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Memorandum

To: Regional Director, National Park Service, Denver, Colorado

From: Field Supervisor

Subject: Biological Opinion for the Widen North Puerto Blanco Road Project, Organ Pipe Cactus National Monument General Management Plan

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed Widen North Puerto Blanco Road Project for the National Park Service's (NPS) Organ Pipe Cactus National Monument (NM), located in Pima County, Arizona, and its effects on the Sonoran pronghorn (*Antilocapra americana sonoriensis*, pronghorn), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*, bat), and cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*, pygmy-owl) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA).

This biological opinion is based on information provided on the proposed action by your agency, new information on the status of pronghorn, telephone conversations, field investigations, and other sources of information as detailed in the consultation history. A complete administrative record of this consultation is on file at the Phoenix, Arizona Ecological Services Field Office (AESO).

Because of the length of this document, we have provided the following Table of Contents.

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CONSULTATION HISTORY

January 8, 2001, received NPS request for a species list
February 16, 2001, provided NPS a species list for Pima County
April 5, 2002, formal consultation initiated

The North Puerto Blanco Road project was included in the 2001 Organ Pipe Cactus National Monument General Management Plan (GMP) supplemental environmental impact statement as a "possible future action. The supplemental environmental impact statement was required because of a court order resulting from a lawsuit, Civil Action No. 99-927 [ESH], *Defenders of Wildlife, et al. v. Bruce Babbitt, et al.* This lawsuit also remanded our 1997 biological opinion on the original GMP. The resulting 2001 biological opinion on the GMP addressed effects of the North Puerto Blanco Road project as a possible future action. The GMP opinion was a non-jeopardy opinion which did not result in take of Sonoran pronghorn.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The project will improve the first 5 miles of the existing North Puerto Blanco Drive in the monument, widening the road to two lanes and adding the following features between the beginning of the road segment and the existing Valley of the Ajo pullout: 1) an entrance turn-around, 2) interpretive pullouts, and 3) development of designated parking, picnic tables, a restroom structure and interpretive exhibits at the end of the two-way section (Figures 1 and 2). The improved road section will remain unpaved except for major drainage crossings and some steep sections that will be paved to make them more durable and safe. All activities will occur within the monument.

The new road section will allow for two-way traffic on the first 5 miles of North Puerto Blanco Drive. The roadway will be widened from its current 14-foot width to 20-feet (2 nine-foot traffic lanes with one-foot shoulders) to meet the NPS standard for dirt roads with 50-200 average daily traffic. Six inches of compacted base will be added to the end of the road surface and may be mixed with a dust pallative (such as magnesium chloride) for dust abatement and road surface stabilization. The design speed is 15 miles per hour (mph) with exceptions (short stretches with lower design speed). There will be a 25-foot maximum vehicle length limit.

Twelve major drainage crossings will be improved into low water crossings. These will be composed of a foundation of pre-made concrete Jersey barriers to anchor the road, a concrete road bed, and wire basket gabions installed to stabilize the upstream and downstream sides. Some steep grades will be paved with 3 inches of asphalt for safety and erosion control. The road will meet Park Road Standards for average daily traffic of 50-200 vehicles.

Construction zones will be marked with stakes or some other means prior to any construction activity. Delineating the construction zone will confine activity to the minimum area required for construction. All protection measures will be clearly stated in the construction specifications and workers will be instructed to avoid conducting activities beyond the construction zone. Construction crews will be notified of sensitive species and protective measures.

Interpretive panels will be installed at the pullouts along the road. Emphasis will be on education; messages will be towards creating an understanding and appreciation of the natural and cultural history of the Sonoran Desert. Four pullouts will be constructed along the road with

parking spaces, picnic tables, comfort station and a gate will be constructed at the terminus of the two-way section near the current "Valley of the Ajo pullout.

Actual length of road improvements will be 4.9 miles. Construction limits (disturbance area) will be between 40 and 60 feet wide. The total area of disturbance will be 31 acres, with 22.5 acres of new disturbance. Of the disturbed area, 11 acres of new disturbance will be permanently impacted. The remaining 11.5 of acres of disturbed area will be rehabilitated and revegetated using plants of genetic stock originating in the Monument. All disturbed areas will be restored as nearly as possible to pre-construction conditions shortly after construction activities are completed. Revegetated areas will exhibit natural spacing, abundance, and diversity of native plant species. In an effort to avoid introduction of exotic plant species, no hay bales or other organic material will be used in erosion control measures. Standard erosion control measures that involve only inorganic material, such as silt fences and/or sand bags, will be used. All buffelgrass located in the project area will be removed by hand. Other exotics identified will be eradicated.

Sensitive plants such as ironwood, organ pipe cactus, and saguaro cactus will be avoided wherever possible. Saguaros less than 3 feet tall will be salvaged, as will approximately 6 to 12 organ pipe cactus. However an estimated 88 to 100 saguaro cactus and 4 to 8 organ pipe cactus will be lost. The 25-foot vehicle limit and 15 mph speed limit minimize loss of habitat, especially pygmy-owl and bat habitat, by use of a more winding route, avoiding many of the larger cacti, ironwood and other tree species and retaining much of the riparian vegetation at wash crossings. Additionally, all construction will take place outside of the pygmy-owl nesting season February 1- July 31.

Twenty five miles of the Puerto Blanco loop will remain a one-way primitive road open to the public during certain times of the year. It will be seasonally closed to protect sensitive wildlife during critical periods. The closure will be accomplished by signing and gates installed at the end of the improved section and in the southwest corner of the road, where the Pozo Nuevo road begins. The unimproved section will receive a lower level and frequency of maintenance than it does now and travel will be restricted (or recommended) to shorter wheel-based, high clearance vehicles when it is open.

Construction will be expected to last 4 to 5 months. It will be scheduled to occur during the low visitation season of summer and early fall. This timing also avoids the pygmy-owl nesting season, and the pronghorn fawning season. All construction activity will be completed by December 20, and before the typical heavy visitor use period and pronghorn fawning season. The road will be closed during construction for visitor safety and construction site security. The public will be notified of the closure through news media, posted notices and roadside signing.

Although the immediate area of the action is the first 5 miles of North Puerto Blanco Drive, as has been described, we have defined the action area differently for each species for reasons that will be explained and discussed in the "Effects of the proposed action section of this consultation.

Several measures specifically addressing conservation of the Sonoran pronghorn are part of the project. Although the pronghorn will also benefit from efforts to minimize habitat loss, mitigation measures aimed at minimizing disturbance from increased visitor use, especially during the critical period for fawn survival, will also be implemented. A pronghorn monitoring program will be utilized to locate pronghorn within the Monument, and a 5-mile diameter area around the animals will be closed to public use around known pronghorn locations and administrative use will be reduced to a minimum. During March, if these closure areas include

North Puerto Blanco Drive, this road will be closed at the end of the two-way section. North Puerto Blanco Road will also be closed annually at the end of the two-way section from March 31 to July 15. A locked gate and signage will be used at points of closure and other appropriate points. Additionally, the Bates Well and Pozo Nuevo Roads will also be closed and backcountry access restricted to those areas east of highway 85 from March 31 to July 15. Construction will also be delayed until significant rainfall occurs and most pronghorn move out of the Monument to other areas of their range (based on radio-telemetry data). NPS will also continue the placement of temporary waters throughout the the Monument during the dry season on an annual basis.

SONORAN PRONGHORN (*Antilocarpa americana sonoriensis*)

I. STATUS OF THE SPECIES

A. Description and Legal Status

Pronghorn are long-legged, small-bodied artiodactyls (hoofed mammal with an even number of toes on each foot). Upper parts are tan; the underpart, rump, and two bands across the neck are white. The male has two black cheek patches. Both sexes have horns, although they are larger in males. Males weigh 100 to 130 pounds, while females weigh 75 to 100 pounds. The Sonoran subspecies (*Antilocapra americana sonoriensis*) was first described by Goldman (1945) from a type specimen taken near the Costa Rica Ranch, Sonora, Mexico by Vernon Bailey and Frederic Winthrop on December 11, 1932, and is currently recognized as one of five subspecies of pronghorn (Nowak and Paradiso 1983). The Sonoran pronghorn is the smallest subspecies of *Antilocapra americana*.

The Sonoran pronghorn was listed throughout its range as endangered on March 11, 1967 (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966. Three sub-populations of the Sonoran pronghorn are currently extant, including: (1) U.S. sub-population in southwestern Arizona, (2) a sub-population in the Pinacate Region of northwestern Sonoran, and (3) a sub-population on the Gulf of California west and south of Caborca, Sonora. The three sub-populations are geographically isolated due to barriers such as roads and fences, and in the case of the two Sonora sub-populations, by distance. Critical habitat has not been designated for the pronghorn.

B. Life History

Sonoran pronghorn inhabit one of the hottest and driest portions of the Sonoran Desert. They forage on a large variety of perennial and annual plant species (Hughes and Smith 1990, Hervert *et al.* 1997b, U.S. Fish and Wildlife Service 1998a), and will move in response to spatial limitations in forage availability (Hervert *et al.* 1997a). Although it is theoretically possible for pronghorn to meet water requirements through forage consumption (Fox *et al.* 1997), after subtracting water required for excretion, respiration, and evaporation (approximately 50 percent), predicted water intake from forage was not adequate to meet minimum water requirements for 14 of 20 simulated diets (Fox *et al.* 2000a, 2000b). Sonoran pronghorn will use water if it is available (U.S. Fish and Wildlife Service1998a).

Pronghorn consume a wide variety of plants. Fecal analysis indicated Sonoran pronghorn consume 69 percent forbs, 22 percent shrubs, 7 percent cacti, and 0.4 percent grasses (U.S. Fish and Wildlife Service1998a). However, Hughes and Smith (1990) reported cacti are the major diet component (44 percent). Consumption of cacti, especially chain fruit cholla (*Cylindropuntia fulgida*, Pinkava 1999), provides a source of water during hot, dry conditions (Hervert *et al.*

1997b). Other important plant species in the diet of the pronghorn include pigweed (*Amaranthus palmeri*), ragweed (*Ambrosia* sp.), locoweed (*Astragalus* sp.), brome (*Bromus* sp.), and snakeweed (*Gutierrezia sarothrae*) (U.S. Fish and Wildlife Service1998a).

Sonoran pronghorn rut during July-September, and does have been observed with newborn fawns from February through May. Parturition corresponds with annual spring forage abundance. Fawning areas have been documented in the Mohawk Dunes and the bajadas of the Sierra Pinta, Mohawk, Bates, Growler, and Puerto Blanco mountains. Does usually have twins, and fawns suckle for about 2 months. Does gather with fawns, and fawns sometimes form nursery groups (U.S. Fish and Wildlife Service1998a). Hughes and Smith (1990) recorded an average group size of 2.5 animals; however, group size observed by Wright and deVos (1986) averaged 5.1, with the largest group containing 21 animals.

The results of telemetry studies in 1983-1991 indicated that Sonoran pronghorns nonrandomly use their habitats (deVos 1998). Pronghorn move from north to south or northwest to southeast, and upslope as summer progresses. Movements are most likely motivated by the need for thermal cover provided by leguminous trees and water available in succulent cacti such as chain fruit cholla (Hervert *et al.* 1997b), that are more abundant on bajadas and in the southern portion of the pronghom's range. Home range size of Sonoran pronghorn ranged from 24.9 to 468 mi^2 for males and from 15.7 to 441 mi^2 for females (Wright and deVos 1986).

Causes of pronghorn mortality are often difficult to determine; however, some radio-collared Sonoran pronghorn have been killed by coyotes, mountain lions, and bobcats. Some of these mortalities may have been influenced by dry periods, which predisposed pronghorn to predation (U.S. Fish and Wildlife Service1998a). Of 580 coyote scat examined on the Cabeza Prieta National Wildlife Refuge (NWR), 5 contained pronghorn remains (Simmons 1969), but some or all of these remains may have resulted from scavenging carcasses. Hervert *et al.* (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain. Three radio-collared pronghorn died in July and August of 2002 with no obvious cause of death. Given that pre-monsoon summer conditions were some of the driest on record, these mortalities were likely due to heat stress and/or malnutrition resulting from inadequate forage conditions due to drought (J. Hervert, AGFD, Pers. comm. 2002).

C. Habitat

Data collected from radio-collared animals and fecal pellet analysis have provided some data on habitat use by Sonoran pronghorn. All three Sonoran pronghorn sub-populations occur in Sonoran Desert scrub vegetation communities (Turner and Brown 1982). Turner and Brown (1982) discussed seven subdivisions of the Sonoran Desert, two of which encompass the habitat of Sonoran pronghorn in the U.S. and the Pinacate Region of Sonora (Felger 2000). These are the Lower Colorado River Valley and the Arizona Upland subdivisions. Creosote (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) are dominant perennials of the Lower Colorado River Valley subdivision. Plant species along major water courses include ironwood (*Olneya tesota*), blue palo verde (*Parkinsonia floridum*), and mesquite (*Prosopis velutina* and *P. glandulosa*). Species in the Arizona Upland include foothill palo verde (*Parkinsonia microphyllum*), catclaw acacia (*Acacia greggii*), chain fruit cholla, teddy bear cholla (*Cylindropuntia bigelovii*), buckhorn cholla (*C. acanthocarpa*), and staghorn cholla (*C. versicolor*).

On the Gulf Coast of Sonora, Mexico, pronghorn also occur in the Central Gulf Coast subdivision of Sonoran Desert scrub. This form of Sonoran Desert scrub is very rich in species, particularly stem succulents, but there is a general absence of a low shrub layer. Elephant tree (*Bursera microphylla, B. hindsiana*), sangre de drago (*Jatropha cuneata*), and *Jatropha cinerea* are common, but creosote is only locally abundant.

The habitat of the pronghorn in the U.S. consists of broad alluvial valleys separated by block-faulted mountain and surface volcanics. In December 1984, 40 percent of the pronghorn observed during a telemetry flight were in the Growler Valley, from the Aguila Mountains to the International Border. The AGFD (1985) reported that pronghorn use flat valleys and isolated hills to a greater degree than other topographic features.

Drainages and bajadas are used by pronghorn during spring and summer. Washes flow briefly after rains during the monsoon season and after sustained winter rains. The network created by these washes provides important thermal cover (shade) for pronghorn during the hot summer season. Bajadas are used as fawning areas in the spring. Pronghorn were observed using palo verde, ironwood, and mesquite for cover during weekly AGFD telemetry flights, which began in 1994 (Hervert *et al.* 1997b).

Pronghorn were observed in playas in April and May of 1988 and 1989 when forbs were abundant, later vacating these areas when desiccation of annuals occurred (Hughes and Smith 1990). In years with sufficient winter and spring precipitation, some playas produce abundant annual plant growth due to drainages into these areas.

Some of the sandy areas within pronghorn habitat such as Pinta Sands, the Mohawk Dunes west of the Mohawk Mountains, and the west side of the Aguila Mountains, provide a greater variety of seasonal vegetation when precipitation events occur. The openness of these areas appears to be attractive for pronghorn as the annuals, grasses, and shrubs provide good forage, particularly in the spring. These areas have long been considered significant pronghorn habitat in the U.S. Carr (1974) reported seeing pronghorn frequently in the Pinta Sands area. Due to the more arid nature of valley and dune habitats, annuals dry and cure, with decreased palatability for pronghorns as summer approaches. Also, these habitats lack sufficient woody vegetation to satisfy pronghorn requirements for nutrition and thermal protection. These factors limit the temporal suitability of these areas and most pronghorn move to bajadas and washes in the southeastern portion of the range by early summer.

D. Distribution and Abundance

United States

Prior to the identification of the subspecies known as the Sonoran pronghorn (Goldman 1945), specimens of pronghorn taken within its range were identified as other subspecies (AGFD 1981). Historically, the Sonoran pronghorn ranged in the U.S. from Arizona's Highway 15 to the east; the Altar Valley and the Tohono O'odham Nation (formerly the Papago Indian Reservation) to the north; and Imperial Valley, California, to the west (Nelson 1925, Monson 1968, Wright and deVos 1986, Paradiso and Nowak 1971) (Figure 3).

During an international boundary survey conducted from 1892 through 1894, pronghorn were found in every open valley along the international boundary from Nogales, Mexico to Yuma, Arizona (Carr 1971). In 1893, Mearns (1907) reported seeing a herd of 12 pronghorn near border monument 143 in the Baboquivari Valley and small numbers in the Santa Rosa Valley near monument 161 on what is now the Tohono O'odham Nation (Nation). Nelson (1925) stated that

in 1923, local people reported that a few pronghorn were still ranging in the Santa Rosa Valley. Carr (1970) noted the "sighting of eight antelope near Pisinimo on the Papago Indian Reservation which most likely drifted north from Mexico, and that "there have been numerous rumors of antelope in the Papago country ; however, no recent reliable observations are known. Carr (1970) also stated that there "is a considerable amount of good Sonoran antelope habitat on the Papago Indian Reservation and particularly in the Great Plains area. However, Indian hunting and grazing practices prohibit a lasting resident antelope population. In 1894, pronghorn were abundant near monuments 178 and 179, and westward to Tule Well (Mearns 1907). In February 1894, Mearns observed them in the Lechuguilla Desert, as well. In the Colorado Desert (presumably west of the Gila and Tinajas Altas mountains), Mearns (1907) reported that pronghorn were not abundant. He observed pronghorn tracks in California at Gardner's Laguna, 6 miles south of monument 216, and 37 miles west of the Colorado River; and then again at Laguna Station, 7 miles north of monument 224 and 65 miles west of the Colorado River.

While Mearns (1907) suggested that pronghorn may have been common in some areas in the late 1800s, evidence suggests the size of the U.S. population declined dramatically in the early 20th century. Sub-population estimates for Arizona, which began in 1925, have never shown the pronghorn to be abundant (Table 1).

Repeatable, systematic surveys were not conducted in Arizona until 1992. Since 1992, Sonoran pronghorn in the United States have been surveyed biennially (Bright *et al.* 1999, 2001) using aerial line transects (Johnson *et al.* 1991). Sub-population estimates from these transects have been derived using three different estimators (Table 2); currently the sightability model (Samuel and Pollock 1981) is considered the most reliable estimator (Bright *et al.* 1999, 2001). The sightability model involves calculating sighting rates by group size using Sonoran pronghorn groups with radio-collared animals that were either observed or missed during previous surveys. Sightability population estimates were subsequently calculated for all survey years, 1992-2000, and are the sub-population estimates for these years that are shown in Table 2 (Bright *et al.* 1999, 2001; J. Bright, AGFD, Pers. comm. 2001). Table 2 presents observation data from transects and compares estimates derived from the three population models from 1992 through 2000.

Occasional sightings of pronghorn are recorded outside of the range defined by telemetry locations in Figure 4. For instance, a possible pronghorn sighting occurred east of Aztec and north of Interstate 8 in 1990 (U.S. Fish and Wildlife Service1998a). Two adult pronghorn were observed in 1990 (U.S. Fish and Wildlife Service1998a) in the northern San Cristobal Valley approximately 5 miles southeast of Mohawk Pass in the Mohawk Mountains. In 1987, a Border Patrol agent reported a pronghorn on the Tohono O'odham Nation, this sighting was not confirmed. In 2002, a radio-collared pronghorn lingered in the Monument east of State Route (SR) 85 for several weeks before dying.

Bright *et al.* (2001) defined the present U.S. range of the Sonoran pronghorn as bounded by U.S. Interstate 8 to the north, the International Border to the south, the Copper and Cabeza Mountains to the west, and SR 85 to the east. This area encompasses 2,508 mi^2 (Bright *et al.* 2001). Based on pronghorn location records from 1994-2001 (Figure 4), locations of pronghorn from 1983-1995, and observations by Carr (1972) and Hall (1981), pronghorn are believed to occur most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo mountains (Daniel's Arroyo area). Wright and deVos (1986) stated that observations in the Growler Valley were frequent and that the Mohawk Valley, San Cristobal Valley, and Barry M. Goldwater Range (BMGR) support herds of 10 to 20 animals during most of the year. Also mentioned was a regularly observed herd of 7 to10 pronghorn in the Cameron tank area on BLM lands near Ajo.

Although observations of pronghorn were common along and east of SR 85 many years ago, very few Sonoran pronghorn have been reported east of SR 85 in the Monument since 1972. The lack of recent observations east of the highway indicates that this heavily-used road currently poses a barrier to eastward movement. On June 12, 1996, however, an adult doe pronghorn was observed running west off the right-of-way at the approach of a vehicle on the north end of the Crater Range (R. Barry, Luke AFB, Pers. comm. 1996). There also exists an unconfirmed report of four Sonoran pronghorn attempting to cross SR 85 in August 1993 approximately 1 mile north of the Monument visitor center. A juvenile crossed the highway (two lanes) to the east, but with the approach of a vehicle, ran back across the road to rejoin a group of three pronghorn (T. Ramon, OPCNM, Pers. comm. 1993). In July 2002, a radio-collared pronghorn was detected east of SR 85 and remained in the area for several weeks, perhaps due to nutritional stress brought on by the current severe drought conditions throughout the species range. This animal died in August 2002.

In recent years, the Tohono O'odham Nation has not been accessible to state and Federal biologists to survey for Sonoran pronghorn. A Border Patrol agent reported a pronghorn on the Nation lands in 1987 (U.S. Fish and Wildlife Service1998a), although unconfirmed, this is the last report of Sonoran pronghorn on the Nation. There are no recent records of pronghorn south of the Nation in Sonora. Carr (1970) reported that hunting and grazing on the Nation was not compatible with maintaining a viable population of pronghorn. Phelps (1981) reported that pronghorn had not been observed on the Nation for 10 years. These observations suggest that pronghorn are likely extirpated from the Nation and adjacent areas.

The sightability model population estimates from 1992 to 2000 show an alarming 45 percent decrease in sub-population size (Table 2). The estimates indicate a steady decline in sub-population size, with the exception of the 1994 survey. The 1994 estimate may be somewhat inflated due to inconsistencies in survey timing (U.S. Fish and Wildlife Service1998a, Bright *et al.* 2001). The 1994 survey occurred in March (whereas those of other years occurred in December) and therefore the number may be slightly inflated because of the sightability of pronghorn at this time of year (J. Morgart, U.S. Fish and Wildlife Service, Pers. comm. 2001). Different population models may result in divergent estimates. Therefore, the inclusion of estimates obtained prior to 1992 in the analysis of population trends is not reasonable.

Some researchers believe that the number of pronghorn observed on transects is more statistically valid for the evaluation of population trends than estimates generated by population models (Johnson *et al.* 1991, Hervert *et al.* 1997a). The number of pronghorn observed on transects decreased by 32 percent from 1992 to 2000 (Table 2). Contrary to the sightability model estimate, the number of pronghorn observed on transects showed only a minor increase, while the total number of pronghorn sighted actually decreased in 1994 compared to the 1992 survey. High fawn mortality in 1995 and 1996 and the death of half (8 of 16) of the adult, radio-collared pronghorn during the 13 months preceding the December 1996 survey suggests that the decline was real. Five consecutive six-month seasons of below normal precipitation (summer 1994 through summer 1996) throughout most of the Sonoran pronghorn range, likely contributed, in part, to observed mortality (Bright *et al.* 2001, Hervert *et al.* 1997b).

In 1996, a workshop was held in which a population viability analysis (PVA) was conducted for the U.S. sub-population of Sonoran pronghorn (Defenders of Wildlife 1998). A PVA is a structured, systematic, and comprehensive examination of the interacting factors that place a population or species at risk (Gilpin and Soulé 1986). For the Sonoran pronghorn PVA, these factors included impacts of inbreeding, fecundity, fawn survival, adult survival, impacts of catastrophes, harvest, carrying capacity, and numbers and sex/age composition of the present population. Based on the best estimates of demographic parameters at the time, the likelihood of extinction of Sonoran pronghorn was calculated as 1 percent in the next 25 years, 9 percent in the

next 50 years, and 23 percent in the next 100 years. More severe threats include population fluctuation, periodic decimation during drought (especially of fawns), small present population size, limited habitat preventing expansion to a more secure population size, and expected future inbreeding depression.

Furthermore the PVA suggested that the current pronghorn population is extremely sensitive to fawn mortality, with the likelihood of extinction increasing markedly when fawn mortality exceeds 70 percent. Thus, a 30 percent fawn crop (30 fawns/100 does) each year is necessary to ensure the continuance of the population. This level of reproductive success has only been achieved in two of the last nine years. Fawn survival is correlated with precipitation (Hervert *et al.* 1997). With above average precipitation in 1998, 33 fawns per 100 does were produced (Bright *et al.* 2001). In 2001, precipitation levels in the pronghorn range were at the highest levels seen in many years. The remaining U.S. pronghorn herd range responded and their numbers increased from 99 in December 2000 to approximately 140 individuals in December 2001 (based on an estimated increase of 50 individuals by recruitment, minus an estimated adult mortality rate of 11 percent). However, with the severe drought in 2002, all the gains from the previous year have likely been lost, and the biologists working on the species for the FWS and the State are concerned that the December 2002 aerial counts may show a further decline for the species in the U.S. Although an estimated 50 fawns were recruited into the population in 2001, it is unknown how well these young and still-maturing animals will handle the severe drought conditions. This year's (2002) fawn crop, based on surveys, is estimated to be a maximum of 5 individuals and may be as few as one (J. Morgart, U.S. Fish and Wildlife Service Pers. comm., 2002).

Although fawns appear to be more susceptible to drought conditions, adult survival is also impacted in drought years. The current year's drought has profoundly affected adult pronghorn, resulting in the highest adult mortality rate documented thus far. Since 1995 adult mortality has averaged 22 percent a year. Yearly mortality rates have fluctuated around this mean in direct relationship with precipitation. In 1997 and 1999, years with relatively good rainfall, there was only 12 and 10 percent adult mortality, respectively. In contrast, during 1996, a relatively severe drought year, a 38 percent adult mortality was documented. This year (2002), 5 of 7 collared pronghorn have been lost. Given this data, a total of 80 (57 percent of 140) adult pronghorn may have been lost this year, resulting in a population size as small of 60 individuals (J. Morgart, Pers. comm., 2002). Furthermore, the population is likely to undergo further declines before forage conditions improve.

Their previously poor status, coupled with the impacts from this year's drought on both recruitment and adult survival, have resulted in the serious imperilment of the U.S. sub-population. Actions taken by Federal and state agencies in the immediate future will determine whether the Sonoran pronghorn will continue to survive in the United States.

Mexico

Historically, Sonoran pronghorn ranged from the Arizona border south to Hermosillo and Kino Bay, west to at least the Sierra del Rosario, and east to the area south of the Baboquivari Valley on the Tohono O'odham Nation. The distribution in Baja California Norte is less clear, but observations by Mearns (1907) indicate they occurred in the Colorado Desert west of the Colorado River, as well. Nelson (1925) reported that a few herds in northwestern Sonora, Mexico, moved back and forth across the Arizona border. Ben Tinker reportedly counted 595 pronghorn in Sonora in November 1924 (Carr 1974). The herds counted by Carr ranged from the southern end of the Sierra del Rosario, south and east to the Sierra Blanca and the Rio Sonoyta, to the eastern side of the Sierra de San Francisco. On the basis of sightings and confiscated

specimens, Monson (1968) stated that the Sonoran pronghorn persisted in some localities along the east side of the Pinacate Lava Flow southward to about 185 miles south near Guaymas.

In Mexico, Sonoran pronghorn currently range west of Highway 8 near the Pinacate Lava flow, and south and west of Caborca. In 2001, a park ranger at Pozo Nuevo, El Pinacate y Gran Desierto de Altar Biosphere Reserve (El Pinacate), reported that pronghorn have been seen in recent years west of Volcan Pinacate to the Pozo Nuevo area, and reportedly use a cement cattle trough north of Pozo Nuevo (J. Rorabaugh, U.S. Fish and Wildlife Service, Pers. comm. 2001).

Sub-populations of Sonoran pronghorn in Mexico had not been exhaustively surveyed until all suitable habitat within the current known range of the Sonoran pronghorn in Mexico was surveyed in December 2000 (Bright *et al.* 2001). Although the 1993 estimate was approximate, survey results suggested a decline in the sub-population of 16 percent from 1993 to 2000 (Table 3). The December 2000 estimate was 346 individuals. This estimate, together with the 2000 U.S. estimate, brings the total estimated size of the U.S. and Mexico Sonoran pronghorn populations to approximately 445 individuals as of December 2000 (J.L. Bright *et al.*, AGFD, unpubl. data). Although the extent to which the Mexico sub-populations have declined in response to the current year's drought is unknown, the total number of pronghorn in all three sub-populations is now undoubtedly smaller than the 2000 estimate.

Although the Sonoran pronghorn sub-population in Mexico declined approximately 16 percent from 1993 to 2000, the decrease was not experienced equally across pronghorn range. Sonoran pronghorn habitat in Mexico is bisected by Highway 8. The sub-population southeast of Highway 8 remained stable or even increased slightly between 1993 and 2000 (Table 4). Forage conditions in 2000 were notably better in this area than the rest of Sonoran pronghorn range in Mexico and the U.S. (J. L. Bright *et al.*, AGFD, unpubl. data). The sub-population west of Highway 8 ranges throughout suitable habitat on and surrounding Volcan Pinacate, and is adjacent to the U.S. sub-population. Mexico Highway 2 (and to a lesser extent the international boundary fence) acts as a barrier to movement between El Pinacate and U.S. sub-populations. The El Pinacate sub-population declined by approximately 73 percent between 1993 and 2000 (Table 4). Dry periods and associated poor forage conditions, likely exacerbated by extensive livestock grazing, may have figured prominently in the significant decline observed in the El Pinacate sub-population. Loss of the El Pinacate sub-population will result in further fragmentation and isolation of the remaining pronghorn sub-populations in the U.S. and Mexico. Portions of Highway 8 are not fenced. Pronghorn moving across Highway 8 to the southeast may also be an explanation for the changes in these sub-populations' sizes. Between 1993 and 2001, Highway 8 was widened and improved, increasing traffic and probably increasing its effectiveness as a barrier to pronghorn movement.

E. Threats

Barriers that Limit Distribution and Movement

Sonoran pronghorn require vast areas of unencumbered open range to meet their annual needs for survival and reproduction. This includes the ability to freely travel long distances between localized, seasonally sporadic rainfall events in search of forage. Highways, fences, railroads, and irrigation canals can block these essential movements. Highway 2 in Mexico runs parallel to the southern boundary of Cabeza Prieta NWR and divides the range of the pronghorn between the U.S. and El Pinacate sub-populations. This highway supports a considerable amount of fast-moving vehicular traffic, and is fenced along its length, so is likely a substantial barrier to Sonoran pronghorn. In 1999, Dr. Rodrigo Medellin of Instituto de Ecologia, reported that

Sonora, Mexico is planning to widen and improve Highway 2 to four lanes, which will further reduce the likelihood of pronghorn crossing the highway.

Both Cabeza Prieta NWR and the Monument maintain boundary fences along the border. At the southern boundary of Cabeza Prieta NWR, a seven-strand livestock fence continues to be a substantial barrier to pronghorn. Modifying the fences along the U.S./Mexico border to allow pronghorn passage could aid in maintaining genetic diversity if sufficient pronghorn movement occurred. It may, however, also lead to increased pronghorn fatalities from motorized traffic on Highway 2. Mexico has been involved in discussions regarding the fences, as any modifications could potentially affect pronghorn sub-populations in both countries. Sonoran pronghorn habitat in Mexico is also bisected by Highway 8 between Sonoyta and Puerto Peñasco. This highway is bordered by a livestock fence and receives considerable tourist traffic. A less-traveled highway runs from Puerto Peñasco to Caborca.

Between Gila Bend and Lukeville, Arizona, SR 85 appears to be a partial barrier limiting pronghorn dispersal from dispersing eastward from their current range. Traffic volume and average speeds have increased substantially over the last 30 years as international trade and tourism have increased. The Arizona Department of Transportation increased the posted speed limit on SR 85 from 55 to 65 mph in 1997, and 85th percentile traffic speed has increased from 68-71 mph in the same period (NPS 2001). This highway corridor is unfenced in the Monument, allowing potential free movement of pronghorn and other wildlife, but has livestock fencing on both sides for most of the remaining mileage on BLM, Department of Defense (DoD), and private lands between Interstate 8 and the Monument. Interstate 8, the Wellton-Mohawk Canal, agriculture, a railroad, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. De-watering of much of the Rio Sonoyta and barriers to pronghorn accessing the Gila River, such as Interstate 8 and the Wellton-Mohawk Canal, have caused significant loss of habitat and loss of access to water (Wright and deVos 1986). Agricultural, urban, and commercial development at Sonoyta, Puerto Penasco, and San Luis, Sonora, and Ajo, Yuma, and along the Gila River, Arizona, have removed habitat and created barriers to movement. BLM grazing allotment fences in the Ajo area may be a barrier to movement, although they were modified after 1997 to allow safe passage of pronghorn (BLM, *in litt*. 2000). Fences between the BLM lands and the Monument and Cabeza Prieta NWR are also designed to allow passage of pronghorn.

Historically, pronghorn occurred in the Lechuguilla Desert and in low numbers in the Colorado Desert to the west of the Gila and Tinajas Altas mountains (Mearns 1907). No apparent barrier to movement from their current range to the Lechuguilla Desert exists. Interstate 8, Mexico Highway 2, and the Gila and Tinajas Altas mountains form a substantial barrier to movement between the Lechuguilla Desert and the Yuma Desert; however, pronghorn could potentially use Tinajas Altas pass as a corridor through the mountains.

Human-caused Disturbance

A variety of human activities occur throughout the range of the pronghorn that have the potential to disturb pronghorn or its habitat, including livestock grazing in the U.S. and Mexico; military activities; recreation; poaching and hunting; clearing of desert scrub and planting of bufflegrass in Sonora; dewatering and development along the Gila River and Rio Sonoyta; increasing undocumented migrant and drug trafficking along the international border and associated law enforcement response; and roads, fences, canals, and other man-made barriers.

Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human traffic, such as a person walking or running past pronghorn in an enclosed pen, a motorcycle driving past, a truck

driving past, a truck blowing its horn while driving past, or a person entering a holding pen, caused an increased heart rate response in American pronghorn in half-acre holding pens (Workman *et al.* 1992). The highest heart rates occurred in female pronghorn in response to a person entering a holding pen, or a truck driving past while sounding the horn. The lowest heart rates occurred when a motorcycle or truck was driven past their pen. Other investigators have shown that heart rate increases in response to auditory or visual disturbance in the absence of overt behavioral changes (Thompson *et al.* 1968, Cherkovich and Tatoyan 1973, Moen *et al.* 1978).

A pronghorn can canter effortlessly at 25 mph, gallop without straining at 44 mph, and run flat out at speeds of 55-62 mph (Byers 1997). During an aerial reconnaissance, one herd of Sonoran pronghorn was observed 12 miles away from the initial observation location 1.5 hours later (Wright and deVos 1986). Hughes and Smith (1990) found that pronghorn immediately ran 1,310-1,650 feet from a vehicle and that military low-level flights (<500 feet AGL) over three pronghorn caused them to move about 330 feet from their original location. Krausman *et al.* (2001) examined effects of ground-based and aircraft military activities on Sonoran pronghorn at the North and South TACs at the BMGR and concluded that behavioral patterns were similar with and without presence of military stimuli. Military activities, both ground-based and aerial, were associated with some changes in behavior (e.g., from standing to trotting or running, or bedded to standing) but the authors concluded that these changes were not likely to be detrimental to the animals. Eighty-seven (4.1 percent) of the 2,128 events with ground-based stimuli resulted in pronghorn changing their behavior to trotting or running; a total of 866 (41 percent) resulted in some change in behavior. Krausman *et al*. (2001) documented 149 direct overflights and 263 other overflights (in which the aircraft passed ≥328 feet to the side of the animal). Pronghorn changed their behavior 39 and 35 percent of the time during direct and other overflights, respectively. Unfortunately, we can not discern from Krausman *et al*. (2001) how pronghorn responded to low-level helicopter flights. No conclusions could be drawn about effects to fawns due to poor fawn productivity during the study. During times of drought, disturbances that cause pronghorns to startle and run would energetically have a more significant effect. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971).

Livestock grazing has the potential to significantly alter pronghorn habitat (Leftwich and Simpson 1978, Kindschy *et al.* 1982, Yoakum *et al.* 1996). This is especially true in the arid Sonoran Desert. Cattle and other domestic livestock were first brought to northwestern Sonora, Mexico, in 1694 (Wildeman and Brock 2000). Overgrazing well into the 19th century by Spaniards and their descendants caused widespread habitat changes throughout much of the Sonoran Desert, particularly in more settled areas such as central Sonora, Mexico (Sheridan 2000).

American ranchers were running livestock by the early 1900s in much of the area that would later become the Monument (Rutman 1997) and Cabeza Prieta NWR (Cabeza Prieta NWR files). Because there was no international boundary fence until 1947, livestock from both the U.S. and Mexico ranged freely across the border (Rutman 1997). Rutman (1997) estimates 1,000 head of burros and horses were present in 1942 on the southern half of the Monument, and as many as 3,000 cattle on the Monument at one time. Cattle were removed from the Monument, Cabeza Prieta NWR, and the BMGR in 1979, 1983, and 1986, respectively (U.S. Fish and Wildlife Service1998a, Rutman 1997). Grazing continues to be an important use of former pronghorn habitat on the Tohono O'odham Nation. Wright and deVos (1986) stated that poor habitat conditions (caused in part by livestock grazing) still appeared to be the leading cause in the decline in Sonoran pronghorn numbers. In Sonora, livestock grazing occurs in ejidos (community ranches or farms) and other ranch lands throughout much of the range of the pronghorn. Cattle range farther in years with abundant annual growth, and are more limited to

areas near water during hot and dry periods and seasons. In Arizona, cattle grazing continues on lands administered by the BLM in currently occupied pronghorn habitat near Ajo, Why, and Sentinel. Telemetry data indicate little use of BLM lands by pronghorn, despite the recent modification to BLM fences to make them pronghorn-friendly. The lack of pronghorn on BLM lands may be due in part to long-term effects of grazing in changing vegetation amount and type, thus reducing the suitability of the habitat for pronghorn.

Mining occurred historically throughout much of the U.S. range of the pronghorn. Miners probably hunted pronghorn and disturbed habitat locally. No mining occurs now on the BMGR, Cabeza Prieta NWR, or the Monument. The open pit and associated tailings piles at the Phelps Dodge copper mine at Ajo eliminated habitat in that area (MCAS-Yuma 2001, NPS 2001).

Illegal crossings by undocumented migrants and drug smuggling in the U.S. range of the pronghorn has increased dramatically in recent years. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. A total of 25,074 pounds of marijuana were apprehended by Ajo Station agents in 2000 (U.S. Immigration and Naturalization Service 2001). In 2001, estimates of undocumented migrants traffic reached 1,000 per night in the Monument alone (NPS 2001, Milstead 2002). These activities and Border Patrol response have resulted in widespread habitat degradation and increased human presence in remote areas. Increased presence of Border Patrol in the Douglas, Arizona area, and in San Diego (Operation Gatekeeper) and southeastern California, have pushed undocumented migrant traffic into remote desert areas, such as Cabeza Prieta NWR, the Monument, and the BMGR (Klein 2000).

Small Population Size and Aging Demographics

A speculative minimum viable population estimate for pronghorn is 50 animals (Reed *et al.* 1986, Scott 1990); however at populations of less than 100, population viability declines significantly (Defenders of Wildlife 1998a). To maintain genetic diversity, a population of at least 500 is desirable (Defenders of Wildlife 1998a). The U.S. sub-population is below 100, well below 500, and with its decimation during the current year's drought may be at or below 50. At 34 (as of December 2000), the Pinacate sub-population is below the possible minimum viable population. Populations at low levels may experience random variations in sex ratios, age distributions, and birth and death rates among individuals, which can cause fluctuations in population size and possibly extinction (Richter-Dyn and Goel 1972). The sex ratio is currently skewed in favor of females (male:female ratio of 63:100 [Bright *et al.* 2001]) which is advantageous in regard to reproductive potential. However, a scenario in which males outnumber females by a similar margin is just as likely. In very sparse populations, males may have trouble finding females, reducing productivity (Ehrlich and Roughgarden 1987). Small populations are also sensitive to variations in natural processes, such as drought and predation (Hecht and Nickerson 1999).

Of additional concern is the age of individual pronghorns in the U.S. sub-population. Because of limited recruitment over the last seven years, in 2001 an estimated 56 percent of the sub-population was more than six years of age. Pronghorn rarely live more than nine years, thus we can expect the majority of the current adult population to die in the next two to three years (Bright *et al.* 2001).

F. Recovery Plan

The 1982 Sonoran Pronghorn Recovery Plan (U.S. Fish and Wildlife Service1982) was revised in 1998 (Service 1998a). The recovery criteria presented in the revised plan entailed the

establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years, as well as the establishment of at least one other self-sustaining population in the U.S. to reclassify the subspecies to threatened.

Actions identified as necessary to achieve these goals included the following: (1) enhance present sub-populations of pronghorn by providing supplemental forage and/or water; (2) determine habitat needs and protect present range; (3) investigate and address potential barriers to expansion of presently used range and investigate, evaluate, and prioritize present and potential future reintroduction sites within historic range; (4) establish and monitor a new, separate herd(s) to guard against catastrophes decimating the core population, and investigate captive breeding; (5) continue monitoring sub-populations and maintain a protocol for a repeatable and comparable survey technique; and (6) examine additional specimen evidence available to assist in verification of taxonomic status.

In February 2001, the D.C. Federal District Court ordered us to reassess Sonoran pronghorn recovery criteria and to provide estimates of time required to perform recovery actions detailed in the 1998 plan. In response, a supplement and amendment to the 1998 Final Revised Sonoran Pronghorn Recovery Plan was prepared (U.S. Fish and Wildlife Service 2001). We concluded that given the nature of the current threats, unknown elements of pronghorn life history and habitat requirements, uncertainty of availability of suitable reintroduction sites and animals for transplants, internal and external resistance to pro-active management actions on wilderness and other areas of the public lands, and continuing uncertainty regarding the long-term stability and status of sub-populations in Mexico, the data do not yet exist to support establishing delisting criteria. Tasks necessary to accomplish reclassification to threatened status (as outlined in the 1998 plan) should provide the information necessary to determine if and when delisting will be possible and what the criteria should be.

As outlined in the supplement, recovery efforts should focus on: (1) improving habitat for fawn survival and recruitment through the establishment and evaluation of forage enhancement plots on the BMGR; (2) initiating a quantitative evaluation of pronghorn use and reliance on sources of free water (temporary and permanent); (3) reducing predation through the selective removal of coyotes from specific areas and at times of the year when adult female pronghorn are most susceptible to predation; (4) evaluating potential transplant locations, establishing relocation methodology and protocols, developing interagency agreements (including with Mexico as required), acquiring funding, and initiating a reintroduction; (5) increasing frequency and expanding scope of aerial monitoring in Mexico to improve comparability with U.S. surveys; and (6) investigating potential pronghorn disease vectors.

We have produced numerous biological opinions on the pronghorn. These are reviewed in detail, including an accounting of anticipated incidental take, in the "Environmental Baseline section which follows.

II. 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 from which to assess the effects of the action now under consultation.

A. Action Area

The "action area means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Within the U.S. portion of the Sonoran pronghorn's range, pronghorn interact to form one sub-population in which interbreeding may occur. The U.S. sub-population is effectively separated from sub-populations in the Pinacate Region and on the Gulf Coast of Sonora by Mexico Highway 2 and the U.S.-Mexico boundary fence. Activities that may affect animals in any portion of the U.S. range of the pronghorn may affect the size or structure of the U.S. sub-population, or habitat use within the U.S. range. The action area for this biological opinion is defined as the range of the pronghorn within the U.S. (Figure 4)[1]. Effects are most evident on the Monument where the proposed action would occur.

Management of the action area is almost entirely by Federal agencies. The largest area, the BMGR (nearly 2 million acres) is managed by Luke AFB and MCAS-Yuma primarily for military training. Recent legislation removed the BLM from natural resources management on the BMGR in November 2001; natural resources are now managed by MCAS-Yuma (western portion) and Luke AFB (eastern portion) in accordance with the Sikes Act. The Monument manages 329,000 acres in the southeastern corner of the action area for scenic, ecological, natural, and cultural values. Cabeza Prieta NWR lies along the border west of the Monument and encompasses 860,000 acres. Cabeza Prieta NWR is managed to protect, maintain, and restore the diversity of the Sonoran Desert. The BLM manages lands near Ajo (four grazing allotments totaling 191,740 acres) and Sentinel (one grazing allotment totaling 21,876 acres) for multiple use in accordance with the Lower Gila Resource Management Plan.

B. Terrain, Vegetation Communities, and Climate in the Action Area

The action area is characterized by broad alluvial valleys separated by block-faulted mountains and surface volcanics. It is bordered on the west by the Gila and Tinajas Altas mountains. To the east of these mountains are a series of basins and ranges; from west to east these include the Lechuguilla Desert; the Cabeza Prieta and Copper Mountains; the Tule Desert and Mohawk Valley, including the Mohawk Dunes and Pinta Sand Dunes; the Sierra Pinta, Mohawk, and Bryan mountains; the San Cristobal Valley; the Aguila and Granite mountains; the Growler Valley; the Crater Range, Growler, Bates, and Agua Dulce mountains; and the La Abra Plain and Puerto Blanco Mountains west of SR 85. Elevations range from 180 feet in the southwest corner of the BMGR to 3,294 feet in the Growler Mountains. Major drainages and mountain ranges run northwest to southeast. The mountains are of two major types: a sierra type, composed of metamorphic and granitic rock, and a mesa type, typically of basaltic composition. Major drainages flow mostly northward to the Gila River, although southern portions of the Monument and the southern slope of the Agua Dulce Mountains drain south to the Rio Sonoyta, Sonora.

Climate is characterized by extreme aridity, mild winters, and hot summers. Approximately 2.7 inches of precipitation fall annually at Yuma, with slightly more than half of this occurring in the winter months (Turner and Brown 1982). Annual precipitation increases from west to east across the BMGR; at Aguajita/Quitobaquito, precipitation is 10.5 inches annually. Infrequent

[1]In response to *Defenders of Wildlife, et. al., v. Bruce Babbitt, et. al.* (Civil Action No. 99-927 [ESH]), Judge Ellen Huvelle of the United States District Court (Court) for the District of Columbia issued a Memorandum Opinion and Order on February 12, 2001. The Court found that the FWS failed to address the impact of various Federal actions on the Sonoran pronghorn when added to the environmental baseline and failed to include in the environmental baseline the impacts of all Federal activities in the area that may affect, directly or indirectly, the pronghorn. In response to the Judge's order, we have adopted a broader view of the action area than has previously been applied, one which incorporates the home range of individuals of the species within the project footprint.

chubascos (tropical storms) bring heavy rains in September or October that can produce spectacular growth on warm-season perennial plants (Felger 2000).

The vegetation community of the western portion of the BMGR has been classified as the lower Colorado River Valley subdivision of Sonoran Desert scrub (Turner and Brown 1982). It is the largest and most arid subdivision of Sonoran Desert scrub. Vegetation in the valleys, is dominated by the creosote-white bursage series of Sonoran Desert scrub (Turner and Brown 1982). This series occupies approximately three-fourths of the lowland or valley areas in the BMGR (Reichenbacher and Duncan 1989). In this series, creosote and white bursage are often co-dominants, with galleta grass (*Hilaria rigida*), dalea (*Psorathamnus emoryi*), coldenia (*Tequilia plicata*) and other locally abundant species. Distinctive floras are also found in dunes in the area, at Pinta Sands, and at the Mohawk Dunes. Species such as dune buckwheat (*Eriogonum deserticola*), mormon tea (*Ephedra trifurca*), and dicoria (*Dicoria canescens*), are found in one or more of these dune habitats. These species are dune specialists typical of the Gran Desierto dunes in northwestern Sonora (Felger 2000).

In drainages, bajadas, and montane habitats (including the Mohawk, Cabeza Prieta, Granite, and the Sierra Pinta mountains), the mixed scrub series of the lower Colorado River subdivision (Turner and Brown 1982) is found. This community is more diverse than the creosote-bursage series and includes species more representative of the Arizona Upland subdivision of Sonoran Desert, such as palo verde, saguaro (*Carnegia gigantea*), ironwood, and desert lavender (*Hyptis emoryi*), among others. Frost-sensitive species such as elephant tree, limber bush, and Mexican jumping bean (*Sebastiania biloculare*) are also found in this community, but are more representative of species and genera of the Central Gulf Coast subdivision of Sonoran Desert scrub found to the south in Sonora (Dames and Moore 1995, Turner and Brown 1982).

The Arizona Upland subdivision of Sonoran Desert scrub is found in the Growler, Puerto Blanco, and Bates mountains, and surrounding bajadas. Vegetation in this community takes on the appearance of a scrubland or low woodland of leguminous trees, shrubs, and cacti. The woodland component is most developed and species richness is greatest in drainages. In the action area, common trees of the Arizona Upland include palo verdes, ironwood, catclaw acacia, and velvet mesquite (*Prosopis velutina*). Dominant cacti include saguaro, chain fruit cholla, teddy bear cholla, and organ pipe cactus. Senita cactus (*Lophocereus schottii*) more common to the south in Mexico, is found in the southern portion of the Monument and the Agua Dulce Mountains, Cabeza Prieta NWR. Vegetation on Cabeza Prieta NWR, the Monument, and most of the BMGR is largely undisturbed by human activities.

Rutman's (1996) assessment of accelerated erosion at the Monument implicates several historic and on-going sources of erosion, including the continued grazing and recreational use on the BLM's Ajo grazing allotments. Aerial photographs show gullies and headcutting originating on BLM land and working towards the Monument, as well as the denuded or nearly denuded area near Rasmussen Tank (north of the Monument boundary) (Rutman 1996). Rutman (1996) suggests the condition of the area near Rasmussen Tank has resulted in "large flows of water being delivered to Cuerda de Lena and Kuakatch Wash. In addition to the increase in runoff resulting from the condition of the Rasmussen Tank area, Rutman (1996) describes the effects of grazing on the Cuerda de Lena and the Monument's concems for continued grazing: "Grazing along Cuerda de Lena on BLM land has caused the development of vertical cutbanks just north of the Monument. In 1995, these banks were chiselled by cattle hooves. Trees in the riparian zone were hedged by shade- and forage-seeking cattle and understory vegetation was lacking or sparse. These conditions signal resource overuse, a situation that could significantly affect the

Monument if the current permitted stocking rate and grazing system are maintained. (See photographs, Appendix 3)

C. Status of the Sonoran Pronghorn in the Action Area

Distribution

Figure 4 illustrates records of Sonoran pronghorn in Arizona from 1994-2001. Based on these locations and observed locations of pronghorn from 1983-1993, pronghorn are believed to occur most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo mountains (Daniel's Arroyo area). All localities from 1994-2001 are south of Interstate 8, east of the Copper and Cabeza Prieta mountains, and west of SR 85 (Bright *et al.* 2001). In 2002, a telemetered pronghorn moved east of SR 85 in the Monument, but was dead a few weeks later. Habitat north of Interstate 8 has not been surveyed to any extent for pronghorn, but habitat in this area is highly fragmented. Interstate 8 and the Wellton-Mohawk Canal are probably barriers to movement of pronghorn.

On Cabeza Prieta NWR, pronghorn groups were most often observed on the southwestern edge of the Sierra Pinta Mountains and in the Pinta Sands, in the valley between the Sierra Pinta and Bryan Mountains, in the San Cristobal and Growler valleys, and near Daniel's Arroyo. At the Monument, pronghorn were most often observed near Acuna and Bates wells, and west of the Bates Mountains and Cipriano Hills. On the BMGR, concentrations of animals were observed near HE Hill on South TAC, with scattered sightings through the San Cristobal Valley and into the Mohawk Valley. John Hervert (AGFD, Pers. comm. 1996) also believes that pronghorn frequent the northern portion of the Agua Dulce Mountains. Pronghorn may have used the Pinta Sands area to a greater degree in the early 1970s (AGFD 1981).

Pronghorn often seek the thermal cover found in the Arizona Upland subdivision of Sonoran Desert scrub during the hot, dry summer months. This cover is best developed in the southeastern portion of their range in Arizona. With the onset of summer rains or cooler temperatures, pronghorn may move to the more open valleys and flats, such as the Growler Valley and Pinta Sands. Rocky, mountainous terrain, such as the slopes of the Growler or Mohawk Mountains, is not considered habitat for the Sonoran pronghorn (deVos 1990); however, pronghorn may be found on lower slopes and in associated washes (L. Thompson-Olais, U.S. Fish and Wildlife Service, Pers. comm.1996).

While pronghorn are present in the Monument at all times of year, a greater proportion of the U.S. population is present in the Monument from approximately February through August each year. This period corresponds with the fawning period and the annual spring warming-drying trend. Pronghorn move east into the Monument, in part to fawn, and also to move upslope onto more densely vegetated bajadas in search of forage, thermal cover, and a slight respite from the greater heat of valley floors. Thus, pronghorn use the Monument under conditions of greatest thermal and hydrational stress. Pronghorn historically crossed SR 85 to use bajada habitats in eastern portions of the Monument, and may still attempt to during the most extreme drought conditions as indicated by the presence of a radio-collared pronghorn during summer 2002.

Population Size and Dynamics

Data on the size of the U.S. population of Sonoran pronghorn is presented in Tables 1 and 2. Before 1992, population estimates were not repeatable or accurate enough to be comparable or to discern trends in population size. However, anecdotal information in historic observations

suggests a real decline. Observations of Mearns (1907) in the early 1890s suggested that pronghorn were locally common in what is now Cabeza Prieta NWR. From 1925-1968, however, population estimates ranged from only 50-105 individuals. Mearns (1907) observed pronghorn in the Lechuguilla Desert, in the Colorado Desert, and on what is now the Tohono O'odham Nation, as well. The pronghorn is not known to occur in these areas today; thus populations declined and the range contracted substantially during the early 20th century.

Quantitative, repeatable estimates of population size were calculated from survey data collected in 1992, 1994, 1996, 1998, and 2000. As late as 1994, the estimated U.S. sub-population of Sonoran pronghorn using distance sampling methods was 282 individuals. The results of an aerial survey, conducted in December 1996, suggested that the most reliable estimate (based on capture-recapture estimates using collared individuals) was 130 individuals at that time (Bright *et al.* 2001). The decrease in the population may be attributable, in part, to dry periods in 1994 (November), 1995 (summer), and 1996 (winter). Because available food was not as abundant during this period, pronghorn may have been forced to use habitat where they are more vulnerable to predation. Lack of water may also be a factor affecting the pronghom.

In 1995, there was abundant rainfall in the spring. Productivity of Sonoran pronghorn was between 1 and 1.4 fawns per doe. In July, the proportion of fawns to does was as high as 50 percent. However, as dry conditions set in from July to December, most fawns died. Recruitment for the year was only 12 fawns per 100 does (12 percent). Dry conditions continued in 1996 and 1997, during which no fawns were known to have been recruited into the population. The heavy and steady precipitation during winter of 1997-98 produced perhaps the best annual plant production since 1978, and good fawn recruitment occurred that year (33 fawns per 100 does). The spring of 1999 was drier than normal, and no fawns were known to have survived by December. Fawn production was 14 fawns per 100 does in 2000 (Bright *et al.* 2001). An exceptional fawn crop in 2001 of approximately 50 fawns may reflect good precipitation in spring and summer of 2001 (J. Hervert, AGFD, Pers. comm. 2001). However, with the severe drought in 2002, it is likely that all gains from the previous year's recruitment have been lost. Further, it appears that few if any of the fawns born in 2002 have survived.

At a population viability analysis workshop conducted for the Sonoran pronghorn, recruitment at a level of 30 fawns per 100 does was deemed to be necessary for the subspecies to persist (Hervert 1996, Defenders of Wildlife 1998). Although there is a close relationship between fawn survival and precipitation, in the context of the last 100 years, the 1990s were not characterized by drought (Rowlands 2000); thus factors, in addition to precipitation, likely contributed to the population decline. However, the seasonal timing and intervals between rainfall events may be more significant than annual totals (J. Hervert, AGFD, Pers. comm. 2001).

Adult mortality has been high in recent years, with predator-related mortality being the most frequently identifiable cause of death. Thirty-five adult pronghorn have been radio-collared by AGFD since 1994. Of these, 22 (63 percent) have died. A total of 11 of these mortalities were attributed to predation, while the remaining were from unknown causes. Some of the 11 mortalities attributed to unknown causes were likely caused by predation (J. Hervert, AGFD, Pers. comm. 1999); however, unavoidable lag times between time of death and scene investigation caused evidence to be obscured. No collared pronghorn mortalities were documented during dry periods and no evidence of predation of pronghorn was documented near water sources (J. Hervert *et al.* 2000). Two recent mortalities of radio-collared pronghorn in July 2002 are suspected to be from heat stress and/or malnutrition resulting from inadequate forage conditions due to drought (J. Hervert, AGFD, pers. com. 2002). Capture myopathy (physiological condition of an animal, caused by fear, stress, and/or overexertion that sometimes manifests itself during or up to 14 days after capture and left untreated the effects can range from temporary debilitation to death) may have played a role in up to five of the mortalities in 1994

(Hervert *et al.* 2000). In the majority of documented mortalities, bone marrow condition was assessed. Only one specimen was determined to be in poor to fair condition, while all others were determined to be in good condition.

Mortality of radio-collared adults in 2002 has been exceptionally high. At the start of the year, a total of 7 radio-collared Sonoran pronghorn were at large in the U.S. sub-population. By August 2002, only 1 was confirmed alive (one transmitter failed - the status of that animal is unknown). Of the 5 mortalities, one was due to mountain lion predation, one was an old female which probably died of natural causes, and three had no identifiable cause of death. The latter three deaths are source of great concern. Given the lack of any signs of disease or predation, and the timing of their deaths during one of the most severe drought years ever recorded, these animals may have died of heat stress and/or malnutrition resulting from inadequate forage conditions due to drought. The deaths of these individuals is perhaps indicative of how severe conditions have become in 2002. Three recent sighting of pronghorn in various parts of their range verify their declining condition. In July 2002, adult pronghorn were observed on the Monument, Cabeza Prieta NWR, and the North TAC of BMGR. In all three cases, observers described the pronghorn as emaciated, with ribs visible, and rough coated (M. Coffeen, USFWS, pers. com. 2002).

Although 7 radio-collared animals is a small sample size, the death of 5 of these in 2002 is alarming. Assuming an estimated population size of 140 animals at the start of 2002, if the mortality rate is 83 percent and the recruitment rate is near zero, then a rough estimate of population size by year end may be as few as 25-65 animals (J. Bright, AGFD, pers. com. 2002). More accurate estimates of population size will not be available until aerial survey flights are completed in December 2002 (J. Hervert, AGFD, pers. com. 2002).

Drought

Precipitation, particularly winter rainfall, is closely associated with production of annual forage, although other factors, such as timing of precipitation, temperature, and soils are important, as well (Felger 2000, Inouye 1991). Hervert *et al.* (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain. Bright *et al.* (2001) concluded that low rainfall and poor forage conditions from 1994-2000 have negatively affected Sonoran pronghorn.

Arizona experienced record drought conditions in 2002, and the pronghorn appeared to be directly affected. Two radio-collared pronghorn died of apparent heat stress and/or malnutrition resulting from inadequate forage conditions due to drought in July, and one radio-collared pronghorn crossed SR 85 in July and remained east of SR 85 for several weeks, perhaps in desperate search for food and water, and died, still east of SR 85 in August 2002 (J. Hervert, AGFD pers. com. 2002). Mortality of Sonoran pronghorn due to heat stress/malnutrition had not previously been documented, and pronghorn had not been documented in areas east of the SR 85 on the Monument since 1972.

Rowlands (2000) examined trends in precipitation for southwestern Arizona and the Monument from 1895-1999. For southwestern Arizona, no trend in precipitation was found for the period, but low precipitation occurred around 1895 and during the 1950s. Periods of high precipitation occurred in 1915-1920 and in the 1980s. For the Monument, there was a slightly increasing trend

in monthly and annual precipitation over the period 1895-1999, a strong drought occurred in the 1950s, and a lesser drought occurred in the 1970s (Felger 1980 notes a 34-month period, from September 1969-August 1972, without precipitation in the Sierra del Rosario). No discernable trend in precipitation in southwestern Arizona or the Monument was found in the 1990s, which is when the current decline in the U.S. pronghorn population began. At four stations in southwestern Arizona, Hervert *et al.* 2000 note below normal precipitation in the winters of 1995/1996 (-2.78 inches) and 1996/1997 (-2.87 inches), and wet winters in 1994/1995 (+1.97 inches) and 1997/1998 (+4.29 inches). Annual plant production was exceptional in the winter of 1997/1998 and spring of 1998. Winter of 1992/1993, spring of 1993, and spring of 2001 also saw a very good crop of annual plants.

NPS (2001) examined available data on precipitation and concluded that "although substantial year-to-year variations exist, the general trend in the later 20th century has been one of slightly increasing rainfall at the Monument. Given that pronghorn populations survived the droughts of the 1890s, 1950s, and 1970s, it is unreasonable to solely attribute the current decline in the U.S. pronghorn population to drought. NPS (2001) concluded, "If (individual) recent dry years have had an impact on Sonoran pronghorn, it is most likely because in recent decades Sonoran pronghorn have much more limited options for coping with even brief moderate drought. Because of restrictions on their movements and range, and increasing human presence within their range, pronghorn are less able to employ their nomadic strategy in search of relief. It is not that drought itself is an impact, but possibly that drought has *become* an impact, due to other factors confounding the species' normal ecological strategy.

Disease

Leptospirosis is a contagious, febrile (fever) disease caused by a spirochete bacteria (*Leptospira interrogans*) that affects mammals (including humans), birds, reptiles, amphibians, and insects. The infection is usually transmitted through skin or mucous membrane contact with the urine of infected animals and by contact with soil, water, or plants that have been contaminated by infected urine. It is believed that the bacteria may live outside the host organism for up to six months under favorable conditions. In general, infections may be very mild and symptomless or may result in disease conditions, including fever, jaundice, hemoglobinuria (a disorder that destroys red blood cells, resulting in the presence of hemoglobin in the urine), renal failure, abortion, and/or death (Merck and Company 1986). Following an abortion caused by leptospirosis, fetal membranes may be retained and fertility may be impaired (Merck and Company 1986). Leptospirosis is considered a serious disease in the livestock industry. Confirmed cases of leptospirosis in the United States are relatively low, but because symptoms of the disease can be nonspecific, actual incidences of the disease may be higher.

The closely related hemorrhagic diseases, bluetongue virus (BTV) and epizootic hemorrhagic disease (EHD), are noncontagious, insect-transmitted viral diseases of wild and domestic ruminants. The biting midge (*Culicoides* sp.) is a suspected vector of the transmission of both diseases (Hoff and Trainer 1981). BTV has also been found in naturally infected cattle lice (*Haematopinus eurysternus*) (Hoff and Trainer 1981). The viruses are associated with wet weather and/or moist, low-lying areas, which would facilitate favorable breeding conditions for the midge. New research by the U.S. Department of Agriculture, indicates that *Culicoides sonorensis* is likely the primary vector (Stellijes 1999). This species is found in the southern and western states. EHD occurs throughout the distribution of the white-tailed deer (*Odocoileus virginanus*). The diseases are sometimes difficult to distinguish from each other because symptoms and lesions are nearly identical and both viruses can be active at the same time.

Like leptospirosis, BTV is considered a serious disease in the livestock industry. According to Hoff and Trainer (1981), all evidence of disease transmission between species in the United States suggests that BTV is spread from domestic livestock to wildlife. Other experts, however, believe that it is not always possible to determine the path of transmission because there may be several species of livestock and wildlife in a given area that may act as hosts of the disease (T. Noon, Arizona Veterinary Diagnostic Lab, Pers. comm. 2001). The impacts of EHD are not as clear in the livestock industry, but are obvious on free-ranging artiodactyls, causing sporadic but locally severe die-offs of white-tailed deer and occasional mortality reported in pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) (Hoff and Trainer 1981). Both diseases are often fatal in wild ruminants, causing extensive hemorrhaging. Cattle infected with BTV typically show no clinical signs, but abortion or the birth of abnormal calves may occur if the cow becomes infected during gestation (Merck and Company 1986). Pronghorn infected in the wild with EHD have been observed to have convulsions, "running fits, and ataxia (the inability to coordinate voluntary muscular movements); experimental infections additionally showed signs of anorexia, dyspnea (difficult or labored breathing), and central nervous system depression (Hoff and Trainer 1981). With both diseases, reproduction of wild ruminants may be adversely affected if does are infected during gestation, resulting in early absorption of the fetus, uncomplicated abortion, and higher susceptibility of fawns to infection, usually resulting in death. Additionally, does who have survived an infection "may succumb to the stress of pregnancy as a result of their earlier infection (Hoff and Trainer 1981).

Blood samples from U.S. Sonoran pronghorns were collected between 1994 and 2000 for serologic, hematologic, and serum chemistry testing. Samples collected in 1994 provided evidence of pronghorn exposure to *Leptospira interrogans* serovar *hardjo* (a strain of the leptospirosis-causing bacteria carried by cattle and sheep) and a high seroprevalence (the rate at which a specific population tests positive for particular antibodies) to BTV and EHD, in both the 1994 and 1997 samples (National Wildlife Health Center, *in litt.* 1999). Results from the AGFD's winter 1997-1998 serology study showed a high seroprevalence for BTV and EHD. Of the nine serum samples, seven animals tested positive for BTV and all nine were positive for EHD; all were negative for leptospirosis (AGFD, *in litt.* 1998; University of Arizona, Arizona Veterinary Diagnostic Lab, *in litt.* 1998). Five additional samples were collected in December 2000 and evaluated at the Arizona Veterinary Diagnostic Lab at the University of Arizona. All five samples tested positive for both BTV and EHD (one sample was considered a "weak positive) (U.S. Fish and Wildlife Service 2001). Leptospirosis, BTV, and EHD may adversely affect reproduction and recruitment and are all potentially fatal diseases. Leptospirosis may be having an effect on pronghorn reproduction and fawn survival by causing abortion or birth of fawns that are weakened by infection (National Wildlife Health Center, *in litt.* 1999).

D. Past and Ongoing Non-Federal Actions in the Action Area

The Status of the Species section describes a variety of human activities that have affected the Sonoran pronghorn since initiation of livestock grazing in the early 1700s (Officer 1993). Most non-Federal activities that have affected the pronghorn are historical in nature, and pronghorn have been all but extirpated from private, State, and Tribal lands.

Before the Taylor Grazing Act of 1934, and land use designations such as the Monument, the BMGR, and Cabeza Prieta NWR, unregulated cattle grazing was widespread in the current range of the pronghorn. Forage and precipitation is greater in the eastern portion of the current range, thus it is likely that grazing was more prevalent in BMGR-East, Cabeza Prieta NWR and the Monument, than in BMGR-West (MCAS-Yuma 2001). However, cattle grazing presently occurs west of Volcan Pinacate and near the Sierra del Rosario in northwestern Sonora, which are as dry as much of BMGR-West; thus we suspect cattle grazing historically occurred

throughout the current U.S. range. The degree to which cattle grazing may have affected soils and vegetation communities in this area is impossible to quantify. Humphrey (1987) compared vegetation in historic photos taken at boundary monuments in the early 1890s with photos taken in the 1980s and could not discern any temporal differences in vegetation in what is now the Monument, Cabeza Prieta NWR, and BMGR. However, the changes may have occurred before 1890. In reference to monument 172 at the southern end of the Quitobaquito Hills, Humphrey notes "the entire region near the spring has probably been grazed by domestic livestock since their introduction by the Spaniards in the early eighteenth century. Any grasses that might have grown there prior to that time had probably been grazed out long before the Monument was erected. NPS (2001) discusses possible effects of long-term grazing in pronghorn habitat, and apparent evidence and impacts of grazing still visible at the Monument 25 years after cattle were removed.

Before the establishment of the Monument, BMGR, and Cabeza Prieta NWR, mining occurred in many of the mountain ranges of the area. The copper mine at Ajo was operated by Phelps Dodge Corporation and others from 1911 to 1985. The open pit mine and its tailings eliminated pronghorn habitat east and southeast of Ajo. Smaller mining operations caused habitat disturbance locally, but most mines were in mountainous terrain outside of pronghorn habitat.

Hunting and poaching may have been an important factor historically in the decline of pronghorn populations early in the 20th century; however, the Sonoran pronghorn has been protected from hunting in the U.S. for more than 50 years, and we are not aware of any recent poaching events (U.S. Fish and Wildlife Service 1998a). Recreational hunting for other species occurs within the U.S. range of the pronghorn. Of particular importance is the bighorn sheep season, which occurs in December of each year, when a small number of hunters access remote portions of Cabeza Prieta NWR and BMGR to hunt a limited number of sheep. Presence of hunters in pronghorn habitat and discharge of firearms has the potential to disturb pronghorn; however, sheep hunting occurs at a time of year when temperatures are moderate, and hunters focus their activities in the mountains whereas pronghorn are in the valleys and bajadas.

Development of agriculture, construction of canals, roads, towns, a railroad, and other activities along the Gila River excluded pronghorn from the riparian habitats and water available along the river. Similarly, construction of Sonora Highway 2, the U.S./Mexico boundary fence, and towns and agriculture along the Rio Sonoyta, excluded pronghorn from these riparian habitats, as well. Flow in the Gila and Sonoyta rivers are now much reduced or restricted to return agricultural flows or periodic flood flows. These greenbelts may have been a source of water and forage, and probably acted as buffers, to enhance survival of pronghorn during drought periods (U.S. Fish and Wildlife Service 1998a).

Numbers of undocumented migrants and smugglers have increased dramatically in the action area. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. A total of 25,074 pounds of marijuana were apprehended by Ajo Station agents in 2000 (U.S. Immigration and Naturalization Service 2001). In 2001, estimates of undocumented migrant traffic reached 1,000 per night in the Monument alone (NPS 2001) and 150,000 for the year (Milstead 2002). These activities have resulted in route proliferation, off-highway vehicle (OHV) activity, increased human presence in backcountry areas, discarded trash, and abandoned vehicles. Habitat degradation and disturbance of pronghorn almost certainly results from these illegal activities. Increased illegal activities have precipitated increased law enforcement presence, particularly Border Patrol, with additional

associated adverse effects. However, without Border Patrol efforts the impacts from undocumented migrants would be even greater.

E. Past and Ongoing Federal Actions in the Action Area

Because of the extent of Federal lands in the action area, most activities that currently, or have recently, affected pronghorn or their habitat are Federal actions. The primary Federal agencies involved in activities in the action area include the Marine Corps, USAF, Service, BLM, NPS, and Border Patrol.

Resource management on and near the BMGR is coordinated through the BEC (Barry M. Goldwater Executive Committee), a group of Federal and state agency representatives with statutory authority and management responsibility for the BMGR, its resources, and adjacent Federal lands. Formalized in March 1998, the BEC provides a conduit for communication regarding resource management issues, conflicts, and planning on the BMGR. Membership on the council includes representatives from Luke AFB, MCAS-Yuma, the Phoenix and Yuma field offices of BLM, Cabeza Prieta NWR us, the Monument, AGFD, and Tucson and Yuma sectors of the Border Patrol. No single agency serves as the council lead and the organization operates on a consensus basis. One subcommittee of the BEC is dedicated to Sonoran pronghorn.

AGFD, working in cooperation with a number of federal agencies, has captured and radio-collared a total of 35 adult Sonoran pronghorn since 1994; 22 in 1994, nine in 1997/98, and four in 2000. Five pronghorn captured in 1994 died within 1-33 days post-capture. Three of these mortalities were from unknown causes, while two appeared predator-related (mountain lion [*Puma concolor*] and coyote [*Canis latrans*]). Since it is unusual to have this many animals die within 40 days post-capture, the direct or indirect effects of capture myopathy, was a suspected factor in their deaths. Capture and handling procedures were immediately modified and no subsequent losses related to capture myopathy have occurred. A sixth animal died from a broken neck caused by capture operations in December 2000. Despite these detrimental effects, data collected through radio telemetry are ultimately of great benefit to the conservation of the subspecies. Telemetry data provide information regarding habitat use and requirements, movement patterns, and increase the validity of population estimates.

In the following discussion, we have categorized Federal actions affecting the pronghorn as: (1) those actions that have not yet undergone section 7 consultation (although in some cases consultation has been completed on components of the Federal activity), and (2) Federal actions that have undergone consultation.

Federal Actions For Which Consultation Has Not Been Completed

Management at Cabeza Prieta NWR

Over 90 percent of Cabeza Prieta NWR was designated by Congress as wilderness in the1990 Arizona Wilderness Act. To help maintain wilderness character, no vehicular traffic is allowed except on designated public use roads. Vehicles may be parked up to 50 feet from the center of the roads in areas previously used by other vehicles. All other off-road travel is prohibited. Visitors are encouraged to practice a "leave no trace" ethic. Recreational activities on the Cabeza Prieta NWR include backpacking, hunting, camping, rock climbing, mountain biking, and driving on roads. Before entering, visitors must obtain a valid Refuge Entry Permit and sign a Military Hold Harmless Agreement.

Most of the Cabeza Prieta NWR is within the air space of the BMGR. Numerous low-flying aircraft cross the Cabeza Prieta NWR on their way to air-to-ground bombing and gunnery ranges

located to the north. Low-level helicopter flights are limited to flight corridors and occur only in the spring and the fall. In FY 1995 this use represented 4.5 and 16.5 hour, respectively. However, such flights may cause pronghorn to flee (Workman *et al.* 1992). Some military training exercises over the Cabeza Prieta NWR may require limitations on travel and even short periods of closure to the public.

Four-wheel drive vehicles are required on all routes except Charlie Bell Road where 2-wheel drive high-clearance vehicles may be driven. Driving in wet areas is prohibited and visitors are encouraged to not travel during wet conditions due to possible damage to refuge roads. In addition to the prohibitions mentioned above, the following activities are prohibited: dumping of litter, sewage, or liquid waste; firearms, except as authorized in writing by the Cabeza Prieta NWR manager; prospecting, removal, or disturbance of sand, rock, gravel, or minerals; rock hounding; excavating or removing objects of antiquity, cultural artifacts, or paleontological artifacts; trapping; collecting, possessing, molesting, disturbing, injuring, destroying, removal, or transportation of any plant, or animal, or part of the natural flora and fauna on the NWR (exceptions to the above are legally taken game); wood campfires; and unleashed pets.

The management plan for the Cabeza Prieta NWR includes an endangered species management component (U.S. Fish and Wildlife Service 1998b). Activities in this component include the use of remote sensors, an increase in monitoring, and the possibility of the establishment of experimental waters for pronghorn. Specific objectives concerning management goals for the pronghorn were presented in a preliminary draft Comprehensive Conservation Plan (CCP) for the Cabeza Prieta NWR (U.S. Fish and Wildlife Service 1998b) and included coordination with AGFD to conduct aerial surveys, weekly telemetry flights, radio-collaring operations, digital vegetation mapping, food plot feasibility studies, installation of water developments with photomonitors to document pronghorn use, telemetry tracking using remote data loggers, and coordination with Mexican authorities on pronghorn populations south of the border. Work continues on the CCP; the EIS is expected to be completed in early 2003. When the CCP is completed, we will conduct section 7 consultation on that Plan. In the interim, we conduct section 7 consultations on individual actions when they are proposed and the refuge requests consultation.

Cabeza Prieta NWR provides habitat for the pronghorn and is actively working to conserve the species. However, the presence of humans within pronghorn habitat may constitute a major disturbance factor. Furthermore, human presence may restrict pronghorn access to cover and/or forage and effectively create a barrier to movement.

Tucson Sector of the Border Patrol

The Tucson Sector Border Patrol section 7 consultation is not yet complete (consultation number 2-21-99-I-138). We have received a preliminary draft BA and expect to receive a second draft from the Tucson Sector Border Patrol in the near future. This consultation encompasses all field activities conducted by the Border Patrol-Tucson Sector, as part of the program to detect, deter, and apprehend undocumented migrants and drug traffickers. Also included will be the newly initiated patrol operation, Operation Grip, which is being conducted on the Los Vidrios Trail area of the Agua Dulce Mountains on Cabeza Prieta NWR. As part of this operation, trailers, which serve as living quarters for Border Patrol agents, have been placed near Bates Ranch on the Monument.

The Tucson Sector is comprised of nine stations: Ajo, Casa Grande, Tucson, Nogales, Sonoita, Naco, Douglas, Wilcox, and Phoenix. The activities within 8 of these stations, Phoenix

excluded, are addressed by the consultation. Activities within the Ajo Station have the greatest potential to adversely affect pronghorn. Adverse effects may result from patrol road activities, drag road activities, off-road operations, aircraft overflights, and the use and maintenance of sensors. Further, the potential for disturbance to pronghorn due to human presence may increase in areas where agents live on site (i.e., Operation Grip).

Patrol roads used by Border Patrol agents are typically public or private ranch roads. Although the Border Patrol is not the primary user of these roads, they do have the potential to encounter Sonoran pronghorn during patrols and cause them to flee the area. The Border Patrol monitors tracks of undocumented migrants on drag roads (dirt roads that are regularly cleared by dragging tires behind a vehicle and then monitored for human tracks). Less than 10 miles of drag roads are used by the Ajo Station. Pronghorn appear to have an affinity for drag roads as the process of preparing the roads promotes forb growth (J. Hervert, AGFD, Pers. comm. 1999). Additionally, these roads may be utilized by pronghorn as bedding areas due to greater predator detection resulting from increased visibility (J. Hervert, AGFD, Pers. comm. 1999). Pronghorn attracted to these areas may be adversely affected by the presence of patrols and road preparation activities. Sensors are placed at strategic locations along the U.S.-Mexico border on established roads or trails within known travel corridors to detect illegal activities. The Ajo Station uses and maintains approximately 85-90 sensors during daily operations. Sensor installation and/or maintenance activities could disturb pronghorn if they are in the immediate area. However, these disturbances should be infrequent and short in duration.

Off-road activities include agents on foot, the use of OHVs, including four-wheel drive vehicles, dirt bikes, and all-terrain vehicles. These activities may disturb pronghorn and disrupt normal behavioral activities. Motorized off-road activities also degrades pronghorn habitat. In addition to off-road activities, one routine helicopter patrol route is flown from Why along a southwesterly route to the Agua Dulce Mountains. Additional helicopter activities may occur throughout the range of the pronghorn and helicopters may hover and land. Areas where low-level helicopters are used have the highest potential for disturbance to pronghorn. Evidence from other subspecies of pronghorn and other ungulates suggests that pronghorn may exhibit elevated heart rates, may flee, and could alter habitat use in response to low-level helicopter flights (Workman *et al.* 1992).

Yuma Sector Border Patrol Beacon Stations

After initiating emergency consultation, the Yuma Sector Border Patrol installed six emergency beacon stations (panic buttons) on the BMGR as a means to reduce mortality of illegal migrants. The stations are comprised of a 30-foot pole illuminated with a beacon. The poles are mounted on a cement block that is approximately 5 ft^2 and 3 to 4 ft high. While the installation of the stations resulted in little habitat disturbance, the presence of the electronic stations may increase human presence in these areas (undocumented migrants, and maintenance and rescue crews) and therefore represents an additional disturbance factor for pronghorns. To date, however, the beacon stations have only been activated once. Yuma Sector Border Patrol has reinitiated consultation on their ongoing activities, including the operation and maintenance of these beacons. We are currently reviewing the preliminary draft BA for these activities.

Federal Actions Addressed in Section 7 Consultations

As part of our comprehensive discussion of all past and present actions affecting pronghorn within the action area, we describe below all biological opinions issued to date that may affect the pronghorn.

Four of the opinions addressed projects with minor effects to the pronghorn. Two opinions (consultation numbers 2-21-83-F-26 and 2-21-88-F-6) covered capture and collaring of pronghorn for research purposes, with no take of pronghorn anticipated. Consultation number 2-21-88-F-81 involved installation of a water source in the Mohawk Valley for pronghorn, with no take anticipated. Consultation number 2-21-89-F-8 addressed change in aircraft use by Luke AFB on the BMGR, including change in aircraft type from the F-15A/B to the F-15E, and an increase in nocturnal flights (F-15E Beddown Project). We anticipated take of pronghorn in the form of harassment as a result of aircraft overflights. Reasonable and prudent measures to minimize take included: (1) development of long-term studies to determine the effects of overflights on the pronghorn, (2) if effects of overflights are identified, Luke AFB would work with us to eliminate them, and (3) work involving pronghorn would be carried out in accordance with appropriate State and Federal permits. This project was later incorporated into the biological opinion on Luke AFB's activities on the BMGR, discussed below.

In response to *Defenders of Wildlife, et. al., v. Bruce Babbitt, et. al.* (Civil Action No. 99-927 [ESH]), Judge Ellen Huvelle of the United States District Court (Court) for the District of Columbia issued a Memorandum Opinion and Order on February 12, 2001. The Court found that the FWS failed to address the impact of various Federal actions on the Sonoran pronghorn when added to the environmental baseline and failed to include in the environmental baseline the impacts of all Federal activities in the area that may affect, directly or indirectly, the pronghorn.

The Court ordered the FWS to produce, in consultation with the defendants, revisions of the following biological opinions: Air Force (USAF) (August 1997), Army National Guard (ARNG) (September 1997), Bureau of Land Management (BLM) (December 1997), Marine Corps (April 1996), and NPS (June 1997). The Court further ordered that the FWS, in consultation with the Federal agencies whose biological opinions have been remanded, must reconsider those portions of the opinions that have been found to be contrary to the dictates of the ESA. This included the scope of the action area, analysis of the environmental baseline, and analysis of the effects of incidental take in context with a revised environmental baseline. The remanded biological opinions were issued on November 16, 2001. In the following discussion, we describe both the original and remanded opinions for these five consultations.

BLM's Lower Gila South Management Area

Three biological opinions address BLM's Lower Gila South Management Area. The Lower Gila South Resource Management Plan-Goldwater Amendment (consultation number 2-21-90-F-042), proposed specific and general management guidance for non-military activities on the BMGR. Of particular importance for pronghorn was proposed management of recreation. Use of the BMGR is by permit only. The number of BMGR recreational use permits issued by the BLM field offices has increased dramatically in recent years, with a total of 893, 2545, and 3528 permits issued in 1998, 1999, and 2000, respectively. Permits are also issued by the USAF, Marine Corps, and Cabeza Prieta NWR. Permits are valid for any part of the BMGR that is open to public recreation. Recreation authorized on the BMGR included sightseeing, OHVs, vehicle camping, backpacking, hiking, and picnicking. The presence of an increasing number of humans creates a disturbance risk to pronghorns, and OHVs may constitute a mortality factor. The OHV roads and heavily used vehicle-camping areas degrade habitat and may disturb pronghorn, as well as create barriers to pronghorn movement. No incidental take was anticipated. We provided conservation recommendations to reduce interaction between pronghorn and recreationists, exclude wild horses and burros from endangered species habitat, and investigate the effects of water sources on pronghorn. The non-jeopardy biological opinion, issued April 25, 1990, was programmatic, requiring BLM to consult when site-specific projects are proposed. To date, no site-specific formal consultations have been conducted. In November 2001, BLM's management

of the range ceased and was replaced by the BMGR Integrated Natural Resources Management Plan (INRMP). A draft INRMP has been completed and should be finalized, after undergoing section 7 consultation, by December 2002.

The Lower Gila South Habitat Management Plan (HMP) (consultation number 2-21-89-F-213) provided management guidance for both specific and general actions in southwestern Arizona. Four actions were addressed in the HMP, including an exchange of 640 acres near Ajo, rehabilitation work on two catchments, and assessment of livestock removal from pronghorn habitat. Exchange of land out of public ownership may facilitate development or other uses that would preclude use by pronghorn. We provided the following conservation recommendations: a study to determine the effects of water developments on pronghorn and their competitors and predators, and development of a water catchment renovation plan in coordination with Cabeza Prieta NWR. No incidental take was anticipated. The non-jeopardy opinion was issued on May 15, 1990.

The biological opinion for the Lower Gila South Resource Management Plan and Amendment (consultation number 2-21-85-F-069) addressed programmatic management of lands in southwestern Arizona, including livestock grazing, wilderness, cultural resources, fire, minerals and energy, recreation, wildlife management, wood cutting, Areas of Critical Environmental Concern, and other land uses. The biological opinion concluded that OHV restrictions and designations of Areas of Critical Environmental Concern would benefit pronghorn, but wood cutting, recreation, grazing activities, mining, and designation of utility corridors would adversely affect pronghorn. Incidental take of the pronghorn was anticipated, but not quantified. Any decline of forage quality or increase in the amount of fencing was judged to indicate that incidental take had been exceeded. Reasonable and prudent measures and terms and conditions to minimize take included: (1) modifying grazing allotment fences to allow passage of pronghorn, (2) improving habitat conditions for the pronghorn, and (3) minimizing human disturbance. We provided conservation recommendations to monitor pronghorn use of the area, assess pronghorn use at livestock waters, and consolidate lands through land exchanges. The non-jeopardy biological opinion was issued on March 27, 1998. In accordance with the opinion, BLM has monitored livestock grazing and allotment fences have been modified to allow passage of pronghorn. Enforcement of vehicle and camping regulations has been increased south of Ajo.

In summary, the biological opinions for BLM's Lower Gila South Planning Area anticipated adverse effects to pronghorn and their habitat from livestock grazing, recreation, a land exchange, wood cutting, mining, and designation of utility corridors, resulting in an anticipated unspecified amount of take. We determined that the proposed actions were not likely to jeopardize the continued existence of the pronghorn.

<u>BLM grazing allotments in the vicinity of Ajo, Arizona</u>

The biological opinion (consultation number 2-21-94-F-192), issued December 3, 1997, addressed effects to pronghorn resulting from issuance of grazing permits on five allotments, four of which are located near Ajo and Why (Cameron, Childs, Coyote Flat, and Why allotments); and the fifth near Sentinel (Sentinel allotment). All but the Child's allotment were considered to be within the current distribution of the Sonoran pronghorn. According to the BLM, livestock use of the five allotments had been relatively low in the previous ten years. The effects of stocking the allotments at any level had not been analyzed. Monitoring of the Coyote Flat and Why allotments had not occurred. The BLM permittees have not fully stocked the Cameron, Why, Sentinel, and Childs allotments for a sustained period of time. The Coyote Flat Allotment has been billed for full stocking. According to the BLM, monitoring data had not shown overutilization of the vegetation or a change in vegetation composition. The BLM estimated that if allotments were stocked at permitted levels, forage utilization rates could approach 40 percent. Preliminary data from the BLM and the AGFD showed that there is little

dietary overlap between pronghorn and cattle. Because of this, the amount of forage on allotments, and the likely utilization levels, we found that adequate forage for the pronghorn should be available. Maintenance of livestock waters, fences, and other improvements may temporarily disrupt pronghorn activity. Pronghorn may also become entangled in livestock fences.

We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. Incidental take of one pronghorn was anticipated to occur in the form of harassment or death due to grazing management activities during the 15 year proposed action. The following reasonable and prudent measures were provided to minimize take of pronghorn: (1) minimize impacts to pronghorn from grazing and (2) minimize habitat loss, degradation, and fragmentation of pronghorn habitat. The opinion included the following conservation recommendations: develop allotment management plans for each allotment and monitor pronghorn use within Cameron, Coyote Flat, Sentinel, and Why allotments.

The BLM has provided two reports regarding the implementation of reasonable and prudent measures. The 1998-1999 report (dated April 13, 2000) stated that no maintenance work was authorized within the "area covered by this opinion . BLM established "utilization studies on the Sentinel, Coyote Flat, and Why allotments in November 1998. The studies appear to consist of one transect for each of the allotments. The utilization transects for the Sentinel, Coyote Flat, Why, and Cameron allotments were read in 1998 and 1999. BLM reported low level of utilization within the study areas. The 2000 report (dated November 28, 2000) stated that BLM modified 18 miles of fence within the allotments (three fencelines between Cameron, Why, and Coyote Flat and a small fence area within Coyote Flat) by replacing the bottom strand with smooth wire, raised 18 inches above ground level. The work was conducted June through August of 2000. Utilization transects for the four allotments were read in 2000. Again, BLM reports low levels of utilization. Both reports state that there had been no incidental take of pronghorn as of the date of each report.

The 1997 biological opinion was remanded to us by the Court on February 12, 2001. A revised biological opinion was issued on November 16, 2001. The Federal action considered in this opinion was the issuance of a 10-year grazing permit on the five allotments. However, because the BLM agreed to finalize their Rangeland Health Allotment Evaluations conducted during 2001, and to then reinitiate consultation regarding the continued grazing of these allotments, the 2001 biological opinion analyzed the effects of the proposed action only for the interim period. In this biological opinion we concluded that grazing activities within this interim period would not jeopardize the continued existence of the Sonoran pronghorn. Further, we concluded that these actions would not result in take of Sonoran pronghorn, during the time period analyzed. The opinion included the following conservation recommendations: 1) evaluate decreasing the numbers of livestock or permanent removal of livestock from the allotments west of SR 85 to eliminate negative effects on Sonoran pronghorn, 2) work with the FWS to investigate the potential for disease transmission from livestock and other common vector host pool species, 3) rehabilitate heavy-use recreation areas of Gunsite Wash and the base of the hills north of the Bates Well Road, 4) implement a seasonal (March 15 to July 15) emergency closure of roads, trails, and camping areas to the general public, 5) coordinate with the Monument and Cabeza Prieta NWR to determine the extent of, and the appropriate measures to correct, the effects of erosion, impacting BLM land as well as the Monument and Cabeza Prieta NWR, resulting from historic and current land use practices on the Ajo allotments, 6) prepare a pronghorn database from all historic sightings in the agency files and support an annual program of documenting wildlife sightings (including pronghorn) by employees, 7) permanently remove livestock grazing over all, or a significant portion of the Sentinel Allotment, and 8) in coordination with the Sonoran Pronghorn Recovery Team, develop and implement a study to investigate and monitor the influences of disease (particularly those that may be transmitted by livestock) and other

stressors to pronghorn. The BLM reinitiated consultation on the 5 Ajo allotments on April 23, 2002. The new proposed action is issuance of 10-year permits on each allotment. A biological opinion is due November 2002.

Marine Corps Air Station-Yuma in the Arizona Portion of the Yuma Training Range Complex

This biological opinion (consultation number 2-21-95-F-114), issued on April 17, 1996, addressed all proposed and authorized actions on the BMGR by MCAS-Yuma, including proposed changes to military flights over Cabeza Prieta NWR, ongoing flights over BMGR, and operation of various training facilities such as landing strips, a rifle range, targets, a parachute drop zone, a transmitter/telemetry system, and ground support areas. MCAS-Yuma conducts Weapons Tactics Instructors (WTI) courses twice a year (March-April and October-November). During a typical WTI course, one flight/day of two to eight helicopters traverse Cabeza Prieta NWR and the BMGR within established flight corridors from west to east. Helicopters use the corridors for 5-17 days. Additional low-level fixed-wing aircraft corridors over Cabeza Prieta NWR are used for six days per course.

Ground-based activities, such as those of troops and vehicles at ground-support areas were likely to adversely affect pronghorn habitat use. Over the entire project area, ground-support areas in potentially occupied pronghorn habitat would encompass approximately 32.4 mi^2. Numerous pronghorn have been located in recent years in R-2301W on the BMGR and the Cabeza Prieta NWR east of the Baker Peaks, Copper, and Cabeza Prieta mountains. In this area, ongoing and proposed military ground-based activities have the greatest potential for adversely affecting pronghorn. Military overflights do not cause habitat degradation, but pronghorn may respond with increased heart rates and flee from aircraft, particularly low-level helicopters. The increased energy expenditure associated with flight behavior may lead to lower reproductive output and/or survival. Additionally, pronghorn may avoid flight paths, which may result in an indirect loss of useable habitat. In areas where helicopters fly particularly low and create more noise and greater visual stimuli, disturbance to pronghorn would be expected to be greater. Ordnance delivery may also adversely affect pronghorn on the area. Pronghorn use both the North and South TACs, and ordnance, live fire, and shrapnel could potentially strike and kill or injure a pronghorn. Furthermore, pronghorn could be killed or injured during an encounter with unexploded live ordnance on the ground. MCAS-Yuma proposed measures to minimize, in part, the direct and indirect impacts of the proposed action, including measures to reduce or eliminate take of Sonoran pronghorn and to minimize destruction and degradation of habitat.

We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. Incidental take of one pronghorn per 10 years was anticipated in the form of direct mortality, and undetermined numbers of pronghorn were anticipated to be taken in the form of harassment by low-level fixed wing and helicopter flights, military vehicles, or other activities authorized, funded, or carried out by MCAS-Yuma. The following reasonable and prudent measures were provided to minimize take of pronghorn: (1) personnel and visitors educational/information programs and operational procedures, (2) to the extent practicable, military activities shall be located outside of pronghorn habitat, and (3) monitor incidental take resulting from the proposed action and report to us the findings of that monitoring. The following conservation recommendations were provided: (1) continue to fund and support basic research, inventory, and monitoring of the pronghorn. In particular, MCAS-Yuma should investigate the effects of low-level helicopter and fixed wing aircraft flights over the BMGR and Cabeza Prieta NWR and ground based military activities on the behavior and physiology of the pronghorn; and (2) map noise level contours resulting from military flights over the Cabeza Prieta NWR. This map should be provided to Cabeza Prieta NWR for analysis of the effects of aircraft noise on pronghorn habitat use.

Implementation of MCAS's proposed mitigation (minimization) measures, the reasonable and prudent measures, and terms and conditions is unclear because of inadequate reporting by MCAS. We have only received annual reports for 1998 and a draft report for 1999. With few exceptions, these reports have not detailed, action by action, what steps MCAS-Yuma has taken to implement the opinion. In 1999, MCAS reported that no pronghorn habitat was modified, Range Management received no reports of Sonoran pronghorn encounters, and all air and ground crews were briefed on the requirements of the opinion. We are not aware of any incidental take of pronghorn attributable to MCAS-Yuma YTRC activities. On March 18, 1998, an amendment was requested on the consultation by MCAS-Yuma. This request slightly changed the description of the equipment and personnel to be used in the Stoval Field exercise area. We determined that the changes would have no additional effects not already anticipated in the biological opinion.

The 1996 biological opinion was remanded to us by the Court on February 12, 2001. During consultation, MCAS-Yuma proposed 26 conservation measures aimed at the reduction of adverse effects of the proposed action on the environment, including impacts to the Sonoran pronghorn (Dames and Moore 1995; MCAS -Yuma 1995, 1997, 2001; letter from MCAS-Yuma to the FWS dated October 15, 2001). We concluded that the proposed action would not jeopardize the continued existence of the Sonoran pronghorn. Further, we concluded that no more than 6 Sonoran pronghorn would be taken as an incidental result of the proposed action. The incidental take was expected to be in the form of harassment. This incidental take provision will be reviewed concurrent with subsequent reviews of the Barry M. Goldwater INRMP, which will occur every five years. The following reasonable and prudent measure was provided to minimize take of pronghorn: MCAS-Yuma shall modify low-level helicopter use to avoid areas of significant pronghorn use to minimize adverse effects from helicopters on the pronghorn and its habitat, particularly areas important for fawns and their mothers. In addition the following conservation measures in regard to Sonoran pronghorn were suggested: MCAS-Yuma should 1) continue to fund and support basic research, inventory, and monitoring of the pronghorn, 2) fund or staff Sonoran pronghorn recovery projects (a list of appropriate projects was provided as an appendix to the biological opinion), 3) eliminate use of ground support areas 43, 44, 45, and 67 because they are in significant use areas of the pronghorn, including areas used by fawns and their mothers, and 4) coordinate with Luke AFB to implement more intensive monitoring of the North and South TACs.

The Monument General Management Plan

The biological opinion (consultation number 2-21-89-F-078), issued June 26, 1997, addressed implementation of the Monument's General Management Plan (GMP). The purpose of the GMP is to guide management for the next 10-15 years. Plan elements included: (1) working with Arizona Department of Transportation to ensure continued travel and commerce on SR 85 while enhancing resource protection, (2) seeking designation of the Monument as the Sonoran Desert National Park, (3) establishment of partnerships to share facilities, staff, and costs in Why and Lukeville, (4) increased wilderness and development of an interagency wilderness and backcountry management plan, (5) changes in trails at Quitobaquito, (6) changes in facilities in the Twin Peaks area, (7) increasing primitive camping and designated trails, and (8) full implementation of the Monument Cultural Resources Management Plan.

To reduce adverse effects on pronghorn, the Monument proposed the following: (1) pursue an agreement with Arizona Department of Transportation to establish a vehicle for continued communication regarding road-related issues, construct underpasses at known movement corridors to facilitate safe passage of pronghorn across the highway, and establish a program to

explore other measures to better understand and subsequently reduce the impacts of SR 85 on pronghorn; (2) continue working with the Arizona Department of Public Safety to enforce the existing speed limit within the Monument; (3) convert the bottom strands of the Monument's north and south boundary fences to smooth wire to encourage pronghorn movements between the Monument and surrounding areas; (4) educate motorists about the plight of pronghorn using a variety of interpretive media in an effort to encourage lower speeds and increased awareness of wildlife use of the highway corridor; (5) continue to serve as a member of the Interagency Core Working Group for Sonoran pronghorn recovery and implement activities outlined in the recovery plan, including development of a monitoring program; and (6) monitor visitor use and restrict access where necessary to minimize the potential for disturbance to pronghorn.

Recreational activities include hiking, camping, horse-back riding, and biking. These activities can disturb pronghorn and degrade habitat. Maintaining and/or adding hiking trails at the Monument is likely to maintain or increase visitor presence in pronghorn habitat, resulting in long-term, moderate, adverse, regional disturbance to pronghorns. All proposed facilities would be located within areas of existing development and would involve relatively small tracts of land surrounded by larger areas of undisturbed habitat. However, development of facilities that result in increased visitor use may adversely affect the pronghorn. Increased use of some frontcountry and backcountry areas has the potential to adversely affect pronghorn if it causes an alteration in behavior or habitat use. Increased visitation to the Monument was also expected to result in increased traffic along SR 85, adding to the barrier effect of existing traffic patterns. Approximately 22 miles of SR 85 lie within the Monument. We concluded that the highway is a deterrent to expanding pronghorn populations, and resulting modified behavioral patterns may lead to a reduction in genetic exchange, reduced viability, and a concomitant reduction in the ability of pronghorn to adapt to environmental change.

We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. Incidental take in the form of injury or death to one pronghorn associated with traffic on SR 85 was anticipated. The following reasonable and prudent measures were provided to minimize take of pronghorn: (1) work with agencies to implement actions to reduce effects of current and future traffic patterns on SR 85; (2) fences shall be modified for pronghorns; (3) motorists shall be educated on pronghorn vulnerability to traffic; and (4) monitor use and restrict access where necessary to minimize pronghorn disturbance. The following conservation recommendation was provided: the NPS should continue to contribute to multi-agency recovery efforts and help implement appropriate management actions as new information becomes available.

It is unclear to what extent the Monument has begun to reduce the impacts of traffic speed and volume along SR 85. The Monument cites "installation of new road signs and construction of "interpretive waysides as part of the "completed or continuing projects of the GMP (NPS 2001). According to the Monument personnel, these projects are in the planning stages (T. Tibbitts, NPS, Pers. comm. 2001). The monument has remained a member of the Recovery Team, and has continued to aid in implementation of recovery plan activities, including population monitoring and radiotelemetry studies. The livestock fence on the boundary between The Monument and Cabeza Prieta NWR has been removed. The livestock fence along The Monument's northern boundary with BLM lands west of SR 85 has been modified for pronghorn. It is not clear what measures the Monument has enacted to educate the public on the vulnerability of the pronghorn to traffic. The Monument has closed the Pozo Nuevo Road seasonally, partly in response to pronghorn use. However, they used concrete Jersey barriers to block the road which resulted in habitat destruction as illegal traffic expanded out into the desert to go around the barrier. The Monument law enforcement has been working with Border Patrol to address illegal traffic, and has incorporated pronghorn radiotelemetry data into their management of park traffic with some degree of success (T. Tibbitts, Pers. comm. 2001). No incidental take of pronghorn associated with the proposed action has been documented.

The 1997 biological opinion was remanded to us by the Court on February 12, 2001. The GMP had changed since the 1997 plan was released, most notably with regard to GMP projects which were ongoing or had been completed, and the addition of new projects. To reduce adverse effects, NPS also included 14 conservation measures for Sonoran pronghorn in its proposed action. Consequently, we did not anticipate any incidental take of Sonoran pronghorn as a result of the proposed action. However, we did specify the following conservation recommendations: NPS should 1) continue to fund and support basic research, inventory, and monitoring of the Sonoran pronghorn, and 2) explore additional methods of ameliorating the barrier effects of SR 85, such as establishing a lower speed limit on SR 85 and investigating the feasability of the installation of underpasses on SR 85.

Not all of the 14 conservation measures proposed by NPS appear to have been implemented during the period since the remanded opinion was issued on November 16, 2001. A pronghorn monitoring plan was not initiated and no areas were closed as a result of monitoring until late July when several pronghorn were observed in the Monument, radio-collared animals had been detected in the Monument for weeks, and a radio-collared pronghorn was found east of SR 85. The North Puerto Blanco Road was not closed until July, a closure which should have occurred on April 1, 2002. The restriction on back country permits was not implemented in 2002. Temporary waters were not placed until July, and the 3-year experimental pronghorn crossing zone on SR 85 has not yet been implemented.

Luke AFB Use of Ground-Surface and Airspace for Military Training on the BMGR

The biological opinion (consultation number 2-21-96-F-094), issued August 27, 1997, addressed military use of airspace and ground space on the eastern half of the BMGR by Luke AFB. At the time of the consultation, about two-thirds of the BMGR was located on lands managed primarily by the BLM, with the remaining third located within Cabeza Prieta NWR. Approximately 5 percent (7.6 percent, not including Cabeza Prieta NWR) of the range had been impacted by military activities. Military activities within the area of overlap with the Cabeza Prieta NWR were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. The eastern part of the BMGR is known as the Gila Bend segment. Military activities occurring within the Gila Bend segment are managed by Luke AFB and included: airspace use, four manned air-to-ground ranges, three tactical air-to-ground target areas, four auxiliary airfields, Stoval Airfield, and explosive ordnance disposal/burn areas.

We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. During each 10-year period of the project, take was anticipated in the form of harassment that is likely to injure up to two pronghorn and in the form of death of at least one pronghorn. The following reasonable and prudent measures were provided to minimize take: (1) minimize impacts of activities on pronghorn; (2) minimize habitat loss, degradation, and fragmentation of pronghorn habitat; (3) monitor and study reactions of pronghorn on the BMGR to military activities; and (4) determine the level of incidental take that results from the project. The following conservation recommendations were provided: (1) Luke AFB should pursue funding for all research needs that are identified for implementation by DoD in the final revision of the pronghorn recovery plan, as well as all research needs that are now and in the future identified by the Sonoran Pronghorn Core Working Group; (2) Luke AFB should conduct and/or fund research to determine the effects of low level flights on free-ranging pronghorn and use the information to evaluate flight ceilings and flight corridors (i.e., Military Training Routes) over Cabeza Prieta NWR; and (3) Luke AFB should fund and implement an ecosystem partnership for managing the Sonoran Desert to determine other conservation needs in the area.

Implementation of the reasonable and prudent measures have been documented in their annual reports for which we are in receipt of the 1998, 1999, and 2000 reports. We are not aware of any take of pronghorn attributed to Luke AFB use of the ground-surface and airspace on the BMGR, although a pronghorn found dead near a target may have been strafed, it is also possible that it died from other causes.

The 1997 biological opinion was remanded to us by the Court on February 12, 2001. During the course of this consultation, Luke AFB made substantial commitments to minimize the effects of their activities on the Sonoran pronghorn, and additionally committed to implementing a variety of recovery projects recommended by the Sonoran Pronghorn Recovery Team. A total of 12 conservation measures were added to the proposed action. We concluded that the proposed action, including conservation measures, would not jeopardize the continued existence of the Sonoran pronghorn. We further concluded that no more than 3 Sonoran pronghorn would be taken as an incidental result of the proposed action. The incidental take was expected to be 1 pronghorn in the form of death and 2 pronghorns in the form of harassment. The incidental take provision will be reviewed concurrent with subsequent reviews of the Barry M. Goldwater INRMP, which will occur every five years. To minimize impacts to Sonoran pronghorn, we provided the following reasonable and prudent measure: Luke AFB shall expand efforts to monitor Sonoran pronghorn on the tactical ranges to minimize the likelihood of adverse impacts to the pronghorn from military training exercises. Additionally, the following conservation recommendations were suggested: Luke AFB should 1) pursue funding for all research needs that are identified for implementation by USAF in the final revision of the Sonoran pronghorn recovery plan, as well as all research needs that have been concurrently or subsequently identified by the Sonoran Pronghorn Recovery Team, 2) conduct and/or fund research to determine the effects of low level flights by helicopters on free-ranging pronghorn and use the information to evaluate flight ceilings and low-level flight corridors over Cabeza Prieta NWR, 3) prepare a Sonoran pronghorn spreadsheet database from all historic sightings in USAF files and support an annual program of documenting Sonoran pronghorn sightings by employees, 4) study the feasability of moving or adding targets north of the Crater Range for use when TAC targets are closed due to the presence of pronghorns, and 5) continue efforts to implement the use of modular targets and electronic scoring systems to reduce the number of strafing targets.

One term and condition was stipulated in order to implement the reasonable and prudent measure described above. Luke AFB has since completed this term and condition by updating the range operating instructions to reflect the conservation measures in the proposed action. Luke AFB also continues to support the recovery of the Sonoran pronghorn through the biological monitoring contract and management of their previously obligated funds. During FY 2002, Luke AFB did not budget further funds for Sonoran pronghorn management; however, they are assisting AGFD in managing the currently obligated funds.

Border Patrol Activities in the Yuma Sector, Wellton Station, Yuma, Arizona

This biological opinion (consultation number 2-21-96-F-334), issued September 5, 2000, addressed all Border Patrol activities along the United States/Mexico border in Yuma County from the Colorado River to about the area of Pinta Sands at the south end of the Sierra Pinta Mountains. Border Patrol activities within the Yuma Sector/Wellton Station included helicopter and ground patrols; drag road preparation and assessment of road maintenance; remote sensor installation and maintenance; apprehensions and rescues; and assistance to other sectors and agencies. To reduce adverse effects on pronghorn, the Border Patrol agreed to implement the following measures: (1) purchase new, quieter MD600N helicopters to replace existing OH-06As; (2) contact the AGFD weekly for an update on weekend telemetry flights to avoid areas of pronghorn concentration; (3) modify helicopter flights to avoid fawning areas during the three

peak months of the fawning season (April-June); (4) make confidential monthly reports to the manager of Cabeza Prieta NWR detailing the law enforcement actions and wildlife observations made during the previous month; (5) finalize the Memorandum of Understanding between the Border Patrol and Cabeza Prieta NWR to address objectives that will minimize potential conflicts including limiting of routine patrols and off-road use in wilderness and provide a framework for cooperation; and (6) conduct an annual interagency meeting with Cabeza Prieta NWR, the Arizona ESO, and BLM to present the annual report and discuss ways to improve coordination.

Disturbance to pronghorn was anticipated as a result of on-the-ground Border Patrol operations, and direct injury or mortality of pronghorn as a result of collision with Border Patrol vehicles or by low level helicopter flights abruptly approaching and startling pronghorn which may result in injury or energetic stress, particularly during drought. Pronghorn may also be adversely affected by noise and visual impacts of aircraft overflights. The increased energy expenditure caused by sudden or loud noises may lead to lower reproductive output and/or survival. The potential for detrimental effects to pronghorn may be greatest during the fawning season (April-June). Habitat disturbance due to off-road vehicle travel would also result.

We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. We anticipated take in the form of harassment that is likely to injure up to one pronghorn in 10 years. The following reasonable and prudent measures were provided: (1) minimize injury of pronghorn; (2) monitor and study reactions of pronghorn on BMGR to Border Patrol activities; and (3) provide a means to determine the level of incidental take that results from Border Patrol activities. The following conservation recommendations were provided: (1) assign an environmental protection specialist to coordinate the effects of their activities statewide on listed species in order to reduce these impacts where possible; (2) continue participation in ecosystem partnerships with other Federal agencies in pronghorn habitat; and (3) obliterate and block illegal roads in pronghorn habitat created by illegal border traffic.

The Border Patrol submitted an annual report of their activities in 2001, in which they stated that they were in the process of implementing the reasonable and prudent measures, terms and conditions, conservation recommendations that were part of the proposed action. We are not aware of any incidental take attributable to Border Patrol activities in the Yuma Sector's Wellton Station resulting from the proposed action. However, we have been informed by Luke AFB representatives that the Border Patrol has graded additional drag roads in San Cristobal Valley. The Border Patrol has currently reinitiated consultation on its existing biological opinion, in order to reanalyze the effects of its ongoing actions on the Sonoran pronghorn.

Western Army National Guard Aviation Training Site Expansion Project

The non-jeopardy biological opinion for the Western Army National Guard Aviation Training Site (WAATS) (consultation number 2-21-92-F-227) was issued on September 19, 1997. The purpose of WAATS is to provide a highly specialized environment to train ARNG personnel in directed individual aviator qualification training in attack helicopters. The WAATS expansion project includes: (1) expansion of the existing Tactical Flight Training Area which includes establishing four Level III touchdown sites, (2) development of the Master Construction Plan at the Silver Bell Army Heliport, and (3) establishment of a helicopter aerial gunnery range for use by the ARNG on the existing East TAC on the BMGR.

This biological opinion did not address the pronghorn, but, in the Court's opinion, should have and was therefore remanded by the Court. Per the final EIS for WAATS, ARNG use of East TAC did not cause existing training to shift to North or South TACs because the USAF

eliminated F-15E training at BMGR, concentrating on F-16 air-to-air and air-to-ground training. This opened up opportunity to absorb the WAATS air-to-ground training on East TAC which is located closer to Gila Bend AFAF and Silver Bell Army Heliport. Therefore, the EIS did not consider impacts to the pronghorn and none were anticipated. All activities that are part of the proposed action occur outside the current range of the pronghorn, with the exception of training at North TAC. Training at East TAC could preclude recovery of historic habitat if the many other barriers that prevent pronghorn use of East TAC were removed. Training at North TAC only occurs when East TAC is closed for annual maintenance and Explosive Ordinance Disposal (EOD) clearances. Effects to pronghorn at North TAC are minimized by monitoring protocols established by Luke AFB.

The final remanded biological opinion, issued in 2001, included 8 proposed conservation measures aimed at the reduction of adverse effects to Sonoran pronghorn and its habitat. The proposed measures minimized, but did not eliminate, habitat disturbance from the ARNG that would occur on North TAC. However, we concluded that the proposed action would not jeopardize the continued existence of the Sonoran pronghorn. Further, we did not anticipate that the proposed action would result in the incidental take of pronghorn. A single conservation recommendation was included, which states: ARNG should continue to contribute to funding and supporting basic research, inventory, and monitoring of the pronghorn.

F. Summary of Activities Affecting Sonoran Pronghorn in the Action Area

Historically, livestock grazing, hunting or poaching, and development along the Gila River and Rio Sonoyta were all probably important factors in the well-documented Sonoran pronghorn range reduction and apparent population decline that occurred early in the 20th century. Historical accounts and population estimates suggest pronghorn were never abundant in the 20th century, but recently, the estimated size of the population in the action area declined from 179 (1992) to 99 (2001). Decreased recruitment and increased adult mortality during 2002 may have further reduced the population to a 60 or fewer individuals. At this low number, genetic diversity has been lost, and the population is in imminent danger of extirpation due to human-caused impacts, or natural processes, such as predation or continued drought. Although the decline of the population during the current year is closely correlated to drought conditions, a combination of factors has exacerbated the effects of drought. The U.S. pronghorn population is isolated from other populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Rio Sonoyta, which likely were important sources of water and forage during drought periods, has been severed.

Within its remaining range, the pronghorn is subjected to a variety of human activities that disturb the pronghorn and its habitat, including military training, increasing recreational activities, grazing, increasing presence of undocumented migrants and smuggling, and in response, increased law enforcement activities. MCAS-Yuma (2001) quantified the extent of the current pronghorn range that is affected by various activities and found the following: recreation covers 69.6 percent of the range, military training on North and South TACs covers 9.8 percent, active air-to-air firing range covers 5.8 percent, proposed EOD five-year clearance areas at North and South TACs and Manned Range 1 cover 1.0 percent, and MCAS-Yuma proposed ground support areas and zones cover 0.29 percent. In addition, livestock grazing occurs over 5.6 percent of the pronghorn's current range (NPS 2001, Bright *et al.* 2001); a total of 860 miles of roads occur in the current range (MCAS-Yuma 2001), and foot and vehicle traffic by undocumented migrants and smugglers occurs at an increasing frequency throughout the area. NPS (2001) identified 165 human activities in the range of the pronghorn, of which 112 were adverse, 27 were beneficial, 26 had both adverse and beneficial effects, and 4 had unknown effects. NPS (2001) concluded that in regard to the pronghorn, "while many projects have

negligible impacts on their own, the sheer number of these actions is likely to have major adverse impacts in aggregate.

The current range of the pronghorn in the U.S. is almost entirely comprised of lands under Federal jurisdiction; thus activities that currently affect the pronghorn in the action area are almost all Federal actions. In seven of 12 biological opinions issued by us that analyzed impacts to the pronghorn, we anticipated that take would occur. In total, we anticipated take of five pronghorn in the form of direct mortality every 10-15 years, and an undetermined amount of take in the form of harassment. We are unaware of any take resulting from these actions to date. Given the small and declining population of pronghorn in the U.S., take at the levels anticipated in the biological opinions would constitute a substantial impact to the population.

Changes in the remanded biological opinions have reduced the amount or extent of incidental take anticipated to occur from Federal actions. In total, we anticipate take in 5 of the 13 (the original 12 opinions plus the ARNG opinion that now considers effects on the pronghorn) biological opinions issued for the Sonoran pronghorn. This amount of take is less than that anticipated in the original opinions because we and the other Federal agencies have worked together to minimize the effects of ongoing and proposed activities on the Sonoran pronghorn.

We believe the aggregate effects of limitations or barriers to movement of pronghorn and continuing stressors, including habitat degradation and disturbance within the pronghorn's current range resulting from a myriad of human activities, combined with periodic dry seasons or years, are responsible for the present precarious status of the Sonoran pronghorn in the U.S.

III. EFFECTS OF THE ACTION

The following is developed from NPS (2002) unless a different citation is given. NPS estimates that the improvement of north Puerto Blanco Road will impact approximately 11 acres over and above the existing roadway area. Although this represents a relatively small loss of habitat in proportion to the 2 million acres of potentially suitable habitat available to the Sonoran pronghorn U.S. population, when considered additively with all other projects of similar size occurring in the pronghorn's range, the cumulative impacts constitute an adverse impact to the Sonoran pronghorn. NPS has addressed the direct loss of habitat due the project by proposing to lower the speed limit on North Puerto Blanco Road to 15 miles per hour, limit vehicle length to 25 feet, and realign the road to minimize habitat loss and the loss of larger tress. All of these measures serve to reduce the overall footprint of the project, and, therefore also reduce the overall loss of habitat. The action will also result in increased vehicular use of North Puerto Blanco Drive and increased recreational use in the areas adjacent to the road.

Recreation is recognized as having significant environmental impacts (Knight and Gutzwiller 1995). Non-motorized human recreation activities, such as hiking, and rock climbing have increased in popularity, are continually expanding, and are extensive in nature. These activities have the ability to disrupt wildlife in many ways, particularly by displacing animals (Knight and Gutzwiller 1995). McArthur *et al*. (1982) reported elevated heart rates and flight among mountain sheep approached by humans. Mountain sheep reactions to hikers were greater than reactions to road traffic, helicopters, or fixed wing aircraft. Peak levels of hiking and skiing displaced chamois from nutritionally important habitats for prolonged periods (Hamr 1988). Orienteering activities in Denmark displaced roe and red deer from their home ranges; however, the animals eventually returned to these areas after disturbances ceased (Jeppesen 1987a, 1987b). Cassirer *et al*. (1992) found that elk in Yellowstone National Park moved an average of 1.1 miles to avoid cross country skiers, often moving to another drainage.

Krausman *et al*. (2001) found that the effects of disturbance from vehicular use of roads on Sonoran pronghorn were a more significant impact than disturbance from aircraft (helicopter, jet

and fixed wing). Sonoran pronghorn reacted to ground disturbances (vehicles or people on foot) with a change in behavior 37 percent of the time, resulting in the animals running or trotting away 2.6 percent of the time. Wright and deVos (1986) noted that Sonoran pronghorn exhibit "a heightened response to human traffic as compared to other subspecies of pronghorn. They noted that "once aware of an observer, Sonoran pronghorn are quick to leave the area. One herd was observed 1.5 hours later 11.2 miles north of the initial observation in October 1984. Other pronghorn have run until out of the observer's sight when disturbed. Hughes and Smith (1990) noted that on all but one occasion, pronghorn ran from the observer's vehicle and continued to run until they were out of sight.

Disturbance and flight of ungulates are known to result in a variety of physiological effects that are adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971, Harlow *et al*. 1987). Frequent disturbance imposes a burden on the energy and nutrient supply of animals (Geist 1971), which may be exacerbated in harsh environments such as those occupied by Sonoran pronghorn. Krausman *et al*. (2001) also found that fawns and their mothers were more sensitive to human disturbance than other life stages of Sonoran pronghorn.

Causes of disturbance of pronghorn within the Monument include: recreation, on-the-ground management activities, vehicles, aircraft, and movements of large numbers of undocumented migrants and smugglers. According to the Monument's website (http://www.nps.gov/orpi/pphtml/facts.html), they had a total of 318,668 recreational visits in 2001 (an increase of 104 percent over the 1999 figure). Human presence causes Sonoran pronghorn to move from an area, thereby denying pronghorn access to that specific site for what may be crucial ecological functions (e.g. foraging, bedding, seeking thermal shelter, seeking mates, seeking fawning sites, seeking areas of relative safety from predators). Causing pronghorn to move also increases their physiological demands by expending calories and metabolic water. Disturbance may also lead to mortality. Causing a pronghorn to be alarmed or agitated, or flee from a disturbance may make it vulnerable to predator attack. This is especially true for fawns and females during the fawning season. Furthermore, these may be critical stressors in seasonally hot-dry periods and in extended periods of low forage availability. Three recent mortalities of radio-collared pronghorn in July and August of 2002, given the lack of any signs of disease or predation, and the timing of their deaths during one of the most severe drought years ever recorded, may have been due to heat stress and/or malnutrition resulting from inadequate forage conditions due to drought. The deaths of these individuals are perhaps indicative of how severe conditions have become in 2002, and illustrate that during the worst conditions, the remnant of available range left for the U.S. population may not be sufficient to sustain even healthy adult animals (J. Hervert, AGFD, pers. com. 2002).

Two-way traffic along the first 5 miles of North Puerto Blanco Road, the addition of four interpretive wayside stopping points along the way, and a parking lot with restrooms and picnic tables at the road terminus will amplify the human activity-related disturbance effects of Monument visitors. Corridors of human activity may act as barriers to pronghorn movement. Pronghorn cross North Puerto Blanco Road and have been seen in the project area. For example, in July 2002, two pronghorn were observed off the northwestern slopes of Twin Peaks less than 0.5 mile from North Puerto Blanco Road, and, also in July 2002, a pronghorn buck was observed crossing North Puerto Blanco Road approximately 2 miles north of the project's northern endpoint. AGFD pronghorn telemetry data confirm that pronghorn occur within the project area, and that the nearby pass between the La Abra Plain and the Valley of the Ajo is an important movement corridor. During periods of peak use (e.g. during exceptional wildflower blooms), vehicular traffic on North Puerto Blanco Road may temporarily inhibit pronghorn movement. Peak vehicular use of the road, as well as use of adjacent backcountry and trails corresponds to the spring fawning period of the pronghorn (T. Tibbitts, Pers. comm. 2001). The fawning period,

generally February through June, is the season when pronghorn are most likely to be in the Monument, presumably because the Monument provides better forage than other parts of the pronghorn's US range, especially during dry periods (T. Tibbitts Pers. comm. 2001). Additionally, pronghorn fawns and mothers with fawns are much more sensitive to disturbance (Krausman *et al.* 2001). Because peak visitor use is in the late winter and early spring, the resulting increased disturbance from the project may limit pronghorn access at a time when it's most needed.

To address the effects of curtailment of range due to human disturbance, the Monument has proposed instituting a monitoring and closure program to protect pronghorn, especially during the critical fawning period. North Puerto Blanco Drive will be closed to public use from April 1 to July 15. The Bates Well Road and Pozo Nuevo Road will also be closed to public use from March 15 to July 15. Also, a monitoring program will be employed, and any pronghorn detected in the Monument will result in a 5-mile diameter buffer zone around the animal which will be closed to all activity, except for a minimal amount of administrative traffic. Additionally, backcountry permits will be limited to areas east of SR 85 and south of North Puerto Blanco Drive from March 15 to July 15. These efforts should effectively minimize disturbance of pronghorn from visitors during the fawning period, and offset curtailment of pronghorn range from the project.

NPS is concerned about the effects of disturbance from the construction activities of the project. To minimize these effects, NPS will coordinate with us and the AGFD to determine pronghorn densities in the Monument prior to construction. NPS will only begin construction after receiving written authorization from us to proceed, based on pronghorn telemetry and overflight survey information. We will evaluate the status of the pronghorn during the summer of 2003, and, in coordination with NPS and AGFD, determine if commencement of construction is prudent to begin in August 2003.

To summarize, the current status of the pronghorn is extremely precarious. Current population estimates are dangerously close to the speculative minimum viable population estimate of 50 animals (J. Krausman, pers. com. AGFD 2002, Reed *et al.* 1986, Scott 1990). Although the effects of the North Puerto Blanco Road project seem small and insignificant when viewed alone, when taken in total with the myriad of activities taking place ad continuum in the area, many with deleterious effects to the species, a cautious analysis is required. The conservation measures proposed by NPS should provide beneficial effects to the pronghorn, primarily through seasonal area closures. These measures, combined with a commitment to monitoring pronghorn in the Monument and adaptive management, such as the actions taken by the Monument in late summer 2002 including closures due to extremely dry conditions and the presence of pronghorn, should minimize the adverse affects of the project.

IV. 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 ESA.

Relatively small parcels of private and State lands occur within the currently occupied range of the pronghorn near Ajo and Why, north of the BMGR from Dateland to Highway 85, and from the Mohawk Mountains to Tacna. State inholdings in the BMGR were recently acquired by the USAF. Continuing rural and agricultural development, recreation, vehicle use, grazing, and other activities on private and State lands adversely affect pronghorn and their habitat. MCAS-

Yuma (2001) reports that 2,884 acres have been converted to agriculture near Sentinel and Tacna. These activities on State and private lands and along the Mexican border and the effects of these activities are expected to continue into the foreseeable future. Historic habitat and potential recovery areas currently outside of the current range are also expected to be affected by these same activities on lands in and near the action area in the vicinity of Ajo, Why, and Yuma.

Of particular concern are increasing illegal border crossings by undocumented migrants and smugglers. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. In 2001, estimates of undocumented migrants traffic reached 1,000 per night in the Monument alone (NPS 2001) and 150,000 for the year (Milstead 2002). Increased presence of Border Patrol in the Douglas, Arizona area, and in San Diego (Operation Gatekeeper) and southeastern California, have pushed undocumented migrant traffic into remote desert areas, such as Cabeza Prieta NWR, the Monument, and BMGR (Klein 2000). Illegal activities result in habitat damage in the form of new roads, discarded trash, cutting of firewood, illegal campfires and increased chance of wildfire (NPS 2001), and likely resulting in disturbance of pronghorn. These activities are likely to continue into the future and may continue to increase.

V. CONCLUSION

Our conclusion that the proposed action is not likely to jeopardize the continued existence of the Sonoran pronghorn is based on an additive analysis of the status of the pronghorn rangewide, the environmental baseline, the effects of the proposed action, and the cumulative effects. To summarize from the "Status of the Species , the status of the pronghorn rangewide is poor, with populations in the Pinacate Region of Sonora, Mexico, and in the United States being most threatened. As discussed in the "Environmental Baseline , within the action area we believe the aggregate effects of limitations or barriers to movement of pronghorn and continuing stressors, including habitat degradation and disturbance within the pronghorn's current range resulting from a myriad of human activities, combined with periodic dry seasons or years, are responsible for the present precarious status of the Sonoran pronghorn in the U.S. Cumulative effects, particularly illegal crossings of the border and travel through pronghorn habitat by smugglers and undocumented immigrants, add additional stressors to pronghorn populations.

Causes of disturbance of pronghorn and their habitat within the Monument include recreational activities, on-the-ground management activities by the NPS, vehicle use on and off roads, aircraft overflights, and movements of large numbers of undocumented immigrants and smugglers. A total of 11 acres of pronghorn habitat will be lost or modified by the project, a habitat loss that is relatively small compared to the subspecies' current range. NPS manages for resource protection, and a number of NPS actions are expected to result in beneficial effects to pronghorn. In particular, NPS has adopted measures specifically designed to protect the Sonoran pronghorn and its habitat as part of this project. These beneficial actions are expected to offset adverse impacts to the pronghorn. For instance, the NPS has committed to seasonal closures of the western portion of the Park to protect pronghorn from disturbance during that portion of the fawning season when they are most vulnerable to disturbance. A pronghorn monitoring program will be put into effect to close areas around known pronghorn locations. Temporary water sources will be placed in key areas for pronghorn, NPS will continue to support pronghorn radiotelemetry, and will continue to coordinate and contribute to the Sonoran pronghorn recovery team. NPS will not begin construction until we confirm that the majority of pronghorn are in areas outside the Monument (as confirmed by AGFD telemetry and overflight information). Other conservation measures will be implemented as described in the "Description of the Proposed Action .

Because of the addition of these conservation measures, the effects of NPS's proposed actions, when added to the current status of the Sonoran pronghorn, the environmental baseline for the action area, and the cumulative effects, are not likely to jeopardize the continued existence of the Sonoran pronghorn. No critical habitat is designated for the pronghorn, thus none will be affected.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA 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 defined 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 (50 CFR 17.30). "Harass is defined 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 ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take Anticipated

The FWS does not anticipate any incidental take of Sonoran pronghorn as a result of the proposed action.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA 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. The FWS recommends implementing the following actions:

1. Continue to fund and support basic research, inventory, and monitoring of the Sonoran pronghorn in conjunction with the recovery team.

2. Explore additional methods of ameliorating the barrier effects of SR 85, such as establishing a lower speed limit on SR 85 and investigating the feasability of the installation of underpasses on SR 85.

3. Work with the recovery team to establish forage enhancement plots on the Monument.

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

LESSER LONG-NOSED BAT (*Leptonycteris curasoae yerbabuenae*)

I. STATUS OF THE SPECIES

A. Species Description

The lesser long-nosed bat is a medium-sized, leaf-nosed bat. It has a long muzzle and a long tongue, and is capable of hover flight. These features are adaptations to feeding on nectar from the flowers of columnar cacti, such as the saguaro and organ pipe cactus, and from paniculate agaves, such as Palmer's agave (*Agave palmeri*), and Parry's agave (*A. parryi* Hoffmeister 1986), *A. desertii* (Engelman 1875), and *A. schotti* (Engelman 1875). Palmer's agave exhibits many characteristics of chiropterophily, such as nocturnal pollen dehiscence and nectar production, light colored and erect flowers, strong floral order, and high levels of pollen protein with relatively low levels of nectar sugar concentrations (Slauson 1996). Parry's agave demonstrates many (though not all) of these same morphological features (Gentry 1982).

The lesser long-nosed bat was listed (originally, as *Leptonycteris sanborni*; Sanborn's long-nosed bat) as endangered in 1988 (U.S. Fish and Wildlife Service 1988a). No critical habitat has been designated for this species. A recovery plan was completed in 1994 (U.S. Fish and Wildlife Service 1994d). Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current endangered status of the species. The recovery plan states that the species will be considered for delisting when three major matemity roosts and two post-maternity roosts in the United States, and three maternity roosts in Mexico have remained stable or increased in size for at least five years.

B. Distribution and Life History

The lesser long-nosed bat is migratory and found throughout its historic range, from southern Arizona and extreme southwestern New Mexico, through western Mexico, and south to El Salvador. It has been recorded in southern Arizona from the Picacho Mountains (Pinal County) southwest to the Agua Dulce Mountains (Pima County), southeast to the Chiricahua Mountains (Cochise County), and south to the international boundary. Roosts in Arizona are occupied from late April to September (Cockrum and Petryszyn 1991) and on occasion, as late as November (Sidner 1999, 2000); the bat has only rarely been recorded outside of this time period in Arizona (Fleming 1995, Hoffmeister 1986, Sidner and Houser 1990). In spring, adult females, most of which are pregnant, arrive in Arizona gathering into maternity colonies. These roosts are typically at low elevations near concentrations of flowering columnar cacti. After the young are weaned these colonies disband in July and August; some females and young move to higher elevations, primarily in the southeastern parts of Arizona near concentrations of blooming paniculate agaves. Adult males typically occupy separate roosts forming bachelor colonies. Males are known mostly from the Chiricahua Mountains and recently the Galiuro Mountains (Snow Pers. comm. 1999) but also occur with adult females and young of the year at maternity sites (Fleming 1995). Throughout the night between foraging bouts both sexes will rest in temporary night roosts (Hoffmeister 1986).

The primary food source for the lesser long-nosed bat in southeastern Arizona from mid-summer through fall is Palmer's agave, which typically occurs on rocky slopes or hill tops, scattered within the desert grassland and oak woodland communities within the elevation range of 3,000-6,000 ft (Gentry 1982). Parry's agave reaches higher elevations than Palmer's, extending from grasslands into oak woodland, chaparral, pine/oak forests, and mixed conifer with an elevation range of approximately 4,900-8,200 ft (Gentry 1982). Like Palmers' agave, Parry's is typically found on rocky slopes (Gentry 1982). Concentrations of paniculate agaves are generally found on the rocky, shallow soils of hills and ridges. Palmer's and Parry's agaves are also found scattered in areas of deep, heavy soils within grasslands or where there may be thick stands of shrubs, mesquite, oak, and other trees.

The ecology of Palmer's agave is poorly understood, especially as it is affected by livestock use

and fire (Slauson, Pers. comm., 1997; Wendy Hodgson, Desert Botanical Gardens, Phoenix, Pers. comm., 1997). Agaves are perennial succulents. Agave seeds germinate readily with adequate moisture, typically in open areas with limited competition from other plants (Tony Burgess, Biosphere Two Center, Tucson, Pers. comm., 1997). Palmer's agave is relatively slow growing, often taking 20 or more years before initiating the single reproductive event in its life (Slauson 1996, 1999). A flowering stalk erupts from the rosette of a mature plant, growing rapidly through the spring and early summer. During the summer 8 to 12 flowering panicles are displayed on the upper third of a stalk 10-16 feet tall (Gentry 1982). Slauson (1996, 1999) has completed a pollination ecology study of Palmer's agave, finding that many pollinator species contribute to establishing seed set. Lesser long-nosed bats have been recorded visiting individual blooming Palmer's agaves more than 1,000 visits per night (R. Sidner, Tucson, Pers. comm., 1997; Petryszyn, Pers. comm., 1999), while they may not visit other agaves at all (Slauson, Pers. comm., 1997). Bat visits generally last less than one second (Slauson 1999). Apparently there are many factors which influence the year a particular plant may bloom. Precipitation one to several years before blooming is probably of special importance. In the Peloncillo Mountains, about 2 to 5 percent of the agave population flowers each year (Peter Warren, Nature Conservancy, Tucson, Pers. comm., 1997). Palmer's agave may occasionally produce off-sets (vegetative reproduction or cloning of "pups" produced from rhizomes) though this is less likely than for many other agave species (Hodgson, Pers. comm., 1997). Parry's agave freely produces off-sets (Gentry 1982).

The importance of Parry's agave, as well as desert agave and amole, as a forage resource for *Leptonycteris* bats is unknown. As discussed, Parry's agave generally occurs at higher elevation than Palmer's agave, and occurs in forest openings. Benson and Darrow (1982) note that it typically flowers in June and early July, which is before the lesser long-nosed bat arrives at roosts in southeastern Arizona. However, J. Rorabaugh (AESO, Pers. comm., 1998) noted many Parry's agave in flower high in the Huachuca Mountains on the crest trail during late July in 1997. It may be that agaves at high elevation bloom later than at lower sites, and could potentially be blooming and be used as a forage resource when lesser long-nosed bats arrive in July or early August. In addition, Parry's agave may be very important as a forage plant for those bats which arrive in southeastern Arizona during late spring and early summer.

As indicated above, the lesser long-nosed bat consumes nectar and pollen of paniculate agave flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. These bats often forage in flocks. Nectar of these cacti and agaves is high energy food. Concentrations of some food resources appear to be patchily distributed on the landscape and the nectar of each plant species utilized is only seasonally available. Cacti flowers and fruit are available during the spring and early summer; blooming agaves are available primarily from July through October. Columnar cacti occur in lower elevation areas of the Sonoran Desert region, and paniculate agaves are found primarily in higher elevation desert scrub areas, semi-desert grasslands and shrublands, and into the oak woodland (Gentry 1982). In the Huachuca Mountains, Parry's agave is generally found at higher elevations than Palmer's agave; the former is common in forest openings to the crest of the Huachuca Mountains.

Lesser long-nosed bats appear to be opportunistic foragers and extremely efficient fliers. Seasonally available food resources may account for the seasonal movement patterns of the bat. The lesser long-nosed bat is known to fly long distances from roost sites to foraging sites. Night flights from maternity colonies to flowering columnar cacti have been documented in Arizona at 15 miles, and in Mexico at 25 miles and 38 miles (one way)(Dalton et al. 1994; V. Dalton, Tucson, Pers. comm., 1997; Y. Petryszyn, University of Arizona, Pers. comm., 1997). Steidl (Pers. comm. 2001) found that typical one-way foraging distance for bats in southeastern Arizona is roughly 12.5 miles. A substantial portion of the lesser long-nosed bats at the Pinacate Cave in northwestern Sonora (a maternity colony) fly 25-31 miles each night to foraging areas in Organ

Pipe Cactus National Monument (USFWS 1997b). Horner *et al.* (1990) found that lesser long-nosed bats commuted 30-36 miles round trip between an island maternity roost and the mainland in Sonora; the authors suggested these bats regularly flew at least 47 miles each night. Lesser long-nosed bats have been observed feeding at hummingbird feeders many miles from the closest known potential roost site (Yar Petryszyn, Pers. comm. 1997).

C. Status

Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current endangered status of the species. Suitable day roosts and suitable concentrations of food plants are the two resources that are crucial for the lesser long-nosed bat (Fleming 1995). Caves and mines are used as day roosts. The factors that make roost sites useable have not yet been identified. Whatever the factors are that determine selection of roost locations, the species appears to be sensitive to human disturbance. Instances are known where a single brief visit to an occupied roost is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, this sensitivity suggests that the presence of alternate roost sites may be critical when disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

According to Fleming (1995), there are 16 known large roost sites in Arizona and Mexico (Fleming 1995). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy these sites was greater than 200,000. Twelve major maternity roost sites are known from Arizona and Mexico. According to the same surveys, the maternity roosts are occupied by over 150,000 lesser long-nosed bats and of these, just over 100,000 are found at just one natural cave at Pinacate National Park, Sonora, Mexico (Cockrum and Petryszyn 1991). Several new large roost sites have been located in Arizona, bringing the total number of large roosts to 21 (Mike Coffeen, AESO, pers. com. 2001). The numbers above indicate that although a relatively large number of these bats are known to exist, the relative number of known large roosts is quite small. Disturbance of these roosts, or removal of the food plants associated with them could lead to the loss of the roosts. Limited numbers of maternity roosts may be the critical factor in the survival of this species.

Suitable day roosts and concentrations of food plants are the two resources that are crucial for the lesser long-nosed bat (U.S. Fish and Wildlife Service 1994d). Caves and mines are used as day roosts. The factors that make roost sites useable have not yet been identified. Whatever determines roost suitability, the species seems sensitive to human disturbance. Instances are known where a single brief visit to an occupied roost is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, this sensitivity suggests that the presence of alternate roost sites may be critical when disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements. Threats which may contribute to the decline of lesser long-nosed bat populations are excess harvesting of agaves in Mexico, the collection of cacti in the U.S., and the conversion of habitat for agricultural uses, livestock grazing and production of bufflegrass, wood-cutting, and other development.

The lesser long-nosed bat recovery plan (U.S. Fish and Wildlife Service 1994d) identifies the need to protect foraging areas and food plants. Columnar cacti and agaves provide critical food resources for this bat. Populations of these plants need continued protection to sustain nectar-feeding bat populations. A critical need in this area is information about the size of the foraging

areas around roosts so that adequate areas can be protected. This information will show the minimum area needed to support a roost of nectar- and fruit-eating bats, provided the roost locations are known. Additional life history information can be found in the recovery plan (U.S. Fish and Wildlife Service 1994d) and other references cited therein.

We have produced numerous biological opinions on the lesser long-nosed bat since it was listed as endangered in 1988. Some of these opinions have included incidental take statements, although typically only for a small number of individuals. Survey data indicate that the number of bats estimated to occupy known sites is approximately 200,000.

II. 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.

A. Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The FWS has determined that the action area for the bat includes the direct footprint of the road (5.1 miles in length and approximately 11 acres of permanent habitat loss) and an area around the project defined by a circle with a radius of 38 miles (the maximum documented one-way foraging distance of the bat). The action area is less than five percent of the range of the bat.

B. Terrain, Vegetation Communities, and Climate in the Action Area

A complete description of the region encompassing the action area has been previously provided (see "Environmental Baseline, part B. Terrain, Vegetation Communities, and Climate in the Action Area for the Sonoran pronghorn).

C. Status of the Lesser Long-Nosed Bat in the Action Area

Several large maternity roosts occur in the action area. Bluebird Mine along the eastern border of Cabeza Prieta NWR is approximately 20 miles from the project site and has an estimated 3,000 bats (U.S. Fish and Wildlife Service 1994), although this mine was recently vandalized and is thought to support far fewer bats at the present time. Copper Mountain is within the Monument about 8 miles west of the project footprint, but within the action area; the most recent estimate of roost size was approximately 22,000 bats (NPS 2002). The largest maternity roost in the project area is Pinacate Cave in northern Sonora, Mexico. Approximately 40 miles away from the project site, this roost is an estimated 130,000 bats in size (U.S. Fish and Wildlife Service 1994). Slate Mountain, another large roost (8,000+), occurs nearby on Tohono O'odham lands.

Before they give birth, female bats probably occasionally move between the Bluebird and Copper Mountain roosts, and it has been recommended that these two roosts be censused simultaneously to avoid double-counting bats (U.S. Fish and Wildlife Service 1994). Observations at Copper Mountain and at Pinacate Cave indicate that they are occupied from mid-April to early-to-mid-September (U.S. Fish and Wildlife Service 1994), although these roosts reach their peak

occupancy in late spring/early summer.

The project is adjacent to the foothills of the Puerto Blanco Mountains. These mountains are composed of highly eroded granite, volcanic tufts, rhyolite and basalt. Suitable day and night roosting habitat is present in natural caves and crevices, as well as several abandoned mines. These areas have not been surveyed for lesser long-nosed bat roosts.

Flowers and fruits of 2-3 species of columnar cacti (cordon *Pachycereus pringlei*, saguaro *Carnegia gigantea*, and organ pipe cactus *Stenocereus thurberi*) provide nearly all of the energy and nutrients obtained by pregnant and lactating females roosting in the Sonoran Desert in the spring and early summer (U.S. Fish and Wildlife Service 1994). Saguaro and organ pipe cacti, both common and abundant throughout much of the Monument, flower in May and fruit mature in June and July (Benson 1982). Lesser long-nosed bats feed on both the nectar and fruits of these cacti. When cacti fruit are scarce or unavailable in late July or early August, agave nectar is the primary food resource for lesser long-nosed bats. Agaves typically bolt or flower and provide a nectar resource for foraging bats from about April 15 into October, depending on the agave. These bats are important pollinators for agave and cacti.

A number of activities are taking place in the action area that could affect bats. In 1997, we concurred with the Bureau of Land Management (BLM) that management of grazing leases on the Ajo allotments may affect, but is not likely to adversely affect the bat. BLM has recently requested reinitiation on that opinion and we are currently in consultation. Our 1997 biological opinion on the NPS Organ Pipe Cactus National Monument General Management Plan, found that the proposed action could result in take of bats from recreation; specifically from unauthorized human disturbance to the Copper Mountain maternity roost. The dramatic increases in undocumented immigrants and the associated damage resulting to the landscape from their activities, as well the activities of law enforcement in pursuit of undocumented immigrants, is becoming an increasing threat, not just to bats but to all wildlife of the region. The Bluebird Mine on Cabeza Prieta National Wildlife Refuge was vandalized in June 2002, probably by undocumented immigrants, and resulted in at least four dead bats. The population of the roost subsequently dropped from 3,000 to about 400 bats.

III. EFFECTS OF THE ACTION

The following is developed from NPS (2002) except where a different citation is given. The project is 8 miles from the maternity roost at Copper Mountain and thus will have no direct effect on this maternity colony. However, suitable roosting habitat is available in the Puerto Blanco Mountains. Natural caves and crevices, as well as several abandoned mines are located in the Puerto Blanco Mountains; bat surveys have not been conducted. Lesser long-nosed bats appear to be sensitive to human disturbance; a single brief visit is sufficient to cause a high proportion of lesser long-nosed bats to abandon their roost in favor of another (U.S. Fish and Wildlife Service 1994). The project will likely increase foot traffic in the Puerto Blanco Mountains, thus the possibility exists that unknown roosts could be affected by human disturbance as a result of the project.

Approximately 11 acres of habitat will be permanently disturbed in addition to the existing road surface. Loss of this habitat will result in the loss of some lesser long-nosed bat food sources, including saguaros and organ pipe cactus. This will include direct loss of plants and incidental loss due to damaged roots and rooting area affecting plant vigor and possibly resulting in mortality. Small saguaros and most of the organ pipe cactus will be salvaged. The number of saguaros salvaged will depend on size of plants, staff availability, and time availability. NPS estimates that about 29 saguaros will be salvaged. Some of these may be re-planted on site, if

space is available. NPS estimates that a minimum of 88 to 100 saguaros and 4 to 8 organ pipe cactus will be lost. According to NPS, this loss of foraging habitat represents a loss of approximately 0.007 percent of the foraging habitat available to the bat within the Monument (NPS 2002).

NPS has incorporated several measures to minimize loss of lesser long-nosed bat foraging habitat, in addition to the salvage of 29 saguaros and 4 to 8 organ pipe that will be replanted in the Monument. The speed limit of the road has been lowered from 25 to 15 miles per hour, the 25 foot vehicle limit has been retained, special wash-crossing design features have been incorporated into the road design, and the road has been realigned to avoid approximately 50 large trees, including large saguaros and organ pipe. Lowering the speed limit and retaining the vehicle length limit allowed NPS to design the road with tighter curves and a narrower width, minimizing the loss of habitat and allowing for a more sinuous footprint to avoid large trees and cacti.

In conclusion, the action area represents some of the most important habitat to lesser long-nosed bats in the state, including a large maternity roost. The environmental baseline illustrates that numerous activities are occurring in the area that could be resulting in loss of bat foraging habitat. Although this project will result in a loss of foraging habitat for the species, the area is rich in forage resources, and the overall effect is small by comparison. The project is not expected to facilitate human access to known roosts.

IV. CUMULATIVE EFFECTS

Cumulative effects are those adverse effects of future non-Federal (State, local government, and private) actions that are reasonably certain to occur in the project area. Future Federal actions would be subject to the consultation requirements established in section 7 of the ESA and, therefore, are not considered cumulative to the proposed project. Effects of past Federal and private actions are considered in the Environmental Baseline. Many of the activities expected to occur in the action area as defined would be on Federal land in the Monument, on Bureau of Land Management lands, and in Cabeza Prieta National Wildlife Refuge, and thus the effects of such activities are not considered cumulative. However, much of the action area also occurs on Tohono O'odham Nation lands, and a much smaller portion is on private lands in the U.S. Residential and commercial development, farming, surface mining and other activities occur on these lands. These actions, the effects of which are considered cumulative, may result in small-scale loss or degradation of potential lesser long-nosed bat foraging habitat, and potential disturbance of roosts.

V. CONCLUSION

After reviewing the status of the lesser long-nosed bat, the environmental baseline for the project area, the effects of the proposed action, and cumulative effects, it is our biological opinion that the proposed project is not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species; therefore, none will be affected. Our conclusion that the proposed action is not likely to jeopardize the species is based on the following:

1. The project will not affect any known roosts or increase human access to known roosts; the project may increase access to potential roosts, but the likelihood of adverse affects to potential roosts is low.

2. The project will result in loss of lesser long-nosed bat foraging habitat, but the amount will

be less than 1 percent of foraging habitat available to the bat within the Monument.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA 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 defined 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 (50 CFR 17.30). "Harass is defined 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 ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take Anticipated

The FWS does not anticipate any incidental take of lesser long-nosed bat as a result of the proposed action.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs Federal agencies to utilize their authorities to further the purposes of the ESA 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(c) or 7(a)(1) responsibilities for the lesser long-nosed bat. In furtherance of the purposes of the ESA, we recommend implementing the following actions:

1. Expand proposed surveys for lesser long-nosed bat roosts to include unsurveyed areas of the Monument (Recovery Plan task 1).

2. Monitor the effects of undocumented immigrants on lesser long-nosed bat roosts and foraging habitat; implement measures to protect roosts as necessary (Recovery Plan task 2 and 3).

3. Continue the control of non-native plants that may alter fire frequencies and intensities on the Monument and assist other agencies in developing methods for controlling these species (Recovery Plan task 2).

4. Implement the lesser long-nosed bat recovery plan, as appropriate.

In order for the FWS to be kept informed of actions reducing or avoiding adverse effects or benefitting listed species or their habitat, we request notification of the implementation of any conservation recommendations.

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

I. STATUS OF THE SPECIES

A. Description and legal status

Cactus ferruginous 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. Males average 2.2 ounces and females average 2.6 ounces. The eyes are yellow, the crown is light streaked, and there are no ear tufts. Paired black spots on the nape suggest eyes. The tail is long for an owl and reddish-brown in color with dark bars.

We listed the Arizona population of the pygmy-owl as a distinct population segment (DPS) on March 10, 1997 (U.S. Fish and Wildlife Service 1997). 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 of critical habitat, which supported riverine, riparian, and upland vegetation and was divided into seven critical habitat units, located in Pima, Cochise, Pinal, and Maricopa counties in Arizona (U.S. Fish and Wildlife Service 1999). 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 us for further consideration. A recovery plan is in preparation.

B. Life history

A detailed description of the life history and ecology of the pygmy-owl 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 and Finch 2000), and other information available at the AESO. Information specific to the pygmy-owl 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.

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 the Monument (R. Johnson unpubl. data, T. Tibbitts, the 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, AGFD 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 feet 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 (range of 0.75 to 19 miles, G. Proudfoot unpubl. data). Telemetry studies of dispersing juveniles in Arizona during 1999 and 2000 ranged from 1.4 to 12.9 miles (straight line distance) (n = 6, mean = 6.2 miles) in 1999, and 1.6 to 11.7 miles (n = 6, mean = 5.8 miles) in 2000 (S. Richardson and M. Ingraldi, AGFD unpubl. data). Pygmy-owl telemetry studies have documented movement of owls between southern Pinal County and northwestern Tucson (S. Richardson and M. Ingraldi, AGFD unpubl. data). Juveniles typically dispersed from natal areas in July but did not appear to defend a territory until September. They may move up to one mile in a night; however, they typically fly short distances from tree to tree instead of long single flights (S. Richardson, AGFD 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.

Apparently unpaired females may also remain in the same territory for some period of time. In the spring of 2001, an unpaired female (the male died in 2000) remained in its previous years' territory well into the spring, exhibiting territorial behavior (calling) for 2 months until ultimately switching territories and paring with an unpaired male and successfully nesting (S. Richardson, AGFD unpubl. data). Researchers suspect that if this unpaired female could have attracted an unpaired male during that time, she would have likely remained in her original territory. Apparently at some point the urge to pair is too strong to remain and they seek out new mates.

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

C. Habitat

A variety of vegetation communities are used by pygmy-owls, such as: riparian woodlands, mesquite (*Prosopis* spp.) "bosques (Spanish for woodlands), Sonoran Desert scrub, and mesquite and shrub invaded 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 (*Carnegiea gigantea*) large enough to support cavity nesting, and elevations below 4,000 feet. Historically, pygmy-owls were associated with riparian woodlands in central and southern Arizona. Plants present in these riparian communities include cottonwood (*Populus* spp.), 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 Sonoran Desert scrub (Brown 1994). This community in southern Arizona consists of paloverde (*Cercidium* spp.), ironwood (*Olneya tesota*), mesquite, acacia (*Acacia* spp.), 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). Sonoran Desert scrub 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 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 pygmy-owls 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, pygmy-owls are most commonly characterized by semi-open or open woodlands, often in proximity to forests or patches of forests. Where they are found in forested areas, they are typically observed along edges or in openings, rather than deep in the forest itself (Binford 1989, Sick 1993), although this may be a bias of increased visibility. Overall, vegetation density may not be as important as patches of dense vegetation with a developed canopy layer interspersed with open areas. The physical setting and vegetation composition varies across *G. brasilianum's* range and, while vegetation structure may be 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).

Pygmy-owls 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 pygmy-owl's prey base. Shrubs and large trees also provide protection against aerial predation for juvenile and adult pygmy-owls and cover from which they may capture prey (Wilcox *et al.* 2000).

D. Distribution and abundance

The cactus ferruginous pygmy-owl is one of four subspecies of ferruginous pygmy-owl. Cactus ferruginous pygmy-owls 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. Recent genetic studies suggest that ferruginous pygmy-owl populations in southern Arizona and southern Texas are distinct subspecies, and that there is no genetic isolation between populations in the United States and those immediately south of the border in northwestern or northeastern Mexico (Proudfoot and Slack 2001). Results also indicate a comparatively low haplotypic diversity in the northwestern Tucson population, suggesting that it may be recently separated from those in the Altar Valley, Arizona, and in Sonora and Sinaloa, Mexico.

We are currently funding habitat studies and surveys in Sonora, Mexico to determine the distribution and relative abundance of the pygmy-owl there. Preliminary results indicate that pygmy-owls are present in northern and central Sonora (FWS unpubl. data). Further studies are needed to determine their distribution in Mexico.

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 (AGFD unpubl. data, Hunter 1988).

Records from the eastern portion of the pygmy-owl's range include a 1876 record from Camp Goodwin (nearby current day Geronimo) on the Gila River, and a 1978 record from Gillard Hot Springs, also on the Gila River. Pygmy-owls have been found as far west as the Cabeza Prieta Tanks, Cabeza Prieta National Wildlife Refuge (Cabeza Prieta NWR), in 1955 (Monson 1998).

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 the Monument 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 the Monument (FWS and the 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 northwestern Tucson (Felley and Corman 1993). In 1994, a pair and single owl of unknown breeding status were located in northwestern Tucson during informal survey work by AGFD (Abbate *et al.* 1996). In 1995, AGFD confirmed 5 adult pygmy-owl and one juvenile, one of which was the first nest in many years. In 1996, AGFD focused their survey efforts in the Tucson Basin. A total of 12 pygmy-owls were detected, including one known nesting pair and their 2 fledglings which successfully fledged. Three additional pygmy-owls and three other unconfirmed reports were also recorded at the Monument in 1996.

While the majority of Arizona pygmy-owl detections in the last seven years have been from the northwestern Tucson area in Pima County, pygmy-owls have also been detected in southern Pinal County, at the Monument, Cabeza Prieta NWR, Buenos Aires National Wildlife Refuge (BANWR), and on the Coronado National Forest. The following is a brief summary of recent owl numbers and distribution[2]:

In 1997, survey efforts of AGFD located a total of five pygmy-owls in the Tucson Basin study area (the area bounded to the north by the Picacho Mountains, the east by the Santa Catalina and Rincon mountains, the south by the Santa Rita and Sierrita mountains, and the Tucson Mountains to the west). Of these owls, one pair successfully fledged two young which were banded. Two adult males were also located at the Monument, with one reported from a previously unoccupied area (T. Tibbitts, the Monument Pers. comm. 1997).

In 1998, survey efforts in Arizona increased substantially and, as a result, more pygmy-owls were documented, which may at least in part account for a larger number of known owls. In 1998, a total of 35 pygmy-owls were confirmed (S. Richardson, AGFD unpubl. data, FWS unpubl. data, T. Tibbitts, the Monument unpubl. data, D. Bieber, Coronado National Forest unpubl. data).

In 1999, a total of 41 adult pygmy-owls were found in Arizona at 28 sites. Of these sites, 11 had nesting confirmed by AGFD and the FWS. Pygmy-owls were found in three distinct regions of the state: Tucson Basin, Altar Valley, and the Monument. Almost half of the known owl sites were in the Altar Valley. 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 pygmy-owls is; however, as with other owls and raptors, a high mortality (50 percent or more) of young is typical during the first year of life.

Surveys conducted in 2000 resulted in 24 confirmed pygmy-owl sites (i.e. nests and resident pygmy-owl sites) and several other unconfirmed sites (S. Richardson, AGFD unpubl. data, T. Tibbitts, the Monument unpubl. data, FWS unpubl. data). A total of 34 adult pygmy-owls were confirmed. Nesting was documented at 7 sites and 23 fledglings were confirmed; however, as in 1999, over a 50 percent fledgling mortality was documented (S. Richardson, AGFD unpubl. data). A total of 9 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 was unknown; however, they were presumed dead.

Surveys conducted during the 2001 season resulted in a total of 47 adult pygmy-owls confirmed at 29 sites[3] in Arizona (S. Richardson, AGFD, unpubl. data, T. Tibbitts, Organ Pipe Cactus

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[2] To a large degree, survey effort plays an important factor where owls have been documented. Survey effort has not been consistent over the past several years in all areas of the state, affecting the known distribution and numbers of owls in any particular area.

[3] Pygmy-owl sites are nests and resident pygmy-owl sites that have been confirmed by AGFD or FWS.

National Monument unpubl. data, FWS unpubl. data). There were also several other unconfirmed sites that are not included in these totals. Nesting was documented at 17 sites and 24 young were confirmed to have successfully fledged. In addition, there were 2 nests with young that potentially could have fledged young; however, this was not confirmed. Similar to the previous three years, there was over a 50 percent fledgling mortality documented in 2001 (S. Richardson, AGFD unpubl. data).

During 2002 surveys, AGFD was able to locate and is currently monitoring a total of 18 adult pygmy-owls from 14 sites or territories (S. Richardson, AGFD, Pers. comm.). These include 7 adults from 6 sites in northwestern Tucson, 6 adults from 4 sites in Altar Valley, 2 adults from 2 sites in the Monument, and 3 adults from 2 sites in the Avra Valley. The 2002 drought has had severe impacts to pygmy-owl productivity. In comparison with the previous year when 17 nests were confirmed, only 3 nests were observed in 2002 (an 82 percent decline in nesting). From these 3 nests, 9 young were produced, of which 7 have already been lost. One active nest in northwestern Tucson fledged two young in late May. However, by June 3rd, neither young survived. All 7 young from two nests in Altar Valley fledged unexpectedly on 14 and 15 June. These young were only 22 - 25 days old, younger than most fledglings from any nests during previous years. Conditions at both nest sites were very harsh, with little tree cover and high temperatures. These conditions, probably compounded by the young age at fledging, resulted in the mortality of 5 of the 7 young thus far. It appears that lack of cover and/or the inability to fly very well resulted in predation on at least 2 of the young.

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 the Monument 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 northwestern Tucson. However, in 1999, after extensive surveys in Altar Valley, more owls were found there (18 adults) than in northwestern Tucson (11 adults), although until 2001, there have been fewer nest sites in Altar Valley than in the Tucson Basin (S. Richardson, AGFD unpubl. data). As a result, our knowledge is changing as to their distribution and habitat needs as new information is collected.

E. Threats

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).

Current information suggests that pygmy-owls 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, particularly high-density development. Since widespread surveys began in Arizona in 1999, more owl sites have been documented in areas with little or no human activity or development. For example, in 2001, of the 29 known pygmy-owl sites in the state, 24 sites (83 percent) were in undeveloped areas with very little human activity, compared to only 5 sites (17 percent) that were in areas with some level of low-density development (S. Richardson, AGFD unpubl. data, U.S. Fish and Wildlife Service unpubl. data). No pygmy-owls have been documented in high-density commercial or residential

developments. In 2001, 14 (82 percent) of the 17 known nest sites were in undeveloped areas with little or no ground disturbance or human activity.

To determine the level of vegetation disturbance nesting pygmy-owls may be able to tolerate, a group of pygmy-owl experts on the Recovery Team completed an analysis of all known 2001 and earlier nest site home ranges (n = 9) occurring in developed areas in northwestern Tucson 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 (280 acres) at each nest site. They calculated their average percent disturbance to be 23 percent (also the median). However, 5 of the 9 home ranges had levels below that average, and 6 of the 9 sites were at or below the 25 percent disturbance level. This, when added to the total number of nesting pygmy-owl breeding sites in the State, indicates that pygmy-owls select areas with very little or no human development. In addition, because the majority of surveys are conducted in areas already with some level of development as a result of a proposed project, these areas are sampled in higher proportion to areas with no current or planned development, potentially under-sampling areas without development.

It should be noted that one of the nest sites with one of the highest amounts of vegetation disturbance (33 percent) 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 in 1999. Surveys in 2000 and 2001 did not locate any pygmy-owls at this site, therefore it remains inactive. 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. There were three new nest sites[4] in 2001 with disturbance levels of 21 percent, 30 percent, and 34 percent (S. Richardson, AGFD, unpubl. data). Each of these territories successfully produced fledglings that dispersed to other areas in 2001. This was the first year these sites were reproductively successful and it is unknown whether they will be able to continue to remain in these territories in subsequent years. Preliminary surveys of these territories in 2002, indicate the loss of 2 females and one male from each of the sites. The remaining female from the territory with 34 percent disturbance has apparently paired with the male from an adjacent territory. As indicated above, two of these new nest sites, together with the other nest site that has been inactive since 1999 are at the extreme range of the amount of development occurring within all other pygmy-owl nesting territories in Arizona (greater than 30 percent disturbance).

Although there have been some nesting territories in the upper range of disturbance, other factors also play an import role in developing a recovery strategy for this species. For example, these data represent a very limited sample size for breeding sites within developed areas (n=9); little is understood regarding the long-term effects of increasing levels of development occurring within nest sites in higher developed areas and how this will affect their suitability for breeding and movement in the future; and the potential cumulative effects that increasing levels of development have on owls in this region are not fully understood. The long-term productivity and success of breeding sites in these higher disturbed areas is unknown. In 2001, all of the nest sites were in new areas, resulting in a relatively large proportion (67 percent) of sites where nesting had occurred in the past but that were inactive in 2001 (S. Richardson, AGFD unpubl. data). More research and monitoring is needed to better understand habitat needs and the long-term relationship between development and pygmy-owl requirements.

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[4] Two were resident male pygmy-owls establishing territories in the fall of 1999, remaining at their respective sites until paired with females in the spring of 2001.

There also appears to be a difference in the tolerance to the amount of vegetation disturbance (i.e., development) between nesting and non-breeding pygmy-owls. 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 pygmy-owl sites in northwestern Tucson resulted in a considerably lower amount of vegetation disturbance at nest sites compared to non-breeding sites (e.g., unpaired males) (S. Richardson, AGFD unpubl. data). As stated above, the average amount of vegetation disturbance within the home range of 1998-2001 nesting sites in developed areas was 23 percent. The amount of vegetation disturbance within the home range of non-breeding sites in developed areas was considerably higher, averaging 37 percent during the same period. Although these overall results are based on a small sample size, they represent the best available information and indicate that nesting pygmy-owls may require less disturbed areas than unpaired owls. For example, a juvenile male pygmy-owl established a new territory in the fall of 2000, which is surrounded on three sides by densely developed residential and commercial properties. This male has remained there throughout the 2000 and 2001 breeding seasons and failed to pair with a female owl, even after vigorous calling throughout the spring and summer months both years. In September, 2001 a juvenile female pygmy-owl dispersed from its nest and paired with this resident male. They remained together for approximately 2 weeks until the female was found dead, apparently as a result of cat (*Felis domesticus*) predation. At this time, the male remains unpaired. Within this territory the habitat is highly fragmented, containing the highest degree of development (approximately 50 percent) of any other known pygmy-owl territory (S. Richardson, AGFD unpubl. data.). It is unclear whether the amount of development and vegetation disturbance is too high for successful breeding.

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 pygmy-owl 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, we and the Recovery Team believe that because successful breeding sites are necessary to produce offspring for the survival and eventual recovery of the pygmy-owl 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 recommended by the pygmy-owl experts on the Recovery Team as Special Management Areas (SMAs).

Recovery of the pygmy-owl will require not only protection of all known sites, but also the conservation of other areas not currently known to have nesting owls, which can be measured at two spatial scales. At a large scale, connectivity is necessary among large blocks of suitable habitat that are either currently known to be occupied by owls or are important for recovery. An example is habitat connecting the Tucson Mountains west of Interstate10 to the high concentration of owls in northwestern Tucson. At a finer scale, the protection of habitat within the vicinity of known owl sites for establishment of new sites and movement between them is also essential. For example, the area located south of the 136000 N street alignment in northwestern Tucson, which recently contained the highest number and density of breeding pygmy-owls known in Arizona, also contains areas not currently known to have nesting owls and is particularly important for the expansion of the population. Based on the analysis by pygmy-owl experts on the Recovery Team, the best available science indicates the maximum amount of ground disturbance pygmy-owls are able tolerate is 20 - 25 percent (average of 23 percent), combined with other conservation measures that provide connectivity for movement, etc. This level of disturbance is within the range of where most owls in northwestern Tucson were found and best describes their tolerance for ground disturbance based on current data.

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). Casualties caused by pest control, pollution, collisions with cars, radio towers, glass windows, power lines, and domestic 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). Because of the proximity of pygmy-owl sites to residential areas in northwestern Tucson, these interactions may be a significant cause of owl mortality there (Cartron et al. 2000a).

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, AGFD unpubl. data.). This site was not known to be occupied since 1999. This site has the highest amount of development (33 percent) within its estimated home range of any other known nest site (S. Richardson, AGFD unpubl. data.). The site will continued to be monitored to determine if new owls reestablish a nest site.

In northwestern Tucson, all currently known pygmy-owl locations, particularly nest sites, are in low-density housing areas where abundant native vegetation separates structures. Additionally, they are adjacent to or near large tracts of undeveloped land. Pygmy-owls 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 pygmy-owls in areas with an abundance of native vegetation indicates that a complete modification of natural conditions likely results in unsuitable habitat conditions for pygmy-owls. While development activities are occurring in close proximity 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 areas are typically dirt or two-lane paved roads with low speed limits which minimizes traffic noise. Low density housing areas generally have lower levels of traffic noise because of the limited number of vehicles traveling through the area.

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 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, U.S. Fish and Wildlife Service 1988b, U.S. General Accounting Office 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 project area, 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 pygmy-owl specimens along Rillito Creek, a Santa Cruz River tributary, in present-day Tucson. 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, invasion by non-native plants, 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, Stromberg and Chew 1997). Sonoran Desert scrub 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.

In the United States, pygmy-owls 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 pygmy-owl (Oberholser 1974, Tewes 1993). For example, in 1996, a resident in Tucson reported a pygmy-owl 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, AGFD Pers. comm. 1999).

One of the few areas in Texas known to support pygmy-owls continues to be widely publicized as having organized field trips and birding festivals (American Birding Association 1993, Tropical Birds of the Border 1999). Resident pygmy-owls 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 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).

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 *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.

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 pygmy-owls elsewhere and other species, particularly raptors. 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 (Postovit and Postovit 1987, Porter *et al.* 1973).

Application of pesticides and herbicides in Arizona occurs year-round, and these chemicals pose a potential threat to the pygmy-owl. The presence of pygmy-owls 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 pygmy-owls and may be a threat to pygmy-owls and their prey; in one case, drums of toxic solvents were found within one mile of a pygmy-owl detection (Abbate *et al.* 1999).

Little is known about the rate or causes of mortality in pygmy-owls; however, they are susceptible to predation from a wide variety of species. In Texas, eggs and nestlings were depredated by racoons (*Procyon lotor*) and bullsnakes (*Pituophis catenifer*). Both adult and juvenile pygmy-owl 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). Pygmy-owls 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 pygmy-owls in Arizona and elsewhere.

Another factor that may affect pygmy-owls is interspecific competition/predation. In Texas, depredation of two adult female pygmy-owls nesting close to screech-owls was recorded. These incidences were recorded as "depredation by screech-owl after examination of the pygmy-owl corpses and assessment of circumstances (i.e., one pygmy-owl attempted to nest in a box that was previously used as screech-owl roost site, the other established a nest in a box within 16 feet of screech-owl nest site). In 2001, an unpaired female pygmy-owl was found dead in a tree cavity, apparently killed by a screech-owl (S. Richardson, AGFD unpubl. data). Conversely, pygmy-owls and screech-owls have also been recorded successfully nesting within 7 feet of each other in the same tree without interspecific conflict (G. Proudfoot, unpubl. data). The relationship between pygmy-owl 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 pygmy-owls are located. Pygmy-owls flying into windows and fences, resulting in serious injuries or death to the birds, have been documented twice. A pygmy-owl collided into a closed window of a parked vehicle; 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 a fence and died (S. Richardson, AGFD, unpubl. data). AGFD also has documented an incident of individuals shooting BB guns at birds perched on a saguaro which contained an active pygmy-owl nest. In Texas, two adult pygmy-owls and one fledging were killed by a domestic cat. These owls used a nest box about 246 feet from a human residence. In 2001, predation by domestic cats is also suspected by researchers in two instances in northwestern Tucson (S. Richardson, AGFD unpubl. data). Two female juvenile owls, located 2 ½ miles apart, were found dead from apparent wounds sustained from cats. Free roaming cats can also affect the number of lizards, birds, and other prey species available to pygmy-owls; however, very little research has been done in the Southwest on this potential problem.

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). Most recently, pygmy-owls during the 2001 dispersal period were observed near two lane roads on several occasions (AGFD unpubl. data). Although owls were not directly observed crossing roads, radio telemetry data were collected on either side of roadways. Movement across roads appeared to occur during the night, although transmittered owls were not continuously monitored. Because of a lack of funds and personnel, AGFD researchers are at best only able to collect relocations during 2 random times during a 24-hour period, therefore, the time and location of this crossing is unknown.

Pygmy-owls are capable of flying short distances (up to 100) feet or more over undisturbed vegetation (e.g., Sonoran Desert scrub, semidesert grasslands, or riparian areas) with little or no human activities or structures such as roads, fences, buildings, etc. (G. Proudfoot, unpubl. data, S. Richardson, AGFD unpubl. data). However, as opening size (i.e., gaps between trees or large shrubs) increases, coupled with increased threats (e.g., moderate to high traffic volumes and other human disturbances) relatively wide roads (greater than 40 feet), may act as barriers or significantly restrict owl movement. Wide roadways and associated clear zones cause large gaps between tree canopies on either side of roadways, resulting in lower flight patterns over roads. This low flight level can cause owls to fly directly in the pathway of oncoming cars and trucks, significantly increasing the threat of owls being struck. Measures can be implemented in roadway design to minimize these threats and allow successful movement across roadways. Among other measures, decreasing the canopy openings between trees on either side of roads and increasing the density of trees along roadways to provide greater shelter and cover from predators and human activities can be utilized to minimize adverse effects to owls attempting to cross roads. Specific research is needed to determine the distance at which road and clear zone widths significantly affect successful owl movement, types of vegetation needed, roadway and landscaping designs, speed limits, etc.

Telemetry data collected by AGFD in 2001 indicate that owl movement is affected by roads and traffic (S. Richardson, AGFD, unpubl. data). On two separate occasions in north Tucson, juvenile owls fitted with radio transmitters were tracked moving along washes and upland areas with native vegetation until they came upon busy roads with relatively wide clear zones on either side of the roadways. These owls stopped and were repeatedly observed reacting to passing vehicular traffic by retreating from the road edge vegetation to nearby trees as cars and trucks passed by. They appeared to be affected by road width, the density of vegetation on either side of the roadway, and traffic volume. In both cases, they eventually crossed these roads during lower traffic periods at areas with narrower gaps in vegetation where trees were present on either side of the road.

Researchers in Arizona have found that pygmy-owls require habitat linkages, within and between territories, for movement and dispersal of young. Continuous cover or patches of trees and large shrubs spaced at close, regular intervals, to provide concealment and protection from predators and mobbing, as well as to provide shade and cool temperatures, is necessary (S. Richardson, AGFD unpubl data, Abbate et al. 1999). Pygmy-owls, particularly juveniles because of their inexperience, are susceptible to predation, weather extremes, human-related injury/mortality factors (e.g., cars, buildings, fences, domestic cats, etc.) and other mortality factors (mortality of juveniles is typically 50 percent or more for owls and other raptors). Therefore, it is essential to maintain habitat conditions that reduce their exposure to these threats and provide protection as they disperse from their natal areas. A high degree of cover throughout the landscape increases the likelihood of survivorship to the next breeding season. Limiting these mortality factors is critical, especially for small, depressed populations, such as pygmy-owls in Arizona.

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, 1983; McLaughlin and Bowers 1982). Flesch (1999) also noted that approximately 20 to 30 percent of the mesquite woodland within 164 feet of the nest was fire- or top-killed, and ground cover was also eliminated until the summer monsoons. Esque *et al.* (2000) observed saguaro mortality in excess of 20 percent after a 1994 fire in Saguaro National Monument. Careful use of prescribed fires in areas potentially suitable for pygmy-owls is necessary so that habitat is not lost or degraded (Flesch 1999).

Low genetic variability can lead to a reduction 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 offspring, 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: barn owls, burrowing owls (*Athene cunicularia*), screech-owls, and spotted owls (*Strix occidentalis*). In 1998 and 1999, two cases of sibling pygmy-owls pairing and breeding were documented (Abbate *et al.* 1999). In both cases, young were fledged from the nesting attempts. These unusual pairings may have resulted from extremely low numbers of available mates within their dispersal range, and/or from barriers (including fragmentation of habitat) that has influenced dispersal and limited the movement of young owls (Abbate *et al.* 1999). Further, because the pygmy-owl 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.

Recent genetic research suggests that pygmy-owls in northwestern Tucson may be isolated from other populations in Arizona and Mexico (Proudfoot and Slack 2001). They have found that the low level of genetic variation and the absence of shared haplotypes between owls in northwestern Tucson and the remainder of the State and Mexico may be indicative of natural divergence of this population from the rest of the pygmy-owl population in Arizona. Specifically, this study found that pygmy-owls in northwestern Tucson are in a distinct clade and suggests a current separation between populations in northwestern Tucson and elsewhere in the State and Mexico. In addition, these owls have extremely low levels of average haplotype diversity. Researchers acknowledge this may also be a product of sampling (i.e., sampling from one maternal lineage) and/or an extremely high level of inbreeding as a result of low population numbers and geographic isolation. Given the low number of pygmy-owls in the northwestern Tucson, their potential isolation from source populations, the fact that inbreeding has occurred to the second generation in two documented cases, and potential pressure from urban development, there is a high level of concern for the Tucson Basin population of pygmy-owls.

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 pygmy-owls 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 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 reduce populations to a state in which demographic stochasticity takes hold. In small populations such as with the pygmy-owl, 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.

Federal Projects Resulting in Incidental Take

To date, we have anticipated incidental take of pygmy-owls in only 4 instances: 1) Thornydale Road improvement project in Pima County, Arizona (consultation number 2-21-00-F-213, February 2002); 2) Dove Mountain Development in Marana, Arizona (consultation number 2-21-99-F-363, October 2000); 3) Issuance of an Endangered Species Act section 10(a)(1)(B) permit for the Lazy K Bar Ranch in association with a Habitat Conservation Plan (HCP) (consultation number 2-21-98-F-334, November 1998); and 4) the Tucson Safford BLM Office Grazing Program in southern Arizona (consultation number 2-21-96-F-0160). In order to provide a complete account of the current status of the pygmy-owl in Arizona, we describe these actions in detail below.

Thornydale Road Improvement Project

The proposed action for the Thornydale Road improvement project involved the issuance of a National Pollutant Discharge Elimination System (NPDES) general permit under section 402 of the Clean Water Act (CWA) from the EPA and a section 404 permit under the CWA from the Army Corps of Engineers (COE). The EPA was the lead Federal agency for this consultation. These permits allowed the widening and placement of flood control structures along Thornydale, Magee, and Cortaro Farms roads in Pima County, Arizona. Because of the inclusion of significant conservation measures, we did not anticipate the proposed action would incidentally cause any take in the form of harm, death, or injury of any pygmy-owl. The project site was, however, within a portion of a resident male pygmy-owl's home range. It was therefore believed possible that non-lethal incidental take (in the form of harassment only) of this pygmy-owl may occur as the result of ongoing construction activity.

The biological opinion presented four reasonable and prudent measures for reducing incidental take, which included: 1) minimize vegetation disturbance, loss of key habitat components, and other potential adverse effects to pygmy-owls within the estimated home range of the resident single or pygmy-owl pair; 2) minimize noise disturbance immediately adjacent to a pygmy-owl nest or activity center; 3) promote connectivity to allow for movement within pygmy-owl home ranges, between pygmy-owl sites and adjacent suitable habitat within the project site and Conservation Lands; and 4) monitor construction activities during and after completion of the project to ensure compliance with terms and conditions and to determine their effectiveness to accomplish their stated goals.

Dove Mountain Development

The proposed action for this consultation also involved the issuance of a NPDES general permit under section 402 of the CWA from the EPA and a section 404 permit under the CWA from the COE, with the EPA acting as the lead federal agency. These permits facilitated development

within an approximately 5,924-acre residential and commercial development with parks and open space, located in Marana, Arizona.

We did not anticipate the proposed action would incidentally cause any take in the form of harm, death, or injury of a pygmy-owl. Further, there were no currently known nesting or resident pygmy-owl sites or portions of their home range within the project site. However, because nesting owls were nearby, we anticipated that, for a 20-30 year phased development project, it was reasonably certain that pygmy-owls would move onto or into the immediate vicinity of the project site and establish a nest or activity center. Therefore, it was anticipated that non-lethal incidental take (in the form of harassment only) of a pair or resident single pygmy-owl may occur if a pygmy-owl establishes a territory within 0.37 mile of ongoing development activity.

We provided the following reasonable and prudent measures in order to minimize take: 1) minimize vegetation disturbance, loss of key habitat components, and other potential adverse effects to pygmy-owls which are first detected prior to commencement of clearing vegetation for a construction phase within the estimated home range of a pair or resident single pygmy-owl; 2) minimize noise disturbance immediately adjacent to a pygmy-owl nest or activity center which is first detected prior to the commencement of clearing vegetation for a construction phase; 3) minimize vegetation disturbance, loss of key habitat components, and other potential adverse effects to pygmy-owls which are first detected after commencement of clearing vegetation for a construction phase within the estimated home range of a pair or resident single pygmy-owl; 4) minimize noise disturbance immediately adjacent to a pygmy-owl nest or activity center which is first detected after commencement of vegetation clearing for a construction phase; 5) promote connectivity to allow for movement within pygmy-owl home ranges, between pygmy-owl sites and adjacent suitable habitat, in Conservation Lands, and Open Space areas; and 6) monitor development activities within the home range of a new pygmy-owl, and conservation measures, to ensure compliance with terms and conditions.

Lazy K Bar Ranch HCP

The proposed action was the issuance of an Endangered Species Act section 10(a)(1)(B) permit for the Lazy K Bar Ranch in association with a HCP. The project included the operation of a resort/guest ranch and ultimately its conversion into a low-density, residential area. The consultation covered both the transitional and residential phases of the project. We concluded that take, in the form of harassment due to habitat loss and noise disturbance, may result in up to two pygmy-owls and their young. We provided the following reasonable and prudent measures: 1) minimize the removal of suitable habitat areas associated with project development; 2) avoid disturbance of breeding pygmy-owls and loss of nest trees or saguaros while being used by pygmy-owls; 3) minimize habitat disturbance and loss of key habitat components during project development; and 4) monitor the effects of the proposed project on habitat quality over time, and ensure adherence to HCP criteria.

Safford and Tucson Livestock Grazing Program

The proposed action for this project was the issuance of permits to graze livestock on the Safford and Tucson districts of the BLM, the lead Federal agency for the consultation. This is a large programmatic consultation covering many allotments (over 250) that has been amended several times since the original opinion was issued in 1997. The most recent amendment to address the pygmy-owl was amendment four, which also addressed newly designated critical habitat. As mentioned above, pygmy-owl has since been remanded to us by the district court and is not currently in effect.

We found, given the documentation of nesting pygmy-owls and good habitat on the Guild Wash

and Owl Head allotments, and presence of a pygmy-owl nest within three miles of BLM lands on the Cross Triangle allotment, that take of pygmy-owls is reasonable likely to occur over the life of the proposed action (BLM grazing leases can be of any length of time, but cannot exceed ten years). We anticipated that up to one nesting pair of pygmy-owls and one unpaired pygmy-owl could be harmed due to: 1) construction of range improvement projects (corrals, fences, pipelines, tanks, etc.) or implementation of mechanical of chemical vegetation treatments, or prescribed fire that destroys nesting or foraging habitat, and 2) planting or seeding of non-native plants that may alter fire regimes and increase the chance that a wildfire would occur in occupied pygmy-owl habitat.

We provided the following reasonable and prudent measures in order to minimize take: 1) Actions shall be taken to minimize direct effects of cattle grazing on those habitats that, based on current knowledge, have the greatest potential to support pygmy-owls, 2) Activities that may result in a take of cactus ferruginous pygmy-owl or destruction of pygmy-owl habitat shall be evaluated, monitored, and modified as needed to reduce potential adverse effects to the pygmy-owl, 3) monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring.

II. 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.

A. Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). We have determined that the action area for the pygmy-owl includes the 5 mile long stretch of North Puerto Blanco Road to be widened including a buffer or circle of 19 mile-diameter. We base this determination on the dispersal distance of juvenile pygmy-owls in Texas and Arizona (Proudfoot unpubl. data, S. Richardson, AGFD unpubl. data).

B. Terrain, Vegetation Communities, and Climate in the Action Area

A complete description of the Monument and surrounding areas has been previously provided (see "Environmental Baseline, part B. Terrain, Vegetation Communities, and Climate in the Action Area for the Sonoran pronghorn).

C. Status of the Cactus Ferruginous Pygmy-Owl in the Action Area

Pygmy-owl habitat in the Monument is of moderate to above-average quality. The area offers relatively dense and diverse upper bajada Sonoran Desert scrub, with a number of larger xeroriparian areas, and numerous smaller washes, including wash confluence areas. Pygmy-owl presence at the Monument has been surveyed since 1977 when two pairs were recorded. In 1982, one pair of pygmy-owls was found followed by two pairs in 1992. Through limited surveys, approximately 3 to 5 pygmy-owl territories have been located and monitored since 1995. Four pairs of pygmy-owls were located in 1999 and 4 pairs and 2 individuals were discovered in 2000. Surveys in 2001 detected 5 occupied territories, including 3 confirmed pairs with an additional pair strongly suspected. In contrast, during 2002 only 2 adults from 2 sites in the Monument were detected, and no pairs or nesting were observed. Individual pygmy-owls

have been detected in the project area near the visitor center and residence area as recently as 1997.

Construction and development projects in the Monument have impacted the pygmy-owl and its habitat. Most of the construction and development is related to maintaining, improving, and/or expanding facilities used for management of and providing services to the visiting public. The majority of these actions center on the Twin Peaks area (Visitor Center, residence area, maintenance area, and campground) and have taken place in or adjacent to pygmy-owl habitat and territories. Furthermore, additional maintenance and upgrading projects are planned. Although a number of section 7 consultations regarding potential impacts to pygmy-owls have been conducted within the action area, we did not anticipate any incidental take would result from these actions.

On BLM lands, within the Ajo allotments, only the Cameron and Childs allotments contain suitable pygmy-owl habitat. The Coyote Flat and Why allotments do not contain suitable or potential pygmy-owl habitat. According to the BLM, these allotments do not have the capability to produce potential or suitable habitat in the future because the washes are too small to support dense vegetation patches > 3 acres in size.

Pygmy-owls have been documented on both the Cameron and Childs allotments. On the Cameron Allotment, a single pygmy-owl was detected at the Cuerda de Lena Wash in 1998. Surveys conducted by BLM contract during 2001 also detected a single pygmy-owl along Sikort Chuapo Wash on the Childs Allotment. The initial detection was followed up by Tim Tibbitts of NPS, who stated that although the response call was somewhat atypical for a pygmy-owl, he was reasonably certain of his determination. For this reason, BLM states that this observation was only 70 percent confirmed. Due to the nature of the habitat, its proximity to other pygmy-owl locations, and the high degree of confidence in the determination, we treat this observation as a confirmed sighting. No pygmy-owls were documented on the Ajo allotments during 2002 surveys.

The action area, as defined for the pygmy-owl, includes the Monument, as well as a 19-mile buffer area surrounding the project. Therefore, the action area also includes portions of BLM lands (the Ajo allotments), Cabeza Prieta NWR, and BMGR. Although the majority of Arizona pygmy-owl detections in the last seven years have been from the northwestern Tucson area, pygmy-owls have also been detected in southern Pinal County, including the Monument and Cabeza Prieta NWR. While there are no confirmed current records for pygmy-owl on BMGR, the Range does overlap the pygmy-owl's historic distribution and contains potentially suitable habitat (Dames and Moore 1995). In 2001, 2 new pygmy-owl sites were documented for Cabeza Prieta NWR.

The Monument represents a stronghold of sorts for the pygmy-owl in the area, although owls have been detected on all contiguous federal lands and in Mexico. Of the Federal lands, only the Monument, has had nesting pygmy-owls consistently. Pygmy-owl locations in areas surrounding the Monument may represent individuals disbursing into adjacent areas. Thus the Monument may represent an important source population for surrounding areas, or a dispersal corridor for pygmy-owls from Mexico.

III. EFFECTS OF THE ACTION

The following is developed from NPS (2002) except where a different citation is given. The proposed action will result in the permanent loss of approximately 11 acres of Sonoran Desert

scrub, essentially all of which is suitable habitat for pygmy-owls that has the potential to provide for breeding, feeding or sheltering. NPS will attempt to salvage most of the organ pipe and about half of the saguaros and ironwoods in the impacted area. NPS estimates that, after cactus salvage, approximately 88-100 saguaros, 4 to 8 organ pipe cactus, and 25 to 30 ironwoods would be lost. The Monument represents moderate to above average habitat for pygmy-owls. Nesting pairs have consistently been recorded in the park; as many as 4 nesting pairs have been found in any one year. A calling male was observed in the project area in 1996 and 1997. We therefore can conclude that the action area represents an important area in the range of the pygmy-owl and that it is important, at a minimum, for dispersal, sheltering and feeding. The action area contains large areas of wilderness with small concentrations of disturbed areas (e.g. the Visitor's Center area). Survival and recovery of the pygmy-owl will be dependent on the availability of suitable habitat in this area for offspring to be able to successfully disperse and establish new territories.

Pygmy-owls require habitat linkages, within and among territories for movement and dispersal, consisting of continuous cover or patches of trees and large shrubs spaced at regular intervals, to provide concealment and protection from predators and mobbing, as well as shade and cover to moderate temperature extremes (S. Richardson, AGFD unpubl data, Abbate *et al*. 1999). The project will result in the widening of the existing road from its current width of 14 feet to 20 feet wide. While this will result in the loss of 11 acres of habitat, the project should retain dispersal corridors. Through planning, NPS has avoided the main stems of large ironwood trees, although some disturbance will occur in the rooting zone. Most of the smaller ironwoods that could not be avoided will be salvaged. Most of the organ pipe cacti can probably be salvaged, but efforts will be limited by plant size. Salvaged saguaros, mostly smaller individuals less than one meter tall, will be replanted onsite to the extent space is available, as will other native vegetation, with the rest transplanted to the Monument nursery to be used in other disturbed areas in the Monument. NPS has designed the road to retain the 25-foot vehicle limit and to have a reduced speed limit of 15 miles per hour. The new road alignment will maximize the amount of large trees avoided by the project, especially large organ pipe cacti, saguaro, and ironwood. The net effect of these measures will be to retain a road with intact dense native Sonoran Desert scrub on either side of the road, tree canopy covers of large trees less than 40 feet apart, and a very conservative speed limit, all of which should maintain pygmy-owl dispersal routes through the area.

NPS conducted two years of Service protocol pygmy-owl surveys in the project area with no recorded pygmy-owls. Although pygmy-owls have not recently been in the project area footprint, as mentioned earlier, nesting pygmy-owls are consistently found in the park. NPS will time all construction to avoid the pygmy-owl nesting season.

The proposed action will cause short-term noise disturbance and human activity associated with construction and long-term noise disturbance and human activity from use of the recreational development. 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 (Postovit and Postovit 1987, Porter et al. 1973). The construction of the road and parking area will be a relatively short-term event, with a foreseeable end in noise disturbance activities. However, noise disturbance, increased vehicle traffic, and human activity within developed areas after development will be a permanent effect. Increased noise levels may significantly disrupt normal behavioral patterns including breeding, feeding, and sheltering. Pygmy-owls may be tolerant, to some extent, of certain low-level noise disturbances associated with a few scattered recreational facilities and seasonal light traffic.

Survival and recovery of the pygmy-owl will require not only protection of all known sites, but also the conservation of other areas not currently known to have nesting owls, which can be measured at two spacial scales. The action area contains lands with a variety of human uses, form recreation to cattle grazing and surface mining, all of which affect the pygmy-owl to various

degrees. At a large scale, connectivity is necessary among large blocks of suitable habitat that are either currently known to have nesting owls or are important for recovery. The Monument provides an important area in terms of what may be a source population for pygmy-owls to disperse into adjacent areas such as Cabeza Prieta NWR or the BLM Ajo allotments. The Monument may also act as a corridor for pygmy-owls dispersing from Mexico.

At a finer scale, the protection of habitat within the vicinity of known owl sites for establishment of new sites and movement between them is also essential. Connectivity between breeding and non-breeding owls and areas where juvenile owls can establish new nesting territories or replace owls as they die are essential for the conservation of the pygmy-owl. Based on the current data, the measures taken by NPS to minimize the effects of the new road should serve to maintain existing movement corridors for pygmy-owls.

IV. 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 ESA.

The action area consists of Federal land (the Monument, BLM Ajo allotments and Cabeza Prieta NWR), with the exception of the Tohono O'odham Nation lands, Mexico, and some small private parcels in the vicinity of Why. In the U.S., cumulative effects are expected from activities such as cattle grazing, surface mining, and some residential and commercial development. Similar activities are expected to occur in Mexico. These activities could further reduce the amount of suitable habitat, increase fragmentation, and degrade habitat conditions.

V. CONCLUSION

After reviewing the current status of the pygmy-owl, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is our biological opinion that the proposed action is not likely to jeopardize the continued existence of the pygmy-owl. There currently is no critical habitat for the pygmy-owl, therefore none will be affected. These conclusions are based on the record of this consultation including the BA, EA, project description, and the following:

1. The loss of suitable habitat for the pygmy-owl will be minimized by road design which will maintain as much habitat as possible. Given the size of the project in relation to the amount of pristine habitat in the action area, the effects of this loss are insignificant.

2. Pygmy-owl habitat connectivity within the project area and to adjacent suitable habitat areas will be maintained.

3. Construction will take place outside of the pygmy-owl nesting period, and may be postponed if owls occupy the site before or during construction.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA 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 defined 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 (50 CFR 17.30). "Harass is defined 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 ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take Anticipated

We do not anticipate the proposed action will incidentally take any pygmy-owls.

CONSERVATION RECOMMENDATIONS

Sections 2(c) and 7(a)(1) of the ESA direct Federal agencies to utilize their authorities to further the purposes of the ESA 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(c) or 7(a)(1) responsibilities for the Pygmy-owl. In furtherance of the purposes of the ESA, we recommend implementing the following discretionary actions:

1. NPS should continue to conduct pygmy-owl surveys in all suitable habitat within the Monument and monitor nesting pygmy-owls to determine nesting success.

2. NPS should conduct or fund studies, using both monitoring and telemetry, to determine pygmy-owl habitat use patterns and relationships between owls and the human interface in within the Monument. Surveys involving simulated or recorded calls of pygmy-owls require an appropriate permit from us. AGFD should also be contacted in regard to State permitting requirements.

3. NPS should assist in the implementation of recovery tasks identified in the pygmy-owl Recovery Plan when approved.

4. NPS should transplant all saguaros and organ pipe to disturbed areas of the Monument.

DISPOSITION OF DEAD OR INJURED ANIMALS

Upon finding a dead or injured threatened or endangered animal, initial notification must be made to our 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 Fish and Wildlife Service or AGFD office, or educational or research institutions (e.g., University of Arizona in Tucson) 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, please contact us regarding the final disposition of the animal.

REINITIATION STATEMENT

This concludes formal consultation on the Organ Pipe Cactus Widen North Puerto Blanco Road Project. 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 (or is authorized by law) and if: (1) 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; (2) 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; (3) a new species is listed or critical habitat designated that may be affected by the action. In addition, if the status of the U.S. Sonoran pronghorn population further deteriorates (i.e. is less than the AGFD population estimate of 25-65 animals discussed in this document) we believe reinitiation would be warranted. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and assistance throughout this consultation process. Any questions or comments should be directed to Glen Knowles (x233) or Sherry Barrett (520) 670-4617.

/s/ Steven L. Spangle

cc's (w/attachments)
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State Director, Bureau of Land Management, Phoenix, AZ
Field Office Manager, Yuma Field Office, Bureau of Land Management, Yuma, AZ
Field Office Manager, Phoenix Field Office, Bureau of Land Management, Phoenix, AZ
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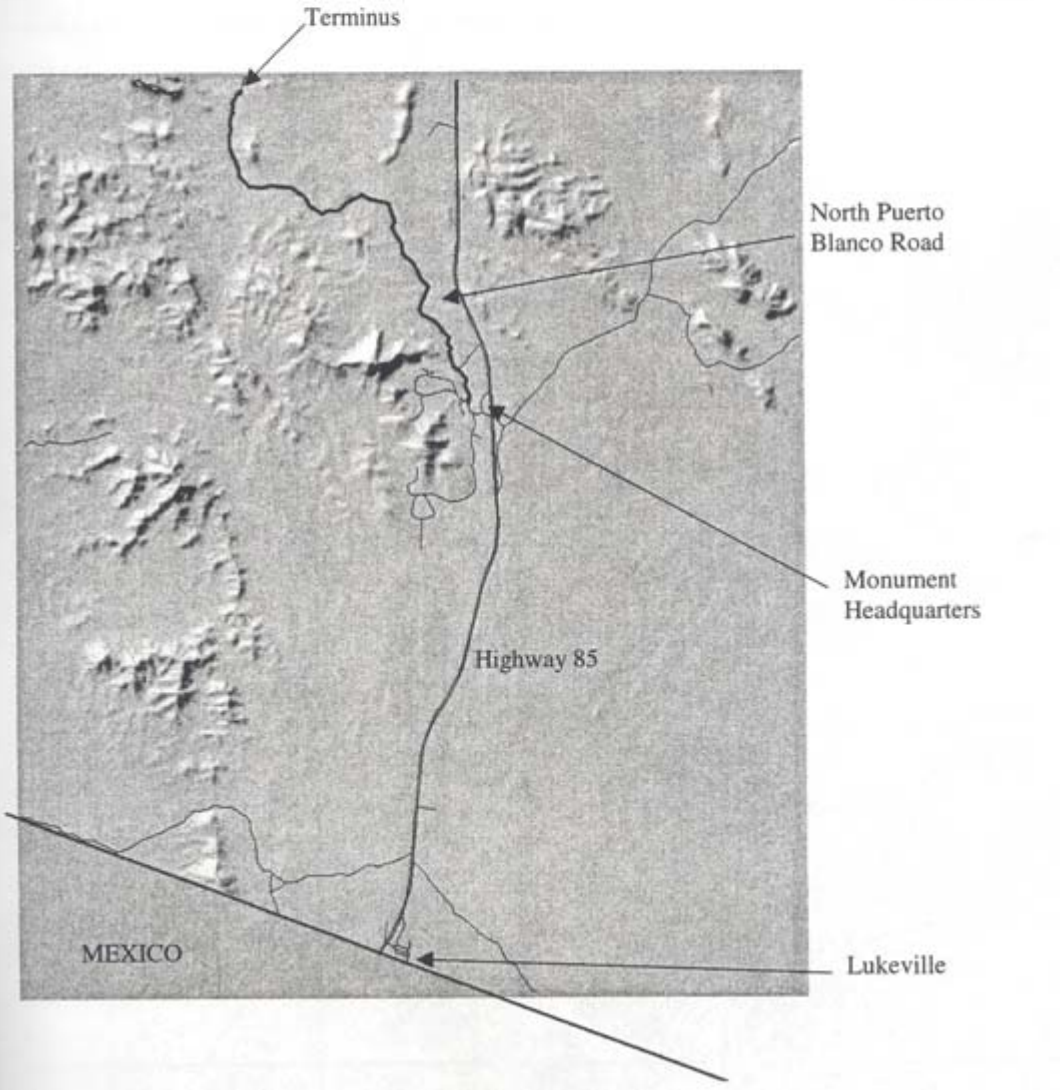
APPENDIX 1 - RESTAB

FIGURES AND TABLES

Project Maps

Right: Arizona map

Below: Location of Project



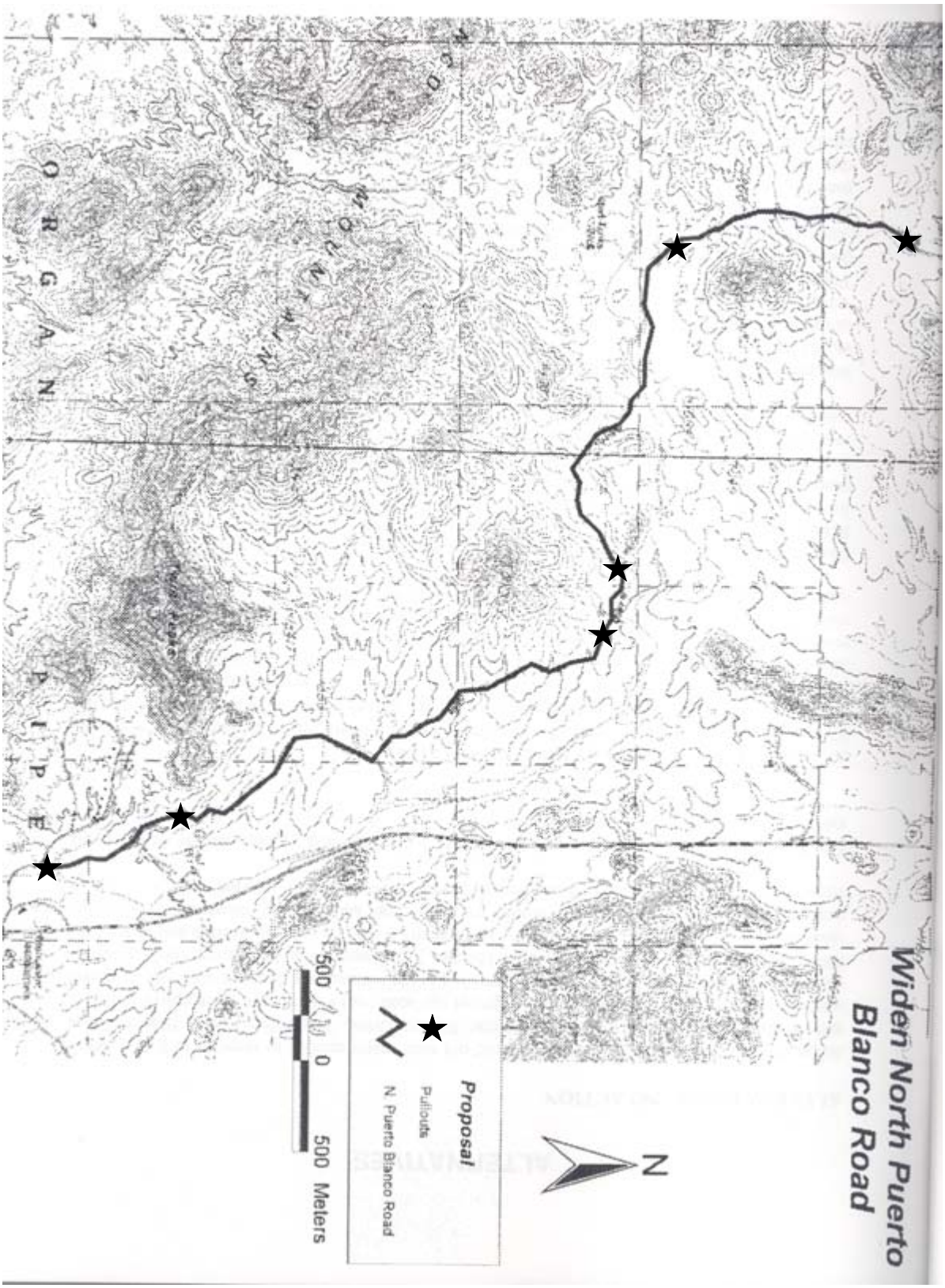


Figure 1. Widen North Puerto Blanco Road project area.

Figure 2. Project area illustrating location of wayside pullouts.

Figure 3. Historic range of Sonoran pronghorn in the United States and Mexico.

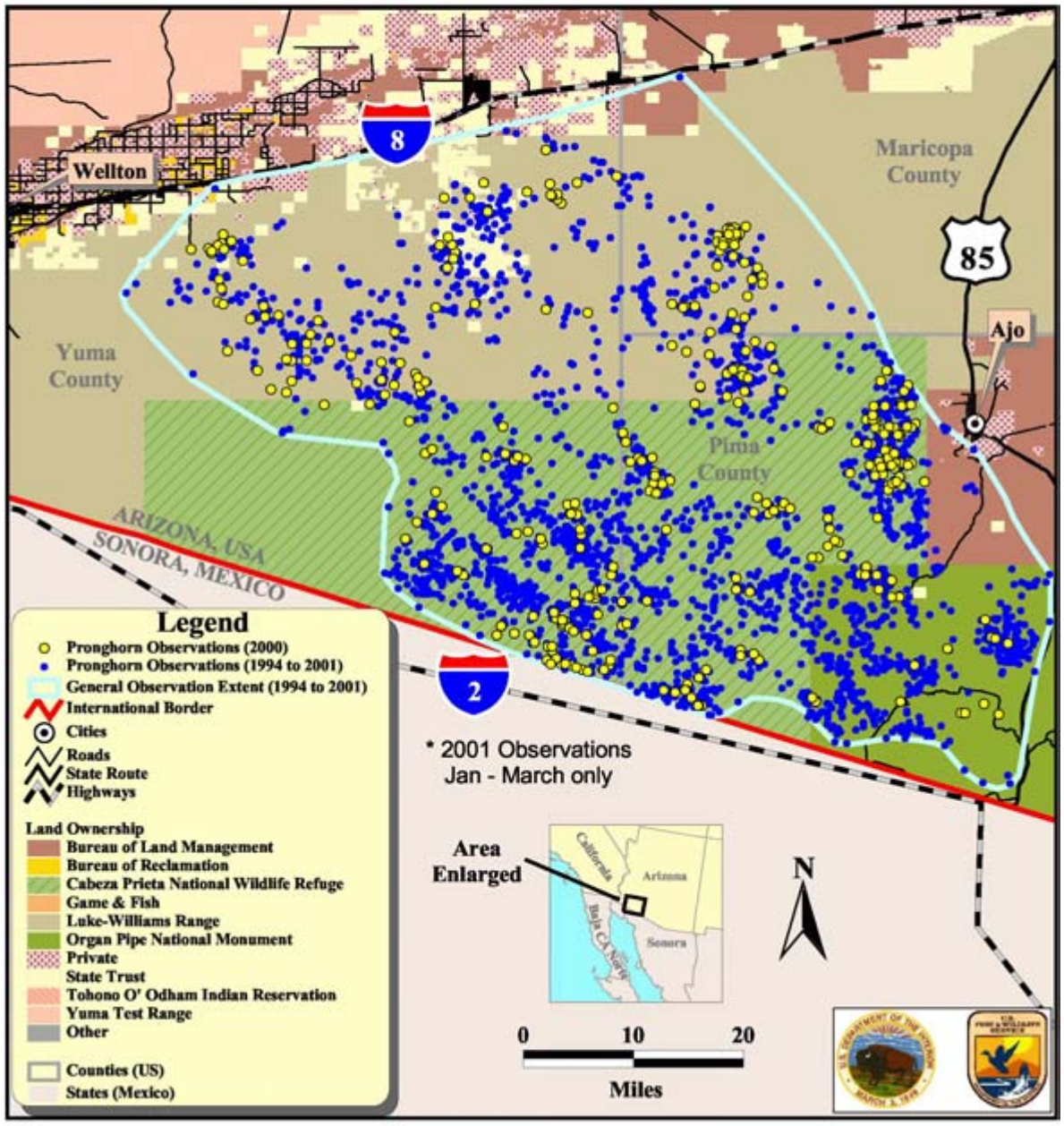

Wellton
8
Maricopa County
85
Ajo
Yuma County
Pima County
ARIZONA, USA
SONORA, MEXICO
2
* 2001 Observations
Jan - March only
Area Enlarged
California
Arizona
Sonora
Baja CA Norte
N
0
10
20
Miles
Legend
Pronghorn Observations (2000)
Pronghorn Observations (1994 to 2001)
General Observation Extent (1994 to 2001)
International Border
Cities
Roads
State Route
Highways
Land Ownership
Bureau of Land Management
Bureau of Reclamation
Cabeza Prieta National Wildlife Refuge
Game & Fish
Luke-Williams Range
Organ Pipe National Monument
Private
State Trust
Tohono O' Odham Indian Reservation
Yuma Test Range
Other
Counties (US)
States (Mexico)

Figure 4. Current Sonoran pronghorn distribution in the United States: Records from 1994-2001.

Table 1. A summary of population estimates from literature and field surveys for Sonoran pronghorn in the U.S.

Date	Population estimate (95 percent CI[a])	Source
1925	105	Nelson 1925
1941[b]	60	Nicol 1941
1957	<1,000	Halloran 1957
1968	50	Monson 1968
1968-1974	50 - 150	Carr 1974
1981	100 - 150	Arizona Game and Fish Department 1981
1984	85 - 100	Arizona Game and Fish Department 1986
1992	179 (145-234)	Bright *et al.* 1999
1994	282 (205-489)	Bright *et al.* 1999
1996	130 (114-154)	Bright *et al.* 1999
1998	142 (125-167)	Bright *et al.* 1999
2000	99 (69-392)	Bright *et al.* 2001

[a] Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.
[b] Population estimate for southwestern Arizona, excluding Organ Pipe Cactus National Monument.

Table 2. Comparison of U.S. Sonoran pronghorn population surveys, 1992-2000.

	Pronghorn observed		Population estimates		
Date	On transect	Total observed	Density estimate using DISTANCE (95 percent CI[a])	Lincoln-Peterson (95 percent CI)	Sightability model (95 percent CI)
Dec 92	99	121	246 (103-584)	---	179 (145-234)
Mar 94	100	109	184 (100-334)	---	282 (205-489)
Dec 96	71	82 (95[b])	216 (82-579)	162 (4-324)	130 (114-154)
Dec 98	74	86 (98[b])	---	172 (23-321)	142 (125-167)
Dec 00	67	69[b]	---	---	99 (69-392)

[a] Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.
[b] Includes animals missed on survey, but located using radio telemetry.

Table 3. Population estimates from literature and field surveys for Sonoran pronghorn in Mexico.

Date	Population estimate (95 percent CI[a])	Source
1925	595	Nelson 1925
1957	>1,000	Villa 1958
1981	200-350	Arizona Game and Fish Department 1981
1993	414 (317-644)	Bright *et al.* 1999
2000	346 (288-445)	Bright *et al.* 2001

[a] Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.

Table 4. Comparison of Sonoran pronghorn surveys in Mexico, 1993 and 2000.

	Total number of pronghorn seen	Sightability model (95 percent CI[a])
March 1993		
Southeast of Highway 8	163	289 (226-432)
West of Highway 8	51	124 (91-211)
Total	214	414 (317-644)
December 2000		
Southeast of Highway 8	249	311 (261-397)
West of Highway 8	17	34 (27-48)
Total	266	346 (288-445)

[a] Confidence interval; there is only a 5 percent chance that the population total falls outside of this range.

Table 5. Utilization studies within Sentinel, Coyote Flat, Why, and Cameron allotments as reported in the 1998-1999 and 2000 reports from the Bureau of Land Management to the Service per the terms and conditions of the December 3, 1997, biological opinion (consultation number 2-21-94-F-192).

Allotment	Year	Date Read	Species		Estimated Utilzation (%)
Sentinel	1998[1]	11/09/98	mesquite (*Prosopis velutina*)		0.0
			big galleta (*Hilaria rigida*)		0.0
	1999[1]	11/04/99	mesquite		0.0
			big galleta		0.0
	2000[1]	10/24/00	mesquite		3.0
			big galleta		3.0
Coyote Flat	1998	11/22/98	*Lycium* spp.		0.0
			mesquite		0.0
	1999	10/05/99	*Lycium* spp.		0.0
			mesquite		0.0
	2000[2]	10/25/00	*Lycium* spp.		3.0
			mesquite		3.0
	2001	?	R-KP-1	mesquite	2.5
				wolfberry	2.5
				bush muhly	16.0
			R-DW-1	big galleta	43.1
			R-DW-2	palo verde	3.6
Why	1998	11/23/98	*Lycium* spp.		2.5
			mesquite		2.5
	1999	10/13/99	*Lycium* spp.		0.0
			mesquite		0.0
	2000[3]	10/25/00	*Lycium* spp.		3.0
			mesquite		3.0
	2001		R-KP-1	mesquite	2.5
				wolfberry	2.5
			R-DW-2	mesquite	2.5

Allotment	Year	Date Read	Species		Estimated Utilzation (%)
Cameron	1998	04/29/98	R-KP-1	fairy duster (*Calliandra eriophylla*)	2.5
			R-KP-2	big galleta	0.0
				bush muhly (*Muhlenbergia porteri*)	0.0
			R-KP-3	mesquite	0.0
				blue palo verde (*Parkinsonia floridum*)	0.0
	1999	11/03/99	R-KP-1	fairy duster	2.5
			R-KP-2	big galleta	3.6
				bush muhly	2.5
			R-KP-3	mesquite	2.5
				blue palo verde	2.5
	2000[4]	10/25/00	R-KP-1	fairy duster	2.5
			R-KP-2	big galleta	9.0
				bush muhly	10.0
			R-KP-3	mesquite	3.0
				blue palo verde	3.0
	2001	?	R-KP-1	false mesquite	2.5
			R-KP-2	big galleta	13.1
				bush muhly	41.7
			R-KP-3	mesquite	2.5
				blue palo verde	3.6
			R-KP-3a	big galleta	48.1
			R-DW-2	mesquite	2.5
			R-DW-3	mesquite	3.6
				white bursage	5.3
			R-DW-4	chuparosa	76.8
				mesquite	5.7

[1]Allotment was in non-use.
[2]Permittee was licensed for 20 cows (228 AUMs) and took non-use on 20 cows (228 AUMs).
[3]Permittee was licensed for 14 cows (168 AUMs) and took non-use on 24 cows (288 AUMs).
[4]Permittee was licensed for 50 cows (600 AUMs) and 8 horses (96 AUMs) and took non-use on 153 cows (1836 AUMs).