from and meetings with the applicant; and other sources of information. References cited in this opinion are not a complete bibliography of all literature available on the species of concern, water developments and its effects, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office. We have assigned log number 2-21-99-F-360 to this consultation. Please refer to that number in future correspondence on this consultation.

CONSULTATION HISTORY

The applicant and the Service met on several occasions beginning in informal section 7 consultation on June 3, 1999. The CAVSARP project has been broken into three parts. The reservoir/booster pump station and pipeline to the Hayden-Udall treatment plant underwent informal consultation with the Army Corps of Engineers. The Service concurred that on January 18, 2000, that part of the proposed project may affect, but is not likely to adversely affect the CFPO. Informal consultation was also completed on the extraction wells and collector pipelines with the EPA. When the Service concurred on August 22, 2000 that the proposed project may affect, but is not likely to adversely affect the CFPO. This third and final phase of the project covers the eight new recharge basins and three existing basins. Formal consultation was requested on March 1, 2000. The Service notified the EPA on May 12, 2000, that all information necessary to initiate formal consultation had not been received. The required information was received on August 4, 2000, and consultation was initiated then.

The recharge project will receive water from the Central Arizona Project (CAP). The CAP has undergone numerous formal and informal consultations. The potential effects of recharge projects on the endangered Gila topminnow (*Poeciliopsis o. occidentalis*) were analyzed in the draft biological opinion on impacts of the CAP in the Santa Cruz River basin through introduction and spread on nonnative aquatic species (2-21-91-F-406). The CAVSARP project was analyzed. The CAP biological opinion has not been finalized.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The project area occupies more than 1,000 ha (2,500 ac) in Avra Valley in all or parts of Sections 5, 6, 7, and 8, T14S, R11E, and Sections 30 and 31, T13S, R11E (SWCA 1999). About 800 ha (2,000 ac) are within designated critical habitat for the CFPO. All but 65 ha (160 ac) were in

agricultural production until the mid-1970's. Vegetation in the area is typical of Sonoran Desert vegetation, but is younger and less diverse because of the disturbance from agriculture. Vegetation in many areas is only grasses, forbs, and small shrubs. There is saguaro (*Carnegiea gigantea*), palo verde (*Cercidium* spp.), and mesquite (*Prosopis velutina*) in the area. Areas along Brawley Wash have woody shrubs like catclaw (*Acacia greggii*), whitethorn (*A. constricta*), triangle-leaf bursage (*Ambrosia deltoidea*), and creosote (*Larrea tridentata*). There is no ironwood (*Olneya tesota*) and few palo verdes. There are only four saguaros known on the site. Most mesquite in the area is 2 to 5 m (5-15 ft) tall. The BA estimates that 2 to 5 percent of the mesquites in the area are greater than 6 in. diameter at breast height. Most of these are associated with Brawley Wash and are in the conserved area (SWCA 1999, 2000a).

The proposed action is the EPA's coverage of the proposed project under a National Pollutant Discharge Elimination System general permit. The project involves the construction and operation of 11 recharge basins. Three of the basins already exist. The eight new recharge basins and expansion of one existing basin will cover about 109 ha (270 ac). Existing Basin F will be expanded from 8 ha (20 ac) to 12 ha (30 ac). The project is located in Avra Valley, 20 km (32 mi) west of Tucson, near Mile Wide and San Joaquin Roads.

To further reduce on-site impacts from the project to CFPO and its habitat, Tucson Water will conserve 65 ha (160 ac) of designated critical habitat that will remain as natural open space to be managed in perpetuity for conservation purposes for the CFPO, as defined in the BA, supplement, and management plan (SWCA 1999, 2000a, 2000b). Additional conservation actions were identified. Areas disturbed during construction activities that are not used by the various project components or needed for access or maintenance will be recontoured and hydroseeded with native plants. An additional 105 ha (260 ac) next to critical habitat would be set aside. The two land set-asides would be covered by a conservation easement. There will be five corridors established between the recharge basins, and native trees will be planted in the corridors. The corridors are within designated critical habitat and cover 22 ha (53 ac).

Lastly, a 4-strand game fence built to Arizona Game and Fish Department specifications (attached) will be placed at the ends of the five inter-basin corridors (Ken Kertell, SWCA, pers. comm., Nov. 28, 2000). The BA specified a 5-strand fence, but a 4-strand fence was agreed to during the meeting held June 28, 2000.

STATUS OF THE SPECIES

A detailed description of the life history and ecology of the CFPO may be found in the Birds of North America (Proudfoot and Johnson 2000), Ecology and conservation of the cactus ferruginous pygmy-owl in Arizona (Cartron et al. 2000a, 2000b), and other information available at the Arizona Ecological Services Field Office. Information specific to the CFPO in Arizona is limited. Research in Texas has provided useful insights into the ecology of the subspecies, and in some instances represents the best available information; however, habitat and environmental conditions are somewhat different in Arizona and conclusions based on Texas information are tentative.

Species/critical habitat description

The Service listed the Arizona population of the CFPO as a distinct population segment on March 10, 1997, effective on April 9, 1997 (USFWS 1997a). The past and present destruction, modification, or curtailment of habitat is the primary reason for the decrease in population levels of the CFPO. On July 12, 1999 we designated approximately 296,240 ha (731,712 ac) of critical habitat supporting riverine, riparian, and upland vegetation in seven critical habitat units in Pima, Cochise, Pinal, and Maricopa Counties in Arizona, we published a final rule (USFWS 1999). Only lands containing, or likely to develop, those habitat components that are essential for the primary biological needs of the owl and requiring special habitat are considered critical habitat. By definition, all areas above 1,219 m (4,000 ft), areas not containing or capable of developing constituent elements (e.g., saguaro, large diameter trees, etc.), existing features and structures (e.g., roads, buildings, etc.), and areas not requiring special management or other areas (e.g., National Parks, Tribal lands, etc.) were excluded and are not critical habitat. The actual area meeting this definition as defined in the final rule is substantially less than the total area within the exterior boundaries of the area designated.

Areas designated as critical habitat included recent owl locations and areas important for genetic and demographic interchange. This geographical area occupied by the species is essential to its conservation and requires special management considerations. These areas, containing the primary constituent elements, or the capacity to develop these habitat components, are essential for the primary biological needs of this species which include foraging, nesting, rearing of young, roosting, sheltering, and dispersal. Actions that may destroy or adversely modify critical habitat are actions that destroy or alter the primary constituent elements to the extent that the value of critical habitat for both survival and recovery of the species is appreciably diminished. These activities include, but are not limited to: removing vegetation, water diversions or impoundments, ground water pumping, and recreational activities that appreciably degrade habitat.

CFPOs are small, averaging 17 cm (6.75 in) in length. CFPOs are reddish-brown overall, with a cream-colored belly streaked with reddish-brown. The CFPO is crepuscular/diurnal, with a peak activity period for foraging and other activities at dawn and dusk. During the breeding season, they can often be heard calling throughout the day, but most activity is reported between one hour before sunrise to two hours after sunrise, and late afternoon/early evening from two hours before sunset to one hour after sunset (Collins and Corman 1995).

A variety of vegetation communities are used by CFPOs, such as riparian woodlands, mesquite bosques, Sonoran desertscrub, and semidesert grassland communities, as well as nonindigenous vegetation within these communities. While plant species composition differs between these communities, there are certain unifying characteristics in each of these occupied habitat types. These unifying characteristics include the presence of vegetation in a fairly dense thicket or woodland, the presence of trees or cacti large enough to support cavity nesting, and elevations

below 1,616 m (4,000 ft). Historically, CFPOs were associated with riparian woodlands in central and southern Arizona. Plants present in these riparian communities include cottonwood, willow (*Salix* spp.), and hackberry (*Celtis* spp.). Cottonwood trees are suitable for cavity nesting, while the density of mid- and lower-story vegetation provides necessary protection from predators and an abundance of prey items for the CFPO. Mesquite bosque communities are dominated by mesquite trees, and are described as mesquite forests due to the density and size of the trees.

Over the past several decades, CFPOs have been primarily found in the Arizona Upland subdivision of the Sonoran Desert, particularly Sonoran desertscrub (Brown 1994). This community in southern Arizona consists of palo verde, ironwood, mesquite, acacia, bursage (*Ambrosia* spp.), and columnar cacti (Phillips et al. 1964; Monson and Phillips 1981; Davis and Russell 1984, 1990; Johnson and Haight 1985; Johnsgard 1988). Recently however, they have also been found in riparian and xeroriparian habitats and semidesert grasslands as classified by Brown (1994). Desertscrub communities are characterized by an abundance of saguaros or large trees, and a diversity of plant species and vegetation strata. Xeroriparian habitats contain a rich diversity of plants that support a wide array of prey species and provide cover. The densities of annuals and grasses, as well as shrubs, are important to the CFPO's prey base. Semidesert grasslands have experienced the invasion of mesquites (*Prosopis velutina*) in uplands and linear woodlands of various tree species along bottoms and washes.

The density of trees and the amount of canopy cover preferred by CFPOs in Arizona is unclear. 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). For areas outside Arizona, 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 also be a bias of increased visibility. Overall, vegetation density may not be as important as patches of dense vegetation with a developed canopy layer interspersed with open areas. The physical settings and vegetation composition varies in various portions of *G. brasilianum*'s range, and while vegetation structure is more important than composition (Wilcox et al. 1999, Cartron et al. 2000a), higher vegetation diversity is found more often at nest sites than at random sites (Wilcox et al. 2000).

CFPOs typically hunt from perches in trees with dense foliage using a perch-and-wait strategy; therefore, sufficient cover must be present within their home range for them to successfully hunt and survive. Their diverse diet includes birds, lizards, insects, and small mammals (Bendire 1888, Sutton 1951, Sprunt 1955, Earhart and Johnson 1970, Oberholser 1974) and frogs (Proudfoot et al. 1994). The density of annuals and grasses, as well as shrubs, may be important to the CFPO's prey base. Shrubs and large trees also provide protection against aerial predation for juvenile and adult CFPOs and cover from which they may capture prey (Wilcox et al. 2000).

CFPOs are considered non-migratory throughout their range by most authors, and have been reported during the winter months in several locations, including OPCNM (Roy Johnson, unpubl.

data; Tim Tibbitts, Organ Pipe Cactus National Monument, unpubl. data). CFPOs begin nesting activities in late winter to early spring. In Arizona differences between nest sites may vary as much as two months (Abbate et al. 1996; S. Richardson, unpubl. data). As with other avian species, this may be the result of a second brood or a second nesting attempt following an initial failure (Abbate et al. 1996). In Texas, juveniles remained within approximately 50 m (165 ft) of adults until dispersal. Dispersal distances (straight line) of 20 juveniles monitored from their natal sites to nest sites the following year averaged 8.2 km (5 mi)(ranged from 1.2 km to 30.5 km [0.75-19 mi])(Glenn Proudfoot, unpubl. data). Telemetry studies in Arizona during 1999 resulted in generally greater dispersal distances, ranging from 2.3 km to 20.7 km (1.4-12.9 mi straight line distance; n=6, mean 10 km [6.2 mi]; S. Richardson, unpubl. data). Juveniles typically dispersed from natal areas in July and did not appear to defend a territory until September. They may move up to 1.6 km (1 mi) in a night; however, they appear to fly from tree to tree instead of long single flights (S. Richardson, unpubl. data; AGFD, unpubl. data). Subsequent surveys during the spring have found that their locations are in the same general location as last observed the preceding fall.

In Texas, Proudfoot (1996) noted that, while CFPOs used between 1 and 23 ha (3-57 ac) during the incubation period, and they defend areas up to 113 ha (279 ac) in the winter. Therefore, a 113 ha (280 ac) home range is considered necessary for CFPOs. Proudfoot and Johnson (2000) indicate males defend areas with radii from 303 to 606 m (1,100-2,000 ft). Initial results from ongoing studies in Texas indicate that the home range of CFPOs may also expand substantially during dry years (G. Proudfoot, unpubl. data).

Species status and distribution range-wide

The CFPO is one of four subspecies of ferruginous pygmy-owl. CFPOs are known to occur from lowland central Arizona south through western Mexico to the States of Colima and Michoacan, and from southern Texas south through the Mexican States of Tamaulipas and Nuevo Leon. It is unclear at this time if the ranges of the eastern and western populations of the ferruginous pygmy-owl merge in southern Mexico. However, genetic information indicates that eastern and western populations of the CFPO may be genetically dissimilar (G. Proudfoot, R. Zink, R. Blackwell, A. Fry, C. Tchida, P. Heidrich, and M. Wink, unpubl. data). Genetic research is currently being conducted by Pima County to analyze whether there is any genetic variation within tissue samples collected in Arizona compared to samples from Mexico and Texas. Preliminary results remain consistent with earlier studies (about 1% difference between Arizona and Texas samples [G. Proudfoot, unpubl. data]).

The Service is currently funding habitat studies and surveys in Sonora, Mexico to determine the distribution and relative abundance of the CFPO there. Based on the lack of sightings, they may be absent, rare, or uncommon in northern Sonora, Mexico (Hunter 1988, USFWS 1997a). Preliminary results indicate that CFPOs are present in northern and central Sonora (USFWS, unpubl. data). Further studies are needed to determine their distribution in Mexico.

The range of the Arizona distinct population segment extends from the International Border with Mexico north to central Arizona. The northernmost historic record for the CFPO is from New River, Arizona, about 56 km (35 mi) north of Phoenix, where Fisher (1893) reported the CFPO to be "quite common" in thickets of intermixed mesquite and saguaro cactus. According to early surveys referenced in the literature, the CFPO, prior to the mid-1900s, was "not uncommon," "of common occurrence," and a "fairly numerous" resident of lowland central and southern Arizona in cottonwood forests, mesquite-cottonwood woodlands, and mesquite bosques along the Gila, Salt, Verde, San Pedro, and Santa Cruz rivers and various tributaries (Breninger 1898, Gilman 1909, Swarth 1914). Additionally, CFPOs were detected at Dudleyville on the San Pedro River as recently as 1985 and 1986 (AGFD, unpubl. data; Hunter 1988).

Records from the eastern portion of the CFPO's range include an 1876 record from Camp Goodwin (near current day Geronimo) on the Gila River, and a 1978 record from Gillard Hot Springs, also on the Gila River. CFPOs have been found as far west as the Cabeza Prieta Tanks in 1955 (Monson 1998).

Hunter (1988) found fewer than 20 verified records of CFPOs in Arizona for the period of 1971 to 1988. Formal surveys for the CFPO on OPCNM began in 1990, with one located that year. Beginning in 1992, survey efforts conducted in cooperation with the AGFD, located three single CFPOs on OPCNM (USFWS and OPCNM; unpubl. data). In 1993, surveys were conducted at locations where CFPOs had been sighted since 1970. Only one CFPO was detected during these survey periods, and it was located in northwest Tucson (Felley and Corman 1993). In 1994, two CFPOs were located in northwest Tucson during informal survey work by AGFD (Abbate et al. 1996). In 1996, AGFD focused survey efforts in northwest Tucson and Marana and detected a total of 16 CFPOs, two of which were a pair, and two of which were fledglings. Three additional CFPOs were detected at OPCNM in 1996. There were also three additional but unconfirmed reports of CFPOs from OPCNM.

While the majority of Arizona CFPO detections in the last six years have been from the northwest Tucson area, CFPOs have also been detected in southern Pinal County, at Organ Pipe Cactus National Monument (OPCNM), on the Buenos Aires National Wildlife Refuge (BANWR), and on the Coronado National Forest.

In 1997, survey efforts of AGFD located a total of 10 CFPOs in their Tucson Basin study area, which is roughly bounded on the north by the Picacho Mountains on the east by the Santa Catalina and Rincon Mountains, on the south by the Santa Rita and Sierrita Mountains, and on the west by the Tucson Mountains. Eight of the ten CFPOs were found in the northwest Tucson area, and the remaining two were found on the western bajada of the Tortolita Mountains. Of the eight CFPOs documented from northwest Tucson in 1997, one pair successfully fledged four young. Two adult males were also located at OPCNM 1997, with one reported from a previously unoccupied area (T. Tibbitts, unpubl. data).

In 1998, survey efforts in Arizona increased substantially and, as a result, more CFPOs were documented, which may at least in part account for a larger number of known owls. In 1998, a

total of 35 CFPOs were confirmed (S. Richardson, unpubl. data; USFWS; unpubl. data; T. Tibbitts, unpubl. data; D. Bieber, Coronado National Forest, unpubl. data).

In 1999, a total of 41 adult CFPOs were found in Arizona at 28 sites. Of these sites, 10 had nesting confirmed by AGFD and the Service. CFPOs were found in three distinct regions of the state: The Tucson Basin (northwest Tucson and southern Pinal County), Altar Valley, and OPCNM. Overall, mortality was documented for a number of fledglings due to natural (e.g., predation) or unknown causes. Of the 33 young found, only 16 were documented as surviving until dispersal (juveniles known to have successfully dispersed from their natal area). It is unclear what the survival rate for CFPOs is; however, as with other owls and raptors, a high mortality (50% or more) of young is typical during the first year of life.

Surveys conducted in 2000 resulted in 24 confirmed CFPO sites (i.e., nests and resident CFPO sites) and several other unconfirmed sites (S. Richardson, unpubl. data; T. Tibbitts, unpubl. data; USFWS, unpubl. data). A total of 34 adult CFPOs were confirmed. Nesting was documented at 7 sites and 23 fledglings were confirmed; however, as in 1999, over 50% fledgling mortality was documented (S. Richardson, unpubl. data). A total of nine juveniles were known to have successfully dispersed from their natal areas in 2000. Successful dispersal was not confirmed at two nests with four fledglings. The status of the remaining fledglings is unknown; however, they are presumed dead. The following regions of the state are known to have CFPOs.

- **Tucson Basin** - A total of 14 adults were documented at 10 sites (11 adults at 8 sites in northwest Tucson and 3 adults at 2 sites in southern Pinal County). Three nests in northwest Tucson produced 10 fledglings, of which 5 juveniles successfully dispersed. One nest in southern Pinal County produced 5 fledglings, of which 2 juveniles successfully dispersed. There were several unconfirmed CFPO sites.
- **Altar Valley** - A total of 7 adult CFPOs were documented at 6 sites. One nest was confirmed, producing 4 fledglings, of which 4 juveniles successfully dispersed from their natal area.
- **OPCNM** - Six sites were confirmed as active, although nesting was not confirmed at any of these sites.
- **Other** - There were two confirmed CFPO nest sites reported elsewhere in southern Arizona, producing 4 fledglings. It is unknown how many of these young successfully dispersed. There were several other reported, but unconfirmed CFPO sightings elsewhere in the state.

One factor affecting the known distribution of CFPOs in Arizona is where early naturalists spent most of their time and where recent surveys have taken place. For example, a majority of surveys in the recent past (since 1993) have taken place in OPCNM and in the Tucson Basin, and these areas are where most owl locations have been recorded. However, over the past three years, large, previously unsurveyed areas have been inventoried for owls, resulting in a much wider distribution than previously thought. As a result, our knowledge is changing as to CFPO

distribution and habitat needs as new information is collected. For example, before 1998, very few surveys had been completed in the Altar Valley in southern Pima County. Before 1999, the highest known concentration of CFPOs in the state was in northwest Tucson. However, in 1999, after extensive surveys in Altar Valley, more owls were found there (18 adults) than in northwest Tucson (11 adults), although there are still fewer nest sites in Altar Valley than in the Tucson Basin (S. Richardson, unpubl. data). As a result, our knowledge is changing as to their distribution and habitat needs as new information is collected.

Range-wide trend

One of the most urgent threats to CFPOs in Arizona is thought to be the loss and fragmentation of habitat, especially from large scale, commercial, or other developments (USFWS 1997a, Abbate et al. 1999). The complete removal of vegetation and natural features required for many large scale developments directly and indirectly impacts CFPO survival, and the stabilization and recovery of this known population (Abbate et al. 1999).

Habitat loss, degradation, and fragmentation are widely accepted causes contributing to raptor population declines worldwide (Snyder and Snyder 1975, Newton 1979, LeFranc and Millsap 1984). Habitat fragmentation is the process by which a large and continuous block of natural habitat is transformed into much smaller and isolated patches by human activity (Noss and Csuti 1994). Fragmentation has two components: Reduction of the total amount of habitat type and apportionment of remaining habitat into smaller, more isolated patches (Harris 1984, Wilcove et al. 1986, Saunders et al. 1991).

Nesting in small natural patches may have additional risks. For example, Haug (1985) found burrowing owl home range size increases with the percentage of habitat disturbance. In fragmented landscapes, burrowing owls may forage greater distances and spend more time away from the nest, making them more vulnerable to predators, and therefore, less efficient at reproduction (Warnock and James 1997). As fragmentation increases, competition for fewer productive CFPO territories may occur (Abbate et al. 1999). Unlike other larger birds that can fly long distances over unsuitable or dangerous areas to establish new territories, CFPOs, because of their small size, and their short style of flight are exposed to greater risks from predation and other threats (Abbate et al. 1999).

Site tenacity in birds is one of many factors that may create time lags in response to fragmentation and other disturbances. Individuals may remain in sites where they bred successfully in the past, long after the habitat has been altered (Wiens 1985). Because of lack of data, it is unclear whether site tenacity for CFPOs, in increasingly fragmented landscapes, such as exists in the action area is a factor. For example, researchers will be closely monitoring a long established owl site (documented each year since 1996) in which the male died in 1999, apparently from a collision with a wire fence (S. Richardson, unpubl. data.). This site was not known to be occupied in 2000. This site had the highest amount of development (about 33 percent) of any other known site within its estimated home range (S. Richardson, unpubl. data.). Further monitoring will be done at this site.

In northwest Tucson, all currently known CFPO locations, particularly nest sites, are in low-density housing where abundant native vegetation separates structures. Additionally, these areas are adjacent to or near large tracts of undeveloped land. CFPOs appear to use nonnative vegetation to a certain extent, and have been observed perching in nonnative trees in close proximity to individual residences. However, the persistence of CFPOs in areas with an abundance of native vegetation indicates that a complete modification of natural conditions likely results in unsuitable habitat conditions for CFPOs. While development activities are occurring close to owl sites, particularly nest sites, overall noise levels are low. Housing density is low, and, as a result, human presence is also generally low. Roads in the area are dirt or two-lane paved roads with low speed limits which minimize traffic noise. Low density housing areas generally have low levels of traffic noise because of the limited number of vehicles traveling through the area.

Other factors contributing to the decline of CFPO habitat include the destruction of riparian bottomland forests and bosques. It is estimated that 85 to 90 percent of low-elevation riparian habitats in the southwestern U.S. 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 1988b, U.S. GAO 1988, Szaro 1989, Dahl 1990, State of Arizona 1990, Bahre 1991). Cutting of 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 was a favored species because of its excellent fuel qualities. In the Tucson Basin, the famous vast forests of "giant mesquites" along the Santa Cruz River in the Tucson area described by Swarth (1905) and Willard (1912) fell to this threat, as did the "heavy mesquite thickets" where Bendire (1888) collected CFPO specimens along Rillito Creek. Only remnant fragments of these bosques remain.

Regardless of past distribution in riparian areas, it is clear that the CFPO has declined throughout Arizona to the degree that it is now extremely 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). A very low number of CFPOs in riparian areas in recent years may reflect the loss of habitat connectivity rather than the lack of suitability (Cartron et al. 2000b). Cottonwoods also were harvested for fuel wood, fenceposts, and for bark for cattle feed (Bahre 1991).

In recent decades, the CFPO's riparian habitat has continued to be modified and destroyed by agricultural development, woodcutting, 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). Sonoran desertscrub has been affected to varying degrees by urban and agricultural development, woodcutting, and livestock grazing (Bahre 1991). Pumping of groundwater and the diversion and channelization of natural watercourses are also likely to have reduced CFPO habitat. Diversion and pumping result in diminished surface flows, and

consequent reductions in riparian vegetation are likely (Brown et al. 1977, Stromberg et al. 1992, Stromberg 1993a and 1993b). Channelization often alters stream banks and fluvial dynamics necessary to maintain native riparian vegetation. The series of dams along most major southwestern rivers (e.g., Colorado, Gila, Salt, and Verde Rivers) have altered riparian habitat downstream of dams through hydrological and vegetational changes, and have inundated former habitat upstream.

In the United States, CFPOs are rare and highly sought by bird watchers, who concentrate at a few of the remaining known locations. Limited, conservative bird watching is probably not harmful; however, excessive attention and playing of tape-recorded calls may at times constitute harassment and affect the occurrence and behavior of the CFPO (Oberholser 1974, Tewes 1993). For example, in 1996, a resident in Tucson reported a CFPO sighting which subsequently was added to a local birding hotline and the location was added to their website on the internet. Several car loads of birders were later observed in the area of the reported location (S. Richardson, pers. comm., 1999).

One of the few areas in Texas known to support CFPOs continues to be widely publicized as having organized field trips and birding festivals (American Birding Association 1993, Tropical Birds of the Border 1999). Resident CFPOs are found at this highly visited area only early in the breeding season, while later in the season they could not be detected. O'Neil (1990) also indicated that five birds initially detected in southern Texas failed to respond after repeated visits by birding tours. It is unknown if the birds habituate to the playing of taped calls and stopped responding, or if they abandoned the area. Oberholser (1974) and Hunter (1988) additionally indicated that in southern Texas, recreational birdwatching may disturb owls at highly visited areas.

Human activity 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 (G. Proudfoot, pers. comm.). Some outdoor recreational activities (e.g., off road vehicle [ORV] 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., 1999; S. Richardson, pers. comm., 1999). Noise disturbance during the breeding season may affect productivity; disturbance outside of this period may affect the energy balance and, therefore survival. Wildlife may respond to noise disturbances 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).

Currently, all known nesting CFPOs within northwest Tucson are located in areas containing no development or low-density housing developments that are adjacent to undeveloped tracts of land with varying amounts of noise disturbance. Individual CFPOs may react differently to noise disturbances, some individuals exhibiting less tolerance than others. Noise can affect animals by disturbing them to the point that detectable change in behavior may occur. Such behavioral

changes can affect their activity and energy consumption (Bowles 1995). Dangerous or unfamiliar noises are more likely to arouse wildlife than harmless and familiar noises. Habituation is the crucial determinant of success in the presence of noisy disturbances. Exposures of some experienced birds may produce no or minimal losses (Black et al. 1984). The habituation process can occur slowly, so it may not be detected in the short-term. In the long-term, some nesting birds become more tenacious and less responsive in the presence of human disturbance if they are not deliberately harassed (Burger and Gochfeld 1981). It is unknown if noise habituation occurs in some CFPOs as it does with other bird species. Robert and Ralph (1975), Schreiber et al. (1979), Cooke (1980), Parsons and Burger (1982), Ainley et al. (1983), and McNicholl (1983) found that adult birds, and chicks to some extent, habituated to the presence of humans, and their responses to people seemed to be less than those of undisturbed birds. Burger and Gochfeld (1981) and Knight et al. (1987) found responses to noise disturbances and habituation in nesting birds become more tenacious and less responsive in the presence of human disturbance if they were not deliberately harassed.

Raptors in frequent contact with human activities tend to be less sensitive to additional noise disturbances than raptors nesting in remote areas. However, exposure to direct human harassment may make raptors more sensitive to noise disturbances (Newton 1979). Where prey is abundant, raptors may even occupy areas of high human activity, such as cities and airports (Newton 1979, Ratcliffe 1980, White et al. 1988). The timing, frequency, and predictability of the noise disturbance may also be factors. Raptors become less sensitive to human disturbance as their nesting cycle progresses (Newton 1979). Studies have suggested that human activities within breeding and nesting territories could affect raptors by changing home range movements (Anderson et al. 1990) and causing nest abandonment (Porter et al. 1973, Postovit and Postovit 1987).

During the first week of March 2000, an unpaired male CFPO in northwest Tucson was monitored two to three times a week (S. Richardson, unpubl. data). This same male has been holding this territory since the fall of 1998. This owl was unpaired last year, and the duration of its vocalizations this year indicate that it may still be unpaired and trying to attract a mate. Vegetation was cleared in early 2000 on a 4 ha (10 ac) parcel which was within 39 m (130 ft) of where this male had been repeatedly observed prior to grading. Subsequent to grading of this parcel, this male moved about 400 m (0.25 mi) away from its previous location. It is unknown whether this activity, the removal of vegetation on the 4 ha (10 ac) site, the associated noise of large equipment grading the site, or both, affected this owl, causing it to move out of the area. However, it is unusual for adult males to move such a long distance in the spring, and such movement has not been observed in Arizona (S. Richardson, pers. comm.). Movement of such a considerable distance, during this time of year, may indicate that such activities may have adverse impacts on owls and could force them out of an area, or cause them to move from areas where such activity takes place.

Application of pesticides and herbicides in Arizona occurs year-round, and these chemicals 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 (Abbate et al. 1999).

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 one mile of a CFPO detection (Abbate et al. 1999).

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 raccoons (*Procyon lotor*) and bullsnakes (*Pituophis melanoleucus*). Both adult and juvenile CFPO are likely killed by great horned owls (*Bubo virginianus*), Harris' hawks (*Parabuteo unicinctus*), Cooper's hawks, and eastern screech-owls (*Otus asio*) (Proudfoot and Johnson 2000; G. Proudfoot, unpubl. data). CFPOs are particularly vulnerable to predation and other threats during and shortly after fledging (Abbate et al. 1999). Therefore, cover near nest sites may be important for young to fledge successfully (Wilcox et al. 1999, Wilcox et al. 2000). Although nest depredation has not been recorded in Arizona, only a few nests have been monitored (n = 21 from 1996-1999). 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 [16 ft] of screech-owl nest site). Conversely, CFPOs and screech-owls were also recorded successfully nesting within 2 m (7 ft) of each other in the same tree without interspecific conflict. The relationships between CFPO and other similar small owl species needs further study.

Direct and indirect human caused mortalities (e.g., collisions with cars, glass windows, fences, power lines, domestic cats [*Felis domesticus*], etc.), while likely uncommon, are often underestimated, and 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 many CFPOs are located. CFPOs flying into windows and fences, resulting in serious injuries or death to the birds, have been documented twice. A CFPO flew into a closed window or a parked car it eventually flew off, but had a dilated pupil in one eye indicating serious neurological injury as the result of this encounter (Abbate et al. 1999). In another incident, an adult owl was found dead on a fence wire; apparently it flew into the fence and died (S. Richardson, unpubl. data). AGFD also has documented incidents of individuals shooting BB guns at birds perched on a saguaro that contained an active CFPO site. In Texas, one adult owl and one fledging were killed by a domestic cat. These owls used a nest box about 75 meters (246 feet) from a human residence. Free roaming cats can also affect the number of lizards, birds, and other prey species available to CFPOs; however, very little research has been completed to date.

Because CFPOs have been observed moving around the perimeter of golf courses, avoiding non-vegetated areas, roads and other openings may act as barriers to their movements (Abbate et al. 1999; S. Richardson, unpubl. data). On one occasion, a radio-tagged dispersing juvenile stopped within 0.7 mile of Interstate 10 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).

Fires can impact CFPOs by altering their habitat (Abbate et al. 1999). A recent fire altered habitat near an active CFPO nest site (Flesch 1999) and although four mature saguaros in the area survived (at least in the short-term), post-fire mortality of saguaros has been recorded (Steenbergh and Lowe 1977, 1983; McLaughlin and Bowers 1982). Flesch (1999) also noted that approximately 20 to 30 percent 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. Careful uses of prescribed fires in areas of suitable habitat are necessary to protect important elements of owl habitat so that it is not lost or degraded (Flesch 1999).

Low genetic variability can lead to a lowering in reproductive success and environmental adaptability. Caughley and Gunn (1996) further 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 young, particularly in raptors is rare, and has been documented in only 18 cases, representing 7 species (Carlson et al. 1998). Four of these species were owls: Bam 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 fledged from the nesting attempts. These unusual pairings may have been the result from extremely low numbers of available mates within their dispersal range, or from barriers (including fragmentation of habitat) that have influenced dispersal and limited the movement of young owls (Abbate et al. 1999). 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 from immigration from adjacent populations.

Environmental, demographic, and genetic stochasticity, and catastrophes have been identified as interacting factors that may contribute to a population's extinction (Hunter 1996). Environmental stochasticity refers to random variation in habitat quality parameters such as climate, nutrients, water, cover, pollutants, and relationships with other species such as prey, predators, competitors, or pathogens. Demographic stochasticity is uncertainty due to random variation in reproductive success and survivorship of individuals. Genetic stochasticity is the random variation in gene frequencies of a population due to genetic drift, bottlenecks, inbreeding, and similar factors. Catastrophes are events such as droughts or hurricanes that occur randomly. When these factors interact with one another, there are likely to be a combination of effects, such that a random environmental change like habitat fragmentation can result in population and genetic changes by preventing dispersal. These factors are much more likely to cause extinction when a species' numbers are already extremely low. The small, fragmented population of CFPOs in Arizona may not have the ability to resist change or dramatic fluctuations over time caused by one or more of the factors mentioned above.

Soule (1986) notes that very small populations are in extreme jeopardy. This is due to their susceptibility to a variety of factors, including demographic stochasticity, where chance variations in birth and death rates can result in extinction. A series of environmental changes such as habitat reduction reduces populations to a state in which demographic stochasticity takes hold. In small populations such as with the CFPO, each individual is important for its contributions to genetic variability of that population. As discussed above, low genetic variability can lead to a lowering in reproductive success and environmental adaptability, affecting recovery of this species.

ENVIRONMENTAL BASELINE

The environmental baseline includes past and present impacts of all Federal, State, or private actions in the action area; the anticipated impacts of all proposed Federal actions in the action area that have undergone formal or early section 7 consultation; and the impact of State and private actions which are contemporaneous with the consultation process. The environmental baseline defines the current status of the species and its habitat in the action area to provide a platform to assess the effects of the action now under consultation.

Much of the area near the project is privately owned. The Arizona State Land Department, Tohono O'odham, and the Bureau of Land Management (BLM) are the other major landowners in the area. Much of the private land in the vicinity is former farm land now owned by the City of Tucson. Most private land in the area is zoned by Pima County as Rural Homestead (1 house/4 acres). This area of Avra Valley has been developing, though not anywhere near the same pace as the Tucson basin. Much of the development in Avra Valley has been single family residences and wildcat subdivisions.

Over the past six-month period, we have conducted more than 75 informal section 7 consultations within the Tucson area (e.g., planned residential, commercial, and other developments) and have provided technical assistance to hundreds of individuals seeking to develop single family residences on individual lots. Both federally permitted and private actions are expected to continue to grow in the action area in the near future.

We have completed several livestock grazing consultations with the USDA Forest Service and Bureau of Land Management in southern and central Arizona that addressed adverse impacts to CFPOs. These consultations resulted in a non-jeopardy and no adverse modification determination by the Service. We have also reinitiated consultation with the BLM on the effects their grazing program has on the CFPO and its critical habitat.

Any proposed actions on BLM land or within critical habitat would likely undergo section 7 consultation. In addition, any projects on private land requiring CWA section 402 permits from EPA or CWA section 404 permits from the Army Corps of Engineers would likely be subject to section 7 consultation.

No habitat restoration projects specific to the CFPO exist for lands managed by the U.S. Government, Indian Nations, State agencies, or private parties. The Forest Service and BLM

have focused attention in some areas on modifying livestock grazing practices in recent years, particularly as they affect riparian ecosystems. Several of these actions are within the currently known range of CFPOs, including historical locations. The nearest known CFPO to the project site is about 25 km (15 mi).

The effects of the CAP in the Santa Cruz River basin on Gila topminnow through the introduction and spread of nonnative species are being analyzed by the Service. A biological opinion is in draft form but is not completed. The operation of the recharge basins conforms to parameters analyzed in the biological opinion.

EFFECTS OF THE ACTION

Analysis of the species/critical habitat likely to be affected

The action area is between the two highest known breeding concentrations of CFPOs within Arizona. It is also within Critical Habitat Unit 2 designated for the owl. The proposed action will result in the loss of about 109 ha (270 ac) of habitat that could become suitable for the owl and could then be considered critical habitat. It is not currently suitable (except a small part) and it does not contain constituent elements. Constituent elements could develop over time. The site has been surveyed during the past two breeding seasons and is not within a known owl territory. Some areas have been surveyed over three years. No CFPOs have been recorded within the project site.

Direct and Indirect Effects

This proposed action will result in the permanent loss of about 109 ha (270 ac) of Sonoran desertscrub vegetation which could provide foraging, sheltering, and movement and dispersal habitat for CFPOs in the future. The proposed action will also cause short-term noise disturbance associated with construction and minimal long-term noise disturbance and increase human activity. Because of the lack of data specific to this subspecies in Arizona, we must also rely in part on our knowledge of effects this type of action may have on other species, particularly other raptors.

Current information suggests that CFPOs can live and breed successfully in areas which have undergone at least some degree of low density human development; however, they do not appear to be able to tolerate all types of development. As of 1999, more owl sites in Arizona have been documented with little or no human activity and development (14 sites [20 adult owls]) compared to developed areas (10 sites [14 adult owls])(S. Richardson, unpubl. data; USFWS, unpubl. data). To determine the level of vegetation disturbance nesting CFPOs may be able to tolerate, a group of CFPO experts completed an analysis of all nest site home ranges (n=6) occurring in developed areas that successfully produced offspring. They calculated the amount of vegetation disturbance (e.g., roads, buildings, horse corals, pastures, parking lots, golf courses, etc.) within the estimated home range (113 ha [280 ac]) at each nest site. They calculated their average percent disturbance to be 21 percent (median 21%). However, four of the six home

ranges had levels below that average. Three of the six sites were within the 20 to 25 percent disturbance range.

There also appears to be a difference in the tolerance to the amount of vegetation disturbance (i.e., development) between nesting and non-breeding CFPOs. Single owls may be able to tolerate higher levels of development and more marginal habitats, while breeding owls may need less disturbed vegetation within their home ranges. An analysis of all known CFPO sites in northwest Tucson resulted in a considerably lower amount of vegetation disturbance at nest sites compared to non-breeding sites (e.g., unpaired males)(S. Richardson, unpubl. data). As stated above, the average amount of vegetation disturbance within the home range of 1998-2000 nesting sites was 21 percent (also the median). The amount of vegetation disturbance within the home range of non-breeding sites was considerably higher, averaging 39 percent (median 31%). Although these overall results are based on a small sample size (n=10), they represent the best available information and indicate that nesting CFPOs may require less disturbed areas than unpaired owls. For example, a juvenile male CFPO established a new territory in the fall of 1999 in a highly developed residential area in northwest Tucson and remained there throughout the 2000 breeding season. This male failed to pair with a female owl, even after vigorous calling throughout the spring and summer months. Within its estimated home range, habitat is highly fragmented, containing the highest degree of development (50%) of any other known CFPO territory (S. Richardson, unpubl. data.). Differences in the tolerance of vegetation disturbance between breeding and non-breeding owls are important because nesting owls are necessary for recruitment of young owls and demographic support to achieve recovery of the CFPO in Arizona. Although also important to the population from a demographic standpoint, non-breeding males do not directly contribute to the increase of the population by producing young. Therefore, the Service and Recovery Team believe that because successful breeding sites are necessary to produce offspring for the survival and eventual recovery of the CFPO Arizona population, vegetation disturbance levels found at breeding sites should be used as guidelines rather than those in non-breeding territories. These guidelines are particularly important within specific areas of the state (i.e., Special Management Areas) identified by the Recovery Team (USFWS 2000). More research and monitoring is needed to better understand habitat needs and the relationship between development and CFPO requirements.

It should be noted that the nest site with the highest amount of vegetation disturbance (33%) is that of a long established pair that was documented from 1997 through 1999. Development in the general vicinity of this site continued during this time. As noted above, the male of this pair was found dead late last summer. Surveys in 2000 did not locate any CFPOs at this site. Site tenacity in the short-term may have been a factor in this pair's ability to withstand this higher level of vegetation disturbance compared to other sites in Arizona; however, the long-term effect of this amount of disturbance is unknown. Other than at this site, nesting owls have not been documented in areas with more than 25 percent. As stated above, 14 of the 24 known owl sites in 2000 were located in undeveloped areas, which places the level of vegetation disturbance at this nest site even further as an extreme, compared to all the other sites in the state. The amount of development at this site is considered an exception rather than the norm; therefore, a maximum of 20 percent vegetation disturbance guideline is used for this Special Management

Area, particularly for large projects, to provide for the survival and recovery of the CFPO (USFWS 2000).

Avra Valley may serve as a movement corridor for owls between northwest Tucson and owls in the Altar Valley, the Tohono O'Odham Nation, and Mexico. In fact, one of the purposes of Critical Habitat Unit 2 was to provide such a corridor. If owls do not currently use the corridor, the maintenance or enhancement of critical habitat constituent elements in Critical Habitat Unit 2 will provide for its possible future use by CFPO.

Researchers in Arizona have found that CFPOs require areas or corridors, consisting of continuous cover or patches of trees and large shrubs spaced at regular intervals within a territory and for dispersal, to provide concealment and protection from predators and mobbing, as well as shade and cool temperatures (S. Richardson, unpubl data; Abbate et al. 1999). To permit the movement of owls through the project site and vicinity, and to partially offset adverse effects of the removal of approximately 109 ha (270 ac) of potential habitat, 65 ha (160 ac) of open space within critical habitat and about 105 ha (260 ac) next to critical habitat within the project site will be established. Five corridors between recharge basins will be established to facilitate wildlife movement through the site. The corridors are 15 to 136 m (50-450 ft) wide and 485 to 848 m (1,600-2,800 ft) long. The inter-basin corridors cover 21 ha (53 ac) and will be planted with native trees every 8 m (25 ft). The trees will be watered. The mesquites growing there now will be left as much as possible. Other vegetation will be allowed to establish.

Since the project area is only somewhat fragmented, the project could contribute to further habitat fragmentation. The proposed mitigation of a game fence, inter-basin corridors, limited access, tree planting and watering, and recontouring and hydroseeding will lessen fragmentation. Areas not used for the project will be allowed to grow native vegetation. The planting and watering of native vegetation should allow dispersal or movement habitat to develop quicker in the area. This planted habitat may actually provide better habitat for dispersal than if the area was left alone.

Casualties caused by pest control, pollution, collisions with cars, radio towers, glass windows, power lines, and cat predation are often underestimated, although likely increasing in occurrence due to human population growth (Banks 1979, Klem 1979, Churcher and Lawton 1987). Even where human-related deaths are uncommon, they may still substantially affect populations of rare birds (Cartron et al. 2000a). Scott Richardson (unpubl. data) has documented two separate instances where a CFPO has been severely injured or died as a direct result of a collision with a window or fence. The likelihood of death or injury to an owl is increased with construction of the fence, but it is not expected nor significantly increased because of its design. Vehicle use will also increase, but most on-site traffic will be at lower speeds.

Management of all on and off-site conservation lands will be provided by the applicant. These lands will be covered by a restrictive covenant and will be managed in a manner consistent with the conservation of the CFPO in perpetuity. The restrictive covenant will be approved by the Service.

Currently, all known CFPOs within northwest Tucson are located in areas containing low-density housing developments that are adjacent to undeveloped tracts of land with varying amounts of noise disturbance. Individual CFPOs may react differently to noise disturbances, some individuals exhibiting less tolerance than others. It is unknown if noise habituation occurs in some CFPOs as it does with other bird species (Black et al. 1984). Robert and Ralph (1975), Schreiber et al. (1979), Cooke (1980), Burger and Gochfeld (1983), Parsons and Burger (1982), Ainley et al. (1983), and McNicholl (1983) found that adults, and chicks to some extent, habituated to the presence of humans, and the responses of disturbed birds to people seemed to be less than those of undisturbed birds. Burger and Gochfeld (1981) and Knight et al. (1987) found responses to noise disturbances and habituation in nesting birds become more tenacious and less responsive in the presence of human disturbance if they were not deliberately harassed.

Raptors in frequent contact with humans tend to be less sensitive to additional disturbances than raptors nesting in remote areas. However, exposure to direct human harassment may make raptors more sensitive to disturbances (Newton 1979). Where prey is abundant, raptors may even occupy areas of high human activity, such as cities and airports (Newton 1979, Ratcliffe 1980, White et al. 1988). The timing, frequency, and predictability of the disturbance may also be factors. Raptors become less sensitive to human disturbance as their nesting cycle progresses (Newton 1979). Studies have suggested that human activity within breeding and nesting territories could affect raptors by changing home range movements (Anderson et al. 1990) and cause nest abandonment (Porter et al. 1973, Postovit and Postovit 1987).

Noise disturbance is considered unlikely since no owls are known nearby. Based on the best available scientific information, it appears this species may be tolerant, at least to some extent, of certain low-level noise disturbances associated with human activity. These disturbances include daily activities in residential areas such as people walking, voices, children playing, horses and other livestock, dogs, low to moderate vehicle and large truck traffic, and some occasional construction equipment activity. However, the threshold between noise levels and types of activities that an owl can tolerate versus those that will cause an owl to leave an area are not clearly known at this time.

Interrelated and Interdependent Actions

Interrelated activities are part of the proposed action that depends on the action for its justification, and interdependent activities have no independent utility apart from the action. It can be argued that potable water produced by CAVSARP will contribute to growth in the Tucson area. Recharged CAP water is supposed to replace the use of groundwater, and assist in complying with the 1980 Arizona Groundwater Management Act. However, by most accounts,

the Tucson Active Management Area will not reach safe-yield by 2025. Continued growth in the area will not allow safe-yield to be reached by the goal year. Use of CAP water will only allow the groundwater withdrawal deficit to be smaller than it would have been.

Critical Habitat

A total of 109 ha (270 ac) of critical habitat within Critical Habitat Unit 2 will be eliminated under this proposed action, and 35 ha (88 ac) will be available for development of vegetation and critical habitat in constituent elements. This habitat does not currently contain the constituent elements of critical habitat, but left undisturbed, could develop them overtime. However, movement corridors will be maintained through the project site to allow for the movement of owls, which is the primary reason this area was designated. The conservation measures described above maintain the function and viability of designated critical habitat, particularly within Critical Habitat Unit 2.

Summary

About 20 percent of the area within designated critical habitat boundaries in the project area will be disturbed. This area does not presently contain constituents elements. About 4.5 percent will be recontoured if necessary and hydroseeded. In addition, 86 ha (213 ac) in critical habitat and 105 ha (260 ac) next to critical habitat will be set aside by the City. These lands will be managed in perpetuity for the conservation of the CFPO. We believe this approach to be consistent with the best available science and the intent of recommendations made by the Recovery Team (USFWS 2000) for conservation of the species. Direct or indirect impacts resulting in mortality of a CFPO caused by increased human activity are not expected to occur because owls are not known from the area and the conservation measures taken.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Avra Valley has been developing, though not anywhere near the same pace as the Tucson basin. Much of the development in Avra Valley has been single family residences and wildcat subdivisions. Any activity clearing 2 ha (5 ac) or more requires a National Pollutant Discharge Elimination System section 402 permit under the CWA from the EPA and activities occurring within jurisdictional waters of the U.S. require a section 404 permit under the CWA from the Corps. As a result, a substantial number of these actions will be subject to future section 7 consultations. However, many individual undeveloped parcels that will not require a Federal permit or have a federal nexus (e.g., zoned RH) will continue to be built out, and will not be subject to future consultations.

CONCLUSION

After reviewing the current status of the CFPO, the environmental baseline for the action area, the effects of the proposed CAVSARP recharge basins, and the cumulative effects, it is the Service's biological opinion that this project is not likely to jeopardize the continued existence of the CFPO. Due to the location of the proposed action within critical habitat, that constituent elements are not present, and the conservation of lands that could develop primary constituent elements, it is the Service's biological opinion that the proposed action is not likely to result in the destruction or adverse modification of critical habitat. We base these conclusions on the following:

1. The project site was surveyed in 1998, 1999, and 2000, using the current survey protocol (AGFD and USFWS 2000). If grading activities have not commenced at the site prior to January 1st of any given year, CFPO surveys will be conducted following the current protocol.
2. The site is not within a CFPO territory of a pair or resident owl. If an owl is found within 600 m [0.4 mi]) of the project site in or adjacent to ongoing construction activities the following measures will be taken:

If the Service, EPA, or applicant become aware of a new CFPO nest or activity center of a CFPO on or within 600 m (0.4 mi) of the subject property, they shall immediately notify each of the other parties. No additional clearing of vegetation will occur within this area until the Federal agency, applicant, and the Service conduct a site specific analysis regarding this new information, and the effects of ongoing and proposed activities to the CFPO. The Service has determined the following activities within the parameters outlined below **will not** affect the CFPO beyond that which we have analyzed in this biological opinion and construction activities may continue, provided each of these conditions are met.

- a. Clearing of vegetation that is suitable CFPO habitat outside of the estimated home range (113 ha [280 ac]) or 600 m (0.4 mi) radius of a CFPO nest or activity center;
 - b. Construction noise disturbance outside of a 400 m (0.25 mi) radius of a CFPO nest or activity center;
 - c. New construction noise disturbance of any intensity between a 100 m (330 ft) and 400 m (0.25 mi) radius of a CFPO nest or activity center outside of the breeding season (February 1 through July 31); and
 - d. Ongoing construction noise disturbance of the same or less intensity of that occurring during the period of time that the territory was being established up to 400 m (0.25 mi) radius of a CFPO nest or activity center at any time during the year.
3. The loss of 109 ha (270 ac) of potential dispersal habitat will be offset with the protection of 86 ha (213 ac) of critical habitat and 105 ha (260 ac) next to critical habitat for

conservation purposes of the CFPO. Conservation lands will be managed in a manner that will protect potential habitat for the CFPO and contribute to its conservation in perpetuity.

4. The restrictive covenants on these lands will be approved by the USFWS.

5. The protection of existing habitat and the establishment of native vegetation will eventually facilitate owl movement through the site.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount of Extent of Take Anticipated

We do not anticipate the proposed action will incidentally take any CFPO based on the lack of any documented use on or immediately adjacent (within 600 m [1,980 ft]) to the project site. In the event a new owl site is established on or immediately adjacent to the project site, we do not anticipate incidental take to occur for activity that falls within the parameters specified in the Conclusion section above. Activities outside these parameters will require additional analysis not covered in this opinion as specified on the Reinitiation Notice section below.

Disposition of Dead or Injured Listed Animals

Upon finding a dead or injured threatened or endangered animal, initial notification must be made to the Service's Division of Law Enforcement, Federal Building, Room 8, 26 North McDonald, Mesa, Arizona (602-261-6443) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, and any other pertinent information. Care must be taken in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition. If feasible, the remains of intact specimens of listed animal species shall be submitted as soon as possible to the nearest Service

or AGFD office, educational, or research institutions (e.g., University of Arizona) holding appropriate State and Federal permits.

Arrangements regarding proper disposition of potential museum specimens shall be made with the institution before implementation of the action. A qualified biologist should transport injured animals to a qualified veterinarian. Should any treated listed animal survive, the Service should be contacted regarding the final disposition of the animal.

CONSERVATION RECOMMENDATIONS

Sections 2© and 7(a)(1) of the Act direct Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of listed species. Conservation recommendations are discretionary agency activities to minimize or avoid effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information on listed species. The recommendations provided here do not necessarily represent complete fulfillment of the agency's section 2© or 7(a)(1) responsibilities for the CFPO. In furtherance of the purposes of the Act, we recommend implementing the following discretionary actions:

1. The EPA should continue to actively participate in regional planning efforts, such as Pima County's SDCP, and other conservation efforts for the CFPO.
2. We request copies of any reports regarding implementation of the project. We are especially interested in reports that include an analysis of the effectiveness of the mitigation measures.

REINITIATION NOTICE

This concludes formal consultation on the CAVSARP groundwater recharge system in Avra Valley. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) any incidental take occurs, (2) new information reveals effects of the agency action that may adversely affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a way that causes an effect to a listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by this action. In instances where any incidental take occurs, any operations causing such take must cease pending reinitiation.

Effects to the CFPO that are outside of the parameters specified in the Conclusion Section of this opinion will require a case-by-case analysis to determine if reinitiation of consultation is necessary. If reinitiation is necessary, the Service shall expeditiously consult with the EPA and applicant to resolve any concerns related to the CFPO and to determine what, if any, measures are needed to minimize potential adverse effects to the CFPO.

Mr. Terry Oda

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We have assigned log number 2-21-99-F-360 to this consultation. Please refer to that number in future correspondence on this consultation. Any questions or comments should be directed to Doug Duncan at 520-670-4860 or Sherry Barrett at 520-670-4617.

Sincerely,

/s/ David L. Harlow
Field Supervisor

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)

Scott Richardson and Sherry Ruther, AGFD, Region 5, Tucson, AZ
Director, Tucson Water, Tucson, AZ

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APPENDIX - CONCURRENCES

We concur with the determination that the proposed action will not affect the lesser long-nosed bat or the Pima pineapple cactus. We concur with the finding for the lesser long-nosed bat for the following reasons:

- no records of lesser long-nosed bats exist for the project site;
- no agaves occur on site and only four saguaros do; and
- no forage plants will be disturbed.

We concur with the finding for the Pima pineapple cactus for the following reasons:

- no Pima pineapple cactus were found during surveys south of the project area, except near Ajo Road;
- no Pima pineapple cactus have been found on-site;
- soils on-site are different from those where Pima pineapple cactus occur to the south; and
- since much of the area was used for agriculture, it is unlikely that Pima pineapple cactus have become established there.

