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AESO/SE
2-21-02-F-068 April 30, 2002

Memorandum

To: Refuge Manager, Buenos Aires National Wildlife Refuge, Sasabe, Arizona

From: Field Supervisor

Subject: Biological Opinion on the Buenos Aires National Wildlife Refuge Fire Management Plan

This biological opinion responds to your November 15, 2001, request for formal consultation with the U.S. Fish and Wildlife Service (Service) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was received on November 23, 2001. At issue are impacts resulting from the proposed Fire Management Plan (Plan) for the Buenos Aires National Wildlife Refuge (Refuge) located in Pima County, Arizona, on Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) and cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) (pygmy-owl).

In your memorandum, you requested our concurrence that the proposed action may affect, but is not likely to adversely affect, masked bobwhite quail (*Colinus virginianus ridgwayi*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), and mountain plover (*Charadrius montanus*). Our concurrences are provided in Appendix A.

This biological opinion is based on information provided in the February 5, 2002, biological assessment which was a revision of the November 12, 2001, biological assessment; meetings on February 14, 2002, and April 9, 2002, with Refuge and Regional Fire staff; telephone conversations with Refuge staff on February 28, 2002; field investigations; and the February 22, 2002; April 4, 2002; and April 12, 2002, amendments to the biological assessment. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern, and effects of fire on semi-arid grassland habitats. A complete administrative record of this consultation is on file at the Arizona Ecological Services Office (AESO).

Consultation History

Informal consultation was requested by the Refuge in a memorandum dated November 12, 1991, for a prescribed grassland buming program. The species of issue included masked bobwhite quail, small-flowered agave (*Agave parvifolia ssp. parvifolia*), and Pima pineapple cactus. A concurrence memo (2-21-92-I-90), dated February 3, 1992, noted beneficial effects for masked bobwhite quail and that the project may adversely affect the then Category 1 plants, small-flowering agave and Pima pineapple cactus. A recommendation was made that the Refuge develop a survey, monitoring and management program for the two plant species that would be compatible with managing for the quail.

Pima pineapple cactus was listed as endangered September 23, 1993 (58 FR 49875). Consultation on the Refuge fire plan was reinitiated on November 2, 1993. We sent a nonconcurrence letter (2-21-93-I-066) on November 23, 1993, requesting additional information and recommending the Refuge enter formal consultation. You sent an updated Biological Evaluation to AESO on March 28, 1994, followed by request to enter into formal consultation, which was received April 12, 1994. A Biological Opinion (USFWS 1994) for the 1994 fire season was issued on June 6, 1994.

We received your request to consult on the Fire Management Plan on February 14, 1995, which was accompanied by a biological assessment, and an Intra-Service Biological Evaluation Form. We met with you on March 29-31, 1995, to discuss the issues as part of the consultation. We issued a Biological Opinion (USFWS 1995) on May 24, 1995. As part of the proposed project, a monitoring program was included to determine the effectiveness of the burn program in different vegetation associations and test hypotheses on the effects of fire on native and exotic grassland associations. Listed species included within the Biological Opinion were masked bobwhite quail and Pima pineapple cactus. A reasonable and prudent measure required monitoring of effects of the project on masked bobwhite quail and their habitat so that future actions could be modified to minimize take and maximize habitat improvement. In addition, several conservation recommendations were included to evaluate the effects of the proposed action on Pima pineapple cactus including pre-fire and post fire surveys, tracking of individual cactus to determine direct and indirect fire effects, and an analysis of all monitoring data after 5-years of implementation. On November 23, 2001, we received your November 12, 2001, biological assessment, which was revised on February 5, 2002.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

The Refuge was established under the authority of the Endangered Species Act of 1973. The purpose of the Refuge was " to conserve fish and wildlife which are listed endangered species or threatened species... or plants... The endangered masked bobwhite quail was the primary emphasis when established. Since that time several other listed species have been documented on the Refuge. Fire is one of several methods of managing vegetation to meet masked bobwhite quail's habitat requirements.

Objectives of the refuge fire management program are to protect life, property, and natural resources from wildland fire; to allow fire to regain a natural role in our grasslands; and to meet biological objectives. This will be accomplished by allowing fire to become as much of a natural process as possible, by protecting permitted activities on refuge lands, by providing for protection of homes and property in the wildland-urban interface, and by modifying structure and composition of vegetation, reducing fuel loading, and increasing diversity of refuge habitats.

Specific objectives of the program are as follows:

1 . Control all wildland fires. Rather than using direct attack methods, the appropriate management response will be to use the extensive system of roads, trails, and washes as control features from which the fires will be allowed to burn out.

2. Improve effectiveness of the above management strategy by grading roads, installing water control features and removing brush and trees within 25 feet on both sides of roads.

3. Sensitive resources (important wildlife habitat areas, such as riparian, etc.) and areas near structures will be aggressively protected by using direct attack methods with ground and aerial resources. Fire size will be restricted to 10 acres or less, and retardants will be limited to no closer than 300 ft to wetlands.

4. Firebreaks will be developed to protect Sasabe and Arivaca and a defensive space around 14 refuge buildings and 26 structures located on the refuge will be developed or maintained. Use of heavy equipment to construct new firebreaks will be minimized.

5. Prescribed fire will be used in a 2-4 year burn interval to manipulate existing vegetation to meet broad biological goals and specific species needs. This means that an attempt will be made to reduce and/or maintain mesquite canopy cover to <15%, to reduce and/or maintain mesquite structure as shrub vs. tree, and to reduce introduced lovegrass frequency to 0% - 10% in order to favor native grasses.

Proposed actions, including monitoring, are detailed in the Refuge Fire Management Plan (USFWS 2001).

Conservation Measures

As part of any fire management action, the Refuge is committed to implementing certain measures devised to reduce effects of the proposed actions.

Conservation measures for Pima pineapple cactus

- Surveys for Pima pineapple cactus will be conducted in each fire management unit scheduled for burning prior to and after prescribed burns each year. The goal is to survey each fire management unit completely both prior to and after a prescribed fire. The Refuge will continue to explore ways to get more help for surveys.
- Data collected as part of each survey will include: percent vegetative cover, map of the area surveyed, hours surveyed, number of people surveying, number of Pima pineapple cactus found, number of cactus located and UTMs for each individual located. Pima pineapple cactus data sheets will be completed for each individual.
- All known Pima pineapple cactus will be marked and protected from fire by burning a black-line about 5 m out from the plant, leaving the vegetation within the 5 m radius untouched. A fire-proof, cone-like structure is being investigated as another way of protecting each plant.
- Information from known Pima pineapple cactus sites will be used to develop a predictive model (minimum of 80% accurate) for selecting survey sites in the future.
- The Refuge will meet with Arizona ES biologists after 1 year to evaluate the model and post-fire mortality. If changes are needed in burning protocol, they will be addressed at that time.

Conservation measures for Cactus Ferruginous Pygmy-Owls

- Surveys for cactus ferruginous pygmy-owls will be conducted in all high ranking washes (using Aaron Flesch's habitat ranking system) for 2 consecutive years prior to each proposed burn beginning in Winter/Spring 2002 (AGFD and USFWS 2000).
- If an owl or owls occur within a proposed burn area at the time of burn, the burn will be canceled for that year.
- Portions of washes that have high ranking habitat that have had owls occurring in them will be protected from prescribed fire each year by black-lining the fine fuels on the edge of the wash to avoid burning these washes.
- During a prescribed burn, all ignition patterns will be adjusted so that head fires will be diverted away from washes as best as possible to avoid burning trees bordering washes.
- All known saguaro cactus will be protected from prescribed fire by black-lining the perimeter of a 1-acre area around each cactus. The vegetation within the acre will be evaluated to determine if the fine fuels should be reduced as well (by mowing or cool burn) to reduce the chance of a spark jumping the line and burning the saguaro.

STATUS OF THE SPECIES

Pima pineapple cactus (*Coryphantha sheeri robustispina*)

The Pima pineapple cactus was listed as endangered on September 23, 1993 (58 FR 49875). The rule became effective on October 25, 1993, and critical habitat was not designated at that time. Factors which contributed to the listing include habitat loss and degradation, habitat modification and fragmentation, distribution characteristics and plant rareness, illegal

collection, threats, and difficulties in providing protection of an areas large enough to maintain functioning populations. The biological information below is summarized from the proposed and final rules, and other sources.

Pima pineapple cactus is a low growing hemispherical cactus with adults varying in stem diameter from 5.0 cm (2.0") to 21.0 cm (8.3") and height from 4.5 cm (1.8") to 45.7 cm (18.0"). Individuals are considered adults when they reproduce sexually through flowers. Plants can be either single or multi-stemmed with yellow flowers blooming with the summer rains. Clusters of Pima pineapple cactus stems are formed primarily from vegetative clones produced at the plant base (Benson 1982, Roller 1996). The diagnostic characteristic of this taxon is the presence of one stout, straw-colored, central spine which is hooked. Radial spines extend laterally around the central spine and average 10 to 15 spines on large cacti and six on small cacti (Benson 1982).

Groups of flowers begin to bloom for single day periods following five to seven days after the first monsoon rains. Research has indicated flowering is triggered by as little precipitation as 3 mm. Generally flowers begin opening mid-morning and close at dusk. Adult plants will bloom one to three days each year, flowering is usually over by the end of August. Cross-pollination produces significantly more viable seeds than self-pollination. Fruits are mature within two weeks following successful pollination. Germination has been observed in the field during the summer monsoon rainy season (Roller 1996). Anecdotal observations indicate the species' flowers are visited by a variety of native bees and European honey bees which leave the flowers with their forehead and hind legs covered in Pima pineapple cactus pollen.

Generally, the Pima pineapple cactus grows on gentle slopes of less than 10% and along the tops (upland areas) of alluvial bajadas nearest to the basins coming down from steep rocky slopes. The plant is found at elevations from 720 m (2362 ft) and 1440 m (4593 ft) (Phillips et al. 1981, Benson 1982, Ecosphere Environmental Services, Inc. 1992) in vegetation characterized as either or as combination of both the Arizona upland of the Sonoran desertscrub and semi-desert grasslands (Brown 1982). Pima pineapple cactus occurs south of Tucson, in Pima and Santa Cruz counties, Arizona and adjacent northern Sonora, Mexico. It is distributed throughout both the Altar and Santa Cruz Valleys and in low lying areas connecting the two valleys.

Habitat which contains denser populations, better recruitment, and individuals exhibiting greater plant vigor, represents a transition zone between the two regions of vegetation described by Brown (1982) as semi-desert grassland and Sonoran desert-scrub. Vegetation within this transition zone has been characterized as being dominated by mid-sized mesquite trees, half shrubs (snakeweed, burroweed, and desert zinnia) with patches of native grass and scattered succulents. Because populations are healthier in this transition zone, conservation within these areas is very important (Roller and Halvorson 1997). However, this important habitat type is not uniformly distributed throughout the plant's range. Populations of Pima pineapple cacti are patchy, widely dispersed and highly variable in density. The higher

population densities have only been documented at three sites. Compared to other surveys, two of these sites are very small in scale and range from 6.3 and 7.5 plants per ha (3 to 1 plant per acre). This fact may tend to skew the interpretation of plant distribution. Other densities across the majority of the plant's range vary between one plant per 1.9 ha (1 per 4.6 acres) and one plant per 8.5 ha (1 per 21 acres) (Mills, 1991; Ecosphere, 1992; Roller, 1996).

Using recent survey (1992-1997) information regarding Pima pineapple cacti locations, an extrapolated total population size for the species might appear to be much greater than actual on the ground, standardized observations would reveal. This taxon is extremely rare when numbers of known individuals are applied across its range. Pima pineapple cactus is widely dispersed in very small clusters across land areas which are well suited for residential, commercial or mining development. As well, field observations suggest a great deal of land area within the range boundaries does not support Pima pineapple cactus due to historic human impact or some other environment constraint. Thus, populations are already considerably isolated from each other in specific portions of the range and population size and apparent recruitment vary significantly across the range. Population variability may relate, as observed on a more local scale to habitat development, modification, and/or other environmental factors such as slope, vegetation, pollinators, dispersal mechanisms, etc.

The acquisition of baseline information began with surveys documenting the presence of Pima pineapple cactus as early as 1935. More intensive surveys were initiated in 1991 and other research established in 1993 further investigated the reproductive biology, distribution, fire effects and mortalities associated with various threats. Therefore, the best available baseline information is relatively recent and may not represent actual changes in distribution since the declines in the status of the species began. Population degradation and actual changes in population size are likely greater than the numbers presented here in such a narrow time frame. Further, demographic monitoring across the range will be important for the further development of this baseline information, and for management purposes, the spatial representation of those trends needs to be developed.

Widely scattered surveys were conducted across sites which varied considerably in density between 3 plants per 0.4 ha (1 acre) and 1 plant per 9.0 ha (24 acres). Approximately 50 townships can be delineated within the U.S. range boundaries. However, a considerable amount of land area within the range boundaries due to elevation, topography, hydrology, plant community type, and human degradation does not likely provide habitat for the species. With 22,959 ha (56,730 acres), close to 10 to 20 percent of the U.S. range, surveyed, a current total of 3805 individuals have been located since 1935, with the majority located since 1991 using a more intensive methodology.

It is important to clarify that the above number represents the total number of locations ever found and not the current population size. The number of observed and authorized mortalities and transplantations of individuals since the species was listed in 1993 to present, is 2173 individuals, which equals nearly 60 percent of all known locations. A small portion of these

mortalities are not associated with any specific human activity. These monitoring results are a sample developed to represent the range-wide status of the Pima pineapple cactus which appears to have been recently impacted with threats which have caused the elimination of over half of the documented locations.

The area of habitat impacted or authorized to be impacted across a ten year period between 1987 and 1997 (i.e. habitat developed or significantly modified beyond the point where as restoration would be a likely alternative) was roughly 8,702 ha (23,843 acres) which represents 38% of our area ever surveyed. Based on current knowledge, the following threats documented with this reduction in habitat are viewed as altering the landscape in a manner that would be nearly irreversible in terms of supporting Pima pineapple cactus populations: urbanization, farm and crop development, and exotic species invasion with fire. Monitored land areas which appear to support Pima pineapple cactus populations without evidence of fire and exotic species invasion, overgrazing, and off-road vehicle use, and with evidence of reproduction of healthy new individuals, were not considered to be modified.

As discussed prior, the widely scattered distribution of the species surviving at low densities within the occupied habitat results in small populations widely spread across the known range. These clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to detrimentally impact the habitat. The remaining habitat also is subject to degradation or modification from current land management practices, increased recreational use when adjacent to urban expansion (i.e. off-road vehicle use and illegal collection), and the continuing aggressive spread of nonnative grasses into its habitat. Habitat fragmentation and degradation will likely continue into the foreseeable future based on historic data and growth projections produced by the Pima County Association of Governments in their 1995 Population Handbook. There is very little Federal oversight on ways to provide conservation measures that would protect or recover the majority of the potential habitat. Even some areas legally protected under the Act have been modified and may not be able to support viable populations of the Pima pineapple cactus over the long-term.

Most of the documented habitat development has occurred south of Tucson down through the Santa Cruz Valley to the town of Amado. This area is critical for the future recovery of the species. The expansion of urban centers and mining activities will continue to eliminate habitat and individuals, and result in habitat fragmentation.

Habitat fragmentation and isolation may be an important factor limiting future seed set of this cactus. Recent data show that the species cannot self pollinate and is reliant on invertebrate pollinators. One hypothesis could suggest that the spatial distribution pattern of individual Pima pineapple cacti within a given area may be related to pollinator visitations, thus resulting in more successful cross-pollination and subsequent seed set over the population (Roller 1996). Based on the monitoring results, the range-wide status of the Pima pineapple cactus appears to have been recently impacted with threats which have completely altered or considerably modified over a third of the species' surveyed habitat and which have caused the elimination of

nearly 60 % of the documented locations. These values are supplied to serve as an extrapolation of the situation which might be taking place across the rest of the entire population. Current information regarding the status of this species is in great need of more precise and thorough spatial analysis through the use of geographical information systems and databases than is available at present.

Overgrazing by livestock, illegal plant collection, and fire-related interactions involving exotic Lehmann lovegrass (*Eragrostis lehmanniana*) are also threats which may negatively affect Pima pineapple cactus populations (U.S. Department of Interior 1993).

Vegetation associated with higher Pima pineapple cactus densities, reproduction, and greater levels of cactus vigor is described as a mid-sized mesquite shrubland with an assortment of other succulent species and native bunch grasses. Many of the species dominant in this vegetation type are associated with grazing (i.e. are known as "increasers under some grazing practices). Less grazed pastures did support greater native grass coverage with more species present. However, even with an increased bunch grass abundance, the fuel structure of the community was not continuous and allowed for substantial open patches along the drip line of shrub species where the cactus often occurs (Roller and Halvorson 1997). Also, specific levels of soil movement are required for seed germination because the seed will not germinate on the surface; it generally germinates at a depth between 0.5 cm to 1.5 cm (0.2" - 0.6") (Roller 1996). Few locations throughout the plant's range have documented the presence of seedlings or sub-adults. However, all but one of the known locations had been grazed within three years of the observation. Whether light to moderate grazing practices provides the appropriate level of soil movement to cause seed germination has not been determined. Over-land sheet flow across these areas may also serve to move soil and deposit it over sediments. The study established on the Coronado National Forest should provide some insight on seed germination relative to specific grazing intensities.

Reduced herbaceous biomass within the immediate proximity of individuals may reduce heat intensity with fire. Reduced herbaceous cover, distributed continuously, decreases fire frequencies in semi-desert grasslands which over the long-term increases cactus survival following fire (McPherson 1995, Thomas and Goodson 1992), and limits fire uniformity within burned areas due to the discontinuity of fine fuels (Wright and Bailey 1982).

The invasion of Lehmann lovegrass combined with fire is a threat to Pima pineapple cactus populations. Continuous distribution of fuels and greater biomass near the apex of individual plants have been hypothesized as increasing mortality following fire (Roller and Halvorson 1997). Research shows that fire increases Lehmann lovegrass distribution and suggests fire intensity and fire frequency increases with Lehmann lovegrass invasion (McPherson 1995).

The protection of habitat and individuals is complicated by the varying land ownership within the range of this species. An estimated 10 percent of the potential habitat for Pima pineapple cactus is held in Federal ownership. The remaining 90 percent is on Tribal, State, and private

lands. Most of the federally owned land is either at the edge of the range or in scattered parcels. The largest contiguous piece of federally owned land is the Buenos Aires National Wildlife Refuge, located at the southwestern edge of the species' range at higher elevations and lower plant densities.

The Refuge is particularly important for this species as under Section 9 of the Act, the taking of listed animals is specifically prohibited. These prohibitions apply regardless of landownership status. For listed plants, these prohibitions and the protection they afford do not apply. Listed plant species are only protected from deliberate removal from Federal lands. There is no protection against removal from, or destruction of plants on, any non-Federal lands under the Act by a land owner, unless it is in violation of state law or tresspass. The Arizona Native Plant Law may delay vegetation clearing on private property for the salvage of specific plants species within a 30-day period. Although State Native Plant Law does prohibit the illegal taking of this species on state and private lands without a permit for educational or research purposes, it does not provide for protection of plants existing in place through restrictions on development activities.

Cactus Ferruginous Pygmy-Owl

The Service listed the Arizona population of the pygmy-owl as a distinct population segment (DPS) on March 10, 1997, effective April 9, 1997 (62 FR 10730). The past and present destruction, modification, or curtailment of habitat is the primary reason for the decrease in population levels of the pygmy-owl. On July 12, 1999 we designated approximately 731,712 acres critical habitat supporting riverine, riparian, and upland vegetation in seven critical habitat units, located in Pima, Cochise, Pinal, and Maricopa counties in Arizona (64 FR 37419). However, on September 21, 2001, the U.S. District Court for the District of Arizona vacated this final rule designating critical habitat for the pygmy-owl, and remanded its' designation back to the Service for further consideration.

Pygmy-owls are small birds, averaging 6.75 inches in length. Pygmy-owls are reddish-brown overall, with a cream-colored belly streaked with reddish-brown. The pygmy-owl 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).

Pygmy-owls are considered non-migratory throughout their range by most authors, and have been reported during the winter months in several locations, including Organ Pipe Cactus National Monument (OPCNM) (R. Johnson unpubl. data, T. Tibbitts, Organ Pipe Cactus National Monument unpubl. data). Pygmy-owls begin nesting activities in late winter to early spring. In Arizona differences between nest sites may vary by as much as two months (Abbate et al. 1996, S. Richardson, Arizona Game and Fish Department 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 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 5 miles (ranged from 0.75 to 19 miles (G. Proudfoot unpubl. data). Telemetry studies in Arizona during 1999 resulted in generally greater dispersal distances, ranging from 1.4 to 12.9 miles (straight line distance) (n=6, mean 6.2 miles) (S. Richardson, Arizona Game and Fish Department unpubl. data). On-going studies in the fall of 2000 indicate that juvenile dispersal distances may be even greater than previously documented (S. Richardson, Arizona Game and Fish Department pers. comm.). Juveniles typically dispersed from natal areas in July did not appear to defend a territory until September. They may move up to one mile in a night; however, they typically fly from tree to tree instead of long single flights (S. Richardson, Arizona Game and Fish Department unpubl. data). Subsequent surveys during the spring have found that locations of male pygmy-owls are in the same general location as last observed the preceding fall.

A variety of vegetation communities are used by pygmy-owls, such as: riparian woodlands, mesquite “bosques (Spanish for woodlands), Sonoran desertscrub, and semidesert grassland communities, as well as nonnative vegetation within these communities. While plant species composition differs among these communities, there are certain unifying characteristics such as the presence of vegetation in a fairly dense thicket or woodland, the presence of trees or saguaros large enough to support cavity nesting, and elevations below 4,000 ft. Historically, pygmy-owls 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 pygmy-owl. 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, pygmy-owls 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 paloverde, ironwood, mesquite, acacia, bursage (*Ambrosia* spp.), and columnar cacti (Phillips et al. 1964, Monson and Phillips 1981, Davis and Russell 1984, Johnson and Haight 1985, Johnsgard 1988). However, over the past several years, pygmy-owls 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. Semidesert grasslands have experienced the invasion of mesquites (*Prosopis velutina*) in uplands and linear woodlands of various tree species along bottoms and washes.

The range of the Arizona DPS of the pygmy-owl extends from the International Border with Mexico north to central Arizona. The northernmost historic record for the pygmy-owl is from New River, Arizona, about 35 miles north of Phoenix, where Fisher (1893) reported the pygmy-owl to be "quite common" in thickets of intermixed mesquite and saguaro cactus. According to early surveys referenced in the literature, the pygmy-owl, 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, pygmy-owls were detected at Dudleyville on the San Pedro River as recently as 1985 and 1986 (Arizona Game and Fish Department unpubl. data, Hunter 1988).

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

While the majority of Arizona pygmy-owl detections in the last six years have been from the northwest Tucson area, pygmy-owls have also been detected in southern Pinal County, at OPCNM, on the Refuge, and on the Coronado National Forest.

One factor affecting the known distribution of pygmy-owls 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 pygmy-owl 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. Prior to 1999, the highest known concentration of pygmy-owls 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, Arizona Game and Fish Department unpubl. data). As a result, our knowledge is changing as to their distribution and habitat needs as new information is collected.

One of most urgent threats to pygmy-owls in Arizona is thought to be the loss and fragmentation of habitat (U.S. Fish and Wildlife Service 1997, Abbate et al. 1999). The complete removal of vegetation and natural features required for many large scale and high-density developments directly and indirectly impacts pygmy-owl survival and recovery (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 (1) reduction of the total amount of habitat type and (2) 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 vegetation 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 pygmy-owl 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, pygmy-owls, 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 pygmy-owls, in increasingly fragmented landscapes, such as exists in the action area is a factor. For example, researchers have been closely monitoring an established pygmy-owl site (documented each year since 1996) in which the male died in 1999, apparently from a collision with a fence (S. Richardson, Arizona Game and Fish Department unpubl. data.). This site was not known to be occupied in 2000. This site has the highest amount of development (33%) within its estimated home range of any other known nest site (S. Richardson, Arizona Game and Fish Department unpubl. data.).

Other factors contributing to the decline of pygmy-owl habitat include the destruction of riparian bottomland forests and bosques. It is estimated that 85 to 90% 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, U.S. Fish and Wildlife Service 1988, U.S. General Accounting Office1988, 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. Only remnant fragments of these bosques remain.

Regardless of past distribution in riparian areas, it is clear that the pygmy-owl 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 pygmy-owls in riparian areas in recent years may reflect the loss of habitat connectivity rather than the lack of suitability (Cartron et al. 2000b).

In recent decades, the pygmy-owl'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 pygmy-owl 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.

Human activities near nests at critical periods of the nesting cycle may cause pygmy-owls to abandon their nest sites. In Texas, 3 of 102 pygmy-owl 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 pygmy-owls during their breeding season (particularly from February through July (G. Proudfoot pers. comm. 1999 and S. Richardson, AGFD 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 pygmy-owls 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 pygmy-owls 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 pygmy-owls as it does with other bird species. Robert and Ralph (1975), Schreiber (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.

During the first week of March 2000, an unpaired male pygmy-owl was monitored two to three times a week, in the action area (S. Richardson, Arizona Game and Fish Department 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 10-ac parcel which was within 130 ft of where this male had been repeatedly observed prior to grading. Subsequent to grading of this parcel, this male moved approximately 0.25 mile away from its previous location. It is unknown whether this activity, the removal of vegetation on the 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, Arizona Game and Fish Department pers. comm.). Movement of a 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.

Because pygmy-owls 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, AGFD 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 pygmy-owls 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 affect pygmy-owls by altering their habitat (Abbate et al. 1999). A recent fire altered habitat near an active pygmy-owl 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 and 1983, Mclaughlin and Bowers 1982). Flesch (1999) also noted that approximately 20 to 30% of the mesquite woodland within 50 meters (164 ft) of the nest was fire- or top-killed, and ground cover was also eliminated until the summer monsoons. Careful use of prescribed fires in areas potentially suitable for pygmy-owls is necessary so that habitat is not lost or degraded (Flesch 1999).

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.

Areas of the Altar Valley, which are now part of the Refuge, are considered to have once been representative of the Sonoran Savanna Grassland, a biotic community which now only exists as small, relict stands in Mexico. The Sonoran Savanna Grassland was a subtropical fire-climax grassland which occurred in valleys with level plains and gentle rolling hills on deep, fine textured soils. The principle grass species were summer-active root perennials such as Rothrock grama (*Bouteloua rothrokii*) and various species of three-awns (*Artistida* sp.). Other dominant plant species which were present were also of subtropical origins. Herbaceous shrubs and forbs were important components of this grassland community. Species characteristic of warm temperate origins such as curly mesquite (*Hilaria belangeri*) and side-oats grama (*B. curtipendula*) were likely restricted to sites along drainages and north-facing slopes. Most of the scrub species characteristic of semidesert grasslands such as burroweed and snakeweed were not typical components of the Sonoran Savanna Grassland Community, but probably occurred in the general vicinity. Trees and large shrubs were present within this community, but varied in density. Larger cacti, such as saguaros, were present, but not prevalent (Brown 1982).

The land managed by the Refuge is now largely considered semi-desert grassland or desert scrub. Mesquite and other woody species have invaded the upland habitats throughout the valley. This is due a combination of long-term climate changes, the introduction of cattle, horses, and the resulting soil erosion brought on by historic poor grazing management. Impacts from human agricultural uses combined with periods of severe drought and the lowering of the water table from the deepening of the arroyos in the valley have resulted in a habitat conversion favoring trees, woody shrubs and exotic grasses introduced in an attempt to halt the watershed degradation.

Pima pineapple cactus

A. Status of the species within the action area

The Refuge is the largest contiguous piece of federally owned land which is known to contain Pima pineapple cactus. In the 1991 request to initiate consultation on the Refuge fire program, the Refuge documented less than 20 individuals in two areas of the Refuge. The Refuge in the 1992 Prescribed Burning Program BA, stated that burn units would be searched for these cacti and weed trimmers would be used to create firelines around each cactus.

In the 1994 BO for the Refuge Prescribed Grassland Burning, approximately 64 Pima pineapple cacti were known to occur on the Refuge (USFWS 1994). It was noted that surveys of the three burn units proposed for 1994 were not complete and only three cacti were so far known in these units. It was expected that undiscovered cacti were present in these burn units

and could possibly be killed from direct damage by fire. Conservation recommendations for the cactus were 1) protect known individuals, 2) survey areas to be burned and concentrate surveys in higher quality habitat, 3) survey areas post burn to determine detectability and refine the identification of potential habitat, 4) track individual cacti, 5) develop a 5-year fire plan with monitoring to determine the effect of the fire program on the spread of Lehmann lovegrass versus native grass, and 6) conduct intensive surveys in areas of ground disturbance.

In 1995, the 5-year fire plan recommended in 1994 was presented to AESO. It referred to 68 known Pima pineapple cacti on the Refuge. A major portion of this plan involved monitoring to determine the effectiveness of the fire management program on restoring habitat for masked bobwhite quail. In addition, the monitoring program would determine the effect the fire program had on the spread of Lehmann lovegrass. This is of particular importance as the ability of Pima pineapple cactus to withstand fire in native grass may be different from its ability to withstand fire in monotypic stands of Lehmann lovegrass. Lehmann lovegrass stands support higher fuel loads, more intense heat and can burn more often than native grasslands, with the potential result of higher mortality of Pima pineapple cactus located in Lehmann lovegrass stands. To date, no results have been received from the monitoring that was in the conservation recommendation in 1994 BO and included as part of the fire management plan consulted on in 1995. The current Fire Management Plan, approved in September 2001, includes the same plan to monitor and evaluate the fire management program's ability to meet objectives and determine effects it has on the native versus exotic vegetation.

In the 2002 Intra-Service Section 7 Consultation BA, the Refuge estimates that approximately 60 percent of its acreage, about 70,309 acres, is potential Pima pineapple cactus habitat. This is all included within the fire management units. Based upon information in the Arizona's Heritage Data Management System, there were 65 known sites on the Refuge in 2001.

B. Factors affecting species environment within the action area

Pima pineapple cactus within the action area are protected from most of the threats faced by this species off the Refuge, such as, urban development, mining, and recreational off-road vehicle use. However, ground disturbances from Arizona Department of Transportation maintenance activities, specifically the clearing of a 30-foot recovery zone in some areas along the sides of SR 286, may disturb individuals that may be growing near the road side. Past road improvement projects, such as a bridge replacement and road realignment, may have resulted in the loss of individuals. Several acres of habitat were converted to highway roadway. In addition, several roadside fires have impacted the habitat along the road side.

Human disturbance in the action area while localized, could have a substantial effect on Pima pineapple cactus. The least impacting of these human activities is individuals exploring wildlife-

related recreational opportunities on the Refuge. A more serious human disturbance is the large number of undocumented aliens and drug traffickers moving through the action area. New trails are created regularly and campfires left unattended pose a serious fire risk. In addition, the use of off-Highway Vehicles by Border Patrol while monitoring and apprehending these individuals could present a significant impact on this species.

Prescribed fire has been used as a habitat management tool on the Refuge since it was established. The effects of a decade of prescribed fire on the spread of Lehmann lovegrass has yet to be evaluated.

Cactus ferruginous pygmy-owl

A. Status of the species within the action area

The Refuge is located in the southern portion of the Altar Valley. This valley has been identified as a recovery area for the pygmy-owl, by the Cactus Ferruginous pygmy-owl Recovery Team. They identified this area as important in maintaining breeding habitat and to allow movement of pygmy-owls from the northern Recovery Areas into Mexico and the Tohono O'odham Nation. This valley presently has seven known sites occupied by individuals, one of these is on the Refuge (Abbate pers com). The Refuge has also had one nesting site identified. Much of the Refuge has not been surveyed in accordance with the current approved survey protocol.

There have been four breeding pairs and ten other individuals found in this area in the past (Harris Environmental Group, Inc. 1998; Flesch 1999; Abbate et al. 2000). In 1999, 31 individual owls were located within the Altar Valley (Pima County, 1999). Arizona Game and Fish Department located 29 individual and 4 nest sites in 1999, 13 individuals and 1 nest site in 2000, and 30 individuals and 7 nest sites in 2001. The drop in individuals in 2000 is related to an inability to access an area where owls were located in 1999. Currently, in 2002, survey and monitoring efforts are on going. A total of seven birds have been located, including three locations on the Refuge. A leg-banded female from 2001 was located this spring, a second bird was located and radio tagged, and a third was detected in a fire management unit proposed for a burn next year. (Abbate pers com and Huniccutt pers com).

B. Factors affecting species environment within the action area

This species is potentially limited by available nest sites within the Valley. Saguaro cactus, the common nesting site for pygmy-owls, is an infrequent component of the vegetation community on the Refuge. Alternative nesting substrate includes larger trees (>6 in. dbh) which are of a size that could provide cavities for nesting. While mesquite trees of this size or larger were historically common in this valley, they are currently found scattered in xeroriparian areas along washes that run through the valley.

The dispersed nature of suitable nesting sites throughout the valley makes the need to maintain connectivity throughout the valley very important. Arizona Department of Transportation maintenance activities resulted in the clearing of a 30-foot recovery zone in some areas along each side of SR 286, effectively increasing the impacts of the road from a 24-foot gap in the habitat to an 84-foot gap. In addition, several roadside fires have impacted the habitat along the road side. A bridge replacement and road realignment resulted in the loss of habitat and increased fragmentation at the site of the new right-of-way due to the second road bed and the construction foot print.

Human disturbance in the action area discussed above can also result in harassment of individuals, nesting adults, and the loss of habitat from unattended campfires.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action, that will be added to the environmental baseline. Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur.

Pima pineapple cactus (*Coryphantha scheeri robustispina*)

The proposed fire management plan may result in direct loss of individuals of Pima pineapple cactus due to prescribed fire and fire related activities. There are 65 Pima pineapple cactus known from 2001. The Refuge has surveyed 20 % of the area of the burn management units proposed to be burned in 2002 and no new individuals have been located. The continued surveys of the burn units and protection of known individuals will mitigate losses, but in dense stands of grass or in areas that may not be covered in surveys, the potential exists that individual cacti will be killed by fire. The post-burn surveys that are part of this action will aid in 1) determining rates of detection, 2) determining fire related mortality, and 3) providing additional information on cactus distribution. These data will further the accuracy of a predictive model that will assist the Refuge in focusing surveys in areas of highest potential habitat and in implementing conservation actions.

The proposed minimum acreage of prescribed burning each year is identified as 15,000 acres, although 24,000 acres are planned for FY 2002. Based upon the planned acreage, the entirety of potential Pima pineapple cactus habitat on the Refuge could burn, at least once, every 3 years. In some fire management areas the Fire Management Plan proposes to increase the fire frequency to 2 years in some burn units, but no data are presented to support this change. The vegetation type that the two year burn frequency would be used in is not identified in the Fire Management Plan.

Indirect effects on this species includes the potential increase of exotic Lehmann lovegrass within the grassland habitats on the Refuge. There is no evidence to support the hypothesis that frequent burning will reduce the density of Lehmann lovegrass (E. Gieger pers com). The potential exists that Lehmann lovegrass could become the dominant grass species across the Refuge, as fire can provide an opportunity for Lehmann lovegrass to become established. The largest factor that is correlated with the spread of Lehmann lovegrass seems to be high precipitation (E. Gieger pers com). The effects of rainfall patterns and long-term climate change are issues that are beyond the control of the Refuge, but will also contribute to changes in vegetation and fire ecology of this area. As discussed above the increase of Lehmann lovegrass could result in increased fire intensity and frequency which would be detrimental to Pima pineapple cactus.

Cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*),

There are three pygmy-owls known to occur in the action area, one was a leg banded individual detected in 2001, another was found just north of a fire management unit proposed for a burn this year, and the third was located in a fire management unit scheduled to be burned in 2003.

Fire can affect pygmy-owl habitat by removing ground cover and destroying potential cavity bearing saguaro cacti and trees. Human disturbance from fire management activities can also impact bird behavior and interfere with brood rearing. The timing of this action, April to June, occurs within the breeding and rearing season of this species. Fire locally can impact prey density through direct mortality of reptiles, small mammals, and song birds. Indirect impacts on vegetative cover could also affect prey species densities and distributions.

The Conservation measures that are part of this action should mitigate most of the potential effects discussed above. The foremost of these is the two years of surveys of suitable habitat prior to burning a fire management unit and not burning the unit if an owl is known to be present. This alleviates the possible disturbance of reproductive effort, direct loss of individuals, indirect effects from changes in prey availability, and habitat features. The protection of a 1-acre buffer around saguaro cactus will protect existing potential nest sites and any young saguaros around the adult to help ensure this resource remains available in the future. High quality habitat within washes will also be protected through black-lining and other protective measures.

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.

The Altar Valley Conservation Alliance (Alliance), whose members include the majority of the land owners and state lease holders in the Altar Valley, are currently working on a prescribed fire plan. This plan has been under development for several years, and the Alliance is waiting for the Refuge to finish consultation on this Plan, so that it can be used as a model. The Alliance's burn plan could cover the remaining portions of the Altar Valley Drainage. This would include the only portion of Pima pineapple cactus' known distribution that is not currently impacted by development and the entirety of Recovery Area 1 for the pygmy-owl. If adequate conservation measures are not put into place and implemented, and associated monitoring completed, Pima pineapple cactus could be extirpated from this portion of the range and connectivity with Mexico for the pygmy-owl population in NW Tucson could be lost.

In addition, the corridor along SR 86 from Tucson, AZ to Three-points, AZ is being developed at an increased rate, in particular the north end of the Altar Valley. We are currently aware of development plans for approximately 640 acres, south of Three-points. This area is likely to be under increased pressure for urban developments in the near future. Developments in this area could effectively isolate the southern portion of the Altar Valley from the rest of the range of Pima pineapple cactus and pygmy-owl.

Other activities in the Altar Valley include on-going grazing, outdoor recreational activities and those activities of Arizona Department of Transportation as mentioned above.

CONCLUSION

After reviewing the current status of Pima pineapple cactus and cactus ferruginous pygmy owl, the environmental baseline for the action area, the effects of the proposed BANWR Fire Management Plan and the cumulative effects, it is the Service's biological opinion that the Fire Management Plan, as proposed, is not likely to jeopardize the continued existence of the Pima pineapple cactus or cactus ferruginous pygmy-owl. No critical habitat has been designated for these species, therefore, none will be affected.

We present these conclusions for the following reasons:

Pima pineapple cactus

- Pre-burn surveys will be performed over the burn units with a goal of 100% coverage.
- All known individuals within a burn unit will be protected from the effects of prescribed fire.
- Post-burn survey efforts will be used to determine detectability rates of pre-burn surveys and survival rates of unprotected and formerly unknown individuals to aid in future determinations.
- Data collected from each location will aid in understanding the biology and ecology of this species.
- The data collected from each location will aid in developing a model to identify likely habitat areas and aid in future conservation efforts for this species.
- The vegetation monitoring program is included as part of the Fire Management Plan.

Cactus Ferruginous Pygmy-Owl

- Surveys will be conducted to avoid direct impacts of pygmy owls in suitable habitat.
- Prescribed burns will be cancelled in fire management units where an owl is found.
- Portions of washes that are known to be used by pygmy-owls will be protected from prescribed burns
- Ignition patterns will be adjusted to avoid burning trees in and along washes.
- All known saguaro cacti will be buffered by a protected acre.
- Fuel reduction activities may occur to avoid uncontrolled spot fires within the buffer around saguaro cacti.

The conclusions of this biological opinion are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any Conservation Measures that were incorporated into the project design.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

1. The refuge monitoring of fire effects as proposed in the Fire Management Plan is part of the action as described, however statistical power and validity of the monitoring should be tested and improved to provide rigorous evaluation of the effects of the Fire Management Plan and its long-term role in habitat management.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the Service requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the request. 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 retained and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may 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 manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates the Refuge's efforts to identify and minimize effects to listed species from this project. For further information please contact Marty Tuegel (520) 670-4778 or Sherry

Barrett (520) 670-4617. Please refer to the consultation number, 2-21-02-F-068, in future correspondence concerning this project.

/s/ David L. Harlow

cc: Regional Director, Fish and Wildlife Service, Albuquerque, NM (ARD-ES)
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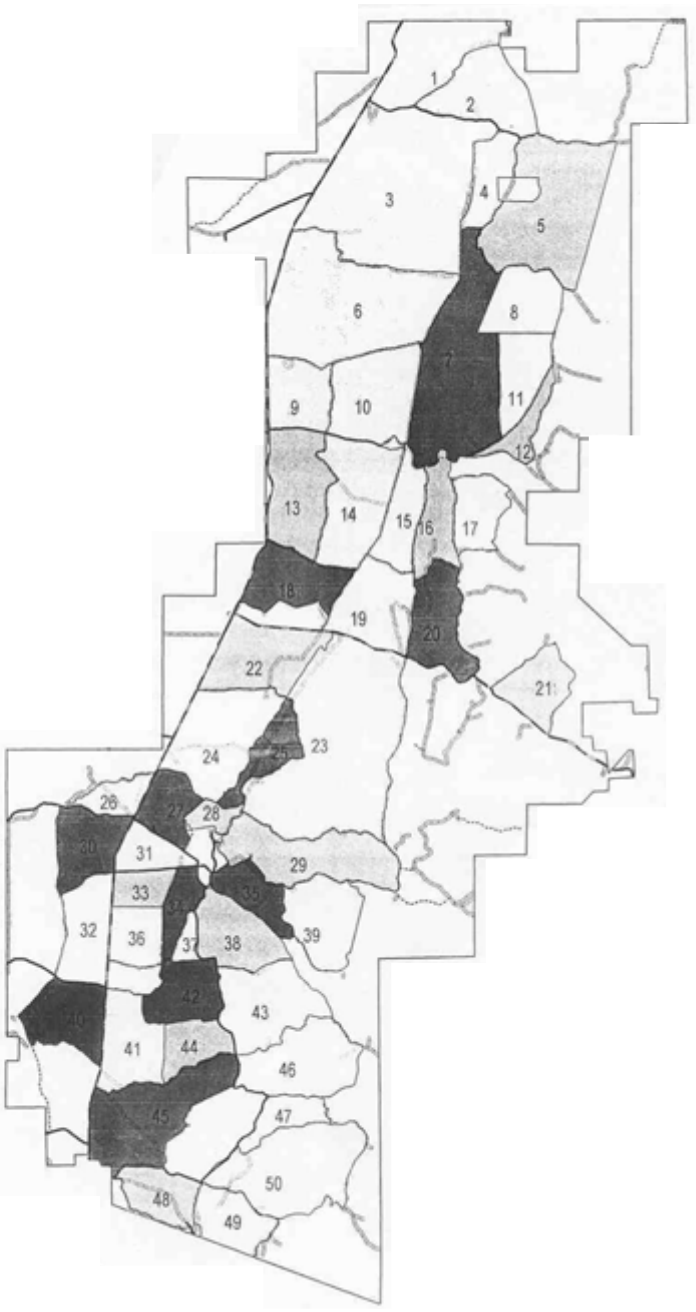
Figure 1. BANWR Fire Management Units



Appendix A:

CONCURRENCES

This section contains all concurrences with "may affect, not likely to adversely affect and not likely to jeopardize determinations.

Masked Bobwhite Quail (*Colinus virginianus ridgwayi*)

Environmental Baseline

Approximately 80 percent of the Refuge is current or potential masked bobwhite quail habitat. Quail have been released in numerous locations throughout the Refuge grasslands, and have dispersed throughout. In 2001, a population of 644 individuals were estimated based upon call count surveys (Hunnicutt, pers. com.). Prescribed fire is a standard tool for bobwhite quail (Stoddard 1031; Rosene 1955). The core area for management of masked bobwhite is located in the south-central part of the Refuge, south of the Arivaca Road. This core area was not designated as a separate Fire Management Unit. The timing of the prescribed burns (May and June) allows the burns to take place and some vegetation to regenerate prior to the typical masked bobwhite nesting season of late July through early September. In wet years when early season breeding occasionally is observed (March and April), all birds should be capable of flight at the time of the burns and should be able to move in advance of flames.

Conclusion

After reviewing the status of the masked bobwhite quail, the environmental baseline for the action area, and the effects of the proposed action, the Service concurs that the proposed action may affect, but is not likely to adversely affect masked bobwhite quail, based upon the following:

- The main objective of this proposal is to enhance the habitat for this species.
- The core area of the Refuge for this species is not in a single burn unit.
- The action is scheduled outside of the nesting season.
- All adult birds should be mobile and habitat is available in other units.

Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*)

Environmental Baseline

This species is known from grasslands and arid scrublands below 5500 ft in elevation. In Arizona, they arrive in mid- April, roosting in caves, abandoned mine shafts and tunnels. Young are typically born in maternity colonies in mid-May. Females and young remain in maternity roosts and forage below about 3500 ft until approximately mid-July. At this time the range

expands and bats are found up to about 5500 ft in areas of semi-desert grassland and lower oak woodland. These bats typically leave southern Arizona by late September to early October. While there are small caves and some mine shafts on or near the Refuge, no roost sites or maternity colonies are known to be on the Refuge.

Lesser long-nosed bats are known to forage on the Refuge, using species of agave and columnar cacti, as well as hummingbird feeders. *Agave parryi* on the Refuge typically occurs in relatively small numbers in the foothills portion of the Refuge. These areas are not part of a burn unit. When this agave is found within a burn unit it is typically in gravelly soils which are sparsely vegetated and have little ability to carry a fire. Saguaro cactus, which are not numerous within the burn units, will be protected from prescribed fire as described above.

Conclusion

The Service concurs with the Refuge determination that the action may affect, but is not likely to adversely affect lesser long-nosed bat, based upon the following:

- There are no known roost sites within the burn units.
- The majority of the foraging resources for this species are outside the burn units.
- Saguaro cactus within the burn units will be protected from prescribed fire.

Mountain Plover (*Charadrius montanus*).

Environmental Baseline

No records of the mountain plover are known from the Refuge. However, the habitat could be appropriate during the winter months and the bird occurs both to the east and west of the Refuge. Wintering areas can include grasslands, but most of the wintering populations utilize agricultural lands. Since the fire management plan would execute burns in May and June, the areas which are burnt should have recovered in response to late summer rains. In years with below average rain fall recovery may be slower, but the net effect of the fire management plan should be improved grasslands. Therefore, a beneficial effect to mountain plover may result from more open habitat.

Conclusion

The Service concurs with the Refuge determination that the action may affect, but is not likely to adversely affect this species based upon the following:

- There are no known occurrences of this species on the Refuge.
- The use of semi-desert grasslands in Southern Arizona by this species is in the winter, which is outside the season of the proposed burns.
- The actions may enhance habitat for this species.