

Appendix M: Comprehensive Conservation Plan Management Goals, Objectives and Strategies

GOAL 1: WILDLIFE AND HABITAT MANAGEMENT

Protect, maintain, enhance and/or restore the diversity and abundance of wildlife species and ecological communities of the Sonoran Desert represented at Cabeza Prieta National Wildlife Refuge (NWR).

Objective 1:

Continue to gather sound scientific data on the size and movements of the U. S. sub-population of Sonoran pronghorn.

Current Status:

The refuge coordinates population survey/monitoring activities with the Arizona Game and Fish Department (AGFD). Regularly occurring activities include an aerial survey of all Sonoran pronghorn habitat on the refuge every two years using a standard protocol that provides population estimates with a 95 percent confidence interval, less rigorous surveys on alternating years, and weekly aerial reconnaissance of portions of the refuge Sonoran pronghorn habitat. Two Sonoran pronghorn are currently radio collared.

Rationale for Objective:

This objective, is an action item of the Sonoran pronghorn recovery plan.

Strategies for Accomplishing Objective:

1. In cooperation with the Arizona Game and Fish Department (AGFD), conduct the survey of the U.S. sub-population at least biennially.
2. When necessary weather conditions are present, and a determination has been made that the risk of capture myopathy is sufficiently low, the refuge will conduct radio collaring operations, with eventual goal of having operating radio collars on 10 percent of the U.S. population.
3. The refuge, in cooperation with AGFD, will continue weekly aerial monitoring of radio collared pronghorn.
4. Refuge and AGFD staff will monitor fawn recruitment while conducting the weekly telemetry flights.

Objective 2:

Continue to ensure that reliable sources of free water are available in at least 22 locations within the range of the Sonoran pronghorn.

Current Status:

Twenty-two developed waters located within Sonoran pronghorn habitat are currently functional. Two of these waters, Charlie Bell and Bassarisc Tank, are used by both desert bighorn sheep and Sonoran pronghorn. The remaining 20 functional pronghorn waters include: Redtail and Jose Juan Charcos, excavations in the soil which collect runoff and are supplemented by fiberglass tanks and drinking troughs; Adobe Well, Adobe House Well and Tanks, Chico Shunie Well, Jack's Well, Little Tule Well, Lower Well, Papago Well, Tiller Well, Antelope Tank, and nine recently developed buried storage tanks with multiple water collection locations and regulated wildlife drinking troughs

Supplemental water is periodically hauled to six of the pronghorn waters, Redtail Charco, Jose Juan Charco, Antelope Tank, Bassarisc Tank, Jack's Well, and Little Tule Well. Antelope Tank has been redeveloped using a model that has been successful in other southwestern desert environments. This includes a large buried storage tank, multiple runoff collection points and a drinking trough metered by a float valve. In more than two and one-half years of operation, including a period of prolonged drought in the fall and winter of 2005 and 2006, Antelope Tank has not required any supplemental water. This suggests that supplemental water will be required very infrequently, and only after protracted drought. The nine recently developed buried tanks also employ this model, and should require only very infrequent hauling of supplemental water. Little Tule Well is proposed for redevelopment, and likely will not require water hauling after redevelopment. The remaining wells pump water through the use of windmills and do not typically require any hauling of supplemental water.

Rationale for Objective:

While there is some debate among wildlife biologists regarding the efficacy of developed water to support populations in arid regions, it is professional judgment of refuge biologists and the Sonoran pronghorn recovery team that the developed waters should be maintained and supplied with water. Experiments with temporary waters conducted in the summers of 2002 and 2003 demonstrated that Sonoran pronghorn do use new sources of free water in the refuge environment. The refuge will continue to study the effects of supplying supplemental water and will provide water to pronghorns as long as the recovery plan and recovery team mandate.

Strategies for Accomplishing Objective:

1. Continue hauling water as needed to Redtail Charco, Jose Juan Charco, Antelope Tank, Bassarisc Tank, the nine newly developed Sonoran pronghorn waters, Jack's Well, Adobe Well, and Little Tule Well.
2. Redevelop non-functioning or poorly functioning pronghorn waters at Jack's Well and Chico Shunie Well.
3. Survey Sonoran pronghorn habitat throughout the refuge to identify potential sites for upgraded developed waters similar to the redeveloped water at Antelope Tank.
4. Develop additional waters at suitable sites in Sonoran pronghorn habitat, should the Sonoran pronghorn recovery team determine they are necessary.
5. If suitable, reliable equipment can be located, install water sensors with remote transmission capability in Sonoran pronghorn waters.
6. Annually collect samples of water from all developed waters in Sonoran pronghorn habitat and sample for organisms or compounds pathogenic to Sonoran pronghorn.

Objective 3:

Continue to review and evaluate Sonoran pronghorn use of developed waters, both temporary and permanent.

Current Status:

During the summers of 2002 and 2003 the refuge placed temporary waters south of Charlie Bell Road in Daniels Arroyo, and at two locations on the bajada of the Agua Dulce Mountains. Water were equipped with automated cameras set to photograph any large animal that approached the water. Refuge and AGFD staff visited the temporary waters regularly to replenish the water supply, recover film and service the cameras. Monitoring demonstrated that pronghorn did find and use the temporary waters. Analysis of this study and review of secondary source materials confirms that Sonoran pronghorn will readily use supplemental water, but its role in Sonoran pronghorn recovery is still not fully understood (Morgart et al. 2005).

Rationale for Objective:

Evaluating pronghorn use of sources of free water is an objective of the Sonoran pronghorn recovery plan. Additional information about the pronghorn's use of developed waters will be useful in developing recovery actions to be implemented on the refuge.

Strategies for Accomplishing Objective:

1. Determine occupied habitat in early summer, examine locations of known waters, select areas of occupied habitat without water nearby, and pack in portable waters. Monitor use with cameras.
2. Monitor developed waters in Sonoran pronghorn habitat using automated cameras, on a sample of the waters to document use by pronghorn, other wildlife and undocumented aliens (UDAs).

Objective 4

Continue to operate semi-captive breeding enclosure for Sonoran pronghorn and relocate breeding stock from Mexico to the enclosure.

Current Status:

In 2003 refuge staff established a semi-captive breeding site for Sonoran pronghorn, following guidelines from a white paper on Sonoran pronghorn reestablishment standards prepared for the Canada/Mexico/U.S. Trilateral Committee for Wildlife and Ecosystem Conservation and Management (Morgart et al., 2002) The breeding enclosure is located in refuge non-wilderness south of Charlie Bell Road. This is an area of approximately 260 hectares (640 acres) enclosed by a fence that will contain pronghorn and exclude predators. Predators, primarily coyote, were aggressively trapped and removed from the enclosure. A water source, Tiller Well, has been drilled in the enclosure to provide both a source of free water in a wildlife drinking trough and irrigation water for a forage plot. This plot is irrigated to mimic rainfall received in a wetter than average year, but is not planted with forage species. Rather, the existing seed bank in the soil supplies the source of vegetation, decreasing the likelihood of introducing non-native plant species. After observing Sonoran pronghorn eating alfalfa hay used as bedding material during transport, refuge staff has provided alfalfa hay in a manger as a supplemental food source in periods of drought. During 2004 and 2005 refuge and AGFD staff captured Sonoran pronghorn in Mexico and on the refuge to serve as breeding stock. In the spring of 2006 there were 18 adult Sonoran pronghorn in the facility, 12 does, 2 breeding bucks and 4 yearling bucks. The yearling bucks were considered surplus animals and they were scheduled for release into the refuge when conditions were favorable.

Rationale for Objective:

Establishing relocation methodology and protocols is an action item in the Sonoran pronghorn recovery program. By providing enhanced food and water resources in an environment of reduced predation, the semi-captive breeding enclosure should foster high recruitment rates. Crossing females from Mexico's larger population with refuge male stock should help increase the overall genetic diversity of the small U.S. population of Sonoran pronghorn.

Strategies for Accomplishing Objective:

1. Monitor the enclosure regularly to detect predator entry, pronghorn productivity and general health.
2. Consider experimental planting of alfalfa in the enclosure's forage enhancement area.

Objective 5

Continue to close eastern portion of refuge to visitor access during Sonoran pronghorn fawning season.

Current Status:

From 2002 to 2006 the refuge has been closed to all public access in an area ranging from its eastern boundary to a north-south line passing approximately 8 kilometers (5 miles) east of Tule Well, or approximately the eastern three-quarters of the refuge, between March 15 and July 15. This closure is aimed at protecting Sonoran pronghorn from disturbance during their fawning season, when fawns and nursing mothers are particularly sensitive.

Rationale for Objective:

“Reducing disturbance at critical times of the year” is called for in the Sonoran pronghorn recovery plan. Other public lands near the refuge have been ordered to close public access during the Sonoran pronghorn fawning season as a condition of their biological opinions under Section 7 of the Endangered Species Act. Such closure should benefit the species during a period of time critical to recruitment of new animals.

Strategy for Accomplishing Objective:

1. Closure of eastern portion of refuge during Sonoran Pronghorn fawning season until the U.S. population has stabilized is recommended in the CCP Biological Assessment.

Objective 6:

Within two years of plan adoption, develop two additional forage enhancement areas in Sonoran pronghorn habitat on the refuge.

Current Status:

The semi-captive breeding enclosure, described above under Objective 4, includes one forage enhancement area for Sonoran pronghorn. Three other forage enhancements have been developed in the Childs Valley of the refuge and two to the north of the refuge on the Barry M. Goldwater Range (BMGR).

Rationale for Objective:

Establishing and evaluating forage enhancement plots on BMGR is the first recovery objective mentioned in the Sonoran pronghorn recovery plan. Sonoran pronghorn have been observed using existing enhancements on the refuge and BMGR. The Sonoran pronghorn recovery team endorses developing two additional plots on the refuge.

Strategies for Accomplishing Objective:

1. Survey refuge for suitable forage enhancement sites.
2. Select sites of approximately 10 hectares (25 acres), in areas of higher than average vegetative cover and documented frequent pronghorn presence.
3. Selectively thin creosote bush by burning with a hand-held propane-fired weed burner to create openings.
4. Rig approximately 2.4 hectares (6 acres) within each forage enhancement area for sprinkler irrigation and irrigate to mimic natural rainfall of a slightly wetter than average year.
5. Monitor use of the forage enhancement with automated cameras.

Objective 7:

Within two years of plan adoption, implement a study of Sonoran pronghorn predator density, movement, and developed water use on the refuge. Under certain situations, implement predator controls.

Current Status:

Studies of predation on Sonoran pronghorn on the refuge to date have been limited to necropsy of pronghorn mortalities to identify cause of death and incidental observation of coyote and other predators during weekly pronghorn reconnaissance flights.

Rationale for Objective:

The Sonoran pronghorn recovery plan calls for “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 predations (the need for coyote control will vary from year-to-year based on environmental conditions).” Conducting predator studies will enhance the refuge’s ability to determine the likely impact of predation and better focus/time coyote removal.

Strategies for Accomplishing Objective:

1. Radio collar at least three coyotes to facilitate tracking.
2. Investigate use of developed waters, size of home range and breeding success of coyote on the refuge.
3. When the U.S. Sonoran pronghorn population is below 100 and winter and spring precipitation is 50 percent or less of the average, selectively remove coyotes from pronghorn fawning and rearing habitat.

Objective 8:

Within one year of plan adoption install additional measures to protect the lesser long-nosed bat maternity roost on refuge.

Current Status:

Although the location of the maternity roost is remote and unpublished, it had been used frequently as a shelter by UDAs or smugglers. This use may have been responsible for the roost’s not having been used by lesser long-nosed bats during the summer of 2003. In the early spring of 2004, the refuge installed a steel fence ranging from 2.5 to 3 meters (8 to 10 feet) high around the roost entrance to discourage human entry. The fence is constructed of 2.5-centimeter (1-inch) vertical pipes welded to cross pipes at 13-centimeter (5 - inch) intervals. The tops of the vertical pipes are cut at an angle to produce a sharp point and the top 30 centimeters (12 inches) of the pipe is bent outwards. The sharp tops and outward bend should make climbing over the fence difficult. This fence provided an immediate positive effect to bats that were displaced by human interference. Bats returned to roost in large numbers during the summers of 2004 and 2005. Refuge staff periodically monitors the entrance to the roost to document damage caused by unauthorized human use and assess use by bats. Refuge law enforcement personnel conduct periodic surveillance of the roost to check signs that the entrance has been used as a campsite, storage area or shelter and/or apprehend persons so using the entrance. Refuge biologists will continue to survey for additional, unknown roost sites on the refuge. The refuge will continue to keep the location of the roost unpublished. Survey and surveillance activities are conducted on foot in wilderness.

Rationale for Objective:

Recovery actions for this endangered bat species include protection of all known roost sites from disturbance. Eliminating or reducing the roost disturbance known to occur on the refuge is thus a priority.

Strategies for Accomplishing Objective:

1. Install a gate at the roost entrance if there is any evidence that unauthorized human use of the roost entrance is occurring. This gate will be locked closed during the season when the migratory bats are not present, to interrupt patterns of human use. The gate will be locked open during the bat's breeding and rearing season, as juvenile lesser long-nosed bats are poor flyers and have little ability to pass through any type of gate. The gate will be designed to allow passage of adult bats in case it remains closed inadvertently. This gate will be a secondary line of defense, should unauthorized users breach the fence.
2. Post bi-lingual signs warning of bio-hazards such as rabies to further discourage use of the roost entrance.
3. Continue to conduct periodic monitoring and surveillance of the roost entrance.

Objective 9:

Within three years of plan implementation, develop a refuge program to survey the refuge for endangered, threatened or recently delisted species believed to potentially occur on the refuge.

Current Status:

There are two credible records of Cactus ferruginous pygmy owl, recently delisted from endangered species status, occurring on the refuge. The Pierson's milkvetch, a threatened plant, has not been documented on the refuge, but occurs to the west of the refuge on U.S. Marine Corps lands. Suitable habitat for this plant occurs on the Pinta Sands in the south central portion of the refuge.

Rationale for Objective:

The refuge should develop accurate records of all federally protected species occurring within its boundaries.

Strategies for Accomplishing Objective:

1. Develop and implement a monitoring protocol for periodic cactus ferruginous pygmy owl surveys.
2. Develop and implement a survey protocol for Pierson's milkvetch.

Objective 10:

Continue to maintain a database of scientifically valid information regarding the size and composition of the refuge desert bighorn sheep population.

Current Status:

Refuge staff, in cooperation with AGFD, conducts aerial surveys of the refuge desert bighorn sheep population every 3 years (results of surveys conducted since 1993 are presented in Section 2.1.2 of the EIS). Approximately 10 percent of the known refuge desert bighorn sheep population is radio collared at any time. Refuge staff keeps records of sheep movement and maintains a database of desert bighorn sheep population statistics, including group size observed, sex and age structure, and percent of habitat surveyed.

Rationale for Objective:

Conservation of desert bighorn sheep was central to the creation of the refuge. Accurate information about the refuge's desert bighorn sheep population is essential to gauging the efficacy of conservation efforts of the refuge and identifying any needed changes in management regime.

Strategies for Accomplishing Objective:

1. Continue to participate cooperatively with AGFD in aerial surveys of refuge desert bighorn sheep every 3 years.
2. Keep active radio collars on 10 percent of the refuge desert bighorn sheep population.

Objective 11:

Within ten years of plan adoption, maintain a refuge desert bighorn sheep population of 500 to 700 sheep.

Current Status:

No desert bighorn sheep population target range is currently established. The refuge rather manages for a healthy, sustainable population of sheep. The most recent refuge population estimate for desert bighorn sheep is 348, with a 95 percent confidence interval of 236 to 658. This estimate was calculated from the results of the December 2005 population survey.

Rationale for Objective:

The proposed population range of 500 to 700 individual sheep on the refuge is the result of an effort to determine a sustainable population that the refuge might support in the absence of human-created decimating factors such as vegetation change from over-grazing, isolation of the refuge from perennial sources of water in the Gila River to the north, and introduction of disease by domestic livestock. The range was derived by comparing the densities of sheep per acre in other ranges in Southwestern Arizona and applying a low average to the acres of desert bighorn sheep habitat on the refuge.

Strategy for Accomplishing Objective:

1. If the desert bighorn sheep population does not reach the target range with 10 years of plan adoption, the refuge will revisit the target to evaluate its validity and evaluate management.

Objective 12:

Within three years of plan adoption, complete analysis of data generated from University of Arizona study of desert bighorn sheep use of developed waters. Continue to welcome proposals for research of the effect of developed waters on desert bighorn sheep populations.

Current Status:

The University of Arizona initiated an experimental study of desert bighorn sheep use of developed waters and movement response to changes in maintenance of developed waters on the refuge in 2002. Sheep were fitted with satellite radio collars that allow detailed tracking of movement. After two summers of tracking movement of collared sheep, developed waters in the Sierra Pinta Mountains (Heart, Eagle and North Pinta Tanks, see Figure K-1) were experimentally fenced off to exclude sheep access. The movement of sheep was then tracked for three years to detect the impact of removing access to developed waters. The initial experimental design called for longer tracking, but funds to continue the experiment was unavailable.

Rationale for Objective:

There is considerable controversy regarding the nature of the relationship between desert bighorn sheep and developed waters. This experiment was designed to explore that relationship and track behavioral and population level changes when access to developed waters is removed. As the results of this experiment are unlikely to be definitive, additional research is desirable.

Strategy for Accomplishing Objective:

1. The protocols for this experiment have been established by the University of Arizona.
2. The refuge will evaluate the data generated by University of Arizona.
3. The refuge will consider any proposals for additional research on desert bighorn sheep water use.

Objective 13:

If definitive research or experimental results are developed, consider developing additional waters or cessation of water hauling to existing waters.

Current Status:

As stated above there is considerable controversy regarding the effect of developed waters on desert bighorn sheep populations.

Rationale for Objective:

Desert bighorn sheep conservation is a refuge purpose, as is wilderness stewardship. Should better data be developed regarding the effects of developed water on sheep, the refuge should consider such data and act upon them in order to better pursue its purposes.

Strategies for Accomplishing Objective:

1. Should data demonstrate that additional developed waters would benefit sheep populations, the refuge would develop additional waters.
2. Prior to development of any water, the refuge would conduct a habitat analysis of the proposed site of the developed water.
3. After construction any new developed water, the refuge would monitor sheep response.
4. Should data demonstrate that developed water to not aid desert bighorn sheep conservation, the refuge would initiate a phased program of cessation of water hauling.
5. The refuge would monitor sheep response to cessation of water hauling.

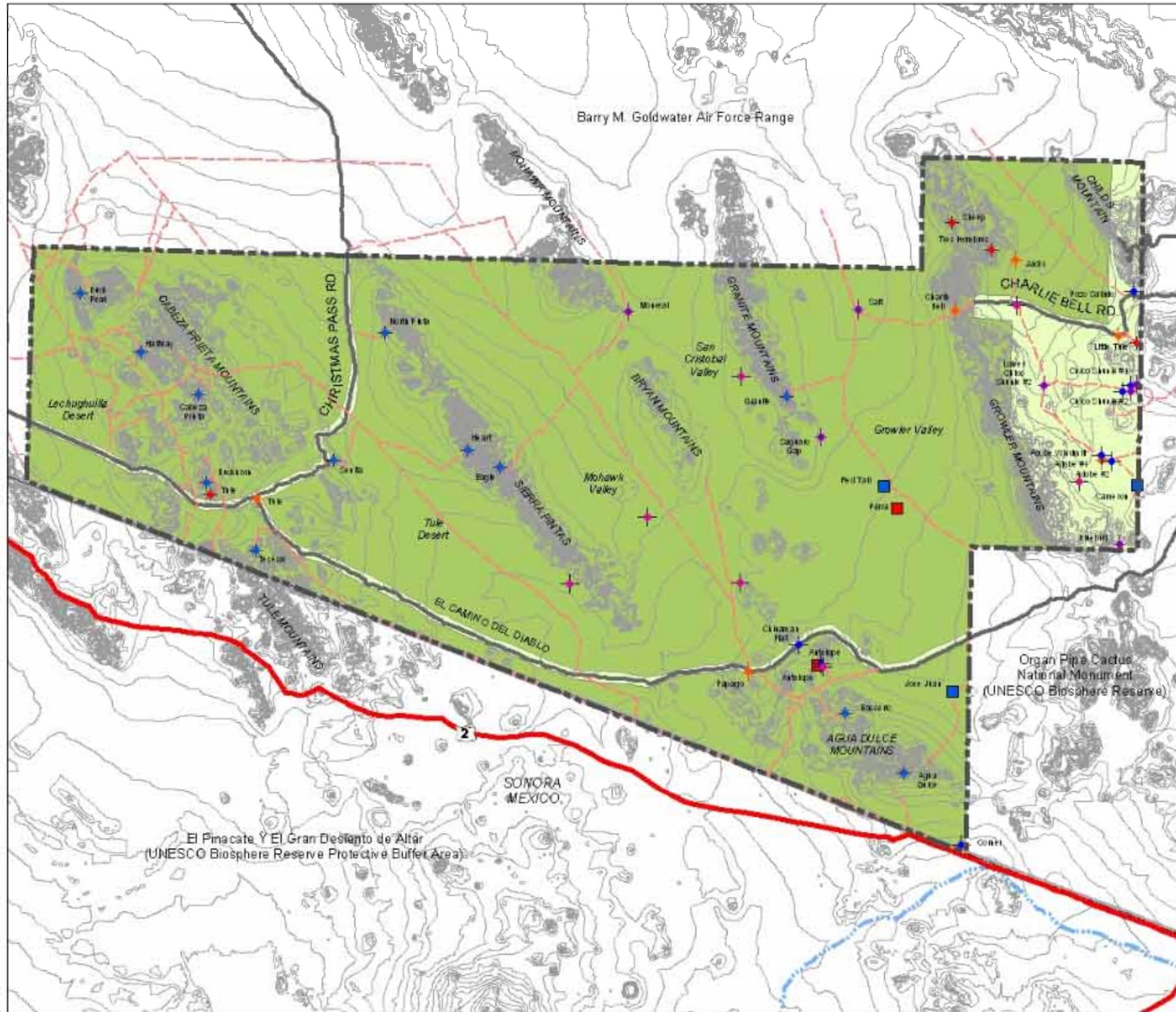


Figure K.1 Refuge Developed Waters

Legend

- Cabeza Prieta N.W.R.
- Wilderness
- Non-Wilderness
- Public Roads
- Administrative Trails
- US/Mexico Border
- Highway
- Rio Sonoyta
- Active Well
- Active Tinaja / Tank
- Inactive Tinaja / Tank
- Inactive Well
- Capped Well
- Active Charco
- Inactive Charco
- Waters for Sonoran Pronghorns

Sources: USFWS, 2003



**CABEZA PRIETA
NATIONAL WILDLIFE REFUGE**

COMPREHENSIVE CONSERVATION PLAN

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH & WILDLIFE SERVICE

Objective 14:

Within 12 years of plan implementation, complete upgrades to the eight desert bighorn sheep developed waters located in wilderness.

Current Status:

The refuge maintains, and periodically supplies water to, eight developed waters located within desert bighorn sheep habitat in wilderness and one developed water located within desert bighorn sheep habitat outside of wilderness. The wilderness waters are Buck Peak, Halfway, Tuseral, Bassarisc, North Pinta, Granite, Eagle and Heart Tanks. The non-wilderness water is the Childs Mountain parabolic tank. The developed waters include short adits bored into bedrock to collect and hold water, as well as natural tinajas with developed enhancements such as sediment dams up gradient or small cement dams at the tinaja to increase its water capacity. Only the Childs Mountain parabolic tank is fully artificial; the other waters all use existing topography to collect water and variously developed depressions to catch and retain the water.

The refuge's approach to managing desert bighorn sheep requires assuring that these waters do not go dry during the hottest periods of the year. During a typical year a developed water may require no supplemental water or one to two loads of supplemental water, with the possibility for additional water hauling in periods of drought. Refuge staff typically hauls water in a 5,675 liter (1,500 gallon) capacity heavy truck. During the extreme drought of 2002, the refuge used a helicopter to deliver water to Heart Tank, although that is not normal practice.

Rationale for Objective

The refuge has provided supplemental wildlife waters in desert bighorn sheep habitat since the 1960s. There is dispute in professional wildlife circles regarding the efficacy of providing developed waters for desert bighorn sheep, and an experiment examining the dependence of sheep on developed waters at Cabeza Prieta is currently underway (see Objective 11). It is the professional opinion of refuge and other Service biologists, however, that provision of reliable sources of free water in desert bighorn sheep habitat has benefited, and will continue to benefit, sheep populations at Cabeza Prieta.

Some individuals and organizations have objected to the refuge's use of vehicles in wilderness to haul supplemental water. From both wilderness stewardship and operational efficiency points of view, reducing the frequency of water hauling trips or eliminating them entirely is desirable. The proposed upgrades to existing desert bighorn sheep waters are of a design that has been used successfully in similar habitats in Southern California and Southwestern Arizona (J. Hervert, AGFD, pers. comm. 2002), as well as at the Antelope Tank on the refuge, a developed water for Sonoran pronghorn. The improved design includes buried water storage tanks, multiple collection points in natural drainage ways and a drinking trough of limited surface area. These improvements greatly increase water collection efficiency during rainstorms, and reduce evaporation of stored water. Increases in water storage volume and collection efficiency, coupled with a decrease in evaporation, should greatly reduce the need to haul supplemental water. Additional benefits anticipated from the upgraded developed water are reduced visual profile as compared to the current waters and an enhanced feasibility of delivering supplemental water by helicopter should that option be desired.

Strategies for Accomplishing Objective:

1. Survey the terrain around the existing desert bighorn sheep developed waters in wilderness to identify suitable locations for water collection points and buried storage tanks. Consult with Regional Office engineering staff and others with experience in siting and designing wildlife waters.
2. Design upgraded waters with enhanced visual clues to water storage level so that water level can be easily checked during wildlife reconnaissance flights.
3. Design upgraded waters to facilitate adding supplemental water by helicopter drop.

4. Coordinate with non-governmental organizations, including, but not limited to, the Arizona Desert Bighorn Sheep Society and the Yuma Valley Rod and Gun Club, for volunteer labor to construct improved waters.
5. After installation is complete, monitor wildlife use through automated cameras.

Objective 15:

Within two years of plan adoption, implement studies, including radio collaring, to investigate use of developed waters, size of home range, breeding success, and movement of mountain lion on the refuge, as well as movement of mountain lion relative to movement of desert bighorn sheep.

Current Status:

Current knowledge regarding predation on refuge desert bighorn sheep by mountain lion is limited to some observed mortality of sheep from lion predation and incidental observation of lion during aerial reconnaissance.

Rationale for Objective:

Conservation of desert bighorn sheep was central to the creation of Cabeza Prieta NWR. Collecting data on lion predation will enhance the refuge management's understanding of ecological forces affecting the sheep populations.

Strategies for Accomplishing Objective:

1. Conduct radio collaring of mountain lion on the refuge and monitor movements.
2. Continue to investigate mortalities of collared desert bighorn sheep.

Objective 16:

Within three years of plan adoption, determine and track the status and distribution of bird species of conservation interest for the Sonoran Desert.

Current Status:

The refuge staff monitors Le Conte's thrasher nests for reproductive success, renesting attempts and nest site characteristics. Le Conte's thrasher is listed by the Arizona Partners in Flight program as an indicator of Sonoran Desert health.

Rationale for Objective:

The Service's Office of Migratory Bird Management lists several birds known or believed to inhabit the refuge as Birds of Conservation Concern. Similarly some birds that occur on the refuge have been listed by the Arizona Partners in Flight Program's indicators of Sonoran Desert health. Tracking the population trends, distribution, and habitat use of such birds on the refuge will contribute to overall knowledge of the health of the Sonora Desert ecosystem and also provide a measure of the effectiveness of habitat management of the refuge.

While refuge habitats are protected from urbanization, they are still impacted by illegal entries by undocumented aliens seeking access to the U.S., illegal transport of drugs through the refuge, actions of the agencies charged with protecting our borders from aliens and drugs, military operations (over flights currently, bombing missions in the past), refuge staff conducting various management actions and members of the public visiting the refuge. Also, areas outside of the refuge are impacted by development and other

land uses. Monitoring these populations will facilitate identification of long-term changes in Sonoran Desert health. The data collected can also be used to assess needs for landscape level conservation.

Strategies for Accomplishing Objective:

1. Initiate point counts for loggerhead shrike, Bell's vireo, gray vireo, crissal thrasher, yellow warbler, black-chinned sparrow and sage sparrow.
2. Continue to monitor Le Conte's thrasher nests for reproductive success, renesting attempts and nest site characteristics.
3. Initiate studies of the age/size class of saguaros used by nesting by Gila woodpecker and glided flicker.
4. Initiate collection of natural history information on the cactus ferruginous pygmy owl.
5. Record all data from these investigations/surveys in a database.
6. Repeat all surveys every two years.

Objective 17:

Within 5 years of plan adoption, implement surveys for desert tortoise, Gila monster, chuckwalla, canyon spotted whiptail and rosy boa.

Current Status:

While there have been isolated records of several of these animals on the refuge, no information regarding their numbers or distribution currently exists.

Rationale for Objective:

The refuge has not collected data on reptiles in a systematic manner. The Sonoran population of desert tortoise, a former candidate for listing as an endangered species, has received considerable attention due to the listing of the Mohave Desert tortoise population. The Service decided not to list this species because much of its habitat is on federal lands, but is still concerned about the species, and its populations should be monitored. The other reptiles listed above are indicators of the overall health of the Sonoran desert.

Strategies for Accomplishing Objective:

1. Use information from the Bureau of Land Management's (BLM) document "Desert Tortoise Habitat Management on Public Lands," to identify suitable habitat for the tortoise on the refuge. Conduct surveys in these areas, using protocols from the BLM.
2. Determine potential habitat for the Gila monster, chuckwalla, canyon spotted whiptail and rosy boa, and conduct survey of this habitat.

Objective 18:

Within five years of plan adoption, develop and implement protocols for inventory and monitoring of golden eagle, prairie falcon and raven.

Current Status:

The refuge does not currently monitor for raptors or ravens.

Rationale for Objective:

Collection of data on these high-level predatory birds will aid in identifying population trends among their prey species.

Strategy for Accomplishing Objective:

1. Refuge staff will review the protocols in place at other refuges and federally managed land and prepare similar protocols for the refuge.

Objective 19:

Within five years of plan adoption, develop and implement a program to monitor long-term desert health on the refuge.

Current Status:

The refuge formerly operated eight meteorological instruments that record precipitation, temperature and humidity, these instruments are currently non-functional and need repairs. The refuge established vegetation transects in 2002 for repeat monitoring to detect changes in vegetation composition over time.

Rationale for Objective:

Given concerns about climate change, human impacts and the effects of invasive/exotic species, monitoring the long-term condition of the desert is appropriate.

Strategies for Accomplishing Objective:

1. Repair and relocate meteorological instruments.
2. Resume monitoring of meteorological instruments.
3. Continue to periodically survey vegetation transects.
4. With the Regional Office Remote Sensing Scientist, develop and implement a change detection analysis using aerial photography sampling.

Objective 20:

Within three years of plan adoption, the refuge will develop protocols to survey invasive/exotic species, establish priorities for invasive species management, and develop measures to limit the spread of invasive species

Current Status:

Three invasive plant species: buffelgrass, Sahara mustard, and fountain grass have become established on the refuge. Domestic and feral animals continue to be an occasional problem on the refuge.

Rationale for Objective:

Invasive, exotic plant species can disrupt native ecosystems through aggressive displacement of native species. Many domestic or feral animals can carry diseases pathogenic to native wildlife, particularly desert bighorn sheep.

Strategies of Accomplishing Objective:

1. Continue to train refuge staff to recognize nonnative vegetation encountered during refuge field-work and document its location and extent of spread.
2. The refuge will work with the Mexican government to identify means of controlling the spread of exotic plants along Mexican Highway 2.
3. Where new or isolated small infestations of invasive plants are located, refuge staff will eradicate them using hand pulling or appropriate chemical means to prevent the spread of infestations.
4. When trespass livestock is encountered, refuge staff will attempt to locate the owner and have the livestock removed quickly. When no owner can be found, trespass livestock will be humanely removed.

Objective 21:

Within five years, develop and implement a protocol for surveying the refuge mule deer population.

Current Status:

There is no systematic survey of refuge mule deer populations. Information about the populations is anecdotal.

Rationale for Objective:

The refuge mule deer population likely competes directly with the endangered Sonoran pronghorn population for forage and water resources. An increased understanding of the status of mule deer population on the refuge will facilitate informed decisions regarding management of this resource.

Strategies for Accomplishing Objective:

1. Consult with AGFD to identify practical methods of deer survey.
2. Implement surveys as staffing and budget allow.

GOAL 2: WILDERNESS STEWARDSHIP

Protect and conserve refuge wilderness employing strategies of wildlife and plant conservation that will maintain and restore the wilderness character of Cabeza Prieta NWR.

Objective 1:

Throughout life of plan, conduct minimum requirements analysis (MRA) prior to initiating any management actions taking place in wilderness.

Current Status:

Activities generally prohibited in wilderness may be approved under Section 4(c) of the Wilderness Act of 1964, when they are the minimum required to meet the needs of administering the wilderness. The MRA is a two-step process of determining, first that the proposed activity is necessary to administer the land as wilderness, and second that the activity is the minimum (or least disturbing of wilderness character) alternative for such administration. Programmatic MRAs for all management programs proposed in this CCP have been completed and appear in Appendix F to the CCP/EIS document.

Rationale for Objective:

While the programmatic MRAs already completed should address all management activities anticipated to occur in wilderness, they are generic to each class of activity and do not capture all the variables unique to each activity in wilderness. For this reason, activity-specific MRAs will be completed prior to each management action proposed to occur in wilderness. It is also possible that changed conditions or approaches to refuge management may require unanticipated management actions. These actions will require also MRAs, if they will occur in refuge wilderness.

Strategies for Accomplishing Objective:

1. Prior to undertaking each proposed management activity in wilderness, complete an activity specific MRA. This analysis will step-down from the activity's programmatic MRA and include variables specific to the activity, such as season, site-specific conditions, etc.
2. Conduct a MRA of each proposed new management activity identified. This analysis should resolve the following issues: Is the activity necessary to support administration of the area as a wilderness? Would any other activities having less impact on wilderness character achieve the same end? Do the means of accomplishing the activity create the minimum intrusion on wilderness feasible? In analyzing impacts to wilderness from an activity, the cumulative effects of each means of conducting the activity must be considered (e.g., use of rotary wing aircraft transport and power tools to execute a task in one day may have intense short term impacts, but these may be less than the cumulative impacts of deploying a work crew using hand tools and pack stock in the wilderness for six weeks to accomplish the same task). Activities that pass the minimum requirements test described above may be considered appropriate for implementation in the wilderness.
3. Establish standards for verifying that each activity carried out meets its MRA, including post-activity monitoring to detect impacts to the wilderness.

Objective 2:

Continue to remove abandoned vehicles as quickly as is feasible when they are identified on the refuge.

Current Status:

Many vehicles used in smuggling UDAs or narcotics across the refuge are abandoned when they become stuck or break down. Refuge staff removes vehicles abandoned in wilderness to a non-wilderness access point, where they are further removed by a commercial vehicle hauling service. Vehicles abandoned in non-wilderness are removed by a commercial service if they are accessible by public access road, otherwise they are towed to a public access road by refuge staff.

Rationale for Objective:

The presence of abandoned vehicles in refuge wilderness is disruptive to the sense of solitude, natural condition and untrammled character called for in the Wilderness Act of 1964. Removing vehicles as soon as possible is consistent with the Wilderness Act.

Strategies for Accomplishing Objective:

1. With a refuge vehicle, pull the abandoned vehicle to the nearest public access road it crossed. When feasible, use the vehicle tracks as a pathway to avoid additional impacts to wilderness and new disturbance of desert soil.
2. If the abandoned vehicle has functional steering, a refuge staff member will ride in the towed vehicle and steer so as to keep it within existing vehicle ruts.
3. Investigate the feasibility and suitability of using heavy-lift military helicopters for removing vehicles, if any military units are interested in using this as a training opportunity.

Objective 3:

Within one year of plan adoption, discontinue all refuge management use (other than refuge law enforcement personnel engaged in border law enforcement in cooperation with Border Patrol) of administrative trails not required to provide management access as documented by minimum requirement analysis.

Current Status:

Approximately 234 kilometers (145 miles) of administrative trails occur within the wilderness portion of the refuge. These are unimproved or very lightly improved vehicle trackways established prior to wilderness designation in 1990. Refuge staff operates motor vehicles on these trails to accomplish approved management activities, subject to MRA, and Border Patrol agents operate motor vehicles on these trails to execute law enforcement activities consistent with the memorandum of understanding (MOU) between the Department of Homeland Security, the Department of the Interior and the Department of Agriculture. All other use of the administrative trails by any type of mechanized or motorized transport is prohibited.

Rationale for Objective:

The administrative trails, although primitive as compared to actual roads, are visible evidence of vehicular travel, and thus detract from the wilderness character of the refuge wilderness. Even infrequent use of the trails leaves enduring marks on the desert landscape. The presence of administrative trails may also invite unauthorized wilderness travel by otherwise authorized visitors traveling on the non-wilderness access corridors. Discontinuing refuge management use of administrative trails not necessary for administration of the refuge as a wilderness is consistent with the wilderness stewardship refuge purpose. It should be noted, however, that the refuge has no authority to close the administrative trails to use by border law enforcement personnel.

Strategies for Accomplishing Objective:

1. Close all trails not essential to management (see Figure K-2 for trails remaining open under this alternative). This is approximately 32 kilometers (20 miles) of administrative trails.
2. Post all closed trails as closed to any vehicular use on all refuge maps depicting the trails.
3. Where closed trails are accessible from one of the non-wilderness public routes, also post them closed at the access point.

Objective 4:

Continue to rehabilitate old vehicle trackways not officially part of the administrative trails network.

Current Status:

The *Final Programmatic Environmental Assessment for the Future Management of Cabeza Prieta National Wildlife Refuge and Draft Comprehensive Conservation Plan*, published in September of 1998, identified 224 kilometers (139 miles) of discernable vehicle trackways as not being part of the Administrative Trails system. These trails were slated for closure. Although the 1998 plan has not been implemented, these non-designated trails have not been considered part of the Administrative Trails system. The refuge has rehabilitated, and will continue to rehabilitate, such unofficial trails or other vehicle tracks in wilderness. Each year, refuge volunteers do a limited amount of rehabilitation to reclaim unauthorized trails in wilderness

Rationale for Objective:

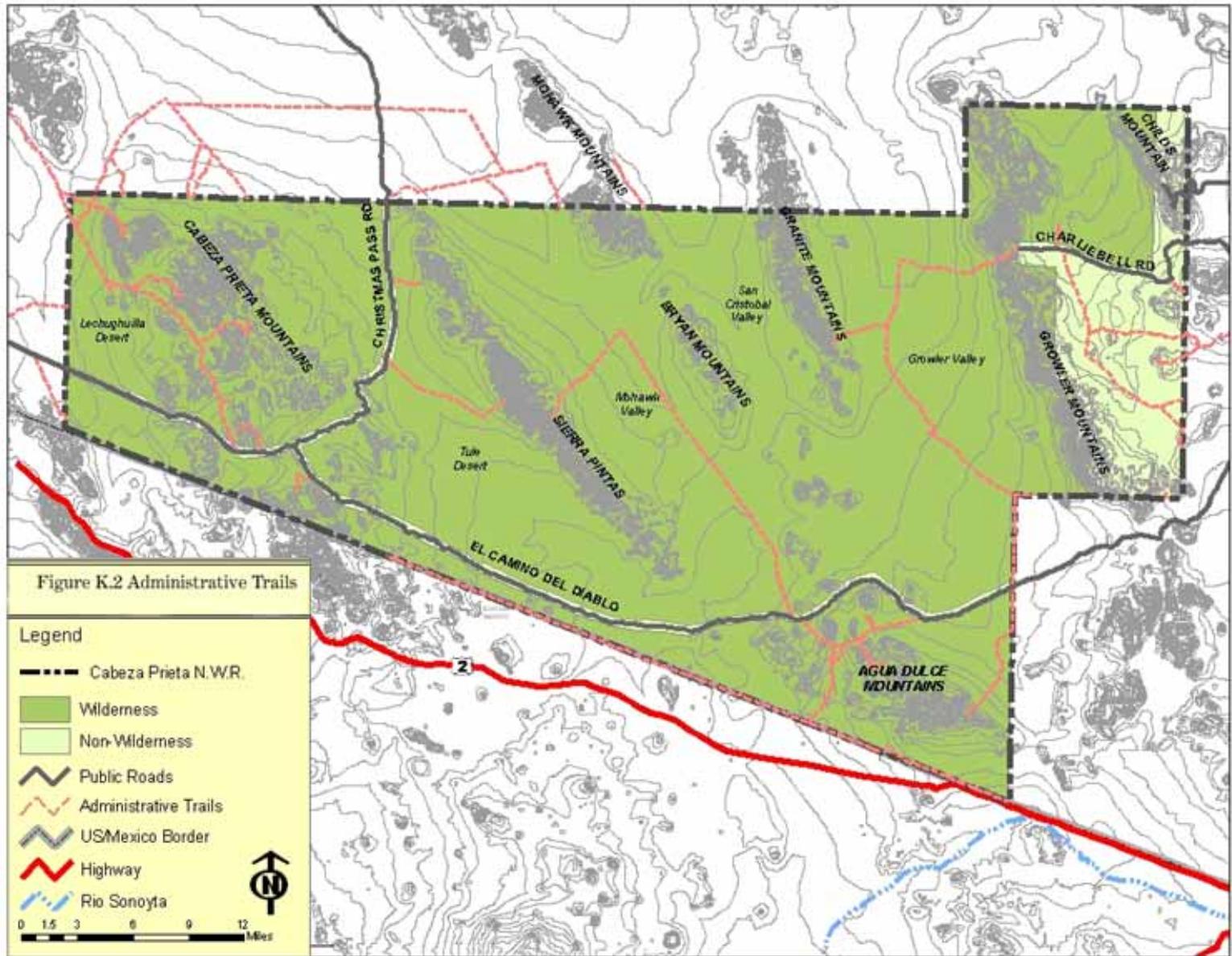
Rehabilitating the old trackways to a natural appearance is consistent with preserving /restoring wilderness character and should have the additional benefit of discouraging their unauthorized use as roadways by smugglers of UDAs or Narcotics.

Strategies for Accomplishing Objective:

- 1 Where feasible, use naturally occurring materials to physically block entry to closed trackways from the access corridors or administrative trails. This is only recommended where terrain or vegetation define a fairly narrow entry to the trail being closed. In other cases blocking the entry to the trail may result in the trail entrance migrating around the barrier, creating new areas of impact to wilderness character.
- 2 Rehabilitate the old trackway to a natural appearance, using hand tools and natural materials from the immediate the area or live native plants taken from alongside the public access roads.
- 3 Where old trackways extend for some distance into the backcountry, rehabilitate the first 400 meters (1/4 mile) to obscure the end of the trackway.

Objective 5:

Within three years, develop a comprehensive outreach program to Border Patrol, Customs and other border law enforcement agency staff.



Current Status:

The Arizona Desert Wilderness Act of 1990 provided for continued border law enforcement activities in the refuge wilderness, under an MOU between the Service and Border Patrol to avoid unnecessary degradation of wilderness. A national MOU was signed in 2006 between the Department of Homeland Security, Department of the Interior and Department of Agriculture to establish guidelines for cooperation on border law enforcement among bureaus of the agencies. The pre-existing local MOUs between the refuge and the Yuma and Tucson area offices of the Border Patrol are rendered out of date by this new national MOU.

Most border law enforcement patrols use El Camino del Diablo and conduct daily helicopter reconnaissance. Patrols by vehicle are also allowed on refuge administrative trails in wilderness. Vehicles are used off of established refuge roads and administrative trails only in cases of rescue and arrest activities. The Border Patrol has also established a residential camp/command center (Camp Grip) on El Camino del Diablo and is currently in process of completing environmental compliance documents for additional residential camps along the Camino. These facilities have been located within the non-wilderness corridor, but are visible from surrounding wilderness.

In recent years undocumented alien traffic in and around the refuge has increased greatly, apparently in response to increased law enforcement in areas previously used more heavily. The refuge has been criticized for allowing border law enforcement agents to engage in unacceptable practices, such as vehicle use in wilderness. The refuge has presented training and orientation sessions for Border Patrol and Customs agents to increase their awareness of appropriate use of wilderness.

Rationale for Objective:

The recent increase in undocumented alien and smuggling traffic on the refuge has caused serious degradation of wilderness resources. Impacts from this traffic include development of a heavily used unofficial "highway" running northeast from the Camino del Diablo through the Mohawk and San Cristobal Valleys to an administrative trail in the Growler Valley, other readily observed vehicle trails and footpaths, large amounts of litter, and a great increase in the number of abandoned vehicles. Given these impacts, the refuge has a strong interest in accommodating and facilitating border law enforcement in any way possible, but must also work to ensure that such activities are as wilderness compatible as is feasible. Past outreach to Border Patrol has been successful, but periodic reassignment of agents necessitates an ongoing effort.

Strategies for Accomplishing Objective:

1. Continue to offer formal training and informal informational contacts to Border Patrol and Customs.
2. Draft updated MOUs with the local offices of the Border Patrol and obtain approval.
3. Develop a field use map for Border Patrol and Customs agents, depicting all administrative trails and including bulleted information about low impact wilderness travel.
4. Develop a training video covering wilderness issues and low impact techniques that can be viewed by reassigned agents prior to their deployment in wilderness.
5. Encourage cross training between Border Patrol, Customs and refuge law enforcement staffs.

Objective 7:

Remove at least 25 military tow darts or similar pieces of military debris from wilderness annually.

Current Status:

At least 1,600 pieces of large military debris, such as tow darts used as targets in air-to-air combat training, litter areas of the refuge wilderness. The Air Force has surveyed the refuge to identify locations of concentrations of such material. Unexploded ordnance is removed by the military as it is identified.

Rationale for Objective:

The presence of military debris is inconsistent with the Wilderness Act's definition of a designated wilderness as an area ". . . which generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable. . ." (Sec. 2 (c)). Metallic debris can also cause considerable visual impact due to glare from reflected sunlight.

Strategies for Accomplishing Objective:

1. Conduct minimum requirements analysis to identify appropriate means of removing debris. Consider use of pack stock, helicopter, and/or motor vehicles.
2. Schedule all removal activities during time of the year when impacts to refuge resources, particularly Sonoran pronghorn, will be minimized, and when visitation is low.
3. Solicit volunteer labor from Friends of the Cabeza Prieta and other groups interested in protecting the refuge's wilderness character.

Objective 8:

Continue to coordinate with military, other governmental, and private commercial lessees of communication sites on Childs Mountain to assure that all installations, buildings, and other equipment not essential to protecting human health and safety or efficient border law enforcement, are removed by 2018.

Current Status:

Childs Mountain has been used as a communications equipment site since construction of the Ajo Air Force Base (now closed) in 1956. Facilities current operating on the summit include an Air Force radar tower, several private communications facilities, and an Air Route Surveillance Radar-4 (ARSR-4) operated by the Federal Aviation Administration (FAA). The ARSR-4 is used as a civilian aircraft tracking system for civilian air traffic control, as well as Air Force, Border Patrol, and U.S. Customs Service.

The Service, Luke Air Force Base and the FAA entered into a MOU in 1998 to allow use of the summit for a 20-year period. According to that MOU, all facilities will be removed from the summit in 2018, at the end of the period. The MOU is subject to modification, however, and recent investments in upgrading equipment suggest that lessees may anticipate an extension of the equipment's tenure on Childs Mountain. The refuge and the Service support retaining those facilities necessary to the protection of human health and safety or U.S. national security beyond the 2018 expiration of the current MOU.

Rationale for Objective

Although the radar and communications site on the summit of Childs Mountain lies outside of the designated wilderness, developed facilities on the summit are prominently visible from large areas of the eastern portion of the wilderness. These facilities do not serve a refuge purpose and degrade wilderness character. For these reasons the refuge should avoid renewing or revising the MOU to extend the tenure of the facilities, except where they serve a vital health and safety or national security function.

Strategy for Accomplishing Objective

1. Notify all operators and owners of facilities on Childs Mountain that the current MOU may not be extended, so that they can explore alternative sites.

GOAL 3: VISITOR SERVICES MANAGEMENT

Provide visitors with compatible, high quality wildlife-dependent recreational and educational experiences designed to foster better appreciation, understanding and protection of the plant, animal and wilderness resources of Cabeza Prieta NWR.

Objective 1:

Continue to coordinate access permitting with the military and BLM.

Current Status:

Access to the refuge, other than the visitor center, is by permit only. The refuge, the BMGR and BLM issue joint public access permits. Permits are available at several locations, including the refuge office and visitor center in Ajo, Luke Air Force Base in Phoenix, Marine Corps Air Station Yuma in Yuma, Gila Bend Auxiliary Air Base in Gila Bend and the Bureau of Land Management Office in Phoenix. Visitors must contact the Auxiliary Air Base by telephone prior to entry and upon exit of the BMGR. Visitors must contact the refuge automated phone-in line prior to entering the refuge, but must not contact the line upon leaving the refuge. The refuge access permit serves as a hold harmless agreement protecting the military from any liability if refuge visitors are harmed by military activities or debris. Each recipient of an access permit also receives an informational packet outlining the rules and regulations for the BMGR and the Refuge. The refuge visitor center is staffed during normal business hours on weekdays year round, as well as on Saturdays during the winter months (October through April).

Rationale for Objective:

The current joint permit is a military requirement due to an on-going need to protect the military from liability related to potential visitor harm from current or previous military activity.

Strategy for Accomplishing Objective:

1. Continue to implement the current permit system.

Objective 2:

Within one year of plan adoption implement new vehicle restrictions. Travel trailers will not be allowed on the refuge non-wilderness access roads due to concerns about visitor safety. Licensed, street legal motorcycles and off road vehicles (as defined by the state of Arizona) will be permitted. Passenger vehicles and trucks will continue to require four-wheel-drive on el Camino del Diablo and Christmas Pass Road. Passenger vehicles and trucks using Charlie Bell Road will require high clearance, but two-wheel-drive will be allowed. A party size limit of four vehicles traveling together will be implemented to reduce impact of large caravans.

Current Status:

Visitors intending to drive on El Camino del Diablo or Christmas Pass Road must have a vehicle with four-wheel-drive (4WD). Two-wheel-drive, high-clearance vehicles are permitted on Charlie Bell Road. Motorcycles, off-road recreational vehicles and travel trailer are not specifically denied access to the refuge. There is no party size restriction.

Rationale for Objective:

The restriction of travel trailers is aimed at reducing the amount of visitor rescue necessary. Vehicles pulling travel trailers have a greater likelihood of becoming stuck on the primitive refuge roads. Licensed, street-legal motorcycles and off-road vehicles will be allowed on the refuge as there is no rationale for prohibiting legal vehicles that are capable of safely transiting the refuge non-wilderness roads. Restricting party size will allow control of large caravans traveling together by requiring a special use permit.

Strategies for Accomplishing Objective:

1. Provide information detailing the new vehicle restrictions in all visitor outreach information.
2. Post signs clearly explaining the restrictions at all points of entry to the refuge.
3. Continue to restrict vehicle use to traveled road surface, allowing pull-offs for parking or passing within the center 30 meters (100 feet) of the 60 meter (200 foot) non-wilderness public access corridors through the wilderness.
4. Refuge law enforcement personnel will cite visitors using unauthorized types of vehicles.
5. Implement that all motorcycles and ATVs must be fitted with a mast displaying an orange flag at least 2.4 meters (8 feet) off the ground. The flag's area must equal or exceed 0.5 square meter (80 square inches).
6. Parties of five or more vehicles traveling together will require a Special Use Permit.

Objective 3:

Upon plan adoption establish new visitor camping regulations in order to limit impacts to the wilderness resource and other natural resources.

Current Status:

The following restrictions currently apply to visitors camping on the refuge. No camping is allowed within 400 meters (1/4 mile) of any wildlife water, fires are restricted to charcoal or camp stoves and the maximum length of stay is 14 consecutive days. There are three developed, vehicle accessible, primitive camping areas with minimal amenities at Papago Well, Tule Well and Christmas Pass. There is no restriction on visitor group size.

Rationale for Objective:

Camping is considered an appropriate use on the refuge in support of hunting and wildlife observation due to the remoteness of the refuge, difficulty of access and twilight or nocturnal activity of many desert wildlife species. Camping has the potential to adversely affect wilderness character and other refuge resources if not adequately managed. Fire restrictions at the established campsites are necessary to prevent consumption of dead wood that provides habitat for desert insects. Fire restrictions are not necessary in the refuge backcountry, due to the dispersed nature and very low rate camping in the backcountry. Length of stay restrictions are typically used on public lands allowing camping to facilitate tracking of visitor use and prevent "squatting" or permanent occupation of public land. Party size restrictions protect the wilderness and other natural resources of the refuge. Larger camping and hiking parties tend to create far greater impacts than do smaller parties using similar camping and travel techniques (see Monz et al., 2000, for a discussion of reasons to limit party size in wilderness).

Strategies for Accomplishing Objective:

1. Continue to prohibit camping within 400 meters (1/4) mile of any wildlife water.
2. Continue to limit recreational visitors' length of stay to 14 consecutive days.
3. Implement recreational visitor party size limitation of four vehicles or eight persons.
4. Allow larger parties and longer visits on a case-by-case basis by special use permit
5. Allow back-country users (those hiking and not camping at the three established, vehicle accessible campsites) to use dead and downed wood for campfires. At the established campsites, allow wood fires using wood hauled into the refuge that is readily identifiable as wood not native to the refuge (pine, construction waste lumber, etc.).

Objective 4:

Retain exiting pack and saddle stock regulations.

Current Status:

Virtually all use of pack and saddle stock on the refuge has been by desert bighorn sheep hunters, but any refuge visitor could use stock, subject to a special use permit. Restrictions of the special use permit for pack and saddle stock include: a maximum of four horses, burros or mules per party; travel only on the administrative trails, dry washes and along the base of the mountain ranges; no grazing on the refuge or use of refuge water holes, tinajas, tanks, etc. to water stock; feed pellets or processed and pelletized feed only while on the refuge and for three days prior to entry. There are five designated stock camps along the refuge public access roads: Daniel's Arroyo, Lower Well, Agua Dulce, O'Neil Hills, Christmas Pass, Coyote Wash and Tule Tank (1 mile east of Tule Well). Long term camping (more than two nights) with pack or saddle stock is allowed only in these designated stock camps, all surface disturbance at campsites must be restored and all trash and animal waste must be removed from the camps.

Rationale for Objectives:

Control of pack and saddle stock, through the requirement of a special use permit with restrictions, is appropriate due to the much greater impacts on campsites and trails caused by pack and saddle stock versus hikers (Spildie et al., 2000).

Strategies for Accomplishing Objective:

1. Provide notice that a special use permit is necessary for pack or saddle stock on the refuge.
2. Provide information regarding the responsibilities of pack and saddle stock users with all permits issued to such users.

Objective 5:

Within ten years of plan adoption, develop a revised hunt program for implementation as conditions warrant.

Current Condition:

A desert bighorn sheep hunt occurs on the refuge each year during the month of December. In cooperation and coordination with AGFD, the refuge establishes the number of sheep hunting permits that will be issued, based on the size of the refuge desert bighorn sheep population. Since hunting began in 1968, the number of permits issued has ranged between seven and one per year. No other hunting is currently allowed on the refuge.

Rationale for Objective:

Hunting is one of the six wildlife dependent public uses and should be permitted on National Wildlife Refuges when compatible with the refuge purpose(s). Although data on population numbers are not currently sufficient to evaluate the appropriateness of hunting other species, hunting mule deer and predators (primarily coyote) on the refuge may be determined compatible when the refuge Sonoran pronghorn population has recovered sufficiently to allow hunting within the range of Sonoran pronghorn. Mule deer compete with Sonoran pronghorn for forage and water resources. Managing the refuge mule deer population could thus benefit the pronghorn population. Predator hunts could be beneficial if coyote become established on the refuge at greater than natural densities.

Strategies for Accomplishing Objective:

1. Continue to offer a desert bighorn sheep hunt in coordination with AGFD, setting permit numbers based on the refuge sheep population.
2. If results of population surveys indicate that the refuge mule deer herd would sustain hunting, and the U.S. Sonoran pronghorn population would not be jeopardized by a hunt in its range, conduct a compatibility determination for a mule deer hunt.
3. If results of population surveys indicate that coyote numbers on the refuge unnaturally high and predator hunts are consistent with refuge management, conduct a compatibility determination for a public refuge predator hunt.
4. In cooperation with AGFD, implement mule deer or predator hunt, as determined compatible. Monitor hunt for any adverse effects to refuge wildlife populations.

Objective 6:

Continue to ensure that the leave-no-trace (LNT) ethic of wilderness use and travel is reflected in the refuge's provision of visitor services and that LNT information is available to visitors.

Current Status:

LNT brochures are provided to all bighorn sheep hunters and back country campers.

Rationale for Objective:

Staff training and up-to-date public information on LNT will help to ensure that visitor use activities are consistent with protection of wilderness character.

Strategies for Accomplishing Objective:

1. Ensure that all refuge visitor contact and field staff as well as refuge volunteers have opportunities to be trained in LNT techniques at least every other year.
2. Provide LNT information to all refuge backcountry visitors.
3. Submit all LNT visitor information brochures to the Service Regional Wilderness Coordinator annually for review.

Objective 7:

Within five years, acquire a 12-hectare (30-acre) site adjacent to the refuge office site, develop an interpretive trail and develop additional interpretive materials for site.

Current Status:

In November of 1940, Executive Order 8598 set aside 16 hectares (40 acres) in Ajo for an administrative site. In 1969, Public Land Order 46171 revoked 12 hectares (30 acres) of that withdrawal and returned it to the state. A visitor center was built in 1980 on the remaining 4 hectares (10 acres). There is a short interpretive trail on the 4-hectare site, but lack of space and existing administrative facilities on the site limit the length and variety of that trail. The refuge has investigated leasing or purchasing the revoked 12 hectares (30 acres) to add an interpretive trail to the visitor center.

Rationale for Objective:

Visitors to Ajo, Arizona have access to some interpretive materials at the existing refuge office and visitor center, but must travel some distance on poor roads to experience the refuge resources. An improved interpretive trail adjacent to the office and visitor center would allow visitors to become acquainted with a range of Sonoran Desert vegetation and interpretive materials at an easily accessed location. An interpretive trail and other site interpretation at this location would also greatly facilitate the refuge's ability to conduct interpretive and educational programs for area schools, residents and visitors.

Strategies for Accomplishing Objective:

1. Service Regional Office realty staff will enter negotiations with the State of Arizona for the purchase or long-term lease of the 12-hectare (30-acre) parcel.
2. Upon purchase or lease of the property, the refuge, in coordination with the Service Regional Office Division of Visitor Services, will contract for a landscape design incorporating a trail, native landscape plantings, interpretive panels, and self-guided interpretive tour.

Objective 8:

Within ten years of Plan Adoption expand the visitor center/Administrative Office Complex, and develop new interpretive and educational materials for the visitor center.

Current Status:

The visitor center was built in 1980. It houses a small exhibit room with some interpretive materials and modest video screening facilities as well as the refuge administrative offices. Interpretive materials in the visitor center include cultural artifacts, wildlife life taxidermy mounts, a variety of interpretive brochures and a refuge orientation video.

Rationale for Objective:

Refuge visitation and staff have both grown since the construction of the visitor center in 1980. A larger visitor center/Administrative Office would accommodate present and future visitation levels and staff numbers. Developing new interpretive and educational materials is appropriate to reflect current resource knowledge, as well as interpret recent developments such as the precipitous decrease in Sonoran pronghorn on the refuge and the great increase in illegal traffic on the refuge.

Strategies to Accomplish Objective:

1. Contract with vendors to develop plans for enlarged visitor center/administrative building.
2. Develop an updated refuge orientation video.
3. In cooperation with Regional Office Visitor Services staff, develop interpretive and educational materials for the refuge.
4. If grant funding is obtained, construct accessible trail and overlook with shade structure and

interpretive panels for desert pupfish refugium on visitor center site.

Objective 9:

Within eight years of plan adoption increase opportunities for self-guided interpretive public activities in the refuge non-wilderness.

Current Status:

Other than the exhibits at the visitor center and its site, there are no interpreted sites available to the general public on the refuge. The interpretive panels on the Childs Mountain Watchable Wildlife station are not generally available, as they can only be accessed by guided tour groups under current management restrictions.

Rationale for Objective:

Interpretation is one of the six priority public uses of National Wildlife Refuges. Providing additional self-guided interpretive opportunities will lead to greater visitor appreciation and understanding of refuge resources.

Strategies for Accomplishing Objective:

1. Continue to offer guided tours of the Childs Mountain Watchable Wildlife site.
2. Coordinate with BLM to redevelop a public access road loop in the non-wilderness portion of the Childs Valley. This road would only be open to public use after a determination that such use would not jeopardize the Sonoran pronghorn.
3. Develop interpretive signage at overlooks and other suitable locations along the Childs Mountain Road and the Childs Valley loop road.
4. Develop additional interpretive pamphlets regarding the beneficial attributes of bats, such as plant pollination.
5. Continue to participate annually in the Sonoran Shindig.

GOAL 4: CULTURAL RESOURCES MANAGEMENT

Protect, maintain and interpret cultural and historic resources on Cabeza Prieta NWR, in cooperation with Tribal governments and the State of Arizona to benefit present and future generations.

Objective 1:

Continue to protect refuge cultural and historic resources through pre-disturbance surveys and resource assessment.

Current Status:

The refuge conducts on-site, pre-disturbance surveys prior to any work requiring disturbance of soil. In 2001 the *Cultural Resources Overview and Assessment, Cabeza Prieta National Wildlife Refuge* was completed. This analysis of records of cultural resources on the refuge provides information about prehistoric use and settlement patterns on the land that became the refuge.

Rationale for Objective:

The National Historic Preservation Act established a responsibility for cultural resources protection on all federal lands. Cultural resource awareness and protection also produces good will with the Tohono O'odham Nation and Hia-Ced O'odham band, which have cultural links to the refuge lands.

Strategies for Accomplishing Objective:

1. Require archaeological review to be completed prior to any work on the refuge that will require disturbance of the soil surface.
2. Consult with the Tohono O'odham Tribe and Hia-Ced O'odham band prior to permitting any archaeological research on refuge lands.
3. Continue to update refuge cultural resources records as cultural resources are discovered on the refuge. Location information in these records will not be disclosed to the public in order to protect sensitive cultural sites.
4. Continue to allow Archaeological Site Stewards, an Arizona registered volunteer association, to survey the refuge for cultural and historic sites.

Objective 2:

Within three years of plan adoption, develop and implement standards for cultural resources interpretation.

Current Status:

Some artifacts are interpreted at the refuge visitor center.

Rationale for Objective:

Interpretation of refuge cultural resources is consistent with their protection, provided that no on-site interpretation calls attention to fragile prehistoric cultural resources that might be subject to damage or removal by collectors.

Strategies for Accomplishing Objective:

1. Develop interpretive materials for the old Ajo landfill on the visitor center site. These materials would deal with the early twentieth century history of Ajo.
2. Update generalized cultural and historic brochure for the refuge.
3. Continue to display interpretive cultural artifacts at the visitor center, but do not remove any additional artifacts from their context in the refuge.
4. Do not develop any site-specific interpretive materials for cultural resources on the refuge.

Objective 3:

Within three year of plan adoption, implement periodic inspections of known cultural sites to identify and mitigate disturbance.

Current Status:

No regular, formal inspection of cultural sites occurs, although staff inspects sites from time to time.

Rationale for Objective:

Regular inspections of, and mitigation of damage to, cultural sites on the refuge will keep these sites intact for future research when archaeological techniques have improved to reveal more about the prehistoric use of the refuge lands.

Strategies for Accomplishing Objective:

1. Refuge staff will annually visit each known archaeological site and inspect for damage.
2. Where sites have suffered damage, the refuge will develop and implement stabilization measures, in coordination with the regional cultural resources officer
3. Refuge law enforcement staff will periodically patrol known sites to apprehend unauthorized individuals and discourage unauthorized entry.
4. The refuge will provide training to border law enforcement personnel regarding the sensitivity of refuge cultural resources and avoidance of damage to such resources during border law enforcement operations.

REFERENCES CITED

- Monz, C., J. Roggenbuck, D. Cole, R. Brame and A. Yoder. 2000. Wilderness party size regulations: implications for management and a decision making framework. *In*: Cole, David N., Steven F. McCool, William T. Borrie and Jennifer O'Loughlin. 2000. Wilderness Science in a Time of Change Conference – Vol.5. Ogden UT: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 265-273.
- Morgart, J.R., J. C. deVos, Jr., and J. J. Hervert. 2002. Overview on Sonoran pronghorn reestablishment alternatives." VII Meeting of the Canada/Mexico/U. S. Trilateral Committee for Wildlife and Ecosystem Conservation and Manangement: Nuevo Vallarta, Nayarit, Mexico.
- Morgart, J.R., J.J. Hervert, P.R. Krausman, J.L. Bright and R.S. Henry. 2005. Sonoran pronghorn use of anthropogenic and natural water sources." *Wildlife Society Bulletin* 33:51 – 60.
- Spildie, D. R., D. N.Cole, and S. C. Walker. 2000. Effectiveness of a confinement strategy in reducing pack stock impacts a campsites in the Selway-Bitterroot Wilderness, Idaho. *In*: Cole, David N., Steven F. McCool, William T. Borrie and Jennifer O'Loughlin. 2000. Wilderness Science in a Time of Change Conference – Vol.5. Ogden UT: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 199-20.

Appendix N: Intra-Service Biological Opinion for the Cabeza Prieta National Wildlife Refuge Comprehensive Conservation Plan, Arizona

United States Department of the Interior
U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 FAX: (602) 242-2513

In Reply Refer To:
AESO/SE
22410-2006-F-0416

August 22, 2006

Memorandum

To: Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona

From: Field Supervisor

Subject: Intra-Service Biological Opinion for the Cabeza Prieta National Wildlife Refuge
Comprehensive Conservation Plan, Arizona

Thank you for your request for formal intra-service consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (Act). Your request was dated May 5, 2006, and received by us on May 12, 2006. At issue are impacts that may result from implementation of your proposed Comprehensive Conservation Plan (CCP) on the Cabeza Prieta National Wildlife Refuge (CPNWR) in Yuma and Pima counties, Arizona. The proposed action may affect Sonoran pronghorn (*Antilocapra americana sonoriensis*) and lesser long-nosed bats (*Leptonycteris curasoae yerbabuena*).

This biological opinion is based on information provided in the "Working Final Cabeza Prieta National Wildlife Refuge Comprehensive Conservation Plan Environmental Impact Statement and Draft Wilderness Stewardship Plan, June 2006" (WFEIS) and other sources of information as described in the consultation history. Literature cited in this biological opinion is not a complete bibliography of all literature available on the species of concern; management, monitoring, and recreational activities and their effects; or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at the Phoenix, Arizona, Ecological Services Office (AESO).

CONSULTATION HISTORY

- July 25, 2005: We attended your Public Hearing in Tucson that was held to solicit public comment on draft documents to be used to prepare the CCP.
- April 6, 2006: We received an electronic mail requesting our review and approval of your Final Intra-Service Section 7 Biological Evaluation Form (BEF). In this form you requested our concurrence that implementation of the CCP will have no effect on the cactus ferruginous

pygmy-owl (*Glaucidium brasilianum cactorum*)¹ and lesser long-nosed bat and that it may affect, but will not likely adversely affect, pronghorn.

- April 10, 2006: We sent you an electronic mail regarding your effects determinations in the BEF and stated we believed that implementation of the CCP will likely adversely affect the Sonoran pronghorn and lesser long-nosed bat.
- April 11, 2006: We spoke with you regarding our April 10 correspondence. During this conversation you agreed with our recommendations regarding effects determinations and agreed to request formal Intra-Service section 7 consultation.
- May 12, 2006: We received your letter and revised BEF, dated May 5, 2006, requesting formal consultation on the proposed action and its effects on the Sonoran pronghorn and lesser long-nosed bat.
- May 19, 2006: We sent you a letter initiating formal consultation (consultation period beginning on May 12, 2006). In this letter, we additionally stated that we would not be formally consulting on the cactus ferruginous pygmy-owl because it was removed from the Federal List of Endangered and Threatened Wildlife.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The CPNWR proposes to implement the CCP and Wilderness Stewardship Plan for the CPNWR (Figure 1), located in Yuma and Pima counties in southwestern Arizona. The FWS is required to prepare CCPs by the National Wildlife Refuge System Improvement Act (P.L. 105-57) passed in 1997. The CCP describes the desired future condition of the CPNWR and provides long-range guidance and management direction for the CPNWR for the next 15 years.

The description of the proposed action is described primarily in “Elements Common to All Alternatives” (Section 2.1) and “Alternative 4 (Proposed Alternative): Active Management” (Section 2.5) of the WFEIS. A portion of the proposed action is described in “Alternative 5: Maximum Effort” (Section 2.6). Specifically, section 2.6.1.1.1.2 will replace section 2.5.1.1.1.2 and section 2.6.1.1.1.5 shall replace section 2.5.1.1.1.5. These two changes are related to implementing the Sonoran pronghorn recovery plan and reflect the CPNWRs current understanding of the importance of water and forage during drought periods for Sonoran pronghorn. Additionally, section 1.12.2 includes “Issues Covered by Existing Policy, Law, or Regulations and Common to All Alternatives”.

The CCP includes both existing actions that will be carried forward and new actions. As summarized below, it proposes wildlife and habitat management, including species recovery and

¹ Since the issuance of the April 6 BEF, the pygmy-owl was removed from the Federal List of Endangered and Threatened Wildlife and, accordingly, its designated critical habitat was also removed. We also withdrew the proposed rule to designate new critical habitat for the pygmy-owl (U.S. Fish and Wildlife Service 2006). We continue, however, to strongly encourage the continued implementation of monitoring and conservation activities included in the CCP for pygmy-owls.

conservation activities; wilderness stewardship; visitor service management; cultural resources management; and staffing level increases.

Wildlife and Habitat Management

As part of the CCP, the CPNWR will implement existing and new recovery and conservation activities for listed and non-listed species. To recover and conserve the Sonoran pronghorn, the CPNWR will: 1) implement Sonoran Pronghorn Recovery Plan (U.S. Fish and Wildlife Service 2002) actions; 2) monitor the U.S. sub-population of Sonoran pronghorn (this includes capturing and radio-collaring approximately 10% of the population; tracking radio-collared animals weekly using aerial radio-telemetry methods; tracking uncollared pronghorn weekly using visual surveys; conducting U.S. sub-population counts every two years; 3) develop additional, upgrade existing, and maintain all pronghorn waters (22 developed waters currently occur on the CPNWR); 4) implement the captive breeding program which includes maintaining a semi-captive breeding pen on the CPNWR and translocation of animals; 5) restrict public access to pronghorn habitat during the fawning season², until it has been determined that the U.S. subpopulation of Sonoran pronghorn has stabilized (i.e., either it has met the criteria for downlisting described in the “Status of the Species” and it has been downlisted or the environmental documents are being processed to finalize the downlisting, or the pronghorn population has remained stable with over 200 individuals for several years; Curtis McCasland, CPNWR, personal communication, June 30, 2006); 6) enhance forage for pronghorn (six forage enhancement plots currently occur on or near the CPNWR; additional enhancements are proposed); 7) conduct predator management (including conducting research on coyotes, reviewing data on coyote predation on pronghorn, and selectively removing coyotes based on results from research).

Though pronghorn recovery and conservation activities numbers 1, 2, and 4 (implementation of certain components of the Recovery Plan, capturing, monitoring, and implementing the captive breeding program) above are included as part of the proposed action for the CCP, these activities and take that could occur as a result of them are subject to a separate permitting process under section 10(a)(1)(A) of the Act. The 10(a)(1)(A) permits that have been issued for the aforementioned activities, as well as other pronghorn related research activities, are currently undergoing Intra-Service section 7 consultation (consultation number 22410-2006-F-0546).

To recover and conserve the lesser long-nosed bat, the CPNWR will: 1) protect the Bluebird Mine maternity roost from human disturbance through restricting access to, maintaining fencing (~ nine foot steel fence to discourage human entry) around, and monitoring the roost site; 2) develop and place a bat-friendly gate at the entrance of the maternity roost if the fencing fails to keep illegal immigrants/smugglers out; and 3) survey for additional, unknown roost sites on the

² The eastern three-quarters of the CPNWR (roughly from five miles east of Tule Well to the eastern boundary) is generally closed to public access from March 15 to July 15. During wet years, however, the eastern three-quarters of the CPNWR may be closed at a later date, such as April 1, if the CPNWR receives concurrence from the Arizona Ecological Services Office and the Sonoran pronghorn recovery team that a later closure date will not affect pronghorn. Administrative access to the eastern portion of the CPNWR is not restricted, however, CPNWR staff always implement measures to avoid and/or minimize impacts to pronghorn year-round.

CPNWR. The endangered desert pupfish (*Cyprinodon macularius*) is not known to have ever naturally occurred on the CPNWR, however a refugium for pupfish was developed at the visitor center, and CPNWR staff will continue to maintain and monitor the population.

Though lesser long-nosed bat monitoring and pupfish refugium maintenance and monitoring are included as part of the proposed action for the CCP, these activities and take that could occur as a result of them are subject to a separate permitting process under 10(a)(1)(A) of the Act.

The 10(a)(1)(A) permits that have been issued for the aforementioned activities, as well as other lesser long-nosed bat and pupfish related research activities, are currently undergoing Intra-Service section 7 consultation (consultation numbers 22410-2006-F-0548 and 22410-2006-F-0548).

Though Peirson's milkvetch (*Astragalus magdalenae peirsonii*) has not been documented on the CPNWR, CPNWR staff will conduct periodic surveys in suitable habitat (Pinta Sands) for this threatened plant. Because potential habitat for cactus ferruginous pygmy-owls occurs in areas on the CPNWR (two records of the owl exist from the CPNWR), CPNWR staff will develop a monitoring protocol to survey potential pygmy-owl habitat and continue to monitor the presence and number (if present) of pygmy-owls.

To conserve and manage desert bighorn sheep, the CPNWR will: 1) continue to monitor populations using standard aerial techniques every three years; 2) pending the results of a sheep/water relationship study, continue to haul supplemental water to existing bighorn sheep waters in wilderness and non-wilderness areas; 3) upgrade existing developed waters in wilderness; 4) develop additional waters if research indicates that additional waters would benefit sheep; 5) remove waters if research indicates that they do not benefit sheep; 6) conduct studies, which will include radio-collaring animals, to investigate mountain lion and bighorn sheep interactions.

The CPNWR will continue, as funding permits, to monitor and survey, initiate research on, and/or establish and implement protocols for inventorying and monitoring a variety of species, including birds and herpetofauna of concern and mule deer. The CPNWR will also continue, as funding permits, to conduct long-term monitoring; including monitoring vegetation transects and every two years, taking and analyzing aerial photographs of the CPNWR to detect changes in the plant community.

The CPNWR will continue to document new occurrences of exotic plants and attempt to limit their spread where feasible. The CPNWR will work with the Mexican government to identify means of controlling the spread of exotic plants along Mexican Highway 2. The CPNWR will also remove trespass livestock, which can cause a variety of problems on the CPNWR, including introducing exotic plants, spreading disease to wildlife, competing with wildlife for forage resources, etc.

Additionally, the CPNWR will continue to conduct and support biological research on the CPNWR such as implementing research goals of the Sonoran pronghorn recovery effort and facilitating and supporting research on desert bighorn sheep, herpetofauna, birds, exotic invasives, and other species, as well on ecosystem integrity by academics and other experts.

Wilderness Stewardship

CPNWR management and operations will continue to strive to protect the character of the designated wilderness³, so that it meets the definition found in the Wilderness Act of 1964. The CPNWR will streamline the minimum requirements analysis (MRA) process by establishing programmatic MRAs for all predictable, recurring activities, such as water hauling, wildlife surveys, removal of abandoned vehicles, and water sample collection, which require generally prohibited uses of wilderness. Though activity-specific MRAs will still be prepared, the programmatic MRAs will simplify the preparation process.

The CPNWR will continue to remove abandoned vehicles, taking care to limit damage to vegetation and the soil surface, when they are found. In the case of vehicles abandoned in wilderness, CPNWR staff will tow the vehicle, along its entry track whenever feasible, to the nearest non-wilderness road using a CPNWR vehicle. The vehicle will be hauled off of the CPNWR by a commercial towing company once removed to a road outside of wilderness. The CPNWR will also examine the feasibility of entering into a memorandum of agreement with adjacent military commands to make heavy-lift military helicopters available for removing abandoned vehicles from CPNWR wilderness.

The CPNWR will continue to notify and coordinate with the military to remove unexploded ordnance as it is found. Additionally, the CPNWR will coordinate with the military and volunteers to remove tow darts and tow cable from the CPNWR, using appropriate means in wilderness to accomplish the removal.

The CPNWR will close 20 miles of administrative trails to management vehicular use. The trails will, however, remain available to border law enforcement use under the provisions of the Arizona Desert Wilderness Act of 1990. Management use of the administrative trails not closed will continue to require an MRA. CPNWR back-country visitors will be encouraged to hike on administrative trails in order to concentrate user impacts on already affected areas. If future

³ The Arizona Desert Wilderness Act of 1990 designated 93 percent of the CPNWR area as Federal Wilderness. This wilderness is administered in compliance with the Wilderness Act of 1964, with the exception that the 1990 Act included provisions to allow some generally prohibited uses in order to facilitate border law enforcement and military training activities. The Wilderness Act of 1964 lists uses that are generally prohibited within designated wilderness unless the use is necessary to meet the minimum requirements for administration of the area as wilderness (a "minimum requirements analysis" (MRA) is conducted to determine if a proposed activity is appropriate). These generally prohibited uses are: any temporary road, use of motor vehicles, motorized equipment or motor boats, landing of aircraft, any other form of mechanical transport or any structure or installation. In addition to such uses, which are generally prohibited, but may be allowed as the minimum requirement to administer the area as wilderness, the Wilderness Act of 1964 also prohibits two uses in wilderness unconditionally: commercial enterprises and permanent roads.

changes in management regime result in permanent cessation of all water hauling, all the administrative trails will be closed to management use.

The CPNWR will develop an aerial photography program to monitor impacts of trails created by illegal immigrants or drug smugglers crossing the CPNWR. CPNWR staff will maintain a database of all observed adverse impacts to wilderness, including impacts caused by management, illegal activities, border law enforcement, and visitor use.

In response to increased illegal traffic in the CPNWR, border law enforcement has increased. Though interagency agreements⁴ exist to minimize impacts from border law enforcement activities, some restrictions in the agreements may be relaxed so that border law enforcement can respond to increased illegal activity on the CPNWR (for example, the Department of Homeland Security (DHS) is currently implementing their Arizona Border Control Plan in response to increased illegal traffic). The CPNWR will continue to present training and orientation sessions for Customs and Border Protection (CBP), Office of Border Patrol (OBP), and Drug Enforcement Administration (DEA) agents to increase their awareness of appropriate operations in wilderness, and assist OBP in preparation of a training video that provides guidelines on low impact wilderness travel techniques.

CPNWR law enforcement staff participates in the Border Anti-Narcotics Network (BANN), a combined effort among local and federal law enforcement agencies to combat narcotics trafficking. CPNWR law enforcement will continue to participate in a collaborative effort to combat narcotics trafficking and assist OBP in apprehending undocumented aliens on the CPNWR. The CPNWR and OBP deploy, monitor, and maintain a network of remotely operated sensors (magnetometers) to detect vehicles and pedestrians moving in proximity to the border. The CPNWR will continue to allow currently permitted uses of the Childs Mountain communications site, and will renew permits as deemed necessary for human safety and efficient law enforcement. The CPNWR will maintain a current inventory of all permitted uses and prevent any increase of the development footprint. The CPNWR will work with the military to identify any obsolete buildings or other structures and have them removed. At the end of the current use agreement, the CPNWR will work with the Federal Aviation Administration and military to renew the agreement or have the facilities removed, if no longer needed for human health, safety, and national security.

⁴ The Arizona Desert Wilderness Act of 1990 specifically states that designation of wilderness lands within the CPNWR will not preclude or otherwise affect continued border operations by the Immigration and Naturalization Service (now the U.S. Citizenship and Immigration Services, part of the Department of Homeland Security (DHS)), the Drug Enforcement Administration, or the United States Customs Service (now U.S. Customs and Border Protection, also part of the DHS), in accordance with interagency agreements. Interagency and Interdepartmental agreements (i.e., the "Interagency Agreement (IA) Between FWS CPNWR Ajo, AZ and Immigration and Naturalization Service U.S. Border Patrol Yuma Sector Yuma, AZ" signed in 1999 and the "Memorandum of Understanding (MOU) Among DHS and U.S. Department of the Interior and U.S. Department of Agriculture Regarding Cooperative National Security and Counterterrorism Efforts on Federal Lands along the United States' Borders" signed in 2006), currently in effect between Federal border law enforcement agencies and the FWS include limitation of routine patrol vehicle use to public roads; use of CPNWR administrative trails only to investigate sensor activity, engage in pursuit activity, and search and rescue operation; and limit off-road travel to emergency situations.

Additionally, the CPNWR will continue to annually survey 25 designated monitoring areas located along all public use roads and administrative trails for impacts to wilderness and will continue monitoring campsites to record the number, size, location, and condition of campsites on the CPNWR. These surveys will be conducted as staff time and availability allow.

Visitor Services Management

Access to the CPNWR, other than the Visitor Center, is by permit only. To obtain a more accurate count of CPNWR visitors than is available from counting permit numbers, the CPNWR has established an automated call-in line. The CPNWR access permit includes the telephone number and requests that all visitors call prior to entry and leave the following information: permit number for each person in the party, date of entry, destination, length of visit, and number of vehicles in the party. There is no requirement to call the CPNWR telephone number upon leaving the CPNWR. This information is used by the CPNWR to track numbers of visitors and routes of travel in the refuge.

El Camino del Diablo and Christmas Pass Road will remain restricted to four-wheel-drive, high clearance vehicles only. Charlie Bell Road will remain restricted to high clearance vehicles only (two-wheel-drive permitted). Vehicles will remain restricted to the established roadway for normal travel, with the center 100 feet of the 200-foot, non-wilderness travel corridors along el Camino del Diablo and Christmas Pass Road available for pull-off and passing. Motor vehicles and mechanical transport will remain prohibited in designated wilderness. Parties of five or more vehicles traveling together will require a special use permit. Street-legal, registered all-terrain vehicles and motorcycles will also be allowed on the non-wilderness access roads.

Pack and saddle stock will be allowed only by special use permit. Restrictions of the special use permit for pack and saddle stock will include: 1) a maximum of four horses, burros, or mules per party will be allowed; 2) travel only be allowed on the administrative trails, dry washes, and along the base of the mountain ranges; 3) no grazing will be allowed on the CPNWR or use of CPNWR water holes, tinajas, tanks, etc. to water stock; 4) only pellets or processed and pelletized feed will be allowed while on the CPNWR and for three days prior to entry; 5) long-term stock camps (more than 2 nights) will be permitted only in the seven designated areas: Daniel's Arroyo, Lower Well, Agua Dulce, O'Neil Hills, Christmas Pass, Coyote Wash, and Tule Tank 1 mile east of Tule Well; 6) all surface disturbance at campsites must be restored; and 7) all trash and animal waste must be removed from base camps. All visitors to wilderness will receive orientation information on Leave-No-Trace wilderness use techniques.

The CPNWR will continue to offer a limited (between one to eight tags per years) desert bighorn sheep hunt, under a CPNWR special use permit that includes the same restrictions as those described above. Should the results of the game animal population surveys indicate that CPNWR populations of mule deer, quail, dove, and rabbit are sufficient to support hunting, the CPNWR will implement hunts for these species as well. The hunts will be only be implemented upon a determination that the U.S. subpopulation of Sonoran pronghorn has stabilized and would

not be jeopardized by such a hunt and if adequate law enforcement is available to enforce CPNWR regulations during such hunts.

Public predator hunts for coyote, bobcat, and mountain lion may be authorized on the CPNWR if: 1) it is determined that such hunts would benefit Sonoran pronghorn populations; 2) predator populations can sustain hunting; and 3) the U.S. subpopulation of Sonoran pronghorn has stabilized and would not be jeopardized by such a hunt.

The CPNWR will continue to participate in a binational, multi-partner environmental education program designed to teach youth about the Sonoran Desert ecosystem. The CPNWR will continue to give natural history presentations at local schools and will also develop a Sonoran Desert ecosystem-specific environmental education program for use by staff in schools and other venues.

The CPNWR will continue to provide interpretive services and will also expand interpretive facilities, displays, and services at the CPNWR headquarters. The Childs Mountain Watchable Wildlife site will continue to be open only to guided tours due to safety constraints. The CPNWR will develop additional interpretive signage and overlooks in non-wilderness areas and will investigate the feasibility of developing a loop road in the non-wilderness portion of the Childs Valley in cooperation with BLM if the CPNWR determines that Sonoran pronghorn populations have stabilized and that such use would not jeopardize the subspecies. Additionally, should the CPNWR acquire a 30-acre site adjacent to the current visitor center, the CPNWR will develop an expanded interpretive trail on that site.

The CPNWR will continue to implement the Leave-No-Trace program to educate and encourage visitors to reduce their impacts on the CPNWR. The CPNWR will continue to allow both backcountry and vehicle accessible camping. Rules will be enforced to protect CPNWR resources and maintain wilderness character, as follows: 1) camping will be prohibited within 1/4 mile of any wildlife water; 2) campfires using native fuels will be allowed in the backcountry; 3) at the established campsites, fires will be allowed only if made with wood fuel brought in from off the CPNWR; 4) the maximum length of stay will be 14 consecutive days; and 5) parties of more than eight campers will require a special use permit. Three developed, vehicle accessible primitive camping areas with minimal amenities will be retained at Papago Well, Tule Well, and Christmas Pass.

Cultural Resources Management

All management activities on the CPNWR will be in compliance with Section 106 of the National Historic Preservation Act. CPNWR staff will consult with appropriate Tribes regarding any archeological surveys proposed by researchers on the CPNWR. The CPNWR will not conduct any inventory of cultural resources, however, CPNWR law enforcement staff will periodically patrol known sites to apprehend unauthorized individuals and discourage unauthorized entry.

Staffing

In order to implement the CCP, the CPNWR will need to add three full time positions (wildlife biologist, maintenance worker, and law enforcement officer).

Issues Covered by Existing Policy, Law, or Regulations

Border Law Enforcement

As described above, in response to increased illegal traffic in the CPNWR, border law enforcement has increased. Law enforcement use of the CPNWR is authorized by existing laws, such as The Arizona Desert Wilderness Act of 1990, which specifically states that designation of wilderness lands within the CPNWR will not preclude or otherwise affect continued border operations by border law enforcement. However, interagency and interdepartmental agreements, such as IA and MOU, do exist to minimize impacts to natural resources, such as limiting law enforcement vehicle use to existing designated public and administrative roads and/or trails, except in emergencies involving human life, health, and safety of persons.

Fire Management

General FWS policy is to control all wildfires in the Refuge System, including those within designated wilderness areas unless an approved fire management plan provides for non-suppression under certain circumstances. The CPNWR has no fire management plan, but plans to develop one in the future. Most natural fires on the CPNWR, if discovered, burn out before suppression efforts begin. CPNWR will take immediate action to control all wildfires that do not burn out before suppression crews are mobilized. All control methods in designated wilderness will meet MRA.

Trespass Livestock and Pets

Trespass and feral animals are not permitted and no unconfined domestic animal may enter or roam at large on refuge lands (50 CFR 26.21b). Consequently, CPNWR staff aggressively removes all trespass livestock from the CPNWR and all pets must be leashed and under the control of the owner at all times when on the CPNWR. Methods of livestock removal are determined on a case-by-case basis subject to MRA in wilderness.

SONORAN PRONGHORN STATUS OF THE SPECIES

A. Description, Legal Status, and Recovery Planning

The Sonoran subspecies of pronghorn (*Antilocapra americana sonoriensis*) was first described by Goldman (1945) and is the smallest of the five subspecies of pronghorn (Nowak and Paradiso 1983). The subspecies was listed throughout its range as endangered on March 11, 1967 (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966 without critical habitat. Three sub-populations of the Sonoran pronghorn are extant: 1) a U.S. sub-population in southwestern Arizona, 2) a sub-population in the Pinacate Region of northwestern Sonora, and 3) a sub-population on the Gulf of California west and north 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.

The 1982 Sonoran Pronghorn Recovery Plan (U.S. Fish and Wildlife Service 1982) was revised in 1998 (U.S. Fish and Wildlife Service 1998). 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 include 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 historical 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 2001 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 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.

B. Life History and Habitat

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 1998). During drought years, Hughes and Smith (1990) reported cacti were the major dietary 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 Service 1998). Pronghorn will move in response to spatial limitations in forage availability (Hervert *et al.* 1997a). Water intake from forage is not adequate to meet minimum water requirements (Fox *et al.* 2000), hence pronghorn need and readily use both natural and artificial water sources (Morgart *et al.* 2005).

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 Service 1998). Sonoran pronghorn form small herds of up to 21 animals (Wright and deVos 1986).

Telemetry locations of 35 Sonoran pronghorn demonstrated that during 1995-2002, pronghorn used creosote/bursage and palo verde/mixed cactus vegetation associations less than expected or equal to availability. Pronghorn use of palo verde/chain fruit cholla associations and desert washes occurred more than expected. However, during the cool and wet winter on 1997-1998, pronghorn were found in creosote/bursage associations more than expected (Hervert *et al.* 2005). In contrast, during 1983-1991, pronghorn used creosote/bursage and palo verde mixed cacti associations more than expected (deVos and Miller 2005). Differences between these study results may be due in part to differences in precipitation and forage patterns between these periods. The earlier period was wetter with greater forage availability in flats and valleys where creosote/bursage associations predominate. In wet winters and early spring, pronghorn are often found in flats and valleys, such as Pinta Sands, the Mohawk Dunes west of the Mohawk Mountains, and the west side of the Aguila Mountains. In late spring and summer, pronghorn then move from the flats and valleys upslope into bajadas and often south or southeast where palo verde associations, chain fruit cholla, and washes are more common. Movements are most likely motivated by the need for thermal cover provided by leguminous trees and water available in succulent chain fruit cholla (Hervert *et al.* 1997b). Home range size of Sonoran pronghorn during 1995-2002 ranged from 16.6 to 1,109 mi², with an average of 197 + 257 mi² (Hervert *et al.* 2005).

From 1995-2002, adult mortality rates varied from 11-83%. Adults were killed by coyotes, bobcats, mountain lions, capturing efforts, drought, and unknown causes (Bright and Hervert 2005). However, during 1983-1991, apparently a more favorable period for pronghorn during which the population grew significantly, mean annual survival of females and males was 96% + 0.04 and 92% + 0.04 (DeVos and Miller 2005). Disease may affect mortality, but has not been thoroughly investigated (Bright and Hervert 2005). 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. Drought may be a major factor in the survival of adults and fawns (Bright and Hervert 2005). Three radio-collared pronghorn died in July and August of 2002 with no obvious cause of death. Given that 2002 was one of the driest years on record, the proximate cause of these mortalities was likely heat stress and/or malnutrition resulting from inadequate forage conditions due to drought.

C. Distribution and Abundance

United States

Historically, the Sonoran pronghorn ranged in the U.S. from approximately the Santa Cruz River in the east, to the Gila Bend and Kofa mountains to the north, and to Imperial Valley, California, to the west (Mearns 1907, Nelson 1925, Monson 1968, Wright and deVos 1986, Paradiso and Nowak 1971; Figure 2). Bright *et al.* (2001) defined the present U.S. range of the Sonoran pronghorn as bordered by 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 (see Figure 3). This area encompasses 2,508 mi² (Bright *et al.* 2001).

While Mearns (1907) suggested that pronghorn may have been common in some areas in the late 1800s, evidence suggests that the sub-population declined dramatically in the early 20th century. Sub-population estimates for Arizona, which only 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). Table 2 presents observation data from transects and compares estimates derived from the three population models from 1992 through 2004.

The sightability model population estimates from 1992 to 2000 showed a 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 Service 1998, Bright *et al.* 2001). 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 corresponded to five consecutive six-month seasons of below normal precipitation (summer 1994 through summer 1996) throughout most of the Sonoran pronghorn range, which likely contributed, in part, to observed mortality (Bright *et al.* 2001, Hervert *et al.* 1997b).

Mortality of Sonoran pronghorn in 2002 was exceptionally high (Bright and Hervert 2005). At the start of the year, seven radio-collared Sonoran pronghorn were at large in the U.S. sub-population. By December 2002, all but one of these had died. For most, drought stress was considered to be the proximate cause. For those animals that may have succumbed to predation, it was suspected that drought stress was again a factor, by making the animal more vulnerable to predation, due to an emaciated physical condition and being forced into predator habitats by drought. The 2002 drought, lasting from August 2001 to September 2002, was one of the driest on record. As an example, annual rainfall at the OPCNM visitor center was only 2.54 inches in 2002 (Tim Tibbitts, Organ Pipe Cactus National Monument, personal communication, 2002); *average* annual rainfall for the visitor center is 9.2 inches (Brown 1982). The November/December 2002 population survey revealed the U.S. sub-population had declined to the lowest level ever recorded. A total of 18 pronghorn were observed, in three groups (8, 9, and 1). The sightability model resulted in a population estimate of 21 animals, or a 79% decline from 2000. Also, very few fawns survived in 2002 to replace these dying adults.

Although drought was likely the proximate cause of the dramatic decline of the U.S. sub-population in 2002, anthropogenic factors almost certainly contributed to or exacerbated the effects of the drought. Historically, pronghorn likely moved to wetted areas and foraged along the Rio Sonoyta, Sonora, and the Gila and probably Colorado rivers during drought. These areas are no longer accessible to the U.S. population due to fences, Interstate 8, Mexico Highway 2, and other barriers. The rate of decline in the U.S. sub-population from 2000-2002 (79 percent) was also much greater than that observed in either the Sonoran sub-population southeast of Highway 8 (18 percent decline) or the El Pinacate sub-population (26 percent) during the same period (see discussion of Mexican sub-populations in the next section). Observations of forage

availability suggest the El Pinacate sub-population experienced the same severe drought that occurred on the Arizona side (Tim Tibbitts, John Morgart, personal communication, 2003). Yet that sub-population fared much better than its U.S. counterpart. The high level of human activities and disturbance on the U.S. side, particularly in regard to undocumented alien traffic, smugglers, and law enforcement response, as compared to what occurs in the El Pinacate area, is a likely contributing factor in the differing rates of decline observed north and south of the border. See the section entitled “Drought” in the Environmental Baseline and “Cumulative Effects” for further discussion.

The December 2004 survey documented an estimated 58 wild pronghorn in the U.S. population, a substantial increase brought on by favorable conditions since 2002. Based on casual surveys and estimated fawn survival, the population in 2005 was roughly 75 wild pronghorn. The winter of 2006 was very dry until March 11 when up to 2.5 inches of rain fell over most of the eastern range of the pronghorn. With favorable monsoon moisture, the wild population could continue to increase.

Semi-captive breeding facility

As part of a comprehensive emergency recovery program, adult pronghorn were first captured and placed into a semi-captive breeding facility at CPNWR in 2004. There are currently 27 pronghorn in the enclosure, including nine fawns born this year and six yearlings born in the enclosure last year. The objective is to produce 10-25 fawns each year to be released into the U.S. sub-population, and potentially to establish a second U.S. sub-population at Kofa NWR. Four yearling rams are scheduled to be released this year.

Mexico

Historically, Sonoran pronghorn ranged in Sonora 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 (Nelson 1925, Carr 1974, Monson 1968). 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. Sonoran pronghorn are currently extant in two sub-populations in Mexico, including: (1) Pinacate sub-population west of Highway 8 near the Pinacate Lava flow; and (2) north and west of Caborca and southeast of Highway 8.

Sub-populations of Sonoran pronghorn in Sonora had not been thoroughly surveyed until the December 2000 surveys (Bright *et al.* 2001), at which time 346 pronghorn were estimated to occur in Sonora. Although the 1993 estimate was approximate, survey results suggested a decline in the sub-populations of 16 percent from 1993 to 2000 (Table 3). The two Mexico sub-populations were resurveyed in December 2002. A grand total (both El Pinacate and southeast of Highway 8) of 214 pronghorn in 32 groups were seen for a tentative population estimate of 280, indicating further decline. Only 19 pronghorn were observed in the Pinacate area for an estimate of 25, which is a decline of 26% from the 2000 estimate. Surveys conducted in December 2004 and February 2005 demonstrated that the population southeast of Highway 8 increased to 625 (439 observed), while the Pinacate population increased to 59 (30 observed). In January 2006, surveys indicated that pronghorn numbers are remaining steady with an estimated

total of 634 (486 observed) individuals (combined for both populations). Nine of these were captured, of which five were fitted with radio-collars and released and four were transferred to the semi-captive breeding facility in the U.S.

Population Viability Analysis

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). Based on the best estimates of demographic parameters at the time, the likelihood of extinction of Sonoran pronghorn was calculated as one 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. At populations of less than 100, population viability declined at an increasingly steep rate. To maintain genetic diversity over the long term, a population of at least 500 is desirable (Defenders of Wildlife 1998). The likelihood of extinction increased markedly when fawn mortality exceeded 70 percent. Thus, a 30 percent fawn crop (30 fawns/100 does) each year is necessary to ensure the continuance of the U.S. sub-population. The authors concluded that “this population of the Sonoran pronghorn, the only one in the U.S., is at serious risk of extinction.” The authors made these conclusions prior to the severe drought and decline in the species in 2002. On the other hand, Hosack *et al.* (2002) found that some management actions were possible that could improve the chances of population persistence significantly. Actions that would ameliorate the effects of drought or minimize mortality of pronghorn were of particular importance for improving population persistence.

E. Threats

Barriers that Limit Distribution and Movement

Highways, fences, railroads, developed areas, and irrigation canals can completely block access to essential forage or water resources. Highways 2 and 8 in Sonora, and SR 85 between Gila Bend and Lukeville, Arizona support a considerable amount of fast-moving vehicular traffic, and are fenced in some areas, and are likely a substantial barrier to Sonoran pronghorn. Interstate 8, the Wellton-Mohawk Canal, agriculture, a railroad, powerlines, access roads, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. De-watering of reaches of the Río Sonoyta River and lower Gila River, 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 Peñasco, and San Luis, Sonora; in the Mexicali Valley, Baja California Norte; and at Ajo, Yuma, and along the Gila River, Arizona, have further removed habitat and created barriers to movement.

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 buffelgrass (*Pennisetum ciliare*) in Sonora; gold mining southeast of Sonoyta, dewatering and development along the Gila River and Río Sonoyta; increasing undocumented immigration and drug trafficking across the international border and associated law enforcement response; and roads, fences, canals, and other artificial 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. Pronghorn were more sensitive to helicopters, particularly those flying at low levels or hovering, than fixed wing aircraft. 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). Hughes and Smith (1990) found that pronghorn immediately ran 1,310-1,650 feet from a vehicle. Krausman *et al.* (2001, 2004, 2005a) examined effects of military aircraft and ground-based activities on Sonoran pronghorn at the North and South TACs on the BMGR and concluded that 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. Sightings of pronghorn were biased towards disturbed habitats on the TACs and other areas of military activities, which also corresponded to areas of favorable ephemeral forage production (Krausman *et al.* 2005a). No conclusions could be drawn about effects of military activities on fawns due to poor fawn productivity during the Krausman *et al.* 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).

Habitat Disturbance

Livestock grazing has the potential to significantly alter pronghorn habitat and behavior (Leftwich and Simpson 1978, Kindschy *et al.* 1982, Yoakum *et al.* 1996). 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). The effects of cattle grazing are largely historical; cattle were removed from OPCNM, CPNWR, and the BMGR in 1979, 1983, and 1986, respectively (U.S. Fish and Wildlife Service 1998, Rutman 1997). In 2004, the BLM closed the Cameron Allotment on the borders of CPNWR and OPCNM, but grazing still occurs in the nearby Childs and Coyote Flat allotments near Ajo. In Sonora, livestock grazing occurs at Pozo Nuevo and at Ejido Puerto Peñasco where cattle typically range widely and often compete directly with pronghorn for forage resources.

Mining occurred historically throughout much of the U.S. range of the pronghorn, but is currently not a significant threat to Sonoran pronghorn in the U.S. During recent pronghorn surveys in Mexico, increasing effects from gold mining activities and large open pit copper mine were noted in habitats used by the sub-population located southeast of Highway 8.

Illegal crossings by undocumented immigrants and drug smugglers in the U.S. range of the pronghorn have increased dramatically in recent years. In 2001, estimates of undocumented migrants traffic reached 1,000 per night on OPCNM alone (Organ Pipe Cactus National Monument 2001), and an estimated 150,000 people entered the monument illegally from Mexico (Milstead and Barns 2002). In fiscal year 2005, the Yuma Sector of the Border patrol apprehended record numbers of illegal immigrants and smugglers, and from October 1, 2005 to May 2006, 96,000 arrests have been made, which is a 13% increase over the same time period in 2005 (Gerstenzang 2006). Illegal border-related activities and Border Patrol response have resulted in widespread habitat degradation and increased human presence in remote areas. Increased enforcement in urban areas has pushed illegal traffic to remote areas, including Sonoran pronghorn habitat in southwestern Arizona.

Fire

The winter and spring of 2004/2005 was very wet, resulting in some of the highest productivity of cool season annual plants in recent memory. As these annual plants dried out, they created fuel for wildfire. In 2005, Mediterranean grass combined with high densities of the native woolly plantain (*Plantago ovata*) and other species created fuels adequate to carry fire. Military training, such as strafing and bombing in the tactical ranges, as well as fires set by illegal immigrants or smugglers, provided the ignition sources. Exact numbers are unknown; however, in 2005 roughly 7,500 acres of pronghorn habitat burned on the CPNWR (personal communication with Curtis McCasland, February 15, 2006) and more than 63,000 acres burned on the BMGR-East during that time. Approximately 29,260 acres of pronghorn habitat were consumed as a result of these fires.

Most Sonoran Desert trees, shrubs, and cacti are poorly adapted to fire (Brown and Minnich 1986, Schwalbe *et al.* 2000, Alford and Brock 2002). If areas burn repeatedly, permanent changes are likely in the flora. Even in the best scenario it is likely to be many decades before trees once again provide thermal cover in wash communities and cholla recover to a point that they are useful forage plants for pronghorn.

Small Population Size and Random Changes in Demographics

At populations of less than 100, population viability declines at an increasingly steep rate. To maintain genetic diversity over the long term, a population of at least 500 is desirable (Defenders of Wildlife 1998). At an estimated 21 in 2002, and roughly 75 wild pronghorn in 2005, the U.S. sub-population is critically endangered and is going through a genetic bottleneck. At an estimated 25 in 2002 and 59 in 2004, the Pinacate sub-population is also well below desired numbers. At 625, the third sub-population (southeast of Highway 8) is marginally large enough to maintain genetic diversity for that one sub-population. Loss of the U.S. sub-population would dramatically reduce our ability to manage or recover this subspecies throughout its range. 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). 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).

Disease

Sonoran pronghorn can potentially be infected by a variety of viral and bacterial diseases. Blood testing of pronghorn captured during collaring and transplant operations has shown pronghorn exposure to these diseases by increases in antibody titers over time. The diseases relevant to pronghorn can be transmitted indirectly through vectors, such as infected midges or ticks, or directly via aerosolized or direct contact of infected fluids or tissues. Diseases that potentially infect pronghorn are all serious diseases of cattle, which can act as vectors. Cattle within the current range of the pronghorn have not been tested for these diseases.

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 El Pinacate Region and on the Gulf Coast of Sonora by Mexico Highways 2 and 8. 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 current range of the pronghorn within the U.S. (Figure 3).

Management of the action area is almost entirely by Federal agencies. The BMGR (roughly 1.6 million acres) is managed by Luke Air Force Base and MCAS-Yuma primarily for military training. OPCNM manages 329,000 acres in the southeastern corner of the action area for scenic, ecological, natural, and cultural values. CPNWR lies along the border west of OPCNM and encompasses 860,000 acres. CPNWR is managed to protect, maintain, and restore the diversity of the Sonoran Desert. Most of the CPNWR and OPCNM are designated as wilderness. The BLM manages lands near Ajo for recreation, grazing, and other multiple uses 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. The Yuma Desert on the western edge of the BMGR is part of a broad valley that includes the Colorado River. Major drainages and mountain ranges run northwest to southeast. Major drainages flow mostly northward to the Gila River, although southern portions of OPCNM and the southern slope of the Agua Dulce Mountains drain south to the Río Sonoyta.

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 (Brown 1982). Annual precipitation increases from west to east across the BMGR; at Aguajita/Quitobaquito, precipitation is 10.5 inches annually.

The vegetation community of the western portion of the BMGR has been classified as the lower Colorado River Valley subdivision of Sonoran Desert scrub (Brown 1982). It is the largest and most arid subdivision of Sonoran Desert scrub. The Arizona Upland subdivision of Sonoran Desert scrub is found in the Growler, Puerto Blanco, Ajo and Bates mountains, and surrounding bajadas.

C. Status of the Sonoran Pronghorn in the Action Area

Distribution, Abundance, and Life History

The distribution and abundance of the Sonoran pronghorn in the action area is the same as that described above in the Status of the Species for the U.S. sub-population. Life history, including demographics, chronology of breeding and movements, diet, and other factors were also described above for the U.S. population.

Drought

Rowlands (2000) examined trends in precipitation for southwestern Arizona and OPCNM 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 OPCNM, 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. No discernable trend in precipitation in southwestern Arizona or OPCNM was found in the 1990s, which is when the current decline in the U.S. pronghorn population began.

Since Rowland's analysis, we have had one year characterized by above-average rainfall and abundant ephemeral forage (2001) followed by a year with virtually no precipitation or ephemeral forage (2002). Recruitment and survival were high in 2001 and very low in 2002 (Bright and Herbert 2005). Based on the lack of forage and water, and the condition of pronghorn observed, drought is considered the proximate cause of the 79% decline in the pronghorn population from 2000 to 2002. Currently, the western U.S. is in severe drought. Season-to-date basin precipitation (October 1, 2005-May 12, 2006) stands at 29-56% of normal (Miskus 2006). Despite this, since 2002, winter and summer precipitation has been adequate to maintain pronghorn reproduction and fawn survival. Anthropogenic climate change is causing

warming trends in winter and spring, decreased frequency of freezing temperatures, lengthening of the freeze-free season, and increased minimum temperatures in winter (Weiss and Overpeck 2005). Although this alone is likely to cause some changes in vegetation communities and the types of forage available to pronghorn, future trends in precipitation, or whether the drought will continue or worsen, is unclear (Weiss and Overpeck 2005).

Historically, pronghorn populations must have weathered many severe droughts in the Sonoran Desert, including many that were more severe and longer term than what has occurred recently. Given that pronghorn populations survived the droughts of the 1890s, 1950s, 1970s, and others before those, it is unreasonable to solely attribute recent declines in the U.S. pronghorn population to drought. OPCNM (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.

Emergency Recovery Actions

A number of critically important emergency recovery projects have been recently initiated in an attempt to reverse the decline of the U.S. sub-population of the Sonoran pronghorn (Krausman et al. 2005b). These projects are designed to increase availability of green forage and water during dry periods and seasons to offset to some extent the effects of drought and barriers that prevent pronghorn from accessing greenbelts and water, such as the Gila River and Rio Sonoyta. Nine emergency water sources, with plans for an additional five, have been constructed in recent years throughout the range of the U.S. sub-population. Five forage enhancement plots, each consisting of a well, pump, pipelines and irrigation lines, are used to irrigate the desert and produce forage for pronghorn. Two additional plots will be installed over the next five years, and it is hoped that a total of 10 plots will eventually be constructed. A semi-captive breeding facility at CPNWR, was first stocked with pronghorn in 2004 and now contains 27 animals. As described above, this facility will be used to augment the current U.S. sub-population, and potentially to establish a second herd at Kofa NWR. These crucial projects, which we hope will pull the U.S. population back from the brink of extinction, have been cooperative efforts among the Service, Arizona Game and Fish Department (AGFD), MCAS-Yuma, Luke Air Force Base, and OPCNM, with volunteer efforts from the Arizona Desert Bighorn Sheep Society, Arizona Antelope Foundation, and the Yuma Rod and Gun Club

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 over 300 years ago (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.

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 the U.S. sub-population or their habitat are Federal actions. The primary Federal agencies involved in activities in the action area include the MCAS-Yuma, Luke Air Force Base, Fish and Wildlife Service, BLM, Organ Pipe Cactus NM, and Border Patrol. 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

1) Tucson Sector of the Border Patrol

We have been in informal consultation with the Tucson Sector Border Patrol regarding development of a biological assessment for some time (consultation number 02-21-99-I-0138). This consultation will encompass all field activities conducted by the Tucson Sector under their program to detect, deter, and apprehend undocumented immigrants and drug traffickers. Activities within the Ajo Station of the Tucson Sector have the greatest potential to adversely affect pronghorn; although currently that Station is being operated out of the Yuma Sector. Adverse effects may result from patrol road activities, drag road activities, off-road operations, aircraft overflights, and the use and maintenance of sensors. About 180 miles of illegal roads have been created in wilderness areas of CPNWR in the last four years (Segee and Neeley 2006). These routes have likely been created both by Border Patrol and smugglers, and all are probably used by Border Patrol. Furthermore, the potential for disturbance to pronghorn due to human presence may increase in areas where agents live on site (i.e., Operation Grip). Border Patrol activities can be beneficial as well, in that they deter illegal border crossings, foot traffic, and off-road vehicles in pronghorn habitat associated with undocumented aliens and smuggling. At the same time, effectiveness of Border Patrol operations elsewhere along the U.S./Mexico border have driven illegal activities into remote areas, such as CPNWR.

2) Smuggler/Drug Interdiction

We are aware of U.S. Customs, Drug Enforcement Authority, and Arizona Army National Guard smuggler or drug interdiction activities in pronghorn habitat, including vehicle and helicopter activities. However, none of these agencies have provided information to us about the extent or types of activities they conduct, and no consultation has occurred on these activities. Impacts are probably similar in scope to those described for the Tucson Sector activities.

3) BLM Off-Road Vehicle Use Area

We are aware of an off-road vehicle (ORV) use area located at the northern end of Ajo on BLM land, located near the CPNWR, likely adjacent to suitable pronghorn habitat. The BLM has not authorized the use of this ORV area but plans to in the updated Resource Management Plan (RMP) they are developing for BLM lands in the vicinity. They will request formal section 7

consultation on the updated RMP. To date, BLM has not provided us with information about the extent and type of use of the ORV area or its possible effects to pronghorn.

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 on actions that may affect the pronghorn.

Several opinions addressed projects with minor effects to the pronghorn (capture and collaring of pronghorn for research purposes, consultation numbers 02-21-83-F-0026 and 02-21-88-F-0006; installation of a water source in the Mohawk Valley for pronghorn, consultation number 02-21-88-F-0081; a change in aircraft type from the F-15A/B to the F-15E on BMGR-East [F-15E Beddown Project], consultation number 02-21-89-F-0008; and the following projects at OPCNM: widen North Puerto Blanco Road project, consultation number 02-21-01-F-0109; roadway and drainage improvements to SR 85, consultation 02-21-01-F-0546; vehicle barrier, consultation number 02-21-02-F-237; and improvement, maintenance, and use of the West Boundary Route, consultation number 02-21-05-M-0100 (this opinion has not yet been finalized). Incidental take was anticipated only for the Beddown Project in the form of harassment as a result of aircraft overflights. This project was later incorporated into the biological opinion on Luke Air Force Base's activities on the BMGR, discussed below. All of these formal consultations can be viewed on our website at <http://www.fws.gov/arizonaes/Biological.htm>.

Seven biological opinions evaluated major projects with greater effects to pronghorn:

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

This biological opinion (consultation number 02-21-96-F-0334), 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. The Yuma Sector requested reinitiation of consultation; we delivered a draft biological opinion in 2004. We are awaiting comments from the Border Patrol and hope to conclude reinitiation in 2006. Border Patrol activities within the Yuma Sector/Wellton Station include 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. 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 helicopter overflights. To reduce adverse effects on pronghorn, the Border Patrol agreed to implement a number of conservation measures. 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. Several conservation recommendations were also provided. We are not aware of any incidental take attributable to Yuma Sector activities.

Department of Homeland Security Permanent Vehicle Barrier

This draft biological opinion (consultation number 22410-2006-F-0113), issued June 28, 2006, addressed the CBP/OBP's installation of a permanent vehicle barrier (as well as improvements to access and border roads and associated maintenance and patrol activities) along the border from the western end of the Organ Pipe Cactus NM barrier to Avenue C just east of San Luis, Arizona. Effects to pronghorn included 1) disturbance of a narrow swath of habitat along the border, 2) presence of construction crews and vehicles which may disturb or preclude use of the area by pronghorn, 3) presence of maintenance and patrol vehicles and crews along the barrier access road, and 4) dramatic reduction or elimination of illegal drive-throughs and law enforcement response, with much reduced route proliferation and habitat damage from off-highway vehicles. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take of pronghorn was anticipated.

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 02-21-90-F-0042), proposed specific and general management guidance for non-military activities on the BMGR. The non-jeopardy biological opinion, issued April 25, 1990, was programmatic, requiring BLM to consult when site-specific projects are proposed. No incidental take was anticipated. The Lower Gila South Habitat Management Plan (HMP) (consultation number 02-21-89-F-0213) 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. 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 02-21-85-F-0069) 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 non-jeopardy biological opinion was issued on March 27, 1998; no incidental take was anticipated. In regard to management on the BMGR, these three opinions have been replaced by the opinion on the BMGR's Integrated Natural Resources Management Plan (INRMP) (see below). The Air Force and MCAS-Yuma have assumed BLM's management responsibilities on the BMGR.

BLM grazing allotments in the vicinity of Ajo, Arizona

The original biological opinion (consultation number 02-21-94-F-0192), issued December 3, 1997, addressed effects to pronghorn resulting from issuance of grazing permits on five allotments, four of which were located near Ajo and Why (Cameron, Childs, Coyote Flat, and

Why allotments); and the fifth near Sentinel (Sentinel allotment). All but portions of allotments east of Highway 85 were considered to be within the current distribution of the Sonoran pronghorn. Reinitiations resulted in revised biological opinions dated November 16, 2001, September 30, 2002, June 21, 2004, and March 3, 2005. Under the current proposed action, the Cameron Allotment is closed, the Sentinel Allotment has been in non-use for several years, the Coyote Flat and Why allotments were combined into one (Coyote Flat Allotment), and the Childs Allotment remains relatively unchanged in terms of management. Effects of livestock grazing activities included reduced forage availability for pronghorn, human disturbance due to livestock management, barriers to movement caused by pasture and allotment fences, and potential for disease transfer from cattle to pronghorn. The March 3, 2005 opinion concluded that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take was anticipated, and none is known to have occurred.

Organ Pipe Cactus National Monument General Management Plan

The original biological opinion (consultation number 02-21-89-F-0078), issued June 26, 1997, addressed implementation of OPCNM's General Management Plan (GMP). This opinion was reinitiated four times, resulting in revised biological opinions dated November 16, 2001, April 7, 2003, and March 10 and August 23, 2005. GMP plan elements included: 1) continuing travel and commerce on SR 85 while enhancing resource protection, 2) seeking designation of OPCNM as the Sonoran Desert National Park, 3) establishment of partnerships, 4) increased wilderness and an interagency wilderness and backcountry management plan, 5) changes in trails, facilities, and primitive camping, and 6) implementation of a Cultural Resources Management Plan. Included were a number of conservation measures to minimize impacts to pronghorn. Effects of the action included human disturbance to pronghorn and habitat due to recreation and management activities. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. In the latest versions of the opinion, no incidental take of pronghorn was anticipated. No incidental take is known to have occurred.

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

The original biological opinion (consultation number 02-21-95-F-0114), was issued on April 17, 1996. That opinion was reinitiated, and revised opinions were issued November 16, 2001 and August 6, 2003. These opinions addressed all proposed and authorized actions on the BMGR by MCAS-Yuma, including ongoing and proposed changes to military flights over CPNWR and the BMGR, operation of various training facilities such as landing strips, a rifle range, targets, a parachute drop zone, a transmitter/telemetry system, ground support areas, and Weapons Tactics Instructor courses, conducted twice a year (March-April and October-November) that involve overflights, ground-based activities, and deliverance of ordnance at targets in BMGR-East. Ground-based activities, such as those of troops and vehicles at ground-support areas were determined to adversely affect pronghorn habitat use. In areas where helicopters fly particularly low and create noise and visual stimuli, disturbance of pronghorn was anticipated. Ordnance delivery at North and South TACs could disturb pronghorn, and ordnance, live fire, and shrapnel could potentially strike and kill or injure a pronghorn. MCAS-Yuma proposed measures to reduce 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. In the 2003 version of the BO, no incidental take of pronghorn was anticipated and none is known to have occurred.

Luke Air Force Base Use of Ground-Surface and Airspace for Military Training on the BMGR

The original biological opinion (consultation number 02-21-96-F-0094), issued August 27, 1997, addressed military use of the airspace above and the ground space on BMGR-East and CPNWR by Luke Air Force Base. Military activities within the area of overlap with the CPNWR were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. Military activities occurring within BMGR-East 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. Primary potential effects of the action included habitat loss due to ground-based activities, harassment and possible mortality of pronghorn at target areas, and disturbance of pronghorn due to military overflights. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. This opinion was reinitiated in 2001 and 2003, resulting in revised opinions dated November 16, 2001 and August 6, 2003. In the latest (2003) opinion, no incidental take was anticipated. We are not aware of any take of pronghorn confirmed attributable to Luke Air Force Base use of the ground-surface and airspace on the BMGR. A pronghorn found dead near a target may have been strafed, but it may also have died from other causes (see "Effects of the Proposed Action" in the 2003 opinion for a full discussion of this incident).

During the development of these opinions, Luke Air Force Base 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.

Western Army National Guard Aviation Training Site Expansion Project

The non-jeopardy biological opinion for WAATS (consultation number 02-21-92-F-0227) was issued on September 19, 1997; however, Sonoran pronghorn was not addressed in formal consultation until reinitiations and revised opinions dated November 16, 2001 and August 6, 2003. 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 included: 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 East TAC of the BMGR. 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 North TAC only occurs when East TAC is closed for annual maintenance and EOD clearances (4-6 weeks each year). Effects to pronghorn at North TAC are minimized by monitoring protocols established by Luke Air Force Base. Training at East TAC could preclude recovery of historical habitat if the many other barriers that prevent pronghorn use of East TAC were removed. The November 16, 2001 and August 6, 2003 opinions found that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take

was anticipated and none is known to have occurred as a result of the proposed action. ARNG included the following conservation measures as part of their proposed action: 1) they proposed to study the effects of low-level helicopter flights on a surrogate pronghorn population at Camp Navajo, and 2) they committed to funding up to five percent of emergency recovery actions on the BMGR.

BMGR Integrated Natural Resources Management Plan

The non-jeopardy opinion for this action was issued on August 26, 2005. The Military Lands Withdrawal Act (MLWA) of 1999 required that the Secretaries of the Air Force, Navy, and Interior jointly prepare an INRMP for the BMGR, the purpose of which was to provide for the “proper management and protection of the natural and cultural resources of [the range], and for sustainable use by the public of such resources to the extent consistent with the military purposes [of the BMGR].” The proposed action was comprehensive land management, including public use restrictions, authorizations, and permitting on portions of the BMGR regarding camping, vehicle use, shooting, entry into mines, firewood collection and use, rockhounding, and other activities; natural resources monitoring, surveys, and research; habitat restoration; wildlife water developments; development of a wildfire management plan; law enforcement; limitations on the locations of future utility projects and the Yuma Area Service Highway; control of trespass livestock; and designation of special natural/interest areas, while allowing other designations to expire. The proposed action included many land use prescriptions that would improve the baseline for the pronghorn. No incidental take was anticipated, and none is known to have occurred from the proposed action.

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

Historically, livestock grazing, hunting or poaching, and development along the Gila River and Río 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 wild population in the action area declined from 179 (1992) to 21 (December 2002) and roughly 75 (2005). At 21 and 75, genetic diversity could erode, and the sub-population is in imminent danger of extirpation due to human-caused impacts, or natural processes, such as predation or continued drought. Although the proximate cause of the decline during 2002 was drought, human activities limit habitat use options by pronghorn and increase the effects of drought on the sub-population. The U.S. pronghorn sub-population is isolated from other sub-populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Río 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 immigrants and smugglers, 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. OPCNM (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 four had unknown effects. OPCNM (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.”

Although major obstacles to recovery remain, since 2002, numerous crucial recovery actions have been implemented in the U.S. range of the species, including nine emergency waters and five forage enhancement plots, with additional waters and forage plots planned. The projects tend to offset the effects of drought and barriers to prevent movement of pronghorn to greenbelts such as the Gila River and Río Sonoyta. A semi-captive breeding enclosure, built on CPNWR, currently holds 27 pronghorn. This facility will provide pronghorn to augment the existing sub-population and hopefully to establish a second U.S. sub-population at Kofa NWR.

The current range of the pronghorn in the U.S. is almost entirely comprised of lands under Federal jurisdiction; thus authorized activities that currently affect the pronghorn in the action area are almost all Federal actions. However, illegal, unauthorized foot traffic and off-road vehicle activity, but also Federal law enforcement response have been and continue to be significant threats to the pronghorn and its habitat. Prior to November 2001, in seven of 12 biological opinions issued by FWS 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. Given the small and declining population of pronghorn in the U.S. at the time the opinions were written, take at the levels anticipated in the biological opinions would constitute a substantial impact to the population.

Changes made in proposed actions and reinitiated biological opinions from 2001 to the present, plus the findings in other recent opinions, reduced the amount or extent of incidental take anticipated to occur from Federal actions. Significantly, we have been successful working with action agencies to modify proposed actions and to include significant conservation measures that reduce adverse effects to the pronghorn and its habitat. The only current opinion that anticipates incidental take is the Yuma Sector opinion, in which we anticipated take in the form of harassment that is likely to injure up to one pronghorn in 10 years. With the exception of likely capture-related deaths during telemetry studies (which were addressed in 10(a)(1)(A) recovery permits), we are unaware of any confirmed incidental take resulting from the Federal actions described here (although a pronghorn may have been strafed near one of the targets on BMGR-East – see above).

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, exacerbated by periodic dry seasons or years, are responsible for the present precarious status of the Sonoran pronghorn in the action area. However, collaborative, multi-agency and multi-party efforts to develop forage enhancement plots and emergency waters, combined with the success of the semi-captive

breeding facility, plus planned future recovery actions, including establishment of a second U.S. sub-population, provide hope that recovery of the Sonoran pronghorn in the U.S. is achievable.

EFFECTS OF THE ACTION

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

Implementation of the wildlife and habitat management, wilderness stewardship, and visitor service management elements of the proposed CCP may result in degradation of pronghorn habitat and/or disturbance to pronghorn. Adverse effects to pronghorn could result from vehicular and foot traffic associated with recreational and management/monitoring activities; overflights for wildlife monitoring and management of waters; and management of wildlife waters (if water-borne diseases are transmitted through wildlife waters) described in sections 2.1, 2.5, and part of 2.6 of the CCP. These activities may disturb pronghorn and/or degrade their habitat in a number of ways, such as from associated noise and light pollution; disturbance of soils; and crushing, destruction, or removal of vegetation that may provide forage and cover to pronghorn. Additionally, though it has not been documented for Sonoran pronghorn, there is a potential for pronghorn to be killed or injured through collision with vehicles.

Though the CCP would authorize some activities that may be detrimental to pronghorn, restrictions, prohibitions, and provisions included in the CCP should generally reduce disturbance to pronghorn and degradation of their habitat. Additionally, certain wildlife and habitat management activities included in the CCP will greatly aid in the recovery and conservation of pronghorn. Overall, implementation of the CCP will be beneficial to pronghorn on the CPNWR and throughout their range.

The pronghorn is sensitive to human presence. Krausman *et al.* (2001) reported that 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. 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) (Krausman *et al.* 2001). 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 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. They also found that pronghorn immediately ran 1,310-1,650 feet from a vehicle, and that military low-level flights (<500 feet above ground level) over three pronghorn caused them to move about 330 feet from their original location. 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 (e.g., from standing to trotting or running, or bedded to standing) 39 and 35 percent of the time during direct and other overflights, respectively.

Studies of captive pronghorn, other than the Sonoran subspecies, have also 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).

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. Human presence may cause 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. These may be critical stressors in seasonal hot-dry periods and in extended periods of low forage availability. Disturbance may also lead to mortality. Causing a pronghorn to be alarmed or agitated, or to flee from a disturbance, may also make it vulnerable to predator attack. This is especially true for fawns and females during the fawning season. Krausman *et al.* (2001) found that fawns and their mothers were more sensitive to human disturbance than other life stages of Sonoran pronghorn.

Recreation is recognized as having significant environmental impacts on wildlife (Knight and Gutzwiller 1995). Non-motorized human recreation activities, such as hiking, 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). Cassier *et al.* (1992) found that elk in Yellowstone National Park moved an average of 1.1 mile to avoid cross country skiers, often moving to another drainage.

Wildlife and Habitat Management

Implementing the “Wildlife and Habitat Management” element of the CCP may result in disturbance to pronghorn and their habitat. Vehicles associated with implementing this element could also collide with pronghorn causing injury and/or death. However, because pronghorn are relatively rare and because we are not aware of any such collisions in the U.S., or along unpaved routes anywhere within the range of the Sonoran pronghorn, we believe the chances of such collisions are low. Potential disturbance to pronghorn as well as chance of collision associated with this element should be limited because management and monitoring activities will be conducted when pronghorn are absent from the activity area or if pronghorn are present, all activities would be suspended until pronghorn have moved away from the activity area (Curtis McCasland, CPNWR, personal communication, June 30, 2006). Furthermore, because one of the primary objectives of the CPNWR is to protect and recover Sonoran pronghorn, when pronghorn are encountered by CPNWR staff, staff typically suspend their activity as noted above and record the event (i.e., make note of the pronghorn’s behavior, general habitat characteristics of the area being used by pronghorn, etc.) (Curtis McCasland, CPNWR, personal communication, June 30, 2006). Overall, implementation of this element will result in significant net benefits to pronghorn as described below.

Waters and Forage Enhancement Plots

Continuing to provide perennial water sources and enhanced forage areas should benefit the pronghorn population by increasing recruitment (the survival of fawns to breeding age) during periods of drought (WFEIS 2006). Fox *et al.* (2000) conducted a study of water and nutrient content of forage in Sonoran pronghorn habitat in Arizona and concluded that water content of forage on the eastern third of the CPNWR was insufficient to meet pronghorn water requirements during drought. Given that fawns, pregnant does, and lactating does have greater water and energy requirements than the species on average (Krausman 2004), the need for perennial water and an enhanced forage base to maintain population recruitment is apparent. A recent study suggested that selective foraging on chainfruit cholla cactus by pronghorn during droughts (due to its high water content) may reduce recruitment in the population as this plant has little nutritional value, and, while it may keep pronghorn alive longer in drought, it is probably not sufficient for growing fawns (Bright and Hervert 2005). Forage enhancements should provide nutritious forage with high water content and aid in fawn growth and survival.

Conducting a CPNWR-wide survey for sites appropriate for additional developed pronghorn waters and forage enhancement plots and developing additional waters and plots at the appropriate sites will beneficially affect pronghorn if water and forage are limiting factors on the U.S. Sonoran pronghorn population, as is suggested by Fox *et al.* (2001). Though unlikely⁵, developed waters could adversely affect pronghorn if they harbor and spread harmful pathogens to pronghorn. Monitoring of waters, as recommended by Broyles (1995) and proposed by the CCP, could benefit pronghorn if harmful pathogens are identified and eliminated. Developed waters could also adversely affect pronghorn if predators key-in on the waters and predate upon pronghorn using the waters or if the waters increase the carrying capacity of predators in the area. The CPNWR, however, has no evidence that Sonoran pronghorn have been predated upon at the developed waters and it is unknown as to whether the waters increase the carrying capacity

⁵ No pathogens harmful to native wildlife have been detected at 12 developed waters at the Kofa NWR after being monitored monthly for more than three years (Krausman 2004).

of predators (Curtis McCasland, FWS, personal communication, July 24, 2006). Though it is possible that the waters may increase the risk of predation on pronghorn, overall, the net effects of the developed waters on pronghorn are likely beneficial, particularly during periods of drought.

Seasonal Closures

Closing public access to approximately the eastern three-quarters of the CPNWR (roughly from five miles east of Tule Well to the eastern boundary) during the fawning season (generally March 15 to July 15 as described in the “Description of the Proposed Action”), as has occurred since 2002, until it has been determined that the U.S. subpopulation of Sonoran pronghorn has stabilized (i.e., either it has met the criteria for downlisting described in the “Status of the Species” and it has been downlisted or the environmental documents are being processed to finalize the downlisting, or the pronghorn population has remained stable with over 200 individuals for several years; Curtis McCasland, CPNWR, personal communication, June 30, 2006) should significantly benefit pronghorn (through reducing the chances of interactions between recreational users and pronghorn).

Predator Management

Conducting a study of radio-collared coyotes focused on their use of CPNWR developed waters and movement in relation to Sonoran pronghorn as well as selectively removing coyotes when the wild pronghorn population is less than 100 and winter and spring precipitation is less than 50 percent of average should benefit pronghorn. Predation can be an important limiting factor on populations that are well below carrying capacity (Ballard *et al.* 2001 as cited in the WFEIS), as is the case for Sonoran pronghorn on the CPNWR. Coyote monitoring operations, particularly if done using a vehicle or aircraft, could disturb pronghorn and degrade their habitat as described above and below. However, the proposed study would increase the likelihood of effective coyote control through increased knowledge of coyote movements and den locations (Krausman 2004), which overall, should result in a direct, long-term positive effect on the U.S. Sonoran pronghorn population.

Other Wildlife Surveys, Management, and Research

Most surveys should have no to little effect (pupfish, Peirson’s milkvetch, lesser long-nosed bat, etc.) on pronghorn. Some surveys (bighorn sheep aerial surveys) and management activities associated with other wildlife (e.g., hauling water to wildlife waters, removal of exotic species and trespass livestock) however, particularly if they are conducted within pronghorn habitat, could disturb pronghorn and degrade their habitat (i.e., from aircraft, vehicular use, human presence, etc.). While bighorn sheep aerial surveys have the potential to disturb pronghorn when helicopters are transiting between mountain ranges, effects should be minimal because most of the flight time is in the mountains, typically away from pronghorn habitat.

Some monitoring and management activities for other species will result in net beneficial effects to pronghorn. For example, monitoring and controlling exotic/non-native plant species and removing trespass livestock would benefit pronghorn and pronghorn habitat (i.e., maintain and improve forage conditions; reduce or prevent introduction/spread non-native plants, spread of disease to wildlife, and competition between livestock and pronghorn for forages resources; etc.)

Pronghorn will also generally benefit from continued biological research on the CPNWR. For example implementing the research goals of the Sonoran pronghorn recovery effort may lead to improved management of pronghorn and their habitat. Facilitating and supporting research on exotic and invasive species may ultimately result in improved pronghorn habitat conditions.

Wilderness Stewardship

Implementing the “Wilderness Stewardship” element of the CCP may result in disturbance to pronghorn and their habitat. Vehicles associated with implementing this element could also collide with pronghorn causing injury and/or death. However, for the same reasons stated above, we believe the chances of such collisions are low. Additionally, as described above, potential impacts to pronghorn associated with this element should be limited because “Wilderness Stewardship” activities will primarily be conducted when pronghorn are absent from the activity area or if pronghorn are present, all activity will be suspended until pronghorn have moved away from the activity area. Overall, implementation of this element will benefit pronghorn as described below.

Removal of hazards

Some wilderness stewardship activities (e.g., removing abandoned vehicles via tow-truck and/or helicopter, removing tow-darts, removing unexploded ordnance, etc.) may temporarily disturb pronghorn (from presence of people and vehicles) or degrade their habitat (vehicular use of vehicle routes as further discussed below). However, in general these activities will beneficially affect pronghorn and their habitat, reducing their exposure to potential hazards.

Administrative Trail Restrictions

Closing 20 miles of administrative trails to management vehicular use will benefit pronghorn and their habitat by reducing their exposure to vehicles. The trails will, however, remain available to border law enforcement (i.e., Office of the Border Patrol, OBP) use under the provisions of the Arizona Desert Wilderness Act of 1990 and the MOU, as described in the “Description of the Proposed Action” and below. CPNWR will continue, however, to request OBP to consult with us on any of their actions (that may affect listed species), either proposed or current, that are not covered by existing Section 7 consultations.

Impact monitoring

Monitoring impacts to wilderness from illegal immigrants/smugglers, law enforcement, and visitor use, as well as monitoring campsites, will benefit pronghorn if it results in identifying areas where detrimental impacts to pronghorn habitat are occurring and effective management responses are developed and implemented.

Childs Mountain Communications Site

Continuing to allow currently permitted uses of the Childs Mountain communications site and renewing permits as deemed necessary for human safety and efficient law enforcement may impact pronghorn somewhat. The communications site is outside of pronghorn habitat; however, because the site’s access road passes through some potential pronghorn habitat for a short distance, vehicles using the access road could disturb pronghorn and degrade their habitat. These impacts should be minimal, however, as pronghorn infrequently use the area (likely due to its

proximity to developed areas including an unauthorized OHV area on BLM land at the north end of Ajo).

Border Law Enforcement

In response to increased illegal traffic on the CPNWR, border law enforcement (particularly OBP) has increased. Both illegal traffic and law enforcement activities can adversely affect pronghorn and their habitat as described in the “Status of the Species”, “Environmental Baseline”, and “Cumulative Effects”, as well as other documents and biological opinions (i.e., the draft biological opinion, consultation number 22410-2006-F-0113, issued June 28, 2006 for the CBP/OBP Permanent Vehicle Barrier Project, and the biological opinion, consultation number 02-21-96-F-0334, issued September 5, 2000 and draft biological opinion issued in 2004 regarding Border Patrol Activities in the Yuma Sector, Wellton Station). As described in the “Environmental Baseline”, the OBP has not completed consultation on many of their activities occurring within pronghorn habitat. CPNWR does not have authority over OBP’s activities within the CPNWR; however, interagency agreements exist, such as the “Memorandum of Understanding (MOU) Among DHS and U.S. Department of the Interior (DOI) and U.S. Department of Agriculture (USDA) Regarding Cooperative National Security and Counterterrorism Efforts on Federal Lands along the United States’ Borders” signed in March 2006, that includes general guidelines, pursuant to applicable law, on BP activities, such as patrol, within lands managed by the DOI, such as CPNWR, and USDA. CPNWR will continue to request that OBP consult with the FWS on all of their actions before implementing them on the CPNWR.

CPNWR will also continue their effort to present training and orientation sessions for OBP, CBP, and DEA agents to increase their awareness of appropriate operations in wilderness. Additionally, CPNWR will assist OBP in preparing a training video that provides guidelines on low impact wilderness travel techniques. This training, if followed, should help minimize impacts to pronghorn and other sensitive resources in the CPNWR.

In response to increased illegal traffic in the CPNWR, border law enforcement has increased. Though interagency agreements exist, as explained in the “Description of the Proposed Action” and above, to minimize impacts from border law enforcement activities, the agreements do not prevent border law enforcement from conducting activities, such as off-road travel, outside of guidelines designed to minimize impacts, in emergency situations involving human life, health, safety of persons within the area, or posing a threat to national security. The CPNWR will continue to present training and orientation sessions for Customs and Border Protection (CBP), Office of Border Patrol (OBP), and Drug Enforcement Administration (DEA) agents to increase their awareness of appropriate operations in wilderness, and assist OBP in preparation of a training video that provides guidelines on low impact wilderness travel techniques.

Law Enforcement - CPNWR

CPNWR’s law enforcement patrol activities, which have increased in response to increased illegal immigrant/smuggler traffic, may disturb pronghorn and degrade their habitat. A large percentage of illegal and law enforcement vehicle activity on the CPNWR occurs within Mohawk and Growler Valleys (see figure 4.1 in the WFEIS), both are important areas for pronghorn. Law enforcement activities may cause pronghorn to flee an area and temporarily

avoid or less frequently use areas where patrol is focused. This would be particularly detrimental to pronghorn during times of peak physiological stress such as during a drought period or the fawning season. Vehicle use associated with enforcement activities can also cause soil erosion and changes in surface hydrology (from channelization of water in entrenched vehicle track prisms), which locally may substantially impact vegetation that provides forage and cover to pronghorn. If they travel off-road, in addition to the impacts described above, patrol vehicles can crush and destroy vegetation that provides forage and cover to pronghorn. CPNWR law enforcement follows the same guidelines for vehicle travel within CPNWR established by the MOU for BP (Curtis McCasland, CPNWR, personal communication, July 25, 2006). The guidelines restrict enforcement vehicles to existing designated public and administrative roads and/or trails, except in emergencies involving human life, health, safety of persons within the area, or posing a threat to national security (see the MOU for further guideline detail). Patrol vehicles could also collide with pronghorn causing injury and/or death. However, because pronghorn are relatively rare and because we are not aware of any such collisions in the U.S., or along unpaved routes anywhere within the range of the Sonoran pronghorn, we believe the chance of such collisions are low.

To minimize impacts to Sonoran pronghorn, trips into pronghorn habitat by CPNWR law enforcement are minimized to the greatest extent possible. Most trips into sensitive areas on the CPNWR are conducted in response to requests for help by resource staff or other Federal law enforcement officers. CPNWR law enforcement officers receive training to increase their awareness of appropriate operations in wilderness and participate in staff meetings and supervisory meetings where requests to minimize activities in pronghorn habitat (to reduce impacts to pronghorn and their habitat) are made and discussed. Furthermore, CPNWR law enforcement officers are routinely dispatched into areas with the specific purpose of trying to minimize illegal traffic in areas where pronghorn recovery actions are being implemented. The interdiction of illegal traffic prior to entering into these important areas is critical for the long-term management of pronghorn on the CPNWR.

Also, as described in our draft biological opinion on the CBP/OBP Permanent Vehicle Barrier Project issued on June 28, 2006 (consultation number 22410-2006-F-0113), we expect that the installation of the permanent vehicle barrier on CPNWR, once completed, will significantly reduce illegal vehicle traffic crossing through the CPNWR. Furthermore, illegal pedestrian traffic should also be reduced because improvements to the border road will facilitate interdiction of immigrants and smugglers along the border itself. Decreased illegal traffic should reduce the frequency of law enforcement pursuits through the CPNWR, which consequently will minimize disturbance to pronghorn and degradation of their habitat.

Visitor Service Management

Implementing the "Visitor Service Management" element of the CCP may result in disturbance to pronghorn and their habitat. Vehicles associated with implementing this element could also collide with pronghorn causing injury and/or death. However, for the same reasons stated above, we believe the chances of such collisions are low. Closing public access to approximately the eastern three-quarters of the CPNWR during the fawning season, as described in detail above,

should benefit pronghorn through reducing disturbance from recreational activities to pronghorn during this critical period.

Motorized Recreational Use

Continuing to allow recreational vehicles to use non-wilderness travel corridors (including the unpaved el Camino del Diablo and Christmas Pass Road) and non-wilderness access roads (all dirt-roads) may result in continued disturbance to pronghorn and degradation of their habitat. Roads have been documented to generally affect wildlife and habitat in a number of ways, including the fragmentation and degradation of habitat, and direct mortality from impacts with vehicles. Though larger, paved roads with high traffic volumes have a greater likelihood of impacting wildlife, even dirt roads, such as el Camino del Diablo and Christmas Pass Road, can cause direct, permanent disturbance of the habitat, cause erosion that can reduce the quality of habitat, and facilitate invasion by non-native pest plant species that can displace native habitat through competition or fire. Human use of roads can result in short-term denial of access to habitat for pronghorn or cause pronghorn to flee the area when cars or people approach. Seasonal closures, in addition to restricting recreational vehicle use to the aforementioned corridors/roads only, however, will greatly minimize impacts to pronghorn from motorized recreational use of the CPNWR.

Non-motorized Recreational Use

Allowing hiking and camping on the CPNWR may result in continued disturbance to pronghorn and degradation of their habitat. As described above, non-motorized recreation activities may disrupt wildlife in many ways, such as by displacing them and/or causing physiological effects (increased heart rate, etc.). The seasonal closures described above, however, will minimize adverse effects to pronghorn from hikers and campers, who could otherwise access the eastern portion of the CPNWR by vehicle, during this critical period. Additionally, as included in the "Wilderness Stewardship" portion of the "Proposed Action", CPNWR will encourage back-country visitors to hike on administrative trails in order to concentrate user impacts on already affected areas; if successful, this will assist in minimizing impacts to pronghorn habitat. Implementing the Leave-No-Trace program should also help minimize degradation of pronghorn habitat by visitors.

Use of Stock Animals

Allowing recreational activities involving pack and saddle stock on the CPNWR may result in disturbance to pronghorn (i.e., deny pronghorn access to important habitat or waters) and degradation of their habitat (i.e., stock could introduce non-native species, cause erosion, etc.). The seven stock-related restrictions (i.e., no grazing or use of water resources on CPNWR, restrictions in size of groups and allowed use areas, etc.), however, will minimize potential adverse impacts to pronghorn from stock associated activities.

Hunting

Allowing hunting of desert bighorn sheep may adversely affect pronghorn. Many effects to pronghorn from hunting will be similar to those described under "Motorized" and "Non-motorized Recreational Use" and "Use of Stock Animals" because hunters must access the allowable hunting areas by foot, vehicle, or stock animal. Beyond these effects, we anticipate impacts to pronghorn from the bighorn sheep hunting program will be minimal because

pronghorn and bighorn sheep habitat typically do not overlap (most impacts from hunters will be in the mountains away from suitable pronghorn habitat) and because bighorn sheep hunting is conducted in December, a time during which pronghorn are typically experiencing less stress (i.e., it is outside of the fawning season, temperatures are cooler, and forage is typically available due to winter rainfall, unless there is a serious drought) compared to other times such as the fawning season (February to July).

Pronghorn could be disturbed and their habitat degraded if CPNWR allows hunting of additional game and predator species in the future. However, these hunts will only be allowed if it is determined that the U.S. subpopulation of Sonoran pronghorn has stabilized (i.e., either it has met the criteria for downlisting described in the "Status of the Species" and it has been downlisted or the environmental documents are being processed to finalize the downlisting, or the pronghorn population has remained stable with over 200 individuals for several years; Curtis McCasland, CPNWR, personal communication, June 30, 2006) and would not be jeopardized by such hunts. Additionally, predator hunts would only be authorized if the hunts would benefit pronghorn. The expanded hunting program would be subject to further Intra-Service section 7 consultation.

Educational and Interpretive Services

Participating and providing educational and interpretive services will generally benefit pronghorn if they result in heightened public awareness of and sensitivity toward pronghorn. Pronghorn could be adversely affected should the CPNWR develop a loop road in the non-wilderness portion of the Childs Valley in cooperation with BLM. However, this road will only be developed if Sonoran pronghorn populations have stabilized as described above and that such use would not jeopardize the subspecies. Additionally, the loop road development would be subject to further Intra-Service section 7 consultation.

Issues Covered by Existing Policy, Law, or Regulations

Border Law Enforcement

The effects of border law enforcement on pronghorn are discussed above.

Fire Management

Fire suppression activities may adversely affect pronghorn in a various ways (i.e., presence of fire crews could disturb pronghorn; fire crew vehicles and fire suppression activities, like creating fuel breaks, could degrade pronghorn habitat; etc.), however, all suppression activities that may affect pronghorn, once conducted, are subject to emergency section 7 consultation procedures. Fire suppression will benefit pronghorn if it prevents further destruction (burning) of pronghorn habitat. When CPNWR develops a fire management plan, it will be subject to further section 7 consultation.

Trespass Livestock and Pets

The effects on pronghorn from the removal of trespass livestock are discussed above. Though the presence of pets could disturb pronghorn, the requirement that pets must be leashed and under the control of the owner should minimize their impact on pronghorn (i.e., pets will not be

able to chase pronghorn). We anticipate that the presence of pets on leash will affect pronghorn in similar ways as the presence of humans (described above).

Pronghorn Status

The most recent formal Sonoran pronghorn survey in December 2004 resulted in an estimated 58 wild pronghorn in the U.S. population, which was a substantial increase from an estimated 21 wild pronghorn in the U.S. in 2002. Based on casual surveys and estimated fawn survival, the population in 2005 was roughly estimated at 75 wild pronghorn in the U.S. These increases are likely attributable to favorable habitat conditions since the drought in 2002 as well as emergency recovery actions such as forage enhancement plots and emergency waters (see details under the "Environmental Baseline"), which undoubtedly offset to some extent the effects of drought and barriers that prevent pronghorn from accessing greenbelts and water, such as the Gila River and Río Sonoyta. We expect these recovery actions may also help offset adverse effects described herein as well as other activities within the action area that disturb pronghorn and their habitat. Because pronghorn remain critically endangered, however, it is imperative that all adverse effects to pronghorn from the current and proposed activities are avoided, minimized, and/or offset to the greatest extent possible.

CUMULATIVE EFFECTS

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

Most lands within the action area (current range of the pronghorn within Arizona) are managed by Federal agencies; thus, most activities that could potentially affect pronghorn are Federal activities that are subject to section 7 consultation. The effects of these Federal activities are not considered cumulative effects. 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 have been acquired by the Department of Defense. 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 the effects of these activities are expected to continue into the foreseeable future. Historical 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, Yuma, and along the Gila River.

Of particular concern are increasing illegal border crossings by undocumented immigrants and smugglers. In fiscal year 2005, the Yuma Sector of the OBP apprehended record numbers of illegal immigrants and smugglers, and from October 1, 2005 to May 2006, 96,000 arrests have been made, which is a 13% increase over the same time period in 2005 (Gerstenzang 2006). In 2001, estimates of undocumented migrant traffic reached 1,000 per night in OPCNM alone

(National Park Service 2001 or OPCNM 2001) and an estimated 150,000 people entered the OPCNM illegally from Mexico (Milstead and Barns 2002). Increased presence of the Border Patrol in the Douglas, Arizona area, and in San Diego (Operation Gatekeeper) and southeastern California, have pushed illegal immigrant and smuggler traffic into remote desert areas, such as CPNWR, OPCNM, Tohono O'odham Nation, and BMGR (Klein 2000). Though the operation of Camp Grip within the CPNWR and the temporary camp detail at Bates Well on the OPCNM have reduced the number of illegal drive-throughs in the eastern portion of the CPNWR in FY 2005 (Hubbard 2005, as cited in U.S. Customs and Border Protection 2005), drive-throughs have steadily increased on the BMGR and CPNWR over the past three years (U.S. Customs and Border Protection 2005). Over the past seven years, the number of illegal roads and foot trails created by illegal immigrants within the CPNWR has increased substantially (U.S. Customs and Border Protection 2005). These illegal crossings and law enforcement response have resulted in route proliferation, off-highway vehicle activity, increased human presence in backcountry areas, discarded trash, abandoned vehicles, cutting of firewood, illegal campfires, and increased chance of wildfire. Habitat degradation and disturbance of pronghorn almost certainly result from these extensive illegal activities. Despite increasingly high levels of illegal activity throughout the action area, pronghorn in the U.S. have increased since 2002 as discussed above, possibly due to the construction of forage plots and emergency waters.

We expect illegal activities and their effects on pronghorn to continue, though they should be significantly reduced once the CBP/OBP Permanent Vehicle Barrier Project (described in our draft biological opinion issued June 28, 2006; consultation number 22410-2006-F-0113), is completed. Also a recent bill (S2611) passed by the Senate could create a guest worker program whereby Mexican nationals could legally cross the border to work in the U.S. If such a program is initiated, it might greatly reduce future illegal immigration and law enforcement response, with concomitant reductions in habitat degradation and suspected disturbance of pronghorn.

CONCLUSION

Sonoran Pronghorn

After reviewing the current status of the Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed activities associated with implementation of the CCP, and the cumulative effects, it is our biological opinion the proposed action is not likely to jeopardize the continued existence of the Sonoran pronghorn. No critical habitat has been designated for this species, therefore, none will be affected. Our conclusion is based on the following:

1. The Sonoran pronghorn population has increased since 2002, despite increasingly high levels of human use in the form of off- and on-road vehicle and foot travel by smugglers, illegal immigrants, and law enforcement.
2. Restrictions, prohibitions, and provisions (e.g., the eastern three-quarters of the CPNWR will be seasonally closed to public access during pronghorn fawning season, no stock animal grazing or use of water resources on CPNWR will be allowed, aerial monitoring of pronghorn will only be conducted during cooler times of the day or year, etc.)

described in the proposed action will reduce adverse effects to Sonoran pronghorn from certain activities proposed by the CCP.

3. Conservation and recovery actions for pronghorn (e.g., forage enhancement plots, waters, etc.) included in the proposed action will offset adverse effects of certain activities proposed by the CCP as well as make the pronghorn population in the U.S. more secure and more resistant to drought and other stressors.
4. When added to the environmental baseline, the status of the species, and cumulative effects, the effects of the proposed action, which include beneficial restrictions, limitations, and provisions, do not reduce appreciably the likelihood of survival and recovery of the subspecies in the wild. Therefore, the proposed action will not jeopardize the continued existence of the subspecies. As proposed, implementation of the CCP will not significantly adversely affect important fawn recruitment or significantly adversely affect occupied pronghorn habitat. Concerns about disturbance to pronghorn and habitat degradation are minimized by the CCP's restrictions, limitations, and provisions. The net effect of CCP implementation on the Sonoran pronghorn is beneficial.

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

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation 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 17.3). "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 behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). "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 result in incidental take of Sonoran pronghorn for the following reasons:

1. Restrictions, prohibitions, and provisions described in the proposed action would reduce adverse effects of certain activities proposed by the CCP (see rationale 2 under “Conclusion” above).
2. Conservation and recovery actions for pronghorn included in the proposed action would offset adverse effects of certain activities proposed by the CCP as well as make the pronghorn population in the U.S. more secure and more resistant to drought (when pronghorn are most sensitive to human disturbance) and other stressors (see rationale 3 under “Conclusion” above).
3. Pronghorn are rare on the CPNWR, making encounter with human activities a relatively rare event.
4. With the exception of activities subject to separate permitting under 10(a)(1)(A) and separate consultation, no incidental take of Sonoran pronghorn is known to have occurred on the CPNWR or elsewhere in Arizona due to activities authorized by the CCP.

LESSER LONG-NOSED BAT 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 for feeding on nectar from the flowers of columnar cacti (e.g., saguaro; cardon, *Pachycereus pringlei*; and organ pipe cactus, *Stenocereus thurberi*) and from paniculate agaves (e.g., Palmer's agave, *Agave palmeri*) (Hoffmeister 1986). 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 1988). No critical habitat has been designated for this species. A recovery plan was completed in 1994 (U.S. Fish and Wildlife Service 1997). 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. Recovery actions include roost monitoring, protection of roosts and foraging resources, and reducing existing and new threats.

B. Distribution and Life History

The lesser long-nosed bat is migratory and found throughout its historical 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 Peloncillo 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 2000); the lesser long-nosed bat has only rarely been recorded outside of this time period in Arizona (U. S. Fish and Wildlife Service 1997, 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 (personal communication with Tim Snow, Arizona Game and Fish Department, 1999) but also occur with adult females and young of the year at maternity sites (U. S. Fish and Wildlife Service 1997). Throughout the night between foraging bouts both sexes will rest in temporary night roosts (Hoffmeister 1986).

Lesser long-nosed bats appear to be opportunistic foragers and extremely efficient fliers. They are 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 36 miles (one way) (Dalton *et al.* 1994; personal communication with V. Dalton, 1997; personal communication with Y. Petryszyn, University of Arizona, 1997). Steidl (personal communication, 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 OPCNM (U.S. Fish and Wildlife Service 1997). 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 (personal communication with Yar Petryszyn, University of Arizona, 1997).

Lesser long-nosed bats, which often forage in flocks, consume nectar and pollen of paniculate agave flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. 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 used 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 elevational 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). Lesser long-nosed bats are important pollinators for agave and cacti, and are important seed dispersers for some cacti.

C. Status and Threats

Recent information indicates that lesser long-nosed bat populations appear to be increasing or stable at most Arizona roost sites identified in the recovery plan (AGFD 2005, Tibbitts 2005, Wolf and Dalton 2005). Lesser long-nosed bat populations additionally appear to be increasing or stable at other roost sites in Arizona and Mexico not included for monitoring in the recovery plan (Sidner 2005). Less is known about lesser long-nosed bat numbers and roosts in New Mexico. Though lesser long-nosed bat populations appear to be doing well, many threats to their stability and recovery still exist, including excess harvesting of agaves in Mexico; collection and destruction of cacti in the U.S.; conversion of habitat for agricultural and livestock uses,

including the introduction of buffelgrass, an exotic, invasive grass species; wood-cutting; drought; fires; human disturbance at roost sites; and urban development.

Approximately 20 – 25 large lesser long-nosed bat roost sites, including maternity and late-summer roosts, have been documented in Arizona (personal communication with Scott Richardson, FWS, 2006). Of these, 10 – 20 are monitored on an annual basis depending on available resources. Monitoring in Arizona in 2004 documented approximately 78,600 lesser long-nosed bats in late-summer roosts and approximately 34,600 in maternity roosts. Ten to 20 lesser long-nosed bat roost sites in Mexico are also monitored annually. Over 100,000 lesser long-nosed bats are found at just one natural cave at Pinacate National Park, Sonora, Mexico (Cockrum and Petryszyn 1991). The numbers above indicate that although a relatively large number of lesser long-nosed bats exist, the relative number of known large roosts is quite small.

Maternity roosts, suitable day roosts, and concentrations of food plants are all critical resources for the lesser long-nosed bat. All of the factors that make roost sites useable have not yet been identified, but maternity roosts tend to be very warm and poorly ventilated (U.S. Fish and Wildlife Service 1997). Human presence/disturbance at roosts is clearly an important factor as bats appear to be particularly sensitive to human disturbance at roost sites. For example, illegal activity, presumably by immigrants or smugglers, at the Bluebird maternity roost site, caused bats to abandon the site in 2002, 2003, and 2005. The presence of alternate roost sites may be critical when this type of disturbance occurs.

The lesser long-nosed bat recovery plan (U.S. Fish and Wildlife Service 1997) identifies the need to protect foraging areas and food plants such as columnar cacti and agaves. More information regarding the average size of foraging areas around roosts would be helpful to identify the minimum area around roosts that should be protected to maintain adequate forage resources.

The 2005 fires referred to under Sonoran Pronghorn “Status of the Species” affected some lesser long-nosed bat foraging habitat, though the extent is unknown. For example, the Goldwater, Aux, and Sand Tank Fire complexes on BMGR-East burned through and around isolated patches of saguaros, but the immediate effects and longer term impacts of the fires on saguaros are not yet known. Monitoring of saguaro mortality rates should be done to assess the impacts on potential lesser long-nosed bat foraging habitat. Fire suppression activities associated with the 2005 fires could also have affected foraging habitat. For example, slurry drops may have left residue on saguaro flowers, which could have impacted lesser long-nosed bat feeding efficiency or resulted in minor contamination.

This year’s drought (see the “Environmental Baseline” for Sonoran pronghorn for further details regarding drought) may affect lesser-long nosed bat foraging habitat, though the effects of drought on bats are not well understood. The drought in 2004 resulted in near complete flower failure in saguaros throughout the range of lesser-long nosed bats. During that time however, in lieu of saguaro flowers, lesser-long nose bats foraged heavily on desert agave (*Agave deserti*) flowers, a plant not typically used by lesser long-nosed bats (personal communication with Scott Richardson, FWS, March 20, 2006). Monitoring bats and their forage this year is needed to better understand the effects of drought on this species.

We have produced numerous biological opinions on the lesser long-nosed bat since it was listed as endangered in 1988, some of which anticipated incidental take. Incidental take has been in the form of direct mortality and injury, harm, and harass and has typically been only for a small number of individuals. Because incidental take of individual bats is difficult to detect, incidental take has often been quantified in terms of loss of forage resources, decreases in numbers of bats at roost sites, or increases in proposed action activities.

A few examples of more recent biological opinions that anticipated incidental take for lesser long-nosed bats are summarized below. The 2005 biological opinion for implementation of the Coronado National Forest Land and Resource Management Plan (U.S. Forest Service) included incidental take in the form of harm or harass. The amount of take for individual bats was not quantified; instead take was to be considered exceeded if simultaneous August counts (at transitory roosts in Arizona, New Mexico, and Sonora) drop below 66,923 lesser long-nosed bats (the lowest number from 2001 – 2004 counts) for a period of two consecutive years as a result of the action. The 2004 biological opinion for the Bureau of Land Management Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management included incidental take in the form of harassment. The amount of incidental take was quantified in terms of loss of foraging resources, rather than loss of individual bats. The 2003 biological opinion for Marine Corps Air Station (MCAS) – Yuma Activities on the Barry M. Goldwater Range included incidental take in the form of direct mortality or injury (five bats every 10 years). Because take could not be monitored directly, it was to be considered exceeded if nocturnal low-level helicopter flights in certain areas on the BMGR increased significantly or if the numbers of bats in the Agua Dulce or Bluebird Mine roosts decreased significantly and MCAS-Yuma activities were an important cause of the decline. The 2002 biological opinion for Department of the Army Activities at and near Fort Huachuca (Fort), Arizona anticipated incidental take in the form of direct mortality or injury (six bats over the life of the project), harassment (20 bats per year), and harm (10 bats over the life of the project).

ENVIRONMENTAL BASELINE

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 lesser long-nosed bat includes the areas directly affected by the activities associated with implementation of the CCP and an area around the project defined by a circle with a radius of 36 miles (the maximum documented one-way foraging distance of the lesser long-nosed bat). The action area represents only a small portion of the lesser long-nosed bat's range.

Management of the action area is largely by Federal agencies, as described in the "Action Area" for Sonoran pronghorn. The action area for the lesser long-nosed bat also includes part of the Tohono O'odham Nation (TON) lands and lands near the border in Sonora.

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

A 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).

The action area encompasses multiple mountain ranges, such as the Tinajas Altas, Cabeza Prieta, Tule, Sierra Pinta, Granite, Agua Dulce, Growler, and Childs mountains. Suitable day and night roost sites occur or potentially occur within these ranges, however, most have not recently been surveyed for lesser long-nosed bat roosts with the exception of the Growler Mountains where the Bluebird Mine roost site is located.

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

Based on the known foraging distances for lesser long-nosed bats, it is likely that this species forages throughout portions of the BMGR, CPNWR, OPCNM, and TON where flowers and fruit of saguaro, organ pipe, prickly pear, and agave are available.

Three large maternity roosts occur in the action area, including Bluebird Mine, Copper Mountain Mine, and Pinacate Cave. Bluebird Mine, located along the eastern border of CPNWR in the Growler Mountains, generally supports an estimated 3,000 lesser long-nosed bats at the peak of annual occupancy (U.S. Fish and Wildlife Service 1997). The highest estimate of lesser long-nosed bats using Bluebird Mine from 2001-2005 was 4,500. They abandoned the mine however in 2002, 2003, and 2005 due to disturbance from illegal activities. In 2004, the bats returned to the mine after CPNWR staff placed a high steel fence around the mine to prevent disturbance. The bats returned to the mine in 2005, however abandoned the site once again after the fence was damaged, presumably by illegal immigrants or smugglers. The bats returned again in 2006.

Copper Mountain Mine, located within the OPCNM about 10 miles east of the CPNWR-OPCNM boundary, supports approximately 25,000 bats at the peak of annual occupancy (National Park Service 2002). The highest estimate of lesser long-nosed bats using Copper Mountain Mine from 2001-2005 was 35,000.

The largest maternity roost in the project area is Pinacate Cave in northern Sonora, Mexico. Approximately 30 miles south of the boundary (international border) between CPNWR and the Pinacate and Altar Desert Biosphere Reserve, this roost is estimated to support 130,000 bats each year (U.S. Fish and Wildlife Service 1997). In May 2006, approximately 200,000 lesser long-nosed bats were counted at the Pinacate Cave.

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 1997). Observations at Copper Mountain and Pinacate Cave indicate that they are occupied from mid-April to early-to-mid-September (U.S. Fish and Wildlife Service 1997), although these roosts reach their peak occupancy in late spring/early summer.

Though OPCNM and CPNWR monitor the Copper Mountain and Bluebird roosts annually to determine the presence, abundance, and disturbance of lesser long-nosed bats, including examining the roost year round for evidence of human entry, the rest of OPCNM and CPNWR has not been well surveyed to determine the number of additional day and night roosts that might exist in natural caves and/or mineshafts. A small roost or roosts is known to occur in the Agua Dulce Mountains in the southeastern corner of the CPNWR, though the current status (i.e., whether lesser long-nosed bats are still using the site) of the roost is unknown. Smaller day roosts are known in other mine tunnels, and are also suspected in other mines and natural rock crevices and caves. Short-term night roosts are known in natural caves, under the eaves of buildings, and inside several abandoned buildings associated with past ranching activities. It is likely that there is within- and between-season interchange between these colonies, perhaps even within and between nights (U. S. Fish and Wildlife Service 1997).

Flowers and fruits of saguaro, organ pipe cactus, and cardon 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 1997). Saguaro, which is common and abundant throughout much of the BMGR, CPNWR, and OPCNM; and organ pipe cactus, which is common at OPCNM and localized in the eastern portions of CPNWR and BMGR, flower in May and fruit mature in June and July (Benson and Darrow 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 may be the primary food resource for lesser long-nosed bats in BMGR, OPCNM, CPNWR, and TON. Agaves typically bolt or flower and provide a nectar resource for foraging bats from about July into October. Desert agave occurs in mountainous areas within the study area. As mentioned above under "Status of the Species", last year's fires and this year's drought may have affected/may affect some lesser long-nosed bat foraging habitat within the action area, though the extent is unknown.

A number of activities occur in the action area that could affect bats. In a September 30, 2002, biological opinion, we concurred with the BLM that management of grazing leases on the Ajo allotments may affect, but is not likely to adversely affect, the bat. Our 1997 biological opinion on the OPCNM General Management Plan, found that the proposed action could result in incidental take of bats from recreation; specifically from unauthorized human disturbance to the Copper Mountain maternity roost. The dramatic increases in undocumented immigrants (see "Environmental Baseline, part E. Threats" for the Sonoran pronghorn for further detail about undocumented immigrant activity) 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 lesser long-nosed bats but to all wildlife of the region. As stated earlier, suspected illegal immigrants entered the Bluebird Mine on CPNWR in June 2002, which resulted in at least four dead bats and abandonment of the roost. The bats returned to the mine in 2005; however, they abandoned the site once again after the fence was damaged by illegal immigrants. Both OPCNM and CPNWR are planning to implement additional protective measures at Copper Mountain and Bluebird Mine, such as the construction of bat-friendly gates at roost entrances to prevent illegal human entry. However, lesser long-nosed bats are sensitive to bat gates and may not adapt readily to their use. Therefore, use of bat gates to protect these roosts may not be a feasible alternative. The CBP/OBP currently conducts many activities, such as Tucson Sector patrol, within the action area on which they have not

completed section 7 consultation with us. Some of their activities may degrade lesser long-nosed bat foraging habitat (e.g., vehicle impacts to saguaros and agaves) or disturb lesser long-nosed bats (e.g., use of lights near forage resources at night). We are, however, currently working with them to avoid, minimize, and offset impacts to listed species as well as to complete consultation on their ongoing and proposed actions within the area.

EFFECTS OF THE PROPOSED ACTION

Implementation of the wildlife and habitat management, wilderness stewardship, and visitor service management elements of the proposed CCP may result in degradation of lesser long-nosed bat foraging habitat and/or disturbance to lesser long-nosed bats. Though we anticipate that impacts to lesser long-nosed bats will be limited, adverse effects to bats could result from vehicular and foot traffic associated with recreational and management/monitoring activities and overflights for wildlife monitoring and management of waters described in sections 2.1, 2.5, and part of 2.6 of the CCP. These activities may disturb lesser long-nosed bats and/or degrade their habitat in a number of ways, such as from associated noise and light pollution; disturbance of soils; and crushing, destruction, or removal of lesser long-nosed bat forage resources (i.e., columnar cacti and agave). However, no known or suspected roost sites, other than the Bluebird Mine, will be directly impacted by implementation of the CCP and activities directly affecting the Bluebird mine, such as fence maintenance, should be beneficial to lesser long-nosed bats. Furthermore, the CCP does not authorize any direct removal or destruction of forage resources.

Though the CCP would authorize some activities that may be detrimental to lesser long-nosed bats, restrictions, prohibitions, and provisions included in the CCP should generally reduce disturbance to lesser long-nosed bats and degradation of their habitat. Additionally, certain wildlife and habitat management activities included in the CCP will aid in the recovery and conservation of lesser long-nosed bats. Overall, implementation of the CCP will be beneficial to lesser long-nosed bats on the CPNWR.

Wildlife and Habitat Management

Though some activities associated with the “Wildlife and Habitat Management” element of the CCP may result in disturbance to lesser long-nosed bats and degradation of their habitat, most will have little effect on the lesser long-nosed bats. Overall, implementation of this element will benefit lesser long-nosed bats.

Lesser Long-Nosed Bat Conservation

Proposed lesser long-nosed bat recovery and conservation activities, such as restricting access to and maintaining fencing around the Bluebird Mine maternity roost site, will result in net beneficial effects to the lesser long-nosed bat. Maintaining a fence around the mine site could adversely affect lesser long-nosed bats if they fly into the fence; however, CPNWR has never documented this during their monitoring efforts (counting bats as they leave the roost site) and have never found dead bats on or near the fence during routine fence maintenance checks. Developing and placing a bat-friendly gate at the entrance of Bluebird Mine may benefit the lesser long-nosed bat; however as mentioned in the “Environmental Baseline” for this species, lesser long-nosed bats are sensitive to bat gates and may not adapt readily to their use.

Therefore, use of gates to protect these roosts may adversely affect lesser long-nosed bats and may not be a feasible conservation measure.

Consequently, CPNWR would only place gates at the mine entrance(s) if all efforts, including maintaining fencing around the site and law enforcement, fail to keep trespassers away from the roost site. Gates would be placed, on an experimental basis, on the upper adits of the mine first (Curtis McCasland, FWS, personal communication July 26, 2006). Lesser long-nosed bats use the upper adits, however, the maternity colony is located in the lower adit. Therefore, placing the gates on the upper adits, though they may affect bats using the upper adits, should not affect bats from the maternity colony using the lower adit. Bat gates would be monitored nightly to ensure bats continue to enter/exit the upper adits normally and would be removed if the gates disrupt the normal entering/exiting patterns of the bats. If bat use of the upper adits is not affected by the gates, the gates would be placed on entrance to the maternity colony. Again, bat use of the entrance would be monitored nightly to ensure bats continue to enter and exit normally and would be removed if bats were disrupted. Should CPNWR decide to further develop a design for and use gates at the Bluebird Mine, they will request formal Intra-Service consultation specifically on this activity with our office (Curtis McCasland, FWS, personal communication July 26, 2006).

Seasonal Closures

Though closing public access to approximately the eastern three-quarters of the CPNWR (roughly from five miles east of Tule Well to the eastern boundary) typically from March 15 to July 15 was implemented to protect pronghorn, these dates also generally correspond with the time that lesser long-nosed bats use the Bluebird Mine maternity roost, located in the eastern part of the CPNWR. Consequently, this seasonal closure, while it continues in effect, should also benefit lesser long-nosed bats through minimizing the possibility that recreational users will disturb bats at the Bluebird Mine.

Other Wildlife Surveys, Management, and Research

Most surveys should have no to very little effect (pupfish, Peirson's milk vetch, etc) on lesser long-nosed bats. Some surveys, such as bighorn sheep aerial surveys, and management activities associated with other wildlife, such as hauling water to wildlife waters, could result in temporary disturbance to lesser long-nosed bats (from aircraft noise over the roost). However, we do not anticipate that bats will be affected by these activities because bighorn sheep surveys are conducted in the fall and winter, outside of the period when lesser long-nosed bats use the Bluebird Mine roost, and because no water is hauled to areas near the roost (the nearest water hauling activity occurs about 12 miles southwest of the Bluebird Mine). Also, because water hauling activities would occur during the day, they would not affect behavior of foraging lesser long-nosed bats. Other monitoring, management, and research activities will likely beneficially affect lesser long-nosed bats. For example, facilitating and supporting research on, as well as monitoring and controlling non-native plant species and removing trespass livestock should benefit lesser long-nosed bat foraging habitat (reduce or prevent introduction/spread of non-native plants, minimize trampling of potential bat foraging habitat, etc.).

Wilderness Stewardship

Implementing the “Wilderness Stewardship” element of the CCP may result in disturbance to lesser long-nosed bats and their habitat. Some activities associated with this element, however, will have no effect or a beneficial effect on lesser long-nosed bats.

Removal of hazards

Some wilderness stewardship activities (e.g., removing abandoned vehicles via tow-truck and/or helicopter, removing tow-darts, removing unexploded ordnance, etc.) may temporarily degrade lesser long-nosed bat habitat (from vehicular use of roads). However, in general these activities will beneficially affect lesser long-nosed bat habitat by reducing its exposure to potential hazards.

Administrative Trail Restrictions

Closing 20 miles of administrative trails to management vehicular use will generally benefit lesser long-nosed bat habitat by reducing its exposure to vehicles (the effects of vehicles on lesser long-nosed bat habitat are further discussed below). The administrative trails will, however, remain available to border law enforcement (i.e., OBP) use under the provisions of the Arizona Desert Wilderness Act of 1990 and the MOU, as described in the “Description of the Proposed Action” and the below. CPNWR will continue, however, to request that OBP consult with us on any of their actions (that may affect listed species), either proposed or current but not covered by section 7 consultation.

Impact monitoring

Monitoring impacts to wilderness from illegal immigrants/smugglers, law enforcement, and visitor use as well as monitoring campsites will benefit lesser long-nosed bats if it results in identifying areas where detrimental impacts to lesser long-nosed bat habitat are occurring and effective management responses are developed and implemented.

Childs Mountain Communications Site

Continuing to allow currently permitted uses of the Childs Mountain communications site and renewing permits as deemed necessary for human safety and efficient law enforcement may impact lesser long-nosed bats and their habitat. Lesser long-nosed bats foraging in the area may be disturbed from lights and noise associated with the facility. Because very few saguaros occur in the immediate vicinity of the site however, we anticipate effects to foraging lesser long-nosed bats will be minimal. Though no saguaros or agaves are directly impacted by the facilities at Childs Mountain, vehicle use of the access road could cause minor degradation of potential lesser long-nosed bat foraging habitat. Because vehicle travel on the access road at night is rare, we do not anticipate lesser long-nosed bat foraging behavior will be affected by vehicle access to the Childs’ Mountain site.

Law Enforcement - OBP

In response to increased illegal traffic in the CPNWR, border law enforcement (particularly OBP) has increased. Both illegal traffic and law enforcement activities can adversely affect lesser long-nosed bats and their habitat as described below in “Law Enforcement – CPNWR” and in the “Cumulative Effects”, as well as in other documents and biological opinions, such as the draft biological opinion, consultation number 22410-2006-F-0113, issued June 28, 2006 for the CBP/OBP Permanent Vehicle Barrier Project. As noted in the “Environmental Baseline”, the

OBP has not completed consultation on many of their activities occurring within lesser long-nosed bat habitat. CPNWR does not have authority over OBP's activities within the CPNWR; however, interagency agreements exist, such as the "MOU Among DHS and DOI and USDA Regarding Cooperative National Security and Counterterrorism Efforts on Federal Lands along the United States' Borders" signed in March 2006, that include general guidelines, pursuant to applicable law, on BP activities, such as patrol, within lands managed by the DOI, such as CPNWR, and USDA. CPNWR will continue to request that OBP consult with the FWS on all of their actions before implementing them on the CPNWR.

CPNWR will also continue their effort to present training and orientation sessions for OBP, CBP, and DEA agents to increase their awareness of appropriate operations in wilderness. Additionally, CPNWR will assist OBP in preparing a training video that provides guidelines on low impact wilderness travel techniques. This training, if followed, should help minimize impacts to lesser long-nosed bat habitat and other sensitive resources in the CPNWR.

Law Enforcement - CPNWR

CPNWR's law enforcement patrol activities, which have increased in response to increased illegal immigrant/smuggler traffic, may disturb lesser long-nosed bats and degrade their habitat. Vehicle use associated with enforcement activities, if they occur near columnar cacti and agaves, can cause soil erosion and changes in surface hydrology (from channelization of water in entrenched vehicle track prisms) which may impact lesser long-nosed bat foraging habitat. If they travel off-road, in addition to the aforementioned impacts, patrol vehicles can crush and destroy lesser long-nosed bat forage plants (columnar cacti and agaves), particularly seedlings. CPNWR law enforcement follow the same guidelines for vehicle travel within CPNWR established by the MOU for BP (Curtis McCasland, CPNWR, personal communication, July 25, 2006). The guidelines restrict enforcement vehicles to existing designated public and administrative roads and/or trails, except in emergencies involving human life, health, safety of persons within the area, or posing a threat to national security (see the MOU for further guideline detail). Disturbed ground (from vehicle use) may be susceptible to colonization by invasive exotic plants such as buffelgrass or Sahara mustard. Exotic species may prevent the recruitment of lesser long-nosed bat forage species and may also carry fire that could also impact forage species. Most Sonoran Desert trees, shrubs, and cacti are very fire intolerant. For example, fires at Saguaro National Park resulted in greater than 20 percent mortality of mature saguaros (Schwalbe *et al.* 2000).

Lesser long-nosed bat foraging behavior may also be temporarily affected by nighttime law enforcement vehicle traffic if it occurs within bat foraging habitat. We anticipate that adverse effects to bats from law enforcement vehicle activity, however, will likely be somewhat limited because most law enforcement traffic occurs on the valleys floors (in response to illegal vehicle traffic using valley floors to cross the CPNWR), away from concentrated areas of bat forage resources, which primarily occur in the upper bajadas. Illegal pedestrian activity likely adversely affects lesser long-nosed bats and their habitat because illegal immigrants on-foot tend to travel through saguaro forests in the upper bajadas. Law enforcement typically does not pursue illegal pedestrians through the upper bajadas (because these areas are not generally accessible to vehicles), however, effects to lesser long-nosed bats from law enforcement in pursuit of illegal pedestrians are likely limited.

Also, as described in our draft biological opinion on the CBP/OBP Permanent Vehicle Barrier Project issued on June 28, 2006 (consultation number 22410-2006-F-0113), we expect that the installation of the permanent vehicle barrier on CPNWR, once completed, will significantly reduce illegal vehicle traffic crossing through the CPNWR. Furthermore, illegal pedestrian traffic should also be reduced because improvements to the border road will facilitate interdiction of immigrants and smugglers along the border itself. Decreased illegal traffic should reduce the frequency of law enforcement pursuits through the CPNWR, which consequently will minimize disturbance to lesser long-nosed bats and degradation of their foraging habitat.

Visitor Service Management

Implementing the “Visitor Service Management” element of the CCP may result in disturbance to lesser long-nosed bats and degradation of their habitat. Closing public access to approximately the eastern three-quarters of the CPNWR during from March 15 to July 15, as described above, however, should generally benefit lesser long-nosed bats through minimizing the possibility that recreational users will disturb bats at the Bluebird Mine.

Motorized Recreational Use

Continuing to allow recreational vehicles to use non-wilderness travel corridors (the unpaved el Camino del Diablo and Christmas Pass Road) and non-wilderness access roads (all of which are dirt-roads) may result in continued degradation of lesser long-nosed bat foraging habitat and temporary disturbance of foraging lesser long-nosed bats (if vehicle use occurs during the night). Though larger, paved roads with high traffic volumes have a greater likelihood of impacting wildlife habitat, even dirt roads, such as el Camino del Diablo and Christmas Pass Road, can cause direct, permanent disturbance of the habitat, cause erosion that can reduce the quality of habitat, and facilitate invasion by non-native pest plant species that can displace native habitat through competition or fire. Restricting recreational vehicle use to the aforementioned corridors/roads only, however, will minimize impacts to lesser long-nosed bats from motorized recreational use of the CPNWR.

Non-motorized Recreational Use

Allowing hiking and camping on the CPNWR may result in disturbance to lesser long-nosed bats and degradation of their habitat. Though we expect effects to lesser long-nosed bats will be minimal, lights and noise at night associated with non-motorized recreational activities may disrupt bat foraging behavior, and foot traffic could degrade lesser long-nosed bat foraging habitat. As described in the “Wilderness Stewardship” portion of the “Proposed Action”, CPNWR will encourage back-country visitors to hike and administrative trails in order to concentrate user impacts on already affected areas; if successful, this will assist in minimizing impacts to lesser long-nosed bat habitat. Implementing the Leave-No-Trace program should also help minimize degradation of lesser long-nosed bat habitat by visitors.

Use of Stock Animals

Allowing recreational activities involving pack and saddle stock on the CPNWR may result in degradation of lesser long-nosed bat habitat (i.e., stock could introduce non-native species, cause erosion, etc.). The seven stock-related restrictions (i.e., no grazing on CPNWR; restrictions in

size of groups and allowed use areas, etc.), however, will minimize potential adverse impacts to lesser long-nosed bats from stock associated activities.

Hunting

Allowing hunting of desert bighorn sheep may adversely affect lesser long-nosed bat habitat. Impacts to lesser long-nosed bat habitat from hunting will generally be similar to those described under “Motorized” and “Non-motorized Recreational Use” and “Use of Stock Animals” because hunters must access the allowable hunting areas by foot, vehicle, or stock animal. Hunting activities will not result in disturbance to lesser long-nosed bats, however, because the desert bighorn sheep hunting season (December) and the period during which lesser long-nosed bats use the action area (spring and summer) do not overlap.

Lesser long-nosed bat habitat could also be degraded if CPNWR allows hunting of game and predator species in the future. Additionally, if predator and game hunts are allowed in the spring or summer, lesser long-nosed bats could be disturbed by activities associated with hunting (lights and noise at night). The expanded hunting program would be subject, however, to further Intra-Service section 7 consultation.

Educational and Interpretive Services

Participating and providing educational and interpretive services will generally benefit lesser long-nosed bats if they result in heightened public awareness of and sensitivity toward the species. Depending on the placement of the potential loop road in Childs Valley (i.e., near columnar cacti or agave), lesser long-nosed bat habitat could be impacted if the road is developed. Development of the loop road would however be subject to further Intra-Service section 7 consultation.

Issues Covered by Existing Policy, Law, or Regulations

Border Law Enforcement

The effects of border law enforcement on bats are discussed above.

Fire Management

Fire suppression activities may adversely affect lesser long-nosed bats in a various ways (i.e., nighttime presence of fire crews could disturb foraging bats; fire crew vehicles and fire suppression activities, like creating fuel breaks, could degrade bats habitat; etc.), however, all suppression activities that may affect bats, once conducted, are subject to emergency section 7 consultation procedures. Fire suppression will benefit lesser long-nosed bats if it prevents further destruction (burning) of bat habitat. Any future CPNWR fire management plan will be subject to further section 7 consultation.

Trespass Livestock and Pets

The effects on lesser long-nosed bats from the removal of trespass livestock are discussed above. Pets could disturb bats if they entered the Bluebird Mine. The requirement that pets must be leashed and under the control of the owner in addition to the presence of the fence around the mine should prevent mine entrance by pets.

CUMULATIVE EFFECTS

Lesser Long-Nosed Bat

Most lands within the action area are managed by Federal agencies; thus, most activities that could potentially affect bats are Federal activities that are subject to section 7 consultation. The effects of these Federal activities are not considered cumulative effects. However, a portion of the action area also occurs on TON lands, on private lands in the U.S., and in Mexico.

Residential and commercial development, farming, livestock grazing, surface mining and other activities occur on these lands and are expected to continue into the foreseeable future. These actions, the effects of which are considered cumulative, may result in small-scale loss or degradation of lesser long-nosed bat foraging habitat, and potential disturbance of roosts. Illegal immigrant/smuggler activities, described above under “Cumulative Effects” for pronghorn, can result in loss or degradation of potential lesser long-nosed bat foraging habitat (impacts to foraging habitat have not been quantified however) and disturbance to and abandonment of roosts, as has been documented at the Bluebird Mine roost site. Though immigrant/smuggler activity has increased dramatically in recent years in Arizona, lesser long-nose bat populations appear to be increasing or stable at many roost sites within and outside the action area.

CONCLUSION

Lesser Long-Nosed Bat

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed activities associated with implementation of the CCP, and the cumulative effects, it is our biological opinion that the proposed action 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 is based on the following:

1. Lesser long-nosed bat populations appear to be increasing or stable at many roost sites in Arizona and Mexico.
2. The project will not directly affect any known bat roosts (Copper Mountain Mine, and Pinacate Cave) in the action area except Bluebird Mine. Maintaining fencing around the Bluebird Mine will directly affect the roost, but this should benefit lesser long-nosed bats. The proposed placement of a bat-friendly gate would, if implemented, directly affect the Bluebird Mine roost; however, this action will undergo further section 7 consultation.
3. The CCP does not authorize the direct removal or destruction of lesser long-nosed bat forage resources.
4. Restrictions, prohibitions, and provisions described in the proposed action (e.g., the eastern three-quarters of the CPNWR will be seasonally closed to public access generally from March 15 to July 15, no stock animal grazing, restricting recreational vehicle access

to non-wilderness travel corridors and access roads only, etc.) will minimize adverse effects to lesser long-nosed bats from certain activities proposed by the CCP.

5. Conservation and recovery activities for the lesser long-nosed bat (e.g., restricting access to and maintaining fencing at Bluebird Mine) included in the proposed action will help protect lesser long-nosed bats at the Bluebird Mine from possible human disturbance (related to implementation of the CCP or other proposed actions such as CBP/OBP's installation of the PVB along the CPNWR). The net effect to the lesser long-nosed bat from implementation of the CCP will be beneficial.

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

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation 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 17.3). "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 behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). "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

Lesser Long-Nosed Bat

We do not anticipate the proposed action will result in incidental take of lesser long-nosed bat for the following reasons:

1. Implementation of some CCP activities will directly affect the Bluebird Mine lesser long-nosed bat roost site, however, these activities should benefit lesser long-nosed bats.
2. Implementation of the CCP will not result in the direct removal or destruction of bat foraging habitat.
3. Protective measures at the Bluebird Mine roost site will help prevent human disturbance of lesser long-nosed bats at the site.

4. No incidental take of lesser long-nosed bats is known to have occurred on the CPNWR or elsewhere in Arizona due to activities authorized by the CCP.
5. Specific proposals for a bat gate at Bluebird Mine will be evaluated in future consultation, including potential for incidental take.

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 effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. We recommend implementing the following actions:

1. Continue to implement recovery and conservation actions for Sonoran pronghorn and lesser long-nosed bats.
2. Develop a fire management plan for the CPNWR in conjunction with our office as well as the MCAS, LAFB, BLM, and OPCNM.

In order for us to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION - CLOSING STATEMENT

This concludes formal consultation on the action outlined in this biological opinion. 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) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner that causes an effect to the listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. 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, as well as your considerable role and leadership in conservation of the Sonoran pronghorn and other important natural resources. Any questions or comments should be directed to Erin Fernandez (520) 670-6150 (x238) or Jim Rorabaugh (602) 242-0210 (x238).

Sincerely,

/s/ Steven L. Spangle
Field Supervisor

cc: Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Yuma, AZ
Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ
Superintendent, Organ Pipe Cactus National Monument, Ajo, Arizona
Director, 56th Range Management Office, Luke Air Force Base, Gila Bend, AZ
Director, Range Management Department, Marine Corps Air Station, Yuma, AZ
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ
Chairperson, Tohono O'Odham Nation, Sells, AZ
Bureau of Indian Affairs, Phoenix Area Office, Phoenix, AZ

W:\Erin Fernandez\CPNWR CCP FINAL BO.doc:egg

REFERENCES CITED

- Alford, E.J., and J.H. Brock. 2002. Effects of fire on Sonoran Desert plant communities. Page 20 in W.L. Halvorson and B.S. Gebow (eds.), *Creative Cooperation in Resource Management: Fourth Conference on Research and Management in the Southwestern Deserts*, extended abstracts. USGS Sonoran Desert Field Station, University of Arizona, Tucson, AZ.
- Arizona Game and Fish Department (AGFD). 2005. Comments submitted 5/3/05 and 5/12/05, in response to Federal Register Notice of Review (70 FR 5460) for the lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*).
- Bright, J.L., and J.J. Hervert. 2005. Adult and fawn mortality of Sonoran pronghorn. *Wildlife Society Bulletin* 33(1):43-50.
- Bright, J.L., J.J. Hervert, L.A. Piest, R.S. Henry, and M. T. Brown. 1999. Sonoran pronghorn 1998 aerial survey summary. Nongame and Endangered Wildlife Program Technical Report No. 152. Arizona Game and Fish Department, Phoenix, AZ.
- Bright, J.L., J.J. Hervert, and M.T. Brown. 2001. Sonoran pronghorn 2000 aerial survey summary. Technical Report No. 180. Arizona Game and Fish Department, Phoenix, AZ.
- Brown, D.E. 1982. Biotic communities of the American Southwest – United States and Mexico. *Desert Plants* 4(1-4):1-342.
- Brown, D.E., and R.A. Minnich. 1986. Fire and changes in creosote bush scrub of the western Sonoran Desert, California. *American Midland Naturalist* 116(2):411-422.
- Carr, J.N.. 1974. Complete report-Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.
- Cassier, E.F., D.J. Freddy, E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. *Wildlife Society Bulletin* 20: 375-381.
- Cherkovich, G.M., and S.K. Tatoyan. 1973. Heart rate (radiotelemetric registration) in macaques and baboons according to dominant-submissive rank in a group. *Folia Primatol* 20:265-273.
- Cockrum, E.L., and Y. Petryszyn. 1991. The lesser long-nosed bat. *Leptonycteris*: An endangered species in the Southwest? Texas Tech Univ., Occas. Pap. Mus., Number 142.
- Dalton, V.M., D.C. Dalton, and S.L. Schmidt. 1994. Roosting and foraging use of a proposed military training site by the long-nosed bat, *Leptonycteris curasoae*. Report to the Luke Air Force Natural Resources Program, Contract Nos. DACA65-94-M-0831 and DACA65-94-M-0753. 34pp.

- Defenders of Wildlife. 1998. Population viability analysis workshop for the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) in the United States. Defenders of Wildlife unpublished manuscript, Washington, D.C.
- deVos, J.C., and W.H. Miller. 2005. Habitat use and survival of Sonoran pronghorn in years with above-average rainfall. *Wildlife Society Bulletin* 33(1):35-42.
- Ehrlich, P.R., and J. Roughgarden. 1987. *The Science of Ecology*. MacMillan Publishing Co., New York, N.Y.
- Fox, L.M., P.R. Krausman, M.L. Morrison, and R.M. Kattnig. 2000. Water and nutrient content of forage in Sonoran pronghorn habitat, Arizona. *California Fish and Game* 86(4): 216-232.
- Geist, V. 1971. A behavioral approach to the management of wild ungulates. *In* E. Duffey and A.S. Watts, eds., *The Scientific Management of Animal and Plant Communities for Conservation*. Symposium of the British Ecological Society No. 11. Blackwell Science Publications, Oxford, U.K.
- Gentry, H.S. 1982. Agaves of continental North America. Pages 443-447 and 538-545, University of Arizona Press, Tucson, Arizona.
- Gerstenzang, J. 2006. Bush visits border, urges Senate action. *Los Angeles Times*, May 19, 2006.
- Gilpin, M.E. and M.E. Soulé. 1986. Minimum viable populations: processes of extinction. *In* M.E. Soulé, ed., *Conservation Biology: The science of scarcity and diversity*. Sinauer Associates, Sunderland, MA.
- Goldman, E.A. 1945. A new pronghorn from Sonora. *Proceedings of the Biological Society, Washington* 58:3-4.
- Hamr, J. 1988. Disturbance behavior of chamois in an alpine tourist area of Austria. *Mountain Research and Development* 8:65-73.
- Harlow, H.J., E.T. Thorn, E.S. Hilliams, E. L. Belden, and W.A. Gern. 1987. Cardiac frequency: a potential predictor of blood cortisol levels during acute and chronic stress exposure in Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*). *Canadian Journal of Zoology* 65:2028-2034.
- Hecht, A. and P.R. Nickerson. 1999. The need for predator management in conservation of some vulnerable species. *Endangered Species Update* 16:114-118.
- Hervert, J.J., J.L. Bright, M.T. Brown, L.A. Piest, and R.S. Henry. 2000. Sonoran pronghorn population monitoring: 1994-1998. Nongame and Endangered Wildlife Program Technical Report No. 162. Arizona Game and Fish Department, Phoenix, AZ.

- Hervert, J.J., J.L. Bright, R.S. Henry, L.A. Piest, and M.T. Brown. 2005. Home-range and habitat-use patterns of Sonoran pronghorn in Arizona. *Wildlife Society Bulletin* 33(1):8-15.
- Hervert, J.J., L.A. Piest, R.S. Henry, and M.T. Brown. 1997a. Sonoran pronghorn 1996 aerial survey summary. Nongame and Endangered Wildlife Program Technical Report No. 124. Arizona Game and Fish Department, Phoenix, AZ.
- Hervert, J.J., L.A. Piest, W. Ballard, R.S. Henry, M.T. Brown, and S. Boe. 1997b. Sonoran pronghorn population monitoring: progress report. Nongame and Endangered Wildlife Program Technical Report No. 126. Arizona Game and Fish Department, Phoenix, AZ.
- Hoffmeister, D.F. 1986. *Mammals of Arizona*. University of Arizona Press, Tucson.
- Horner, M.A., T.H. Fleming, and M.D. Tuttle. 1990. Foraging and movement patterns of a nectar feeding bat: *Leptonycteris curasoae*. *Bat Research News* 31:81.
- Hosack, D.A., P.S. Miller, J.J. Hervert, and R.C. Lacy. A population viability analysis for the endangered Sonoran pronghorn, *Antilocapra americana sonoriensis*. *Mammalia* 66(2):207-229.
- Hughes, K.S., and N.S. Smith. 1990. Sonoran pronghorn use of habitat in Southwest Arizona. Report to Cabeza Prieta National Wildlife Refuge, Ajo, AZ.
- International Boundary Commission. 1936. Investigations Relating to the Establishment of a Federal Zone Along the International Boundary United States and Mexico From the Rio Grande to the Pacific Ocean. Report of the American Commissioner. El Paso, Texas.
- Jeppesen, J.L. 1987a. The disturbing effects of orienteering and hunting on roe deer (*Capreolus capreolus*). *Danish Review of Game Biology* 13:1-24.
- Jeppesen, J.L. 1987b. Immediate reactions of red deer (*Cervus elaphus*) to orienteering and hunting in a Danish environment (in Danish with an English summary). *Danske Vildtundersogelser* 43:1-26.
- Johnson, B.K., F.G. Lindzey, and R.J. Guenzel. 1991. Use of aerial line transect surveys to estimate pronghorn populations in Wyoming. *Wildlife Society Bulletin* 19:315-321.
- Kindschy, R.R., C. Sundstrom, and J.D. Yoakum 1982. Wildlife habitats in managed rangelands - the Great Basin of southeastern Oregon: pronghorn. General Technical Report PNW-145. U.S. Department of Agriculture, Northwest Forest and Range Experimental Station, Portland, OR.
- Klein, K. 2000. Mass smugglings of immigrants on the increase. March 13, Desert Sun, Palm Springs, www.thedesertsun.online.com.

- Krausman, P.R., L.K. Harris, C.L. Blasch, K.K.G. Koenen, and J. Francine. 2004. Effects of military operations on behavior and hearing of endangered Sonoran pronghorn. *Wildlife Monographs* 157:1-41.
- Krausman, P.R., L.K. Harris, S.H. Haas, K.K.G. Koenen, P. Devers, D. Bunting, and M. Barb. 2005a. Sonoran pronghorn habitat use on landscapes disturbed by military activities. *Wildlife Society Bulletin* 33(1):16-33.
- Krausman, P.R., J.R. Morgart, L.K. Harris, C.S. O'Brian, J.W. Cain III, and S.S. Rosenstock. 2005. Introduction: management for the survival of Sonoran pronghorn in the United States. *Wildlife Society Bulletin* 33(1):5-7.
- Krausman, P.R., L.K. Harris, and J. Francine. 2001. Long-term study of the noise effects of military overflights on the Sonoran pronghorn, Barry M. Goldwater Range, Luke Air Force Base, Arizona. U.S. Air Force Contract F41624-98-C-8020-P00003.
- Leftwich, T.J., and C.D. Simpson. 1978. The impact of domestic livestock and farming on Texas pronghorn. *Pronghorn Antelope Workshop Proceedings* 8:307-320.
- Mearns, E.A. 1907. Mammals of the Mexican boundary of the United States, Part 1. *Bulletin of the U.S. National Museum* 56:XVT530.
- Milstead, B, and B. Barns. 2002. Life on the border: monitoring the effects of border-crossing and law enforcement on natural resources. W.L. Halvorson and B.S. Gebow, eds., *Meeting resource management information needs: fourth conference on research and resource management in the southwestern deserts, extended abstracts*. USGS Sonoran Desert Field Station, University of Arizona, Tucson: 87-88.
- Miskus, D. 2006. U.S. drought monitor. U.S. Department of Agriculture, National Drought Mitigation Center. <http://drought.unl.edu/dm/monitor.html>.
- Moen, A.N., M.A. DellaFera, A.L. Hiller, and B.A. Buxton. 1978. Heart rates of white-tailed deer fawns in response to recorded wolf howls. *Canadian Journal of Zoology* 56:1207-1210.
- Monson, G. 1968. The desert pronghorn. *In* *Desert Bighorn Council Transactions*. Las Vegas, NV.
- Morgart, J.R., J.J. Hervert, P.R. Krausman, J.L. Bright, and R.S. Henry. 2005. Sonoran pronghorn use of anthropogenic and natural waters. *Wildlife Society Bulletin* 33(1):51-60.
- National Park Service. 2002. Threatened, endangered and sensitive species: Annual summary of activities. Resources Management Division, Organ Pipe Cactus National Monument, Ajo, Arizona.
- Nelson, F.W. 1925. Status of the pronghorn antelope, 1922-1924. U.S. Department of

- Agriculture Bulletin No. 1346.
- Nowak, R.M., and J.L. Paradiso. 1983. Walker's mammals of the world. 4th Ed. Vol. II. Johns Hopkins University Press, Baltimore, MD.
- Officer, J.E. 1993. Kino and agriculture in the Pimeria Alta. *Journal of Arizona History* 34:287-306.
- Organ Pipe Cactus National Monument. 2001. Draft supplemental environmental impact statement, re-analysis of cumulative impacts on the Sonoran pronghorn. Organ Pipe Cactus National Monument, Ajo, AZ.
- Paradiso, J.L., and R.M. Nowak. 1971. Taxonomic status of the Sonoran pronghorn. *Journal of Mammalogy* 52(4):855-858.
- Pinkava, D.J. 1999. Cactaceae Cactus Family, Part Three. In: *Vascular Plants of Arizona: Cactaceae - Cylindropuntia*. *Journal of the Arizona- Nevada Academy of Science* 32(1):32-47.
- Richter-Dyn, N., and N.S. Goel. 1972. On the extinction of a colonizing species. *Theoretical Population Biology* 3:406-433.
- Rowlands, P.G. 2000. Low temperature and other climatic trends at Organ Pipe Cactus National Monument. In W.L. Halvorson and B.S. Gebow, eds., *Creative Cooperation in Resource Management, extended abstracts*. U.S. Geological Survey, Western Ecological Research Center, Sonoran Desert Field Station, University of Arizona, Tucson, AZ.
- Rutman, S. 1997. Dirt is not cheap: livestock grazing and a legacy of accelerated soil erosion on Organ Pipe Cactus National Monument, Arizona. In J. M. Feller and D. S. Strouse, eds., *Environmental, economic, and legal issues related to rangeland water developments*. The Center for the Study of Law, Science and Technology, Arizona State University, Tempe, AZ.
- Samuel, M.D., and K.H. Pollock. 1981. Correction of visibility bias in aerial surveys where animals occur in groups. *Journal of Wildlife Management* 45(4):993-997.
- Schwalbe, C.R., T.C. Esque, P.J. Anning, and W.L. Halvorson. 2000. Exotic grasses, long-lived species, and managing desert landscapes: a case history at Saguaro National Park. Page 87 in W.L. Halvorson and B.S. Gebow (eds), *Creative Cooperation in Resource Management: Third Conference on Research and Management in the Southwestern Deserts, extended abstracts*. USGS Sonoran Desert Field Station, University of Arizona, Tucson, AZ.
- Segee, B.P., and J.L. Neeley. 2006. On the line, the impacts of immigration policy on wildlife and habitat in the Arizona borderlands. *Defenders of Wildlife*, Washington, D.C. 40 p.
- Sheridan, T.E. 2000. Human ecology of the Sonoran Desert. In S.J. Phillips and P.W. Comus,

- eds., A natural history of the Sonoran Desert. Arizona-Sonora Desert Museum Press, Tucson, AZ.
- Sidner, R. 2000. Report of activities under permit TE-821369-0. Report to the US Fish and Wildlife Service, Albuquerque, New Mexico.
- Sidner, R. 2005. Fifteen years of monitoring the endangered lesser long-nosed bat (*Leptonycteris curasoae*) and other bat species on the Fort Huachuca Military Installation, Cochise County, Arizona. June-November 2004. EEC Project Report to Commander, U.S. Army Garrison, Fort Huachuca, AZ. 105 pp.
- Sidner, R. and F. Houser. 1990. Lunarphilia in nectar-feeding bats in Arizona. *Bat Research News* 31(4):15.
- Thompson, R.D., C.V. Grant, E.W. Pearson, and G.W. Corner. 1968. Cardiac response of starlings to sound: effects of lighting and grouping. *American Journal of Physiology* 214:41-44.
- Tibbitts, Tim. 2005. Annual report for threatened and endangered species permit No. TE19458-1. Resources Management Division, Organ Pipe Cactus National Monument, Ajo, Arizona.
- U.S. Fish and Wildlife Service. 1982. Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM.
- U.S. Fish and Wildlife Service. 1988. Endangered and threatened wildlife and plants; determination of endangered status for two long-nosed bats. *Federal Register* 53(190):38456-3860.
- U.S. Fish and Wildlife Service. 1997. Lesser long-nosed bat recovery plan. Albuquerque, New Mexico. 49pp.
- U.S. Fish and Wildlife Service. 1998. Final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.
- U.S. Fish and Wildlife Service. 2001. Recovery criteria and estimates of time for recovery actions for the Sonoran pronghorn: a supplement and amendment to the 1998 final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.
- U.S. Customs and Border Protection. 2005. Preliminary draft biological assessment permanent vehicle barriers, Barry M. Goldwater Range and Cabeza Prieta National Wildlife Refuge, Yuma and Pima Counties, AZ. U.S. Customs and Border Protection, Washington, D.C.
- Wolf, S. and D. Dalton. 2005. Comments submitted 4/20/05 and 5/2/05, in response to Federal Register Notice of Review (70 FR 5460) for the lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*).

- Workman, G.D., T.D. Bunch, J.W. Call, F.C. Evans, L.S. Neilson, and E.M. Rawlings. 1992. Sonic boom and other disturbance impacts on pronghorn antelope (*Antilocapra americana*). Report to the U.S. Air Force, Hill Air Force Base, UT.
- Wright, R.L., and J.C. deVos. 1986. Final report on Sonoran pronghorn status in Arizona. Contract No. F0260483MS143, Arizona Game and Fish Department, Phoenix, AZ
- Yoakum, J.D., B.W. O'Gara, and V.W. Howard, Jr. 1996. Pronghorn on western rangelands. *In* P.R. Krausman, ed., Rangeland wildlife. The Society for Range Management, Denver, CO.
- Weiss, J.L., and J.T. Overpeck. 2005. Is the Sonoran Desert losing its cool? *Global Change Biology* 11:2065-2077.

TABLES AND FIGURES

Table 1. Comparison of U.S. Sonoran pronghorn population surveys, 1992-2002.

Date	<u>Pronghorn observed</u>		<u>Population estimates</u>		
	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)
Dec 02	18	0	---	---	21 (18-33) ^c

^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.

^c Jill Bright, Arizona Game and Fish Department, pers. comm. 2003

Figure 1. Cabeza Prieta National Wildlife Refuge (WFEIS, June 2006)

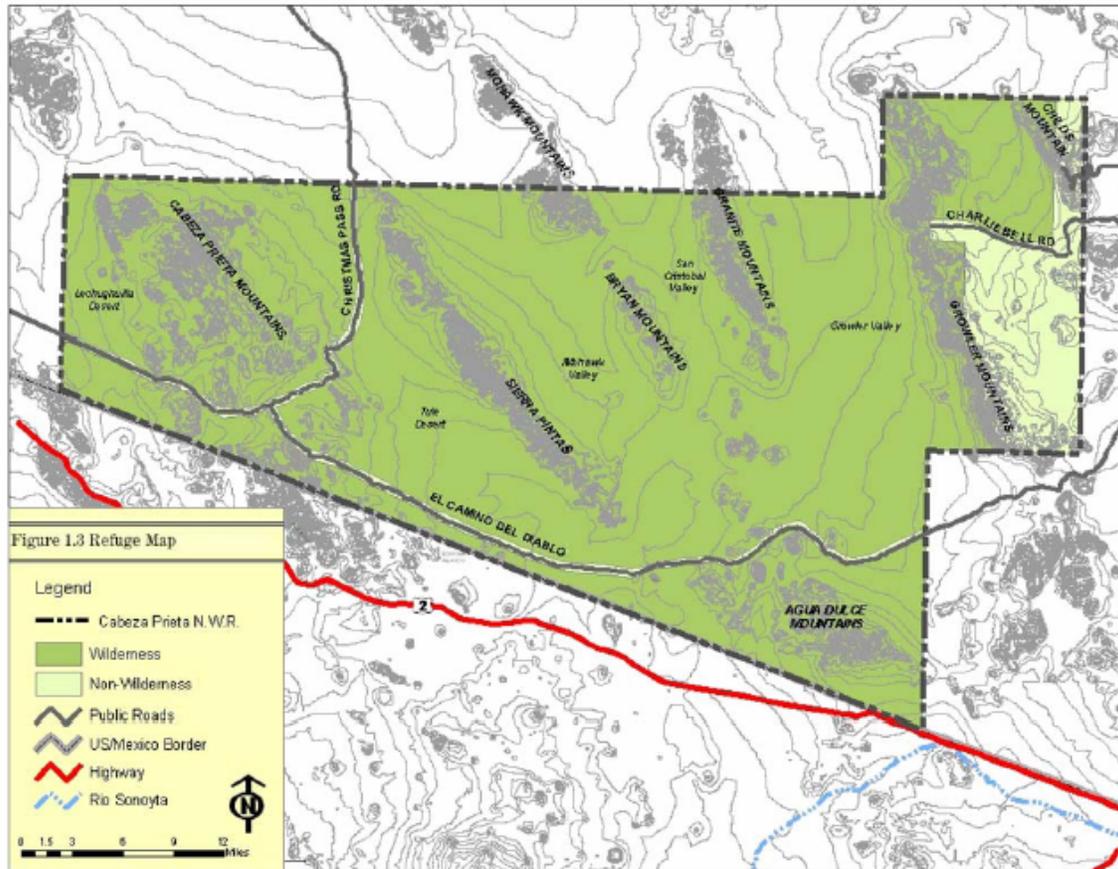
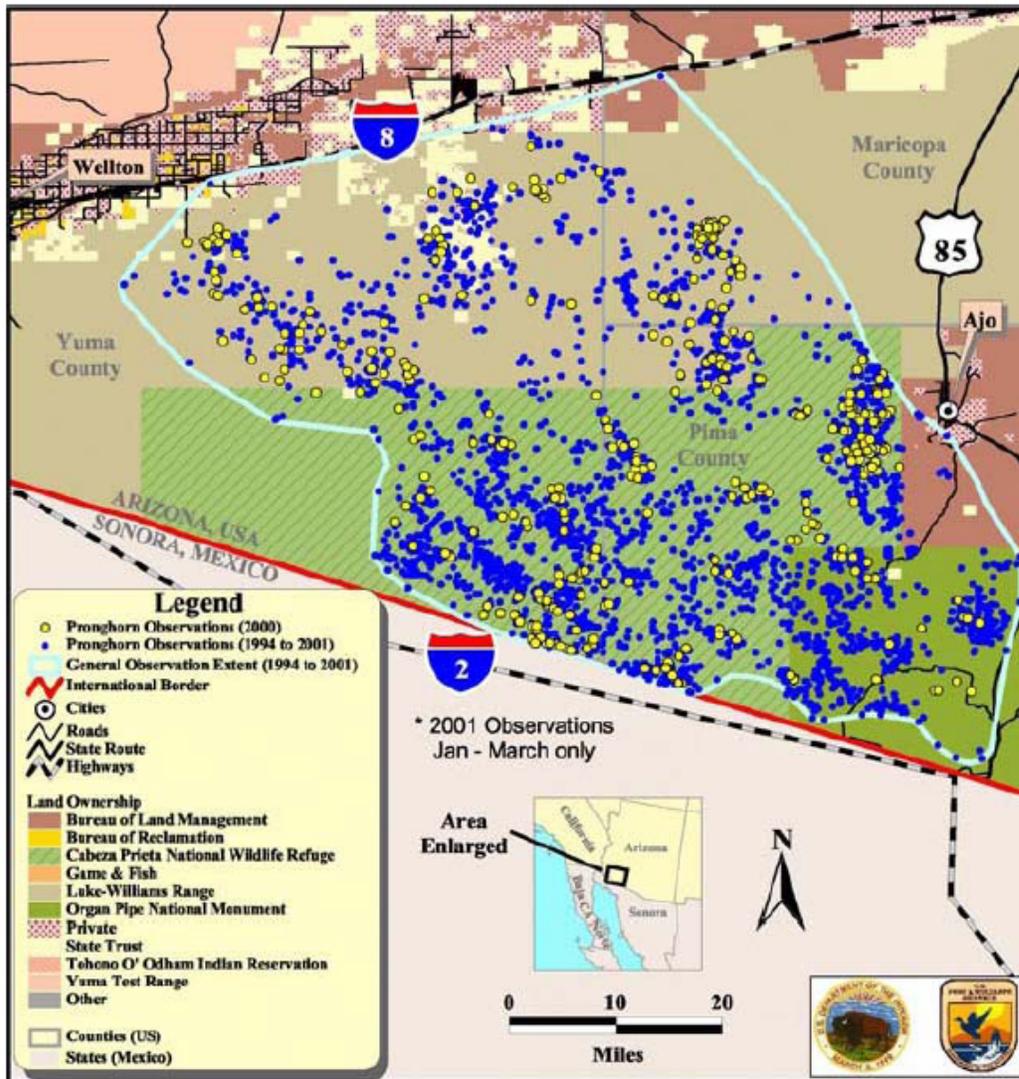


Figure 2. Historic range of Sonoran pronghorn in the United States and Mexico.



Figure 3. Current Sonoran pronghorn distribution in the United State: Records from 1994-2001.



Appendix O: References Cited

- Ajo. 2001. Ajo Community Comprehensive Plan. City of Ajo, Arizona.
- Alderman, J. A., P. R. Krausman, and B. D. Leopold. 1989. Diel activity of female desert bighorn sheep in western Arizona. *Journal of Wildlife Management* 53:264-271.
- Allen, A. W., J. G. Cook, and M. J. Armbruster. 1984. Habitat suitability index models: pronghorn. U.S. Fish and Wildlife Service, FWS/OBS-82/10.65. Fort Collins, Colorado.
- Arizona Department of Commerce. 2002. *Arizona Statewide Economic Study 2002*. <http://www.commerce.state.az.us/prop/ses/sesreportspart1.asp>.
- Arizona Department of Security. 2002. <http://www.de.state.az.us/ddd/>
- Arizona Interagency Desert Tortoise Team. 1996. *Management Plan for the Sonoran Desert Population of the Desert Tortoise in Arizona*.
- Arizona Water Commission. 1975. Phase I - Arizona State Water Plan, Inventory of Resource and Uses, Phoenix, Arizona.
- Audubon, J. W. 1906. *Audubon's western journal: 1849-1850*. F. H. Hodder, ed. Cleveland, Ohio.
- Autenrieth, R., (ed.). 1978. Guidelines for the management of pronghorn antelope. Proceedings of the Pronghorn Antelope Workshop 8: 473-526.
- Ballard, W. B., D. Lutz, T.W. Keegan, L. H. Carpenter, and J. C. deVos, Jr. 2001. Deer-predator Relationships: a review of recent North American Studies with Emphasis on Mule and Black-tailed Deer. *Wildlife Society Bulletin* 29:99-115.
- Ballard, W. B., S. S. Rosenstock, and J. C. deVos, Jr. 1998. The effects of artificial water developments on ungulates and large carnivores in the southwest. Proceedings of a symposium on environmental, economic, and legal issues related to rangeland water developments. The Center for the Study of Law, Science, and Technology, Arizona State University, Tempe.
- Bahre, C. J. 1991. A legacy of change: historic human impact on vegetation of the Arizona borderlands. University of Arizona Press, Tucson.
- Blaisdell, J. A. 1982. Lava Beds wrap-up, what did we learn? *Desert Bighorn Council Trans.* 26:32-33.
- Bradley, W. G., and L. G. Allred. 1967. A study of the kidney of Nelson bighorn sheep: a preliminary report. *Desert Bighorn Council Transactions* 11: 94-98.
- Bright, J. L. and J. J. Hervert. 2005. Adult and fawn mortality of Sonoran pronghorn. *Wildlife Society Bulletin*.33: 43-50.
- Brown, D. E. 1993. Early history. in. *The desert bighorn sheep in Arizona*. R. M. Lee, editor. Arizona Game and Fish Department Research Publication, Phoenix: 1-11.
- _____. 1994. *Biotic Communities of the Southwestern United States and Northwestern Mexico*. University of Utah Press. Salt Lake City, Utah. 342 pp.

- Browning, B. M., and G. Monson. 1980. Food. in G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson: 80-99.
- Broyles, B. 1995. Desert Wildlife Developments: Questioning Use in the Southwest. *Wildlife Society Bulletin* 29:99-115.
- _____. 1996. Surface Water Resources for Prehistoric Peoples in Western Papaguera of the North American Southwest. *Journal of Arid Environments* 33:483-495.
- _____. 1997. Wildlife Developments in Southwestern Arizona. *Journal of the Arizona-Nevada Academy of Science*. Volume 30 (1).
- Broyles, B. and T. L. Cutler. 1999. Effect of surface water on desert bighorn sheep in the Cabeza Prieta National Wildlife Refuge, southwestern Arizona. *Wildlife Society Bulletin*. 29:1082-1088.
- Buechner, H. K. 1960. The bighorn sheep in the United States: its past, present, and future. *Wildlife Monographs* no. 4.
- Bunch, T. D., S. R. Paul, and H. McCutchen. 1978. Chronic sinusitis in the desert bighorn (*Ovis canadensis nelsoni*). *Desert Bighorn Council Transactions* 22:16-20.
- Bunch, T. D., and P. Webb. 1979. Desert chronic sinusitis in Arizona. *Desert Bighorn Council Transactions* 23:25-27.
- Burkardt, N and D.L. Lybecker. 2004. *Cabeza Prieta National Wildlife Refuge, social impact analysis report*. U.S. Geological Survey, Policy Analysis and Science Assistance Program, Fort Collins, Colorado.
- Byers, J. A. 1997. *American pronghorn: social adaptations and the ghosts of predators past*. The University of Chicago Press, Chicago, Illinois.
- Cabeza Prieta National Wildlife Refuge. 1983. Range recovery plan. Ajo, Arizona.
- Carr, J. N. 1971 Progress report – Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department: Phoenix, Arizona: 247-262.
- Cashman, J. L., M. Peirce, and P. R. Krausman. 1992. Diets of mountain lions in southwestern Arizona. *Southwestern Naturalist* 37:324-326.
- Caughlan. 2004. *Regional economic effects of current and proposed management alternatives for Cabeza Prieta National Wildlife Refuge*. USGS, Biological Resources Division: Fort Collins, Colorado.
- Caughley, G. 1977. *Analysis of vertebrate populations*. John Wiley & Sons, New York.
- Childs, C. 1998. Report on waterholes of the Cabeza Prieta Mountains, study submitted for master's thesis, Prescott College, Prescott, Arizona.
- Clynes, T. 2003. Arizona park “most dangerous” in U.S. *National Geographic News*. January, 12. http://news.nationalgeographic.com/news/2003/01/0110_030113_organpipeclynes.html.
- Cockrum, E. L. 1981. Bat populations and habitats at the Organ Pipe Cactus National Monument. Technical Report No. 7, Cooperative National Park Study Unit. University of Arizona, Tucson.

- Comrie, A.C. and Broyles, B. 1997. Precipitation Variability at high spatial resolution in the desert southwest, impact of climate change and land use in the southwestern United States.
- Dalton, V.M. and D.C. Dalton. 1994. Mine/bat survey: eastern and western sections Barry M. Goldwater Air Force Range. Unpublished report prepared for 56th Range Management Office, Natural Resources Program, Luke Air Force Base, Arizona. December.
- D'Antonio, C.M and P.M. Vitousek. 1992. Biological invasions by exotic grasses, the gras/fire cycle, and global change. *Annual review of ecology and systematics* 23:63-97. In Hal J.A., P. Comer, A. Gondor, R. Marshall, and S. Weinstein. 2001. *Conservation elements of and a biodiversity management framework for the Barry M. Goldwater Range, Arizona*. The Nature Conservancy of Arizona, Tucson.
- Defenders of Wildlife. 1998. Population viability analysis workshop for the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) in the United States. Defenders of Wildlife unpublished manuscript, Washington, D.C.
- deVos, J. C. 1993. The role of disease in Arizona's bighorn sheep. in R. M. Lee, editor. *The desert bighorn sheep in Arizona*. Arizona Game and Fish Department Research Publication, Phoenix: 30-62
- deVos, J. C., Jr., R. Remington, and J. E. Scott. 1988. Cabeza Prieta bighorn sheep study: year 2 progress report. Arizona Game and Fish Department Research Branch, Phoenix.
- DiRosa, R. 2004. Desert Showdown in *Wilderness Watcher*. *Wilderness Watch*: 15/1: 3-6
- Dodd, N. 1993. Dietary considerations. in R. M. Lee, editor. *The desert bighorn sheep in Arizona*. Arizona Game and Fish Department Research Publication, Phoenix: 109-134.
- Dominguez, R. S. 1976. Analysis of stomach contents of bighorn sheep in Baja California. *Desert Bighorn Council Trans.* 20:21-22.
- Douglas, C. L. 1988. Decline of desert bighorn sheep in the Black Mountains of Death Valley. *Desert Bighorn Council Trans.* 32:26-30.
- Dunkely, L., and M.R.L. Cattet. 2003. *A Comprehensive Review of the Ecological and Human Social Effects of Artificial Feeding and Baiting of Wildlife*. Canadian Cooperative Wildlife Health Care, University of Saskatchewan, Saskatoon, Saskatchewan.
- Einarsen, A. S. 1948. The pronghorn antelope and its management. Wildlife Management Institute, Washington, D.C.
- Ekker, T. 2000. Wilderness character at the crossroads – the Cabeza Prieta. *Wilderness Watch*: <http://www.wildernesswatch.org/Newsletters/July%202000/Cabeza.htm>.
- EPA. 2004. <http://www.epa.gov/compliance/environmentaljustice/>.
- EPG. 2004. *Cabeza Prieta National Wildlife Refuge wilderness impact analysis report*. Phoenix Arizona. 66pp.
- Errington, P. L. 1956. Factors limiting higher vertebrate populations. *Science* 124:304-307.
- Ezell, Paul. 1954. An archeological survey of Northwestern Papgueria. *Kiva*. 19(2-4): 1-26.

- Felger, R. S. 1998. *Checklist of the plants of Cabeza Prieta National Wildlife Refuge, Arizona*. Drylands Institute: Tucson, AZ.
- Fontana, B.L. 1965. *An archeological site survey of the Cabeza Prieta Game Range, Arizona*. Ms. on file, Arizona State Museum Library, Tucson.
- Fox, L. M., P. R. Krausman, M. M. Morrison, and R. M. Kattnig. 2000. Water and nutrient content of forage in Sonoran pronghorn habitat, Arizona. *California Fish and Game* 86:216-232.
- Grant, C. 1980. The desert bighorn and aboriginal man. *in*: G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson: 7-39.
- Hailey, T. L., R. G. Marburger, R. M. Robinson, and K. A. Clark. 1972. Disease losses in desert bighorn sheep, Black Gap area. *Desert Bighorn Council Transactions* 16:79-83.
- Hall, J.A., P. Comer, A. Gondor, R. Marshall, and S. Weinstein. 2001. *Conservation elements of a biodiversity management framework for the Barry M. Goldwater Range, Arizona*. The Nature Conservancy of Arizona, Tucson. 199 pp.
- Halloran, A. F. 1957. A note on Sonoran pronghorn. *Journal of Mammalogy*. 38(3):423.
- Hansen, C. G. 1980. Physical characteristics. *in* G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson:52-63.
- _____. 1982. Desert bighorn sheep: another view. *Wildlife Society Bulletin* 10:133-140.
- Hansen, C. G., T. L. Hailey and G. I. Day. 1980. Capturing, handling, and transplanting. *in* G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson:273-287.
- Harper, H. and G. L. Wiseman. 1965. *Evaluation report, Kofa and Cabeza Prieta Game Ranges, Arizona*. Bureau of Land Management and Bureau of Sport Fisheries and Wildlife.
- Hastings, J. R., and R. M. Turner. 1980. *The changing mile*, second edition. University of Arizona Press, Tucson.
- Heffelfinger, J. R., R. J. Olding, T. H. Noon, M. R. Shupe, and D. P. Betzer. 1999. Copper/selenium levels and occurrence of bluetongue virus in Arizona pronghorn. *Proceedings Pronghorn Antelope Workshop* 18:32-42.
- Hendee, J. C., and C. P. Dawson. 2002. *Wilderness management: stewardship and protection of resources and values*. Third edition. Fulcrum Publishing, Golden, Colorado.
- Hendee, J.C., G.H. Stankey and R. C. Lucas. 1990. *Wilderness management*. Fulcrum Publishing, Golden Colorado.
- Henry, R. S. 1995. Draft desert bighorn sheep survey on Organ Pipe Cactus National Monument. Arizona Game and Fish Department. Unpublished report.
- Hervert, J. J., J. L. Bright, M. T. Brown, L. A. Piest, and R. S. Henry. 2000. Sonoran pronghorn population monitoring: 1994-1998. Nongame and Endangered Wildlife Program Technical Report 162. Arizona Game and Fish Department, Phoenix, Arizona.

- Hoffmeister, D. F. 1986. Mammals of Arizona. The University of Arizona Press, Tucson.
- Horst, R. 1971. Observations on the kidney of the desert bighorn sheep. *Desert Bighorn Council Trans.* 15: 24-27.
- Hughes, K. S. and N. S. Smith. 1990. Sonoran pronghorn use of habitat in southwest Arizona. Final Report 14-16- 009-1564 RWO #6. AZ Coop Fish & Wildl. Research Unit, Tucson, AZ. 58 pp.
- Jessup, D. A. 1985. Diseases of domestic livestock which threaten bighorn sheep populations. *Desert Bighorn Council Transactions.* 29:29-33.
- Jessup, D. A., and W. M. Boyce. 1996. Diseases of wild ungulates and livestock. *in* P. R. Krausman, editor, Rangeland wildlife. The Society for Range Management, Denver, CO: 395-412.
- Johnson, B. K., F. G. Lindzey, and R. J. Guenzel. 1991. Use of aerial line transect surveys to estimate pronghorn populations in Wyoming. *Wildlife Society Bulletin* 19:315-321.
- Jones, Fred L. 1980. Competition. *in* G. Monson and L. Sumner, editors. *The Desert Bighorn, Its Life History, Ecology, and Management.* the University of Arizona Press: Tucson, AZ: 197 -216.
- Kelly, Warren. 1980. Hunting. *in* G. Monson and L. Sumner, editors. *The Desert Bighorn, Its Life History, Ecology, and Management.* the University of Arizona Press: Tucson, AZ: 336-342.
- Kelly, Warren. 1980a. Predator relationships, *in* G. Monson and L. Sumner, editors. *The Desert Bighorn, Its Life History, Ecology, and Management.* the University of Arizona Press: Tucson, AZ: 186-196.
- Kennedy, C.E. 1958. Water development on the Kofa and Cabeza Prieta Game Ranges. *Desert Bighorn Council Tans.* 2:28-31.
- Kindschy, R. R., C. Sundstrom, and J. D. Yoakum. 1978. Range/wildlife interrelationships - pronghorn antelope. *Pronghorn Antelope Workshop Proceedings* 3:216-269.
- Kindschy, R. R., C. Sundstrom, and J. D. Yoakum. 1982. Wildlife habitats in managed rangelands - the Great Basin of southeastern Oregon: pronghorn. U.S. Department of Agriculture, Forest Service, Northwest Forest and Range Experimental Station, Portland, Oregon. General Technical Report PNW-145.
- Kitchen, D. W. 1974. Social behavior and ecology of the pronghorn. *Wildlife Monographs* 38:1-96.
- Krausman, Paul R. 2004. Biological resources report. Prepared for U.S. Fish and Wildlife Service. The University of Arizona, Tucson.
- Krausman, Paul R., L.K. Harris, and J. Francine. 2001. *Draft report of the long-term study of the noise effects of military overflights on the Sonoran pronghorn, Barry M. Goldwater Range, Luke Air Force Base, Arizona.* Prepared for the Air Force Center for Environmental Excellence.
- Krausman, P. R., S. Torres, L. L. Ordway, J. J. Hervert, and M. Brown. 1985. Diel activity of ewes in the Little Harquahala Mountains, Arizona. *Desert Bighorn Council Trans.* 29:24-26.
- Lee, T. E., Jr., J. W. Bickham, and M. D. Scott. 1994. Mitochondrial DNA and allozyme analysis of North American pronghorn populations. *Journal of Wildlife Management* 58:307-318.

- Lee, R.M., J.D. Yoakum, B.W. O'Gara, T.M. Pojar, and R.A. Ockenfels, eds. 1998. Pronghorn Management Guides. 18th Pronghorn Antelope Workshop, Prescott, AZ. 110 pp.
- Leftwich, T. J., and C. D. Simpson. 1978. The impact of domestic livestock and farming on Texas pronghorn. Pronghorn Antelope Workshop Proceedings 8:307-320.
- Leopold, A. 1933. *Game management*. University of Wisconsin Press, Madison, Wisconsin.
- Leopold Institute. 2004. Monitoring wilderness character. <http://leopold.wilderness.net/htopics/monitor.htm>.
- Leslie, D. M., Jr. and C. L. Douglas. 1979. Desert mountain sheep of the River Mountains, Nevada. *Wildlife Monographs* 66:1-56.
- Manville, R. H. 1980. The origin and relationships of American wild sheep. *in* G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson: 1-6.
- McDougall, W. B. 1935, Correspondence with Dr. Walter P. Taylor.
- Mearns, E. A. 1907. Mammals of the Mexican boundary of the United States. A descriptive catalogue of the species of mammals occurring in that region; with a general summary of the natural history, and a list of trees. *Bull. U.S. Nat. Mus.* 56:1-530.
- Monson, G. 1958. Water requirement. *Desert Bighorn Council Trans.* 2:64-66.
- _____. 1968. The desert pronghorn. *Desert Bighorn Council Transactions* 12:63-69.
- _____. 1980. Distribution and abundance. *in* G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson: 40-51.
- _____. 1998. Cactus Ferruginous Pygmy Owl. *In* R.L. Glinski, ed. *The Raptors of Arizona*. Arizona Game and Fish Department, Phoenix.
- Monz, C., J. Roggenbuck, D. Cole, R. Brame and A. Yoder. 2000. "Wilderness party size regulations: implications for management and a decision making framework." *In*: Cole, D.N., S. F. McCool, W. T. Borrie and J. O'Loughlin. 2000. Wilderness science in a time of change conference – Vol.5. Ogden UT: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 265-273.
- Morgart, J. R. 1990. Desert bighorn sheep forage relationships in the Virgin Mountains, Arizona. Unpubl. Ph.D. Diss., Univ. of Arizona, Tucson.
- _____. 2002. Presentation on the biology of the Sonoran Pronghorn and Desert Bighorn Sheep. USFWS Arizona Ecological Services Field Office, Phoenix, October 23, 2002.
- Morgart, J. R., J. C. deVos, Jr., and J. J. Hervert. 2002. Overview on Sonoran pronghorn reestablishment alternatives. VII Meeting of the Canada/Mexico/U. S. Trilateral Committee for Wildlife and Ecosystem Conservation and Management: Nuevo Vallarta, Nayarit, Mexico.
- Morgart, J. R., J. J. Hervert, P. R. Krausman, J. L. Bright and R. S. Henry. 2005 Sonoran pronghorn use of anthropogenic and natural water sources. *The Wildlife Society Bulletin*: Vol 23/1. 51-60.
- National Outdoor Leadership School. 1994. *Deserts and canyons leave no trace skills and ethics*. Boulder , Colorado.

- National Park Service. 1939. Organ Pipe Cactus National Monument - superintendent's monthly report, May 1939. Organ Pipe Cactus National Monument headquarters, AZ.
- _____. 1941. Organ Pipe Cactus National Monument - superintendent's monthly report, November 1941. Organ Pipe Cactus National Monument headquarters, AZ.
- Nelson, F.W. 1925. Status of the pronghorn antelope, 1922-1924. U.S. Department of Agriculture Bulletin. 1346. 64pp.
- Nichol, A.A. 1937. Desert bighorn sheep. *Arizona Wildlife* 7:9,16.
- _____. 1938. Desert bighorn sheep. *Arizona Wildlife* 8:3,12.
- _____. 1941. Game Reconnaissance of Southwest Arizona, South of the Gila River. unpublished. Arizona Game and Fish Department, Phoenix, Arizona.
- Noise Center. 1996. Noise levels in our environment, Fact Sheet. League for the Hard of Hearing. <http://www.lhh.org/noise/decibel.htm>
- Noss, R. F. 1987. Corridors in real landscapes: a reply to Simberloff and Cox. *Conservation Biology*. 1:159-164.
- Ockenfels, R. A. 1994. Factors affecting adult pronghorn mortality rates in central Arizona. Arizona Game and Fish Department, *Wildlife Digest* 16.
- Officer, J. E. 1993. Kino and agriculture in the Pimeria Alta. *Journal of Arizona History* 34:287-306.
- O'Gara, B. W. 1978. *Antilocapra americana*. *Mammalian Species* 90:1-7.
- O'Gara, B. W., and J. D. Yoakum, eds. 1992. Pronghorn management guides. Pronghorn antelope workshop, Rock Springs, Wyoming.
- Phelps, J. S., Sonoran Pronghorn Recovery Team leader. 1977. Correspondence to W.O. Nelson, Jr., Regional Director U.S. Fish and Wildlife Service.
- Pima Count Department of Transportation. 2002. GIS Library Overview. <http://www.dot.co.pima.az.us/gis/data/about/overview.cfm>.
- Pinkley, F., Superintendent. 1935. *Report on Kofa Mountains and Organ Pipe Cactus National Monuments*. USDI, National Park Service, Headquarters, Southwestern Monuments.
- Rominger, E. 1998. Status of desert bighorn sheep in New Mexico. in.1997. *Desert Bighorn Council Trans.* 42:50-52.
- Rosenstock, S. S., W. B. Ballard, and J. C. deVos, Jr. 1999. Viewpoint: Benefits and impacts of wildlife water developments. *Journal of Range Management* 52:302-311.
- Rosenstock, S. S., J. J. Hervert, V. C. Bleich, and P. R. Krausman. 2001. Muddying the water with poor science: a reply to Broyles and Cutler. *Wildlife Society Bulletin*. 29: 734-743.
- Rozen, Kenneth. 1979. The Cabeza Prieta Game Range Fenceline Survey. *Arizona State Museum Archeological Series*. 130. University of Arizona, Tucson.

- Russo, J. P. 1956. The desert bighorn sheep in Arizona. Arizona Game and Fish Department Wildlife Bulletin No. 1, Phoenix, Arizona.
- Rutman, S. 1997. Dirt is not cheap: livestock grazing and a legacy of accelerated soil erosion on Organ Pipe Cactus National Monument, Arizona. *in* J. M. Feller, and D. S. Strouse, editors, Environmental, economic, and legal issues related to rangeland water developments. The Center for the Study of Law, Science, and Technology, Arizona State University, Tempe: 359-375.
- Sandoval, A. V. 1980. Management of a psoroptic scabies epizootic in bighorn sheep (*Ovis canadensis mexicana*) in New Mexico. *Desert Bighorn Council Trans.* 24:21-28.
- Schmidt-Nielsen, K. 1979. *Desert animals: physiological problems of heat and water*. Dover Publications Inc., New York, New York.
- Schroeder, R. L., J. Holler, and J. P. Taylor. 2004. Managing national wildlife refuges for historic or non-historic conditions. Unpublished paper, USGS & USFWS.
- Scott, J. E., R. R. Remington, and J. C. deVos, Jr. 1990. Numbers, movements, and disease status of bighorn in southwestern Arizona. *Desert Bighorn Council Transactions* 34:9-13.
- Scott, J. M., S. A. Temple, D. L. Harlow, and M. L. Shaffer. 1994. Restoration and management of endangered species. Pages 531-539 *in* T. A. Bookhout, editor, *Research and management techniques for wildlife and habitats*. The Wildlife Society, Bethesda, Maryland.
- Senate committee on energy and natural resources. 1974. *Senate report and minority views to accompany H.R. 2570 to provide the designation of public lands as wilderness in the State of Arizona*.
- Seton, E.T. 1929. *Lives of game animals*. Doubleday, Page, and Co., New York.
- Sheridan, T. E. 2000. Human ecology of the Sonoran Desert. *in* S. J. Phillips and P. W. Comus, editors. *A natural history of the Sonoran Desert*. Arizona-Sonora Desert Museum Press, Tucson: 105-118.
- Simmons, N. M. 1964. A desert bighorn study: part two. *Desert Bighorn Council Trans.* 8:103-112.
- _____. 1965. *The geology of the Cabeza Prieta Game Range*. Ajo, Arizona.
- _____. 1969. The social organization, behavior and environment of the desert bighorn sheep on the Cabeza Prieta Game Range, Arizona. Ph.D. thesis, University of Arizona, Tucson.
- _____. 1980. Behavior. *in* *The Desert Bighorn Sheep, Its Life History, Ecology, and Management*. Gale Monson and Lowell Summer, Eds. The University of Arizona Press, Tucson. 124-144.
- Smith, E. L. 1974. *Established natural areas in Arizona: a guidebook for scientists and educators*. Planning Division, Office of Economic Planning and Development, Phoenix.
- Soule, M.E. , and J. Terborgh. 1999. "Conserving nature at regional and continental scales – a scientific program for North America." *Bio-Science*. 49:808-818.

- Spildie, D. R., D. N. Cole, and S. C. Walker. 2000. "Effectiveness of a confinement strategy in reducing pack stock impacts at campsites in the Selway-Bitterroot Wilderness, Idaho." *In*: Cole, D.N., S. F. McCool, W. T. Borrie and J. O'Loughlin. 2000. Wilderness science in a time of change conference – Vol.5. Ogden UT: U. S. Department of Agriculture, Forest Service, Rocky Mountain Research Station: 199-208.
- Sundstrom, C. 1968. Water consumption by pronghorn antelope and distribution related to water in Wyoming's Red Desert. Pronghorn Antelope Workshop Proceedings 3:39-47.
- SWCA, Inc. 2001. *A cultural resources overview and assessment for the Cabeza Prieta National Wildlife Refuge: a component of the refuge Comprehensive Conservation Plan*. SWCA Cultural Resource Report No. 01-24, Tucson, Arizona.
- Taylor, W. P., Senior Biologist. 1935. *Report on proposed Cabeza Prieta wildlife refuge, Arizona*. Tucson Office, Division of Wildlife Research, Bureau of Biological Survey.
- Thomas, F. C. 1981. Hemorrhagic disease. *in* W. R. Davidson, F. A. Hayes, V. F. Nettles, and F. E. Kellogg, editors, Diseases and parasites of whit-tailed deer. Miscellaneous Publication 7. Tall Timbers Research Station, Tall Timbers Research Station, Tallahassee, Florida: 87-96.
- Thorne, E. T., E. S. Williams, T. R. Spraker, W. Helms, and T. Segerstrom. 1988. Bluetongue in free-ranging pronghorn antelope (*Antilocapra americana*) in Wyoming: 1976 and 1984. *Journal of Wildlife Diseases* 24:113-119.
- Turner, J. C., and R. A. Weaver. 1970. Water consumption of desert bighorn sheep. *Desert Bighorn Council Trans.* 14:189-197.
- _____. 1973. Water energy and electrolytic balance in the desert bighorn sheep (*Ovis canadensis cremnobates* Elliot). Unpubl. Ph. D. thesis, Univ. Calif. Riverside.
- _____. 1980. Water. *in* G. Monson and L. Sumner, editors. *The desert bighorn: its life history, ecology, and management*. University of Arizona Press, Tucson: 100-112.
- USAF. 1980 *Draft environmental impact statement continued use of public lands at the Luke Air Force Range, Arizona*. Tactical Air Command, 58th Tactical Training Wing, Luke AFB, Arizona.
- US Census Bureau. <http://www.census.gov/>
- US Department of the Navy. 2001. *Draft supplemental Environmental Impact Statement - Yuma Training Range Complex*. Marine Corps Air Station, Yuma, Arizona.
- USDI, Bureau of Sport Fisheries and Wildlife. 1971. Draft environmental impact statement for the proposal to designate Cabeza Prieta Wilderness within the Cabeza Prieta Game Range. June.
- _____. 1974. *Proposed Addition to Cabeza Prieta National Wildlife Refuge, Arizona*.
- USDOD. 1998. *Renewal of the Barry M. Goldwater Range Land Withdrawal Draft Legislative Environmental Impact Statement and Community Report*. September.
- USFWS. National Survey of Breeding Birds.
- _____. 1939. Quarterly narrative report, Kofa and Cabeza Prieta Refuges, quarter ending July 31, 1939. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

- _____. 1940. Cabeza Prieta Game Range, quarterly narrative report, May-July 1940. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.
- _____. 1946. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.
- _____. 1946a. Cabeza Prieta Game Range, narrative report, January-April
- _____. 1946b. Cabeza Prieta Game Range, narrative report, September-December 1946. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.
- _____. 1951. Cabeza Prieta Game Range, narrative report, September-December 1951. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.
- _____. 1952. Cabeza Prieta National Wildlife Refuge Annual Narrative.
- _____. 1954. Cabeza Prieta Game Range, narrative report, January-April 1954. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.
- _____. 1966. Cabeza Prieta Game Range, narrative report, 1966. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.
- _____. 1971. Cabeza Prieta National Wildlife Refuge Annual Narrative.
- _____. 1994. Gila/Salt/Verde ecosystem plan. Albuquerque, New Mexico.98
- _____. 1996. Biological opinion and conference opinion for existing and proposed activities by the Marine Corps Air Station - Yuma in the Arizona portion of the Yuma Training Range Complex. United States Fish and Wildlife Service, Albuquerque, New Mexico.
- _____. 1997. Biological opinion for use of ground-surface and airspace for military training on the Barry M. Goldwater Range which may affect the endangered Sonoran pronghorn. United States Fish and Wildlife Service, Albuquerque, New Mexico.
- _____. 1998. Final revised Sonoran pronghorn recovery plan. Albuquerque, New Mexico.
- _____. 2002. *Birds of conservation concern 2002*. Division of Migratory Bird Management, Arlington, Virginia.
- _____. 2002. *Recovery criteria and estimates of time for recovery actions for the Sonoran pronghorn: a supplement and amendment to the 1998 final revised Sonoran pronghorn recovery plan*. Albuquerque, New Mexico.
- Valone, T. J., M. Meyer, J H. Brown, and R. M. Chew. 2002. "Timescale of perennial grass recovery in desertified arid grasslands following livestock removal." *Conservation Biology*, 16/4: 995-1002.
- Van Riper, S., L Williams, D. Segura and B. Broyles. 1987. *Fifty Years of water management in the Cabeza Prieta*, unpublished refuge inventory from refuge files.
- Watts, T. J. 1979. Status of the Big Hatchet desert sheep population, New Mexico. *Desert Bighorn Council Trans.* 23:92-94.

- Werner, William. 1993. Water development. *in The Desert Bighorn Sheep in Arizona*. Raymond M. Lee, editor. Arizona Game and Fish Department: Phoenix, AZ: 161-175.
- Western Regional Climate Center. 2004. /www.wrcc.dri.edu/climsum.html
- Wildeman, G., and J. H. Brock. 2000. Grazing in the southwest: history of land use and grazing since 1540. Pages 1-25 *in* R. Jemison, and C. Raish, editors, *Livestock management in the American southwest: ecology, society, and economics*. Elsevier Science, Amsterdam, The Netherlands.
- Wilson, L. O. 1971. The effect of free water on desert bighorn home range. *Desert Bighorn Council Trans.* 15:82-89.
- Wright, R. L., and J. C. deVos, Jr. 1986. Final report on Sonoran pronghorn status in Arizona. Contract number F0260483MS143, Arizona Game and Fish Department, Phoenix.
- Yoakum, J. D. 1980. Habitat management guidelines for the American pronghorn antelope. Technical Note 347. U.S. Department of the Interior, Bureau of Land Management. Denver Service Center, Denver, Colorado.
- Yoakum, J.D., and B. W. O'Gara. 2000. Pronghorn. *in Ecology and management of large mammals in North America*. S. Demarais and P. R. Krausman, eds. Prentice-Hall, Upper Saddle River, NJ: 559-577
- Yoakum, J. D., B. W. O'Gara, and V. W. Howard, Jr. 1996. Pronghorn on western rangelands. *in Rangeland wildlife*. P. R. Krausman, editor. The Society for Range Management, Denver, Colorado: 211-226.

Appendix P: List of Preparers

John R. Slown, Biologist/Natural Resources Planner, Division of Planning, Southwest Region, National Wildlife Refuge System, U. S. Fish and Wildlife Service, Albuquerque, New Mexico

Roger DiRosa, Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona

Contributors:

Thomas P. Baca, Chief, Division of Planning, Southwest Region, National Wildlife Refuge System, U. S. Fish and Wildlife Service Albuquerque, New Mexico

John Hervert, Wildlife Biologist, Region IV, Arizona Game and Fish Department, Yuma, Arizona

Russell K. Engel, Habitat Program Manager, Region IV, Arizona Game and Fish Department, Yuma, Arizona

John Morgart, Wildlife Biologist, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona

Curtis McCasland, Deputy Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona

David Eslinger, Outdoor Recreation Planner, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona

Vergial Harp, Outdoor Recreation Planner, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona

Kathy Granillo, Regional Refuge Biologist, Division of Resource Management, Southwest Region, National Wildlife Refuge System, U. S. Fish and Wildlife Service, Albuquerque, New Mexico

April Fletcher, Regional Invasive Species Coordinator, Division of Resource Management, Southwest Region, National Wildlife Refuge System, U. S. Fish and Wildlife Service, Albuquerque, New Mexico

Thea Ulen, Biologist/Conservation Planner, Southwest Region, National Wildlife Refuge System, U. S. Fish and Wildlife Service, Tucson, Arizona

Michael Coffeen, Wildlife Biologist, Arizona Ecological Services Office, U. S. Fish and Wildlife Service, Phoenix, Arizona

Nina Burkardt, Social Scientist, Social Science Research Center, U. S. Geological Service, Fort Collins, Colorado

Lynne Caughlan, Economist, Social Science Research Center, U. S. Geological Service, Fort Collins, Colorado