



United States Department of the Interior



Fish and Wildlife Service
Arizona Ecological Services Office
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
02EAAZ00-2015-F-0045

November 18, 2014

Memorandum

To: Stephen Robertson, Chief, Wildlife and Sport Fish Restoration Program, Southwest Region, U.S. Fish and Wildlife Service, Albuquerque, NM

From: Field Supervisor, Arizona Ecological Services Field Office, Phoenix, Arizona

Subject: Formal Section 7 Consultation on the Granting of Wildlife and Sport Fish Restoration Program Funds to the Arizona Game and Fish Department to Implement Aspects of Sonoran Pronghorn Recovery

Thank you for your request for formal 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 October 3, 2014, and received by us on October 9, 2014. At issue are impacts that may result from the proposed granting of Wildlife and Sport Fish Restoration Program funds to implement aspects of Sonoran pronghorn recovery in La Paz, Maricopa, Pima, Pinal, Santa Cruz, and Yuma counties, Arizona. The proposed action may affect, and is likely to adversely affect, Sonoran pronghorn (*Antilocapra americana sonoriensis*). In your memorandum, you requested our concurrence that the proposed action is not likely to adversely affect lesser long-nosed bat (*Leptonycteris curasoae yerbabuena*). We concur with your determination and provide our rationale in Appendix A.

Part of proposed action is located within the endangered range of the Sonoran pronghorn (Figure 1); however, part of it is within the nonessential experimental population (or 10(j)) range of the Sonoran pronghorn (Figure 2). Therefore, for section 7 consultation purposes, Sonoran pronghorn occurring within the endangered range are treated as an endangered species; however, pronghorn occurring or that may occur within the nonessential experimental range are treated as a species proposed to be listed or as a threatened species¹. Accordingly, this biological opinion addresses the effects of the proposed action on

¹ From USFWS 2011 (Final rule for the establishment of a nonessential experimental population (NEP) of Sonoran Pronghorn in southwestern Arizona): When nonessential experimental populations (NEP) are located outside a NWR or National Park Service unit, for the purposes of section 7 we treat the population as proposed for listing and only two provisions of section 7 apply—section 7(a)(1) and section 7(a)(4). In these instances, NEPs provide additional flexibility because Federal agencies are not required to consult with us under section 7(a)(2). Section 7(a)(4) requires Federal agencies to confer (rather than consult) with the FWS on actions that are likely to jeopardize the continued existence of a species proposed to be listed. Because the nonessential experimental population is, by definition, not essential to the continued existence of the species then the effects of

both the endangered and nonessential experimental population of pronghorns within the action area.

This biological opinion is based on the project proposal, literature, telephone conversations, field investigations, and other sources of information. Literature cited in this biological opinion is not a complete bibliography of all literature available on the Sonoran pronghorn, effects of ecological restoration on this species, or on other subjects considered in this opinion. A complete administrative record of this consultation is on file at this office.

CONSULTATION HISTORY

- October 9, 2014: We received your request for formal consultation.
- October 21, 2014: We spoke to clarify and expand the description of the proposed action to include Sonoran pronghorn surveys and monitoring; maintaining and implementing existing forage enhancements, alfalfa feed stations, and water developments; and maintaining and monitoring captive breeding pens, in addition to capture, collaring, and release of Sonoran pronghorn.
- November 4, 2014: We sent the preliminary draft biological opinion to Arizona Game and Fish Department and your office for informal review, primarily to further clarify the description of the proposed action.
- November 12 and 14, 2014: Our office received comments back from Arizona Game and Fish Department on the preliminary draft biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

A complete description of the proposed action is found in your October 9, 2014 Sonoran Pronghorn consultation document, the Sonoran Pronghorn Recovery Programmatic Environmental Assessment Checklist, and the November 12 and 14, 2014 emails from Arizona Game and Fish Department (AGFD) to FWS. The proposed action includes granting of Wildlife and Sport Fish Restoration (WSFR) Program funds to the Arizona Department of Game and Fish to implement aspects of Sonoran pronghorn recovery located in a La Paz, Maricopa, Pima, Pinal, Santa Cruz, and Yuma counties. Sonoran pronghorn recovery activities specifically include: 1) capturing Sonoran pronghorn from the Cabeza Prieta National Wildlife Refuge (CPNWR) and Kofa National Wildlife Refuge (Kofa NWR) captive breeding pens; collaring and/or ear-tagging them; and releasing them back into the capture pen, into a new pen, outside the pen within their current range, or other areas of their historical range; 2) capturing wild Sonoran pronghorn, collaring and/or ear-tagging them, and releasing them on-site, elsewhere within their historical range, or in a captive-breeding pen; 3) surveying and monitoring pronghorn using ground and aerial techniques; 4)

proposed actions on the NEP will generally not rise to the level of jeopardizing the continued existence of the species. As a result, a formal conference will likely never be required for Sonoran pronghorn established within the nonessential experimental population area. For the purposes of section 7 of the Act, we treat an NEP as a threatened species when the NEP is located within a National Wildlife Refuge or unit of the National Park Service, and section 7(a)(1) and the consultation requirements of section 7(a)(2) of the Act apply. Section 7(a)(1) requires all Federal agencies to use their authorities to carry out programs for the conservation of listed species. Section 7(a)(2) requires that Federal agencies, in consultation with the Service, ensure that any action authorized, funded, or carried out is not likely to jeopardize the continued existence of a listed species.

maintaining and implementing existing forage enhancements, alfalfa feed stations, and water developments, and 5) maintaining and monitoring captive breeding pens. This consultation is only for activities that are funded by WSFR and the duration of the action is five years.

AGFD personnel will be assisting the FWS, who have final authority, with these actions. The following Sonoran pronghorn activities, many of which are addressed in this consultation, are currently permitted under Federal Fish and Wildlife Permit number TE078347-0 issued to CPNWR (Attachment A): capture; possess; administer health care; introduce; manage; radio-collar; monitor; maintain; mark; draw blood, hair, and tonsillar swabs for genetic analyses; euthanize in the event of an unrecoverable injury sustained during capture or operations or as otherwise determined by project veterinarian; and breed Sonoran pronghorn with the breeding facilities on CPNWR and Kofa NWR. According to the current permit, the aforementioned activities may be conducted with the wild ranging U.S. Sonoran pronghorn in accordance with the FWS Sonoran Pronghorn Recovery Plan. Numerous individuals, including some from AGFD, are named on this permit to perform the aforementioned activities.

Additionally, in accordance with the **§ 17.84 Special rules—vertebrates** section of the **Final rule for the establishment of a nonessential experimental population of Sonoran Pronghorn in southwestern Arizona** (FWS 2011) (Attachment B), (v)(3) “Any person with a valid permit issued by the U.S. Fish and Wildlife Service (Service) under §17.32 make take pronghorn within the nonessential experimental population for scientific purposes; the enhancement of propagation or survival of the species, and other conservation purposes consistent with the Endangered Species Act” and (v)(5) “Any employee or agent of the U.S. Fish and Wildlife Service, the Arizona Department of Game and Fish, and the tribes listed in paragraph (v)(4) of this section, who is designated for such purpose may, when acting in the course of official duties, take a Sonoran pronghorn [within the nonessential experimental population boundary] if such action is necessary to: (i) Aid a sick, injured, or orphaned Sonoran pronghorn, including rescuing such animals from canals; (ii) Dispose of a dead Sonoran pronghorn specimen, or salvage a dead specimen that may be useful for scientific study; (iii) Move a Sonoran pronghorn for genetic purposes or to improve the health of the population; or (iv) Capture and release a Sonoran pronghorn for relocation, to collect biological data, or to attach, service, or detach radio-telemetry equipment. (6) Any taking pursuant to paragraphs (v)(3) through (v)(5) of this section must be reported as soon as possible by calling the U.S. Fish and Wildlife Service, Arizona Ecological Services Office, 201 N Bonita Avenue, Suite 141, Tucson, AZ 85745 (520/670–6150), or the Cabeza Prieta National Wildlife Refuge, 1611 North Second Avenue, Ajo, AZ 85321 (520/387–6483). Upon contact, a determination will be made as to the disposition of any live or dead specimens”.

Pen Captures, Handling, and Release

There are currently two captive breeding pens, one on CPNWR and one on Kofa NWR. Each year animals must be captured and sorted to 1) maintain the appropriate demographic and genetic composition of each pen (or half of pen) and 2) release pen-raised animals into the wild for recovery purposes. As part of this annual operation, some animals that are captured and processed are released outside the pen while others are placed back in the pen, potentially to the other half of the pen. Currently, animals from the CPNWR pen are being used to augment both the endangered wild population and 10(j) pen and wild populations; while animals from the Kofa NWR pen are just being used to augment the 10(j) wild population. Animals taken from CPNWR to Kofa NWR or other established pens may be transported via helicopter and/or trailer. Animals released closer to each respective breeding pen may be transported via pick-up, trailer, and/or helicopter. The total number of animals at each pen that will be captured, handled, and released (back into the pen or transported and released into the wild) will vary annually; however, about 90 to 100 animals will likely be the average total animals handled for both pens, with about 35 to 45

of those released into the wild. The operations described below currently take place at the CPNWR and Kofa NWR breeding pens, as well as at the soft release pens, but may be expanded to other pens over the next five years, as needed. These operations are only conducted during the months of December and January, when temperatures are cooler, to reduce the risk of hyperthermia in pronghorn. The teams described below are comprised primarily of Federal and State agency personnel; however, FWS-CPNWR and AGFD are the primary responsible parties for planning and implementing all capture operations.

Prior to the Capture

Pen personnel will feed the pronghorn in the bomas (corral traps) for several weeks prior to the capture dates to get them used to entering and being in the bomas.

Capture in the Bomas

1. **Capture:** AGFD and FWS personnel will attempt to capture the pronghorn in the bomas three to six days prior to the processing operation. When the pronghorn are captured in the bomas, pen personnel will make every effort to determine how many animals were captured and which individuals are in the bomas. This will be done from observation hills or towers, without further disturbing the pronghorn in the bomas.
2. **Sorting:** When the pronghorn are originally caught in the bomas, they will have access to all three sections. When the release operation begins, the Sorting Team will be responsible for moving pronghorn between boma sections using interior doors or a curtain to separate two to three pronghorn out for processing. The rest of the animals in the boma complex will be able to move within the other two sections. Every animal that leaves the boma must be examined by the Veterinary Team and be recorded.
3. **Mugging:** Once two to three animals are in one section of the bomas, the approximately eight-person Net Team will enter the boma holding a drive net erect to reduce the amount of space the pronghorn can use. At the same time, the two-person Mugging Teams will enter the boma, and each Mugging Team will grab a pronghorn. As soon as a pronghorn is secured, it will be held off the ground, blindfolded, and carried to a waiting stretcher.
4. **Transport:** The Stretcher Teams will wait outside the bomas until an animal has been secured, then bring the stretcher to the animal if possible without getting in the way of other mugging operations. If it is not possible for the Stretcher Team to go in the boma, the Mugging Team will carry the pronghorn to the waiting stretcher. The pronghorn will be placed on the stretcher with their legs through the slots. The pronghorn will remain on the stretchers and be placed on saw horses at the processing station. The Stretcher Team and the Muggers will stay with that pronghorn while it is being processed in case continued restraint is required and to transport the pronghorn to the helicopters when processing is complete.

Processing

Prior to the capture effort, specific personnel will be assigned to a single processing station. They will remain at the same station so that they have a consistent team. Each processing station will have at least one veterinarian, veterinary technician, temperature monitor, data recorder, someone trained in putting collars and ear tags on, and processing assistants. The Veterinary and Processing Teams will stand by at the processing stations and wait for the Stretcher/Mugging Teams to bring the pronghorn to them.

The priorities at the processing stations are: 1) Ear-tagging and collaring; 2) Vaccinations; 3) Blood draws; and 4) Genetic Swabs. If the animals have temperatures above 105° Fahrenheit, and attempts to lower the temperatures are not working (i.e. dousing with cold water), pronghorn will be released back into the pen or into an external holding pen prior to any or all the above procedures taking place. AGFD personnel, in consultation with veterinarians, will make this decision as necessary.

Anesthetic Protocol

As soon as the pronghorn are taken to a processing station, the veterinarian will administer drugs as necessary. It is vital to administer the intravenous anxiolytic immediately after capture to reduce stress, hyperthermia, and capture myopathy. The injections used will vary depending on the different release options:

1. **Returned to Same Half of Captive Breeding Pen**
Animals to be returned to the captive breeding pen will be given some injections and medications, and will be marked. These animals will not be given anesthetics or anxiolytics, unless the veterinarian determines it is necessary, and handling times will be minimized.
2. **Animals Moved Between Pen Halves**
The animals that will be moved between the north and south halves of the pen may receive Haldol (an anxiolytic) and/or be given some injections and medications as determined by the Veterinary Team, and will be marked.
3. **Animals Going by Helicopter to Other Release Sites**
Pronghorn going to the other release sites by helicopter transport will be anesthetized with A3080/Xylazine and Ketamine (or other appropriate drug combination as determined by the veterinarian and Veterinary Team) by a veterinarian upon capture. After processing, the Mucker/Stretcher Teams will transport the pronghorn to a waiting vehicle and ride with the animal to the helicopter. The goal is to prepare and transport two animals by helicopter in one trip destined for the same release site; however, one animal will be transported if needed. One veterinarian, one veterinary technician, and an additional person will accompany every helicopter transfer.
4. **Animals Going by Trailer to Other Release Sites:**
Pronghorn going to other release sites by trailer will receive Haldol (or other drugs, as determined by the veterinarian).
5. **Emergency**
In the case of an emergency, the attending veterinarian will decide how to proceed. The pronghorn can immediately be released or further care can be administered. Materials to place intravenous catheters to provide fluid therapy and put animals under full anesthetics will be available.

Veterinary Assessment and Treatment

1. **Body Temperature**
The target body temperature is 101 to 104 degrees Fahrenheit. Pronghorn have a tendency to overheat due to stress, high environmental temperatures, and the fact that their hollow hair

insulates them well. Noise is minimized around the bomas and processing stations to help reduce pronghorn stress levels. When the animals are removed from the boma they are immediately taken to a processing area that is in the shade and have their temperature taken. This occurs simultaneously to the vet administering intravenous anesthesia if the animal is designated for that treatment. One processing person at each processing station will be responsible for continual temperature monitoring while the pronghorn is at the station. If the temperature is above 104 degrees Fahrenheit the pronghorn is doused in water over its entire body. The temperature trend is continuously monitored by the veterinary staff and recorded by the Data Recorders. If multiple animals coming out of the boma continue to show high initial temperatures then the operation may be terminated, or at least all animals from then on should be doused with water or other cooling techniques immediately after leaving the boma regardless of their destination.

2. Positioning

Body positioning is important to maintain open airways and prevent regurgitation. Regurgitation can lead to aspiration pneumonia which is fatal. Ideally, pronghorn will be maintained sternal (upright, on its stomach and sternum, with legs in the stretcher leg holes or tucked in natural position underneath) with the head elevated above the chest and stomach. Special care will be taken not to obstruct the throat or airway when holding the pronghorn in this position. If it is not possible to have the pronghorn sternal, then it will be laid with the right side down and left side up, still keeping the head elevated above the chest and stomach.

3. Oxygen

Pronghorn will be given oxygen as the attending veterinarian deems necessary. Oxygen administered through a nasal cannula helps to ensure blood oxygenation and prevent hyperthermia. The nasal cannula can be lightly taped to the muzzle with medical tape, being sure not to block the nasal passage.

4. Injections

The following injections will likely be administered by the veterinarian or veterinary technicians to all handled animals:

Name	Dose	Route	Type/Reason
Banamine	0.8cc	IM	Non-steroidal anti-inflammatory
Vitamin A,D & E	2.0cc	IM	Vitamin
Ivermectin	0.8cc	SQ	De-wormer
BOSE	0.8cc	IM	Vitamin E/Selenium
Oxy200	3.5cc	IM	Antibiotic
Rabies Vx	1.0cc	SQ	Vaccine
CD&TVx	2.0cc	SQ	Vaccine
BTV/EHDVx	2.0cc	SQ	Vaccine

Collaring and Tagging

The Marking Team will be fully responsible for the organization and administering of ear tags and radio collars so the Veterinary Team can focus their efforts on animal care. The Marking Team must

coordinate with the Data Recorders to ensure all the appropriate information is recorded. Pronghorn will be marked as per the release plan. Pronghorn will receive either a VHF or GPS collar, and/or ear tags.

Sample Collection

The Veterinary Team will take responsibility for collecting blood samples from all pronghorn that are handled. Ideally the blood will be drawn before the pronghorn is radio-collared because the radio collar can continue to hold-off the vein after the blood is drawn which increases blood flow and hinders the ability to clot. These blood samples are used to test for disease exposure, genetics, and individual or herd health. All excess blood on the pronghorn after processing is removed with water. If there is a medical emergency with the pronghorn, or the pronghorn has a high body temperature, collecting blood samples is not critical, and the pronghorn will not be detained to get them.

When possible, the Veterinary Team will assist with other samples requested such as additional blood collection, oral swabs, and body measurements.

Recording Data

Each processing station will have an assigned Data Recorder; this person will become familiar with the boma capture data sheet prior to the capture. Every pronghorn that is processed will have their own data form. The Data Recorders actively work to ensure that the forms are filled out completely and accurately. The capture forms are legal documentation of the use of drugs that are controlled substances.

Release

After processing, the pronghorn will either be transported to a helicopter, pick up, or trailer for transport to other release sites, or released back into the captive breeding pen.

1. Returned to Same Half of the Captive Breeding Pen

Pronghorn being released back into the captive breeding pen will be taken by the Stretcher and Mugger teams to an area away from the bomas and processing stations. One mugger will hold the pronghorn off the ground while the Stretcher Team quickly removes the stretcher. The other mugger will take off the blindfold and the pronghorn will be released into the pen. Data Recorders will accompany their pronghorn to the release to ensure complete data records.

2. Animals Moved Between Pen Halves

An animal moving between pen halves will be taken by the Stretcher/Mugger Team to a waiting pick-up and transported to the appropriate pen. It will be carried on the stretcher into the pen where one mugger will hold the pronghorn off the ground while the Stretcher Team quickly removes the stretcher. The other mugger will take off the blindfold and the pronghorn will be released into the pen.

3. Release into the Wild or Other Captive Breeding Pens Using Helicopter Transport

The pronghorn to be released will be transported, via stretcher, to a waiting pick-up or helicopter. Ideally two pronghorn will be taken in one helicopter trip. However, if there aren't two animals in one processing group slated to be released, the helicopter will go with just one. A veterinarian, veterinary technician, and one other person will accompany the pronghorn in the helicopter. At the release site, each pronghorn will be moved into a 10' X 10" recovery pen (one pronghorn per pen). One at a time, pronghorn will be given the appropriate reversal drug as determined by the

veterinarian (likely Naltrexone for A3080 and Tolazoline for Xylazine), and allowed to recover in the pen under the watch of a veterinarian. When the veterinarian deems the first animal has recovered enough, it will be released into a larger holding pen or the captive breeding pen (i.e., Kofa NWR pen). After the pronghorn have been released into the holding pen, personnel and helicopter will return to the CPNWR pen. Personnel will be stationed at the release site to assist with transport of pronghorn and to monitor pronghorn after their release into the holding pen. Pronghorn will be held in the holding pen until all animals going to that release site have been moved, had time to form a new herd, and acclimated to their new surroundings. This may take a few days to a few weeks.

4. Release into the Wild or Other Captive Breeding Pens Using Trailer Transport

After processing, these animals will be placed in a transport trailer staged nearby. They will be kept in the trailer until all the animals to be released have been processed out of the boma complex. They will be driven to a holding pen or captive breeding pen. Because these animals will have been tranquilized for trailering with no option for a reversal drug, they will be held until the effects of the tranquilizer wears off. Pronghorn will be held at least overnight and until the veterinarian deems them ready to be released into the wild. If necessary, a veterinarian and/or veterinary technician will stay with the pronghorn overnight in case of an emergency.

Emergencies

In the event that one of the pronghorn designated for any transport is not doing well under physical restraint or anesthesia, the protocol will have to be re-assessed on the spot. The lead veterinarian and recovery team leader will decide the best course of action. This may include immediate release inside the captive breeding pen, or just outside the captive-breeding pen. Alternative treatments may include full anesthesia. Once under anesthesia further treatment can be administered.

Dart Capture

Pronghorn in the captive breeding pen that need to be moved, but were not caught in the boma traps may be darted. Pronghorn will be darted from blinds at feeders, waters, or other baited areas by trained and experienced personnel, using A3080/Xylazine and Ketamine (or other appropriate drug combination determined by the veterinarian). Ketamine will not be used unless the animal is going to be transported out of the pen. Observers will be located on both hills and in the towers. A medical team will assemble at a staging area to wait until pronghorn are darted.

Darting teams and observers will be in radio contact. Observers will watch the darted pronghorn until they are down and then radio the darters with the location of the downed pronghorn. A medical team will then be sent in to attend to the pronghorn. Pronghorn will be blindfolded and given oxygen, drugs and/or medications as determined by the veterinarian. Pronghorn will be processed, marked, transported, and released in the same manner as the boma capture.

Wild Captures, Handling, and Release

Wild pronghorn are occasionally captured to 1) move a new breeding animal(s) into the captive breeding pen at CPNWR to maintain the genetic health of the captive herd, or 2) radio-collar them for monitoring purposes. The latter of the two is a lower priority now that animals released from the captive breeding pens are fitted with radio-collars; however, on occasion it may be determined to be beneficial for monitoring and recovery purposes. Over the next five years, a total of about four to six animals may be captured for placement in the CPNWR and/or Kofa NWR pens and eight to ten animals may be captured for monitoring purposes (i.e., an approximate maximum of 16 wild captures over the next five years).

These capture operations will only be conducted during the months of December and January, when temperatures are cooler, to reduce the risk of hyperthermia in pronghorn. The crews described below are comprised primarily of Federal and State agency personnel; however, FWS-CPNWR and AGFD are the primary responsible parties for planning and implementing all capture operations.

Pronghorn will be captured in the wild using a helicopter for wildlife capture and either a net fired from a CODA net gun or a dart fired from a dart gun by experienced personnel. Two helicopters will be used during any attempt to net gun or dart pronghorn: one helicopter will be dedicated to the actual pursuit and capture of individual pronghorn, the second helicopter will be used to transport the support crew and equipment associated with the ground crew and will follow the first, but at a safe distance, causing no interference with the capture operation. The observer will initially restrain each pronghorn, placing a blindfold over the animal as soon as possible. The gunner will assist the observer as soon as the initial restraint is completed. A veterinarian with experience in treatment of stress and trauma problems in large animals will be present at every capture and may ride in the second support helicopter but shall be on the scene immediately after the capture. The support crew will assist the veterinarian with medical supplies and support materials. To prevent overheating and excessive stress, pronghorn will be given a saline solution intravenously and oxygen administered through a mask. The temperature and a 20 cc blood sample will be collected from each animal to the extent possible without jeopardizing the animal.

Pronghorn to Be Collared and Released on Site

If the animal was caught using the net gun, no drugs will be administered unless deemed necessary by the veterinarian. The pronghorn will receive either a VHF or GPS collar and/or eartag(s) and be released on site. If the pronghorn was caught using the dart gun method, the pronghorn will receive either a VHF or GPS collar and/or eartag(s), and be given the appropriate reversal drug by the veterinarian, allowed to recover, and released on site.

Pronghorn Going to the Captive Breeding Pen

Pronghorn being transported to the captive breeding pen will be given A3080/Xylazine and Ketamine (or other appropriate drug combination determined by the veterinarian). They will be flown by helicopter to the pen, transported on stretchers into a small 10' X 10' recovery pen inside the captive pen, given the appropriate reversal drugs, allowed to recover, and released into the larger pen. They will have received either a VHF collar and/or eartags.

To reduce the chances of mortality during a wild capture operation, the following protocol will be followed:

- If drought conditions occur (i.e. if it has not rained in three months, the environment starts to display drought stress, and creosote bushes start turning brown) in the months preceding, the scheduled operation will be canceled;
- Only adults will be captured;
- Animals will be pursued uphill where possible to limit chase speeds;
- Each pronghorn will be netted or darted at heights from 5 to 30 feet above the animal, in a manner that minimizes the risk of injury;
- No capture will be initiated when ambient temperatures are over 75 degrees Fahrenheit;
- Captures in extremely rocky broken terrain, or where injury to an animal is likely, will not be undertaken;
- If fawns are separated from a group during the chase, the chase will be aborted;
- No pronghorn shall be chased for more than five minutes with chase time beginning when pronghorn are continuously running from the helicopter or fixed-wing aircraft; and
- A group of pronghorn may not be chased more than once every seven days.

Surveys and Monitoring

Biennial Surveys

To accurately monitor Sonoran pronghorn population trends, range-wide aerial surveys of Sonoran pronghorn will take place in Arizona every two years. These surveys will be conducted by two trained observers from a small fixed wing aircraft using the methods described below.

- **Survey Blocks** - The survey areas are partitioned into blocks flown by fixed wing aircraft in north/south transects for one to three hours. Transects are flown along every half degree of longitude (i.e. approximately 0.5 miles apart), at 200 feet above ground level (AGL), and at 148 km/hour (80 knots).
- **Observers** - Observers are located in the right front and left rear seats of each plane during each survey. Three or four fixed-wing planes are used each day.
- **Timing** - Surveys are conducted in the early morning and late afternoon to take advantage of optimal light.
- **Data Recorded** - Pronghorn group size, location, behavior, and direction of movement are recorded for each observation. Group composition is recorded, if possible, without disturbing the pronghorn.

Currently in Arizona, pronghorn are surveyed on CPNWR, Barry M. Goldwater Range (BMGR), and parts of Organ Pipe Cactus National Monument (OPCNM). Sonoran pronghorn in the 10(j) population are not currently surveyed; however, they will be in the near future.

Monitoring

Monitoring via periodic aerial and ground telemetry, as well as by using motion-activated cameras, will occur year round to assess population status, productivity and recruitment, habitat use, mortalities, etc. Monitoring methods are described below.

- **Aerial Telemetry** - Aerial telemetry from fixed-wing planes occurs at least 1,000 feet AGL to avoid disturbing the pronghorn. It is typically conducted every other week, but frequency is based on a variety of factors (e.g., funds, personnel, weather).
- **Ground Telemetry** - Occasional ground telemetry is conducted; for example, when a mortality is detected, personnel investigate as soon as possible to attempt to determine the cause of death. Personnel conducting ground telemetry avoid disturbing pronghorn.
- **Motion-Activated Cameras** - Motion-activated cameras are used to monitor Sonoran pronghorn. Cameras are placed in areas (e.g., at water sources) to obtain photos without disturbing pronghorn. Personnel check/change batteries and camera cards, and maintain the cameras as needed.

Forage Enhancements, Alfalfa Feed Stations, and Water Developments

AGFD personnel will maintain and implement forage enhancement plots, pump water, and turn valves to achieve the desired irrigation scheme as needed to achieve optimal forage conditions to sustain existing Sonoran pronghorn populations. There are currently five functioning forage enhancement plots within the range of the endangered Sonoran pronghorn. Each of these plots has a water well, water storage tanks, generators, PVC pipelines, valves, and smaller irrigation lines to disperse water to areas of favorable native forage. Each plot also has a free-standing water source.

AGFD personnel provide alfalfa hay to supplement forage at several water sources and forage enhancement plots. This operation includes hauling alfalfa bales to the plots, dispersing them into the feeders, and removing any waste. Periodic maintenance of the wooden feeders is also conducted.

AGFD personnel also monitor and maintain all additional waters within the range of Sonoran pronghorn, and occasionally haul water via truck, helicopter, or hose-lays. There are currently 13 additional water sources for Sonoran pronghorn in the CPNWR and BMGR, and four on Kofa NWR. These waters consist of underground storage tanks connected to a ground-level drinking trough. There are several small dams in nearby washes which are plumbed to the storage tanks and fill storage tanks during precipitation events.

Captive Breeding Pen Maintenance

Currently there are two captive breeding pens. The CPNWR pen is located in Child's Valley on the east side of CPNWR and the Kofa NWR captive breeding pen is located in King Valley on Kofa NWR. AGFD will continue to maintain and monitor Sonoran pronghorn captive breeding pens as necessary to reach recovery goals. AGFD personnel monitor the pens and pronghorn on a near daily basis, observing all pronghorn, assessing their condition, recording productivity, recruitment, and mortalities, and assuring there are sufficient supplies of alfalfa, pelleted food, and water daily. Personnel also check the woven wire and electric fences, irrigate the pen as needed, and conduct all other aspects of maintaining the pen. Personnel monitor pronghorn and the enclosure from observation towers near the pen. Each tower is covered with military surplus camouflage netting to reduce the visual impact of the structures. A dirt road about 12 feet wide surrounds the perimeter to provide access for management and security purposes, including serving as a fire break.

STATUS OF THE SPECIES - SONORAN PRONGHORN

A. Description, Legal Status, and Recovery Planning

The Sonoran subspecies of pronghorn was first described by Goldman (1945) and is the smallest of the four subspecies of pronghorn (Nowak and Paradiso 1983, Brown and Ockenfels 2007). 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. Four populations of the Sonoran pronghorn are extant: 1) a U.S. population in southwestern Arizona on CPNWR, OPCNM, BLM – Ajo Block, and BMGR (endangered population), 2) a population in southwestern Arizona on Kofa NWR, YPG, and surrounding areas (nonessential experimental 10(j) population) (established in 2013), 3) a population in the Pinacate Region of northwestern Sonora, and 4) a population on the Gulf of California west and north of Caborca, Sonora. The four populations are predominantly geographically isolated due to barriers such as roads and fences. Recently in Arizona 2014, several individuals (from the endangered population) crossed Highway 85 and spent some time on the east side of OPCNM within the nonessential experimental range of the species. Although animals that cross Highway 85 into the eastern portion of OPCNM (i.e., within the nonessential experimental boundary) are biologically considered part of the endangered population in Arizona, for section 7 purposes they are treated as part of the nonessential experimental population (USFWS 2011).

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.

The FWS and the Sonoran Pronghorn Recovery Team are currently revising the Sonoran Pronghorn Recovery Plan. The revised plan will address Sonoran pronghorn populations both in Mexico and the U.S. and will be finalized in 2015.

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. Within the endangered Arizona pronghorn range, fawning may occur throughout the range. Does usually have twins, and fawns suckle for about two 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 within the endangered Arizona range 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 (also in the Arizona endangered range) 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 the endangered Arizona pronghorn range, 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 in the endangered Arizona range 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 $96\% \pm 0.04$ and $92\% \pm 0.04$ (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 causes of these mortalities were likely heat stress and/or malnutrition resulting from inadequate forage conditions due to drought.

C. Distribution and Abundance

United States

Endangered Wild Population

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 3). 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 1). 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). Table 2 presents observation data from transects and compares estimates derived from the different population models from 1992 through 2006, plus other estimates 2008 to 2012. 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 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. endangered 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 Río 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 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 (T. Tibbitts, J. 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 cross-border violator (CBV) traffic, smugglers, and required law enforcement response, as compared to what occurs in the El Pinacate area, was 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, 2006, 2008, 2010, and 2012 aerial surveys resulted in an estimated 58, 58, 68, 85, and 159, respectively, pronghorn in the U.S. endangered population (Tables 1 and 2), a substantial increase brought on by the implementation of ongoing recovery measures and improved range conditions since 2002. The 2006, 2008, and 2012 estimates included a number of captive-born individuals that were newly released into the wild (see below for more information on the captive breeding programs). During the 2008 and 2010 surveys, observers noted a skewed sex ratio (approximately 2:1) with more males than females; this affects the rate at which the population may increase.

Since 2002, when the Sonoran pronghorn population in Arizona declined to about 21 animals, recovery efforts of the Sonoran Pronghorn Recovery Team and its partners have helped the wild population in Arizona increase nearly eight-fold. Key recovery actions include implementing captive breeding, waters, and supplement feeding programs, as well as operating forage enhancement plots. Although the U.S. Sonoran pronghorn population has increased significantly, until the most recent survey of 2012, the increase was not as great as the Sonoran Pronghorn Recovery Team had predicted given the adequate to favorable range conditions since 2002, as well as the previously mentioned recovery efforts. Some members of the Sonoran Pronghorn Recovery Team believe that this slow pronghorn population growth (caused by low fawn recruitment) is likely correlated with high CBV and U.S. Border Patrol (USBP) activity within the pronghorn range. Strong evidence of this correlation has been seen during the biennial aerial surveys where, since 2000, off-road vehicle tracks have been seen progressively increasing in extent and density, throughout the endangered pronghorn's U.S. range (electronic mail from Tim Tibbitts, Organ Pipe Cactus National Monument and member of the Sonoran Pronghorn Recovery Team, September 21,

2009). Between 2010 and 2012, the wild pronghorn population benefitted from better than average rainfall during 2011 and 2012 which resulted in a robust fawn crop of 78 fawns per 100 does during 2012.

In addition to the endangered population described above, a wild population is currently being reestablished at the Kofa NWR as an experimental, nonessential population under section 10(j) of the Act (see more detailed information below).

Semi-captive Breeding Facilities and 10(j) Wild Population

As part of a comprehensive emergency recovery program, a total of 11 adult pronghorn (10 females and one male) were initially captured (from Sonora and Arizona) and placed into a semi-captive breeding pen at CPNWR in 2004. The breeding program has been very successful and there are currently (as of September 2014) 88 pronghorn in the enclosure at CPNWR. Since establishing the program, about 19 pronghorn older than current year have died in the pen due to various causes, including one confirmed case of epizootic hemorrhagic disease, two from malnutrition prior to the introduction of alfalfa hay in the pen, two from bobcat predation, one from entanglement in the fence, and two from capture operations. Eight deaths were from unknown causes and although disease was suspected, it could not be confirmed. Sonoran pronghorn have been released from the pen every year since 2006. As of January 2014, about 100 individuals have been released into the endangered population, many of which are known to still be alive.

The objective is to produce at least 20 fawns each year to be released into the current U.S. population, and to establish additional U.S. populations at Kofa NWR and BMGR East, east of Highway 85. The additional populations are being established as experimental, nonessential populations under section 10(j) of the Act. A final Environmental Assessment and final 10(j) rule (USFWS 2011) were published in April and May, 2011, respectively. See Figure 2 for a map of 10(j) Nonessential Experimental Population area for Sonoran pronghorn in southwestern Arizona. In December 2011, 13 Sonoran pronghorn were moved from the CPNWR breeding pen to the newly built breeding pen in the King Valley on Kofa NWR. One of the animals died due to capture myopathy and one died of unknown causes, leaving 11 (9 does and 2 bucks) in the pen for breeding purposes. In December 2012, 11 additional pronghorn were moved to the Kofa NWR from the CPNWR breeding pen, including two replacement breeder does for the Kofa breeding pen and nine pronghorn (three does and six bucks) for release into the wild. In September 2012, one adult doe was killed by a bobcat in the Kofa breeding pen. In December 2013, 16 additional pronghorn were moved to the Kofa NWR from the CPNWR, all of which were for release into the wild (one doe, however, had to be moved back into the breeding pen). As of September 2014, the Kofa pen contains 31 pronghorn.

Sonoran pronghorn have now been released in the King Valley on Kofa NWR in January 2013 (9 animals) and January 2014 (24 animals, including 9 from the Kofa pen and 15 from the CPNWR pen). There were some mortalities among the 2013 released animals but some are still alive. All 24 of the animals released in 2014 are still alive and 10 wild-born fawns were documented and also believed to still be alive as of September 2014. Therefore, in total there should be about 27 wild adult pronghorn and 10 fawns in the 10(j) population, as of September 2014.

Additionally, recently in Arizona in 2014, several individuals (from the endangered population) crossed Highway 85 and spent some time on the east side of OPCNM within the nonessential essential experimental range of the species. Although animals that cross Highway 85 into the eastern portion of OPCNM (i.e., within the nonessential experimental boundary) are biologically considered part of the

endangered population in Arizona, for section 7 purposes they are treated as part of the nonessential experimental population (U.S. Fish and Wildlife Service 2011).

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 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). Since 2000, the two Mexico sub-populations have been resurveyed biennially, with the exception of the winters of 2004/05 and 2005/06, when they were surveyed both years, and the winter of 2013/2014 when the Pinacate sub-population could not be surveyed. In December 2002, a 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) (684 total estimated, 469 total observed). In 2004, several capture-related mortalities occurred in Sonora associated with efforts to capture pronghorn to stock the breeding pen in Arizona. Since then, capture protocols were examined and improved. In January 2006, surveys indicated that pronghorn numbers remained relatively 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.

In December 2007, surveys indicated pronghorn numbers declined with an estimated total of 404 (360 observed) individuals combined for both populations (including 354 pronghorn [325 observed] in the area southeast of Mexico Highway 8 and 50 [35 observed] to the west of the highway). Of these pronghorn, four pronghorn (three does and 1 buck) from the Pinacate Biosphere Reserve were captured and fitted with GPS radio collars. The male was found dead during a subsequent telemetry flight; his death was likely capture-related as his temperature rose dangerously high during the collaring effort. The decrease in Sonoran pronghorn population in Sonora from 2006 to 2007 is likely attributable, at least in part, to drought conditions in the pronghorn range in Mexico. During the aerial surveys, observers noted many extremely dry areas and some areas where the vegetation appeared dead in the pronghorn range. Additionally, an increasing number of fences and mine expansion within the range of the southeastern pronghorn population may be adversely affecting this population. In December 2009, surveys indicated pronghorn numbers increased somewhat with an estimated total of 482 (311 observed) individuals combined for both populations (including 381 pronghorn [258 observed] in the area southeast of Mexico Highway 8 and 101 [53 observed] to the west of the highway). In December 2011, surveys indicated pronghorn numbers drastically decreased with an estimated total of 241 (197 observed) individuals combined for both populations (including 189 pronghorn [167 observed] in the area southeast of Mexico Highway 8 and 52 [30 observed] to the west of the highway). In December 2013, surveys could not be conducted for the Sonoran pronghorn population west Mexico Highway 8 (Pinacate region) due to aircraft

shortage; however, surveys of the population in the area southeast of Mexico Highway 8 indicated pronghorn numbers increased since 2011, with an estimated 2013 total of 434 (372 observed) (Table 3).

D. Threats

Barriers that Limit Distribution and Movement

Highways, fences, railroads, developed areas, and irrigation canals can block access to essential forage or water resources. Brown and Ockenfels (2007) report that numerous railroad and highways bisect what was former contiguous pronghorn habitat, often dividing these rangelands into parcels too small to support, viable, long-term populations of pronghorn in Arizona. Furthermore, they state railroads and paved highways are especially restrictive, as in addition to acting as intimidating barriers in their own right, they are often fenced on both sides of the right-of-way.

Highways 2 and 8 in Sonora, and SR 85 between Gila Bend and Lukeville, Arizona support a considerable amount of fast-moving vehicular traffic, are fenced in some areas, and are likely a substantial barrier to Sonoran pronghorn (one pen-raised radio-collared male crossed SR 85 and Mexican Highway 2; however, this is considered highly unusual). Interstate 8, the Wellton-Mohawk and Palomas Canals, agriculture, a railroad, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn.

Canals have been the cause of six pronghorn deaths since 2008. Three pen-raised pronghorn drowned in the Palomas Canal in 2008, one pen-raised pronghorn drowned in the Wellton Canal in 2010, and two pen-raised pronghorn (part of the 10(j) population) died due to falling in the Wellton-Mohawk Canal in 2013 (specifically, one drowned and one died within days after being rescued from the canal).

De-watering of reaches of the Río Sonoyta and lower Gila River has also 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 Río Colorado, Sonora; in the Mexicali Valley, Baja California; and at Ajo, Yuma, and along the Gila River, Arizona, have further removed habitat and created barriers to movement.

Vehicular Collision with Sonoran Pronghorn

Although vehicle collisions with Sonoran pronghorn are rare, it has been documented. An adult male pronghorn was struck and killed by a vehicle near kilometer post 29 on Mexico Highway 8 in July of 1996 (U.S. Fish and Wildlife Service 2002). National Park Service (NPS) records include a Sonoran pronghorn found dead just east of SR 85 along Ajo Mountain Drive in 1972. It was suspected to have been struck and killed by a vehicle (electronic mail from Tim Tibbitts, OPCNM, September 1, 2011). In 2003/2004 John Hervert (AGFD) investigated a Sonoran pronghorn mortality found a few hundred feet from Interstate 8. It had a broken leg, and so vehicle collision was suspected. In 2013, a doe was found dead east of Tacna on private property; based on initial examination it appears she may have been hit by a vehicle along a high speed dirt road. We are trying to open a FWS investigation so that the animal can be sent to our forensics lab for further investigation.

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; CBV activity across the international border and associated required law enforcement response; and roads, fences, canals, and other artificial barriers.

Of the aforementioned human activities, in the U.S. range of the endangered pronghorn, CBV activity and required law enforcement response is the most significant current source of disturbance to Sonoran pronghorn and its habitat. As a result of increased presence of the USBP in more developed areas, CBV traffic has shifted into remote desert areas, such as CPNWR, OPCNM, and BMGR (Klein 2000). In 2001, estimates of CBVs reached 1,000 per night in OPCNM alone (Organ Pipe Cactus National Monument 2001), and an estimated 150,000 people entered the monument illegally from Mexico (Milstead and Barns 2002). Apprehensions of CBVs in the USBP Tucson Sector-Ajo Station's Area of Responsibility peaked to 22,504 in 2006. However, after construction of the border vehicle fences on OPCNM in 2006 and CPNWR in 2009, apprehensions declined to 17,385 in Fiscal Year 2011. Illegal drive-throughs in particular declined after the construction of the fences. Since the SBInet towers and infrastructure became operational in late 2010 in the Ajo Station's Area of Responsibility, the number of apprehensions has increased. This increase is believed to be attributable to increased CBV activity, as well as increased USBP effort, tactical infrastructure, and technology in the area which have improved USBP's ability to detect and apprehend CBVs (personal communication with USBP, September 1, 2011).

In fiscal year 2005, the Yuma Sector of the USBP apprehended record numbers of CBVs, and from October 1, 2005 to May 2006, 96,000 arrests were made, which was a 13% increase over the same time period in 2005 (Gerstenzang 2006). The Wellton Station of the Yuma USBP Sector made 2,080 apprehensions in fiscal year 2005 and 3,339 apprehensions from October 2005 to February 2006 (personal communication with USBP, February 10, 2006). USBP officials have indicated, however, that apprehensions in recent years have dramatically declined in the Yuma Sector, particularly in the western portions of the sector, due to USBP presence at Camp Grip, increased numbers of agents, and recently completed tactical infrastructure.

Both CBV and USBP activities have resulted in increased human presence in and widespread degradation of Sonoran pronghorn habitat. Much of the CBV traffic travels through the southern passes of the Growler Mountains that lead either through or by all of the forage enhancements and the captive rearing pen in the Child's Valley, with potential to impact these recovery projects and use of the area by pronghorn (personal communication with Curtis McCasland, CPNWR, 2007).

There is anecdotal evidence that pronghorn are avoiding areas of high CBV traffic and law enforcement activities (personal communication with Curtis McCasland, CPNWR, 2007). This may be especially true during periods of poor range conditions. For example, according to Customs and Border Protection (CBP) records, a drag road adjacent to the current Granite Forage Enhancement Plot (FEP) in the Wellton Station Area of Responsibility was created in 1996 and has been in use since before the FEP was installed. However, at the time the FEP was being planned, this was only a two-track trail with little use (electronic mail communication with John Hervert, AGFD, October 3, 2012). Wellton Station has confirmed that USBP use of this drag road has increased in recent years in response to an increase in illegal activities in the area. In spring of 2009, AGFD reported that they believe that three does with fawns abandoned the Granite Forage Enhancement Plot (FEP) due to the high amount of USBP activity at the site (electronic mail from John Hervert, AGFD, September 16, 2009). The does were later observed at OPCNM; however, the fawns died (electronic mail from John Hervert, AGFD, September 16, 2009). Instances such as these are more likely to occur during periods of poor range conditions and the impacts are likely exacerbated, regardless of the source of disturbance or impact on the pronghorn.

The Camp Grip FOB, located within the current range of the pronghorn, was established in 2005. In 2011, FWS completed an analysis of whether the Camp Grip FOB resulted in impacts on Sonoran pronghorn movement patterns. FWS analyzed available AGFD Sonoran pronghorn location data from radio-collared animals and results of this analysis were inconclusive as to whether Camp Grip had any impact on Sonoran pronghorn movement; however, documenting pronghorn movement can be difficult, particularly when only a very small portion of the wild population is radio-collared. These inconclusive results were also in part due to the many complex factors involving Sonoran pronghorn movement, including artificial feeding and watering of the animals across the species' range. Initial data from radio-collared pronghorn locations appeared to indicate a potential reduction in use of areas in the vicinity of Camp Grip (electronic mail from Mark Sturm, OPCNM, August 31, 2011). Data from 2012 have shown several occurrences of pronghorn in the vicinity of Camp Grip. This may be due to the increased number of pen-reared pronghorn that have been released and that have been exposed on a more regular basis to human activity at the pens (electronic mail from Jim Atkinson, CPNWR, October 5, 2012). Data also indicate a northerly shift in habitat use since Ajo-1 SBInet implementation, which coincides with a documented increase in impacts. This result is despite the presence of abundant and good habitat conditions in areas nearer the border during 2011.

Another FOB, the Bates Well FOB, was exclusively occupied by USBP from 2005 to 2011. During the operation of the FOB, no pronghorn were documented entering the Valley of the Ajo through the Bates Well pronghorn migration corridor. The establishment of the FOB coincides with a drastic decline in pronghorn (attributable to drought and an increase in border activity); therefore, changes in use of Bates Well area by pronghorn may be in part due to decreased population size, however the increased human presence at Bates Well, particularly during the fawning period, may have acted to prevent Sonoran pronghorn movements through the area and into the Valley of the Ajo. Even as the pronghorn population increased, they continued to avoid the Bates Well migration corridor while the Bates Well FOB was still in operation. Considering the sensitivity of pronghorn to human activity, it is likely that pronghorn avoided use of the area due to the high level of human activity currently associated with the site. During 2011, the USBP relocated the Bates Well FOB to a new site in the far western portion of the OPCNM along the ECDD at the CPNWR boundary. The new FOB is centrally located within the southern Growler Valley, an area that pronghorn generally avoid during the summer months. Since the Bates Well FOB was relocated, a holding pen for pronghorn releases was constructed near the site and in 2012 released pronghorn moved from that location back into the Valley of the Ajo.

It has been well documented that human presence in wildlands can disturb animals, causing them to unnecessarily expend energy avoiding people, thereby potentially reducing reproductive success (e.g., Manville 1983, van Dyke *et al.* 1986, Goodrich and Berger 1994, Primm 1996; as cited by Kerley *et al.* 2002) or increasing the likelihood of fatal encounters with humans (Kasworm and Manley 1990, Saberwal *et al.* 1994, Khramtsov 1995, Mattson *et al.* 1996; as cited by Kerley *et al.* 2002). Range abandonment has been documented in response to human disturbance (Jorgenson 1988), and investigators have shown that heart rate increases in wildlife 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). Disturbances that cause pronghorn to startle and run would energetically have a more significant effect during times of drought. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971).

Studies of 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. Luz and Smith (1976) observed pronghorn reactions to overhead helicopter flights which suggested mild disturbance (muscle tensing and interruption of grazing) by helicopter noise levels at approximately 60 dBA and strong reaction (running) at approximately 77 dBA.

Studies of the effects of low-level helicopter flights on other ungulates suggest pronghorn may react more to this type of stimulus than other types of overflights. Helicopters, particularly low-level hovering helicopters, elicit greater responses than fixed-wing aircraft or aircraft flying at higher elevation (Workman *et al.* 1992, Weisenberger *et al.* 1996, Luz and Smith 1976). Bighorn sheep have been documented to abandon their range in response to human disturbance, including human activity and helicopter activities (Jorgenson 1988). Pronghorn would be expected to move greater distances and respond for a longer period of time to helicopters than to fixed-wing aircraft. In a study of disturbance effects to pronghorn in Utah, pronghorn exhibited the greatest response to a hovering Huey helicopter flown at 500 feet AGL (Workman *et al.* 1992). Luz and Smith (1976) found that pronghorn ran from a low-flying helicopter. Habituation by pronghorn to sonic booms and low-level overflights by F-16 aircraft and Huey helicopters was observed by Workman *et al.* (1992). However, pronghorn did not habituate to low-level hovering by a Huey helicopter.

A number of studies have specifically investigated the effects of human activities on Sonoran pronghorn (Hughes and Smith 1990, Landon *et al.* 2003, Krausman *et al.* 2004 and 2005, OPCNM 2013, and the ongoing study by Doerries 2014). Landon *et al.* (2003) evaluated whether Sonoran pronghorn used areas, as defined by noise levels produced by military aircraft, in proportion to their availability on the BMGR. Using 15% of the Arizona Sonoran pronghorn population, they studied pronghorn use of areas with varying sound pressure (ambient sound) levels and found that pronghorn did not use the areas with different ambient sound levels in proportion to their availability. In general, they found that Sonoran pronghorn select areas with the lower noise levels and avoid areas with the higher noise levels; however, they did not consider habitat in their analysis. Whether pronghorn avoid these areas because of the noise or because of some other human-related factor is unknown; however, the various potential factors (i.e. noise levels, human presence, reduced vegetation or cover, disturbance) are interrelated. Hughes and Smith (1990) found that Sonoran pronghorn immediately ran 1,310- 1,650 feet from a vehicle, and that military low-level flights (less than 500 feet above the ground) over three pronghorn caused them to move about 330 feet from their original location.

Krausman *et al.* (2004) examined effects of military aircraft and ground-based activities on Sonoran pronghorn at the North and South tactical ranges (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). On days with stimuli, adult pronghorn bedded more than they foraged (Krausman *et al.* 2004). On days without stimuli, adult pronghorn foraged more and bedded less. Ground stimuli including the presence of vehicles or people and comprised the majority (65%) of all anthropogenic stimuli. Ground stimuli were associated with 866 instantaneous changes in behavior (39%), with 56 of these changes to trotting or running (2.6%). During direct overflights (less than or equal to 100 m to the side of animals), pronghorn changed behavior (e.g., from bedded to standing, walking to bedded, foraging to bedded) 45 times (41%) with 4 changes from any other activity to trotting or running (3.7%). During overflights greater than 100 m to the side of animals, pronghorn changed behavior 105 times (34%), with 5 changes to trotting or running (1.6%). In response to stimuli,

Krausman *et al.* (2004) only considered a change in behavior to trotting or running in response to stimuli as biologically significant. The authors concluded that these changes were not likely to be detrimental to the animals; however, sightings of Sonoran 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.* 2005). No specific conclusions could be drawn about effects of military activities on fawns during the Krausman *et al.* (2004) study, but the data suggests that fawns and their mothers may be more sensitive to anthropogenic stimuli than other pronghorn. In general, the study did not detect differences in the behavior of pronghorn with and without military stimuli; however, Krausman *et al.* (2004) recommends that all ground stimuli and activities that alerts or startles females and their fawns should be terminated.

In more recent studies, staff at OPCNM (2013) documented that during their typical morning activity period (post-sunrise), pronghorn on OPCNM experienced some form of potential disturbance once every 4 hours 10 minutes (even though monitoring was only conducted for 3 hours after sunrise each day, the results were calculated by summing the total number of observation hours and dividing by them by the total number of disturbance events). Actual disturbance responses took place once every 6 hours 15 minutes. Potential disturbance events resulted in the pronghorn running, about once every 8 hours 20 minutes. Helicopter overflights took place once every 6 hours 15 minutes; one out of four overflights resulted in pronghorn running, and one in four resulted in vigilance (standing, alert, watching disturbance source). Vehicles approaching within one mile occurred once every 12 hours 30 minutes. Half of these resulted in pronghorn running, but for the other half, the driver was contacted by radio and advised to drive slowly (<10 mph) past the observation area. These observations only represent pronghorn and human activity in the first 3 hours after sunrise, in a specific area of OPCNM. Types and intensities of activities likely vary through the 24-hour cycle, and across the landscape. These observations led to speculation that the levels of illegal border-related traffic in the area, and interdiction efforts, may have been sufficient to inhibit use of the area and 3-Jack Tank by Sonoran pronghorn.

Preliminary information from an ongoing study on the effects of human disturbance on Sonoran pronghorn indicates that pronghorn consistently exhibit visual responses to human activity, particularly vehicles traveling on a road within several kilometers. Although some instances have been noted where a pronghorn did not exhibit a visual response (for example, one buck did not appear disturbed by three vehicles driving at least 25 miles per hour about 1.5 kilometers away); most observations indicate that pronghorn exhibit a spectrum of responses, from standing vigilant to running from the stimulus. For example, eight Sonoran pronghorn were observed running a short distance and then vigilant towards utility vehicle noise 3.4 kilometers away. Another eight Sonoran pronghorn were observed running from several trucks traveling fast (> 25 mph). Pronghorn were initially vigilant when the vehicles were 1.3 kilometers away but soon started running, travelling over 3.6 kilometers in under five minutes until they were out of sight of the observers (email from Stephanie Doerries, University of Arizona, May 7, 2014).

While specific studies related to the physiological effects of disturbance on Sonoran pronghorn are extremely limited, some information regarding how these effects are manifest in other wildlife may be helpful in assessing the potential effects to pronghorn. Physiological effects of noise on wildlife can include stresses to neural, endocrine, digestive, cardiovascular, and immune systems as well as reproductive function, causing changes such as increased blood pressure, available glucose, and blood levels of corticosteroids (Manci *et al.* 1988, Kaseloo and Tyson 2004, Keay *et al.* 2006). However, available research evaluating physiological impacts of human stressors on wild animal populations also indicates that the responses of species are variable (Manci *et al.* 1988, Larkin 1996, Radle 1998, Kaseloo and Tyson 2004, Stankowich 2008). We believe that, given the information in the above studies, it is possible that Sonoran pronghorn could have a physiological stress response to disturbance without

showing an overt behavioral response. To have a population effect, behavioral and physiological responses to disturbance must ultimately affect survival and productivity, and to date, no research efforts have supported or refuted population level impacts on pronghorn from physiological stress. At some point, increased energetic costs resulting from a stress-related increase in metabolic rate, reduced foraging efficiency due to interrupted feeding, and alarm and flight responses could jeopardize survival and productivity if the disturbance is stressful enough and chronic (Bright and Hervert 2005, deVos and Miller 2005).

Habitat Disturbance

A number of threats, including livestock grazing, mining, and off-road vehicle and pedestrian activity can alter or destroy Sonoran pronghorn habitat. 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, but cattle typically stay close to feed and water except in seasons with abundant annual growth when cattle range widely in the Pinacate region.

Mining occurred historically throughout much of the U.S. range of the pronghorn, but it 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 were noted in habitats used by the sub-population located southeast of Highway 8.

As discussed above, CBV activities and required USBP response have resulted in increased human presence in remote areas and widespread habitat degradation. Prior to the completion of the vehicle fences on OPCNM and CPNWR (construction was started on these fences in late 2003 and 2007 and completed 2006 and 2009, respectively), CBVs frequently crossed the border in vehicles and created countless illegal routes, many of which were continuously used both by CBVs and responding USBP agents. Subsequent to the construction of the vehicle fences on OPCNM and CPNWR, CBV vehicular traffic was significantly reduced (there are occasional breaches in the fence; however, this CBV vehicular activity represents a fraction of that prior to the presence of the fences and are usually limited to smaller all-terrain vehicle (ATV) like vehicles). NPS notes that CBV vehicle activity has decreased at OPCNM since about 2004 (electronic mail, Tim Tibbitts, OPCNM, 2009 and 2011); however, the number of off-road tracks, and new unauthorized vehicle routes in OPCNM continues to increase (electronic mail, Tim Tibbitts, OPCNM, September 1, 2011). Decreased CBV vehicle traffic in pronghorn habitat as a result of the fences has alleviated the adverse effects of this traffic on pronghorn and their habitat. USBP, however, continues to respond (mostly by truck, but also by ATV, horseback, foot, and aircraft) to ongoing CBV activity in these areas. Frequently, this required response involves driving off of authorized roads which, when conducted in pronghorn habitat, results in significant degradation of pronghorn habitat and disturbance to pronghorn as discussed above. For instance, all the valleys at CPNWR and OPCNM are now criss-crossed with a network of unauthorized vehicle routes (UVR) and trails, even though those areas are designated as wilderness. A mapping effort conducted by CPNWR showed almost 8,000 miles of UVRs as of 2008 in CPNWR. A mapping effort conducted by OPCNM documented about 9,367 miles (15,075 kilometers (km)) of UVRs on OPCNM, the western portion of CPNWR, and the southeastern portion of the BLM Ajo Block, and assigned them to one of four condition classes indicating level of

disturbance (1=least disturbed, 4=most disturbed) (Howard *et al.* 2014). Class I UVRs include routes used once or twice and some vegetation may be present within the vehicle tracks. Class II roads are generally dirt two-tracks with vegetation left and right as well as in the middle of the road still being intact. Class III and IV roads do not have much, if any vegetation, remaining in the middle and are usually multiple lanes wide. Ninety-two percent of UVR mileage was categorized as Class I (usually single-use vehicle tracks); 3.1% was Class II; 4.7% was Class III; and 0.2% was Class IV. There were 742.5 miles (1,195 km) of Class >1 UVRs documented. For UVR classes I, II, III, and IV respectively, the average UVR widths were estimated to be 7.2 feet (2.2 meters (m)), 7.9 feet (2.4 m), 8.4 feet (2.6 m), and 148.3 feet (45.2 m). The Growler Valley, which is shared between CPNWR and OPCNM, had the highest UVR density in the project area.

UVR creation continues to occur in these important pronghorn areas. The proliferation of UVRs is a major impact on multiple resources, and provides an index of the level of human activity currently taking place in pronghorn habitat. A cooperative effort was completed recently by CBP, FWS, NPS, and BLM to map and mark roads within the range of the Sonoran pronghorn to indicate those roads that are open for use by these agencies, and roads that are closed to vehicle traffic. It is hoped that this effort will reduce the use of unauthorized and the associated impacts to Sonoran pronghorn. To date, however, it does not appear that the map is functioning as intended.

Fire

The winter and spring of 2004/2005 were 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 CBVs, 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, CPNWR, February 15, 2006) and more than 63,000 acres burned on the BMGR-East during that time. From 2012-2014, numerous fires were set by CBVs in OPCNM in an attempt to draw attention from illegal trafficking and as desperate measures to draw attention to individuals in duress. Approximately 29,260 acres of pronghorn habitat burned 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 years before trees once again provide thermal cover in wash communities and cholla recover to a point that they are useful forage plants for pronghorn. This said, from 2007 to 2010 pronghorn were attracted to the burned areas, which often supported better growth of annual plants and forbs than adjacent unburned areas. However, in the long term and if these areas continue to burn, removal of thermal cover (trees) and chain fruit cholla, which they depend on in drought, would likely adversely affect pronghorn and probably limit the use of these areas to wetter and cooler periods and seasons.

Drought and Climate Change

As discussed, drought may be a major factor in the survival of adults and fawns (Bright and Hervert 2005), and the major decline in 2002 was driven by drought. Mean annual temperatures rose 1.8-3.6 °F in the American Southwest from 1970-2004, that trend is accelerating, and is predicted to continue through the 21st century and beyond (Intergovernmental Panel on Climate Change 2007). Most of the observed increases in globally averaged temperatures since the mid-20th century are very likely due to the observed

increases in anthropogenic greenhouse gas concentrations (Intergovernmental Panel on Climate Change 2007). In the Sonoran Desert, 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, which will likely cause changes in vegetation communities (Weiss and Overpeck 2005). These increases in temperature are predicted to be accompanied by a more arid climate in the Southwest (Seager *et al.* 2007, Intergovernmental Panel on Climate Change 2007). As a result, the Sonoran pronghorn is expected to be confronted with more frequent drought, which increases the importance of recovery actions, such as forage enhancement plots and water developments, which can offset the effects of drought. Bright and Hervert (2005) indicated that periods of drought may force Sonoran pronghorn to use areas of available forage where predators may be more effective. Thus, climate change and drought may also exacerbate the effects of predation on the Sonoran pronghorn population and management actions should be focused in areas where predation is likely to be less successful.

Historically, pronghorn populations must have weathered 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 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."

Small Population Size and Random Changes in Demographics

In populations of fewer than 100 pronghorn, 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 pronghorn in 2002, the U.S. wild endangered population was critically endangered and likely experienced a substantial loss of genetic diversity resulting from the 2002 bottleneck. At an estimated 159 pronghorn in 2013, the U.S. wild endangered population has dramatically increased but is still below desired numbers. At an estimated 25 pronghorn in 2002 and 52 pronghorn in 2011, the Pinacate population is also well below desired numbers. At an estimated 434 pronghorn in 2013, the third population (southeast of Highway 8) is much closer to, but still below the desired size to maintain genetic diversity. Loss of the U.S. population would dramatically reduce our ability to manage or recover this subspecies. 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, as well as parasites. Epizootic hemorrhagic disease and Bluetongue virus are the most common cause of disease caused die-off in wild pronghorn (Brown and Ockenfels 2007). Blood testing 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.

E. Recovery Actions

A number of critically important recovery projects have been implemented in an attempt to reverse the decline of the U.S. endangered population of the Sonoran pronghorn. These projects are designed to increase availability of green forage and water during dry periods and 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 Río Sonoyta. Many developed and nine emergency water sources (six on CPNWR, one on OPCNM, and two on BMGR West) have been constructed in recent years throughout the range of the U.S. endangered population. Additionally, within the past two years, three permanent catchments for Sonoran pronghorn were constructed in the non-wilderness portion of CPNWR (one) and the BMGR East (two). Additionally, one existing water (Sierra Pinta # 3) within the refuge was recently redeveloped resulting in increased storage capacity from 1,800 gallons to over 10,000 gallons. In 2015, one new water for Sonoran pronghorn within the refuge will be constructed (Agua Dulce # 2) and one existing water (Fawn Hills) will be redeveloped to increase storage. Five forage enhancement plots, each consisting of a well, pump, pipelines and irrigation lines, have been developed to irrigate the desert and produce forage for pronghorn. Additionally, starting in 2009, temporary, experimental feed and water stations were placed strategically within the South TAC to enhance pronghorn fawn survival and recruitment during periods of prolonged drought. The primary purpose was to draw pronghorn away from active military targets as an offset to the target closure distances that were in place at that time. These stations were heavily used by pronghorn during times with poor range conditions brought on by drought.

Plots and waters located in areas with little human activity and better range conditions appear to be more effective (i.e., contribute to fawn and adult survival to a greater degree) than those located in areas of high human activity and poor range condition (i.e., experiencing drought) (personal communication with John Hervert, AGFD, September 16, 2009). Therefore, to ensure success of these measures, it is critical that human activity is avoided or significantly minimized near the plots and waters.

A semi-captive breeding facility at CPNWR was first stocked with pronghorn in 2004; as of January 2014, it contains 61 pronghorn. As described above, these facilities are being used to augment the current U.S. population and the new population north of I-8, as well as to establish additional herds elsewhere within suitable portions of historical range in Arizona and potentially in southeastern California. These crucial projects, which are helping pull the U.S. population back from the brink of extinction, have been cooperative efforts among many agencies and organizations, including FWS, AZGFD, Marine Corps Air Station-Yuma (MCAS-Yuma), Luke Air Force Base (LAFB), OPCNM, CBP, Arizona Desert Bighorn Sheep Society, Arizona Antelope Foundation, the Yuma Rod and Gun Club, the University of Arizona, the Los Angeles and Phoenix Zoos, and others.

ENVIRONMENTAL BASELINE – SONORAN PRONGHORN

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 endangered Sonoran pronghorn’s range, pronghorn interact to form one population in which interbreeding may occur. The U.S. endangered population is effectively separated from populations in the Kofa NWR region by Interstate 8; and 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 endangered pronghorn may affect the size or structure of the U.S. endangered population, or habitat use within the U.S. endangered population range. Therefore, the action area for this biological opinion is defined as the current range of the endangered pronghorn population in the U.S. (Figure 1), plus the nonessential experimental population (or 10(j)) range of the Sonoran pronghorn (Figure 2). The current distribution of Sonoran pronghorn within the nonessential experimental range primarily occurs within Kofa NWR and Yuma Proving Grounds (Figure 4).

Endangered Sonoran Pronghorn Range

Management within the endangered Sonoran pronghorn range portion of the action area is almost entirely by Federal agencies. The BMGR (roughly 1.6 million acres) is managed by LAFB and the 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 refuge 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. OPCNM and CPNWR are critically important for Sonoran pronghorn recovery because of their management for protection of natural resources. Lands on the BMGR are managed primarily for military training, and although important recovery is ongoing on these lands and the Department of Defense has generously contributed to the recovery program both on and off the BMGR, changing military priorities could, in the future, limit the value of the BMGR for Sonoran pronghorn recovery.

Nonessential Experimental Sonoran Pronghorn Range

Management within the nonessential experimental range portion of the action area is also entirely by Federal agencies. The YPG encompasses over 838,000 acres and is managed by U.S. Army Garrison YPG for military testing and training. Kofa NWR encompasses 665,400 acres and is managed by the FWS for desert bighorn sheep and other native wildlife and their habitat.

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

Endangered Sonoran Pronghorn Range

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.

Nonessential Experimental Sonoran Pronghorn Range

The action area is included in the Lower Colorado River Valley Subdivision of the Sonoran Desertscrub Biome. The typical plant species that inhabit the action area include microphyllous trees like western honey mesquite (*Prosopis glandulosa*), ironwood (*Olneya tesota*), foothill and blue palo verde (*Parkinsonia microphylla* and *P. floridum*), and smoketree (*Psoralea arguta*). In dryer and more barren areas the more common desert pavement plants are creosotebush (*Larrea tridentata*), white bursage (*Ambrosia dumosa*), brittlebush (*Encelia farinosa*), teddy bear cholla (*Cylindropuntia bigelovii*), and saguaro (*Carnegiea gigantea*). 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).

C. Status of the Sonoran Pronghorn in the Action Area

Distribution, Abundance, and Life History

Endangered Sonoran Pronghorn Range

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. endangered sub-population. Life history, including demographics, chronology of breeding and movements, diet, and other factors were also described above for the U.S. endangered population.

Nonessential Experimental Sonoran Pronghorn Range

The life history of 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. Sonoran pronghorn historically occurred in valleys around the lower Gila river, likely including the King Valley within Kofa NWR until the early 1800's or early 1900's, although little information population size and specific areas used exists (Brown and Ockenfels 2007, Brown 2008). As described in detail above in the Status of the Species, as of September 2014, there are 27 wild adult pronghorn and 10 fawns in the 10(j) population (herein referred to as the Kofa population). Based on telemetry locations in 2013 and 2014, Sonoran pronghorn are primarily using the King Valley of Kofa NWR, as well as the southern part of the King Valley on YPG (Figure 4). There are a number of pronghorn detections in other areas, including to the east and southeast of YPG. The Sonoran pronghorn distribution on YPG, Kofa NWR, and surrounding areas is likely to change as pronghorn continue to become established and more telemetry data is collected.

We are only beginning to gather data on distribution and habitat use of the Kofa population of Sonoran pronghorn. However, based on Sonoran pronghorn habitat use patterns on Cabeza Prieta, and the limited

historical records on Kofa NWR and YPG, we anticipate they will use the lowland desert habitat in the valley bottom and lower bajadas within King Valley (U.S. Fish and Wildlife Service 1998 and 2001). According to a model by FWS, there are 7,405 square miles of potential habitat for Sonoran pronghorn within the nonessential experimental population area A (Figure 7)(USFWS 2010).

Drought

As discussed in the Status of the Species, climate change in the Southwest and the Sonoran Desert is predicted to result in warming trends and drier conditions, with accompanying changes in vegetation communities (Weiss and Overpeck 2005, Seager *et al.* 2007). 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, there was 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 Hervert 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 U.S. pronghorn population from 2000 to 2002. From 2003 to 2013, rainfall and Sonoran pronghorn range conditions have varied, but have improved overall when compared to 2002. Both the August 2014 short-term and the July 2014 long-term drought status maps indicate that southwestern Arizona is experiencing conditions of abnormally dry to severe drought conditions (<http://www.azwater.gov/azdwr/StatewidePlanning/drought/DroughtStatus2.htm>). However, the current Sonoran pronghorn range conditions, as of September 2014, are good.

Historically, pronghorn populations must have weathered 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, 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."

Recovery Actions (Formerly "Emergency Recovery Actions")

A number of critically important recovery projects have been implemented in an attempt to reverse the decline of the U.S. endangered population of the Sonoran pronghorn. These projects are designed to increase availability of green forage and water during dry periods and 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 Río Sonoyta. Many developed and nine emergency water sources (six on CPNWR, one on OPCNM, and two on BMGR West) have been constructed in recent years throughout the range of the U.S. endangered population. Additionally, within the past two years, three permanent catchments for Sonoran pronghorn were constructed in the non-wilderness portion of CPNWR (one) and the BMGR East

(two). Additionally, one existing water (Sierra Pinta # 3) within the refuge was recently redeveloped resulting in increased storage capacity from 1,800 gallons to over 10,000 gallons. In 2015, one new water for Sonoran pronghorn within the refuge will be constructed (Agua Dulce # 2) and one existing water (Fawn Hills) will be redeveloped to increase storage. Five forage enhancement plots, each consisting of a well, pump, pipelines and irrigation lines, have been developed to irrigate the desert and produce forage for pronghorn. Additionally, starting in 2009, temporary, experimental feed and water stations were placed strategically within the South TAC to enhance pronghorn fawn survival and recruitment during periods of prolonged drought. The primary purpose was to draw pronghorn away from active military targets as an offset to the target closure distances that were in place at that time. These stations were heavily used by pronghorn during times with poor range conditions brought on by drought.

Plots and waters located in areas with little human activity and better range conditions appear to be more effective (i.e., contribute to fawn and adult survival to a greater degree) than those located in areas of high human activity and poor range condition (i.e., experiencing drought) (personal communication with John Hervert, AGFD, September 16, 2009). Therefore, to ensure success of these measures, it is critical that human activity is avoided or significantly minimized near the plots and waters.

A semi-captive breeding facility at CPNWR was first stocked with pronghorn in 2004; as of January 2014, it contains 61 pronghorn. As described above, these facilities are being used to augment the current U.S. population and the new population north of I-8, as well as to establish additional herds elsewhere within suitable portions of historical range in Arizona and potentially in southeastern California. These crucial projects, which are helping pull the U.S. population back from the brink of extinction, have been cooperative efforts among many agencies and organizations, including FWS, AZGFD, MCAS-Yuma, LAFB, OPCNM, CBP, Arizona Desert Bighorn Sheep Society, Arizona Antelope Foundation, the Yuma Rod and Gun Club, the University of Arizona, the Los Angeles and Phoenix Zoos, and others.

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). Many 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. However, in the endangered Sonoran pronghorn range, increased illegal border activities have likely had a significant impact on Sonoran pronghorn in the U.S. in recent times, particularly since the turn of the millennium. See the “*Human-caused Disturbance*” and “*Habitat Disturbance*” portions of the “Threats” section under “Status of the Species” above for further detail. As explained in the Status of the Species, highways, fences, railroads, developed areas, and irrigation canals can block access to essential forage or water resources. Highways and railroads can also lead to vehicular and train collisions with Sonoran pronghorn. Additionally, canals can lead to Sonoran pronghorn drowning.

E. Past and Ongoing Federal Actions in the Action Area

Because of the extent of Federal lands in the action area, with the exception of CBV activities, most activities that currently, or have recently, affected the U.S. populations or their habitat are Federal actions. The primary Federal agencies involved in activities in the action area include the MCAS-Yuma, LAFB, YPG, FWS (CPNWR and Kofa NWR), BLM, NPS (OPCNM), and USBP. In the lists below, 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

Examples of Federal actions for which consultation has not been completed include:

- 1) U.S. Border Patrol Activities in the Tucson and Yuma Sectors, Arizona
- 2) CBP Hybrid Fence on BMGR and Vehicle Fence on CPNWR
- 3) CBP Vehicle Fence on CPNWR (another small portion of the fence)

Federal Actions Addressed in Section 7 Consultations

As part of our discussion of all past and present actions affecting pronghorn within the action area, we list below all biological opinions issued to date on actions that may affect the pronghorn; we also explain any incidental take associated with the opinions. All of these formal consultations can be viewed on our website at <http://www.fws.gov/arizonaes/Biological.htm>.

1. Capture and collaring of pronghorn for research purposes, consultation number 02-21-83-F-0026. No incidental take was anticipated.
2. Capture and collaring of pronghorn for research purposes, consultation number 02-21-88-F-00060. No incidental take was anticipated.
3. Installation of a water source in the Mohawk Valley for pronghorn, consultation number 02-21-88-F-0081. No incidental take was anticipated.
4. Implementation of the CPNWR Comprehensive Conservation Plan, consultation number 22410-2006-F-0416, with reinitiations issued on November 21, 2013 and March 14, 2014. No incidental take was anticipated.
5. 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. 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 LAFB's activities on the BMGR, listed below.
6. Widening of North Puerto Blanco Road, consultation number 02-21-01-F-0109, with a reinitiation issued on March 14, 2014. No incidental take was anticipated.
7. Improvements to SR 85 roadway and drainages, consultation 02-21-01-F-0546. No incidental take was anticipated.
8. Construction of a vehicle barrier on OPCNM, consultation number 02-21-02-F-237. No incidental take was anticipated.
9. U.S. Border Patrol Activities in the Yuma Sector, Wellton Station, Yuma, Arizona, consultation number 02-21-96-F-0334, issued September 5, 2000. Incidental take was anticipated in the form of harassment that is likely to injure up to one pronghorn in 10 years.
10. The BLM Lower Gila South Resource Management Plan-Goldwater Amendment, consultation number 02-21-90-F-0042, issued April 25, 1990. No incidental take was anticipated.
11. The BLM Lower Gila South Habitat Management Plan, consultation number 02-21-89-F-0213 issued on May 15, 1990. No incidental take was anticipated.
12. BLM Lower Gila South Resource Management Plan and Amendment, consultation number 02-21-85-F-0069, issued on March 27, 1998. No incidental take was anticipated.
13. BLM grazing allotments in the vicinity of Ajo, Arizona, consultation number 02-21-94-F-0192, issued on December 3, 1997, with reinitiations issued on November 16, 2001, September 30, 2002, June 21, 2004, March 3, 2005, March 8, 2007, and March 14, 2014. No incidental take was anticipated.
14. Organ Pipe Cactus National Monument General Management Plan, consultation number 02-21-89-F-0078, issued June 26, 1997, with reinitiations issued on November 16, 2001, April 7, 2003,

- March 10 and August 23, 2005, March 8, 2007, December 10, 2009, and March 14, 2014. In the latest versions of the opinion, no incidental take of pronghorn was anticipated.
15. U.S. Marine Corps Air Station-Yuma in the Arizona Portion of the Yuma Training Range Complex, consultation number 02-21-95-F-0114, issued on April 17, 1996, with reinitiations issued on November 16, 2001, August 6, 2003, and October 21, 2009. In the 2003 and 2009 versions of the biological opinion, no incidental take of pronghorn was anticipated.
 16. Luke Air Force Base Use of Ground-Surface and Airspace for Military Training on the BMGR, consultation number 02-21-96-F-0094, issued August 27, 1997, with reinitiations issued on November 16, 2001, August 6, 2003, May 3, 2010, and March 2014. In 2010 opinion, we anticipated take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury; and one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment.
 17. Western Army National Guard Aviation Training Site Expansion Project, consultation number 02-21-92-F-0227, 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. No incidental take was anticipated.
 18. BMGR Integrated Natural Resources Management Plan, consultation number 22410-2005-F-0492, issued on August 26, 2005, with reinitiations issued on January 7, 2013 and March 14, 2014.
 19. CBP and USBP Permanent Vehicle Barrier from Avenue C to OPCNM, Arizona, consultation number 22410-2006-F-0113, issued September 15, 2006. No incidental take was anticipated. Subsequent to issuing the biological opinion, the action was changed to include the installation of a section of hybrid-style fence designed to prevent the passage of pedestrians. Because all environmental laws were waived (as permitted by the Real ID Act of 2005) by Secretary of the Department of Homeland Security, CBP never reinitiated consultation with us regarding this change to their proposed action.
 20. CBP and USBP 5.2-Mile Primary Fence near Lukeville, Arizona, consultation number 22410-2008-F-0011, issued February 11, 2008. No incidental take was anticipated.
 21. *SBI*net Ajo-1 Tower Project, Ajo Area of Responsibility, USBP Tucson Sector, Arizona, consultation number 22410-F-2009-0089, issued December 10, 2009, with reinitiations issued on March 15, 2010, April 29, 2011, September 16, 2011, and December 15, 2011. We anticipated take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every 5 years thereafter; and one due to direct mortality over the life of the project.
 22. Tactical Infrastructure Maintenance and Repair Program (TIMR) along the U.S./Mexico international border in Arizona, consultation number 02EAAZOO-2012-F-0170, issued on November 6, 2012. We anticipated incidental take of one Sonoran pronghorn every 10 years for the duration of the TIMR Program in the form of harassment; and one Sonoran pronghorn over the total duration of the TIMR Program in the form of direct mortality.
 23. Land Mobile Radio Modernization for Tactical Communications at Buck Peak, Christmas Pass, Granite Mountain (CPNWR), and Cobre along the U.S./Mexico international border in Pima, Santa Cruz, and Yuma counties, Arizona, consultation number 02EAAZOO-2012-F-0200, issued April 23, 2013. No incidental take was anticipated.
 24. Activities and Operations at the United States Army Garrison Yuma Proving Ground, Yuma and La Paz Counties, Arizona, consultation number 02EAAZOO-2014-F-0161, issued on September 9, 2014. We anticipated incidental take of four Sonoran pronghorn over the life of the project (10-20 years), including two in the form of direct mortality or injury and two in the form of harm.

25. Implementation of the Ecological Restoration Plan on OPCNM, CPNWR, and BLM Ajo Block, Pima County, Arizona, consultation number 02EAAZ00-2014-F-0538, issued on October 2, 2014. No incidental take was anticipated.

In summary, the current biological opinions that anticipate incidental take are: 1) 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; 2) the Ajo 1 Tower opinion, in which we anticipated take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every 5 years thereafter; and one due to direct mortality over the life of the project; 3) the Luke Air Force Base Opinion, in which we anticipated take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury; and one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment; 4) the TIMR opinion, in which we anticipated take of one Sonoran pronghorn every 10 years for the duration of the TIMR Program in the form of harassment; and one Sonoran pronghorn over the total duration of the TIMR Program in the form of direct mortality; and 5) the Yuma Proving Ground opinion, in which we anticipated take of four pronghorn in the form of direct mortality or injury and harm. 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 in the form of direct mortality or injury resulting from the Federal actions described here (although a pronghorn may have been strafed near one of the targets on BMGR-East). That said, we are aware of numerous instances of harassment of Sonoran pronghorn. A study currently being conducted on the effects of human activity will provide details on the origin, amount, and degree of this harassment. Additionally, action agencies, as part of their proposed actions, have committed to implementing or providing funding to implement a variety of recovery projects recommended by the Sonoran Pronghorn Recovery Team. For example, these significant commitments have helped the Sonoran Pronghorn Recovery Team to construct pronghorn waters and forage enhancement plots, build a captive breeding pen at Kofa NWR, and collar and monitor pronghorn.

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

Historically, livestock grazing, hunting or poaching, and development along the Gila River and 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). 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 population. The U.S. endangered pronghorn population is isolated from other populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Río Sonoyta, which likely were important sources of water and forage during drought periods, has been severed. Since 2002, due to improved drought status and implementation of recovery actions, the wild endangered population increased to 159 in 2012. At 159, however, the wild endangered population is still in danger of extirpation due to, among other factors, human-caused impacts, drought, loss of genetic diversity, and predation. That said, it is thought that this population has increased since 2012; results of the upcoming 2014 survey will provide more information on its current status. The U.S. nonessential experimental population is isolated from the endangered U.S. population by Interstate 10, and at 37 animals, it is also in danger of extirpation. It is expected, however, to continue to grow as more individuals are released into the population and animals become adjusted to the new environment.

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, significant presence of CBV and subsequent required law enforcement activities. 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." MCAS-Yuma (2001) quantified the extent of the current pronghorn range that is affected by select 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.

CBV traffic and responding USBP enforcement activities occur throughout the range of the endangered pronghorn in the U.S., and evidence suggests pronghorn are avoiding areas of high CBV and enforcement activities. Historically, pronghorn tended to migrate to the southeastern section of their range (southeastern CPNWR, such as south of El Camino del Diablo, and OPCNM, such as the Valley of the Ajo) during drought and in the summer. Within the last several years, very few pronghorn have been observed south of El Camino del Diablo on CPNWR. This suggests CBV and the interdiction of these illegal activities have resulted in pronghorn avoiding areas south of El Camino del Diablo; these areas are considered important summer habitat for pronghorn and may have long-term management and recovery implications (personal communication with Curtis McCasland, CPNWR, 2007). The valleys at CPNWR and OPCNM, which were once nearly pristine wilderness Sonoran Desert, now have many braided, unauthorized routes through them and significant vehicle use by USBP pursuing CBVs. These areas have also been affected by trash and other waste left by CBVs.

Although major obstacles to recovery remain, since 2002, numerous crucial recovery actions have been implemented in the U.S. endangered range of the species, including nine emergency waters, three permanent catchments, and five forage enhancement plots, with additional waters planned. The projects help to offset the effects of drought and barriers that prevent movement of pronghorn to greenbelts such as the Gila River and Río Sonoyta. Semi-captive breeding facilities on CPNWR and Kofa NWR, currently (as of September 2014) hold 88 and 31 pronghorn, respectively. The CPNWR facility provides pronghorn to augment the existing endangered population and to establish additional U.S. nonessential experimental (10(j)) populations. The Kofa NWR facility provides pronghorn to augment the recently established Kofa 10(j) population. Additionally, vehicle barriers on the international border on CPNWR and OPCNM are facilitating recovery of pronghorn by reducing the amount of CBV vehicle traffic in pronghorn habitat.

The current ranges of the endangered and 10(j) pronghorn populations in the U.S. are 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. As explained above, 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, action agencies have worked with us to modify proposed actions and to include significant conservation measures that reduce and offset adverse effects to the pronghorn and its habitat. The current opinions that anticipate incidental take are listed 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 range resulting from a myriad of human activities, exacerbated by periodic dry seasons or years, are responsible for the precarious status of the Sonoran pronghorn. However, collaborative, multi-agency and multi-party efforts to develop forage enhancement plots and waters, reduce human disturbance of pronghorn and their habitat, combined with the success of the semi-captive breeding facility at CPNWR and the establishment of a second breeding pen and population on Kofa NWR, provide hope that recovery of the Sonoran pronghorn in the U.S. is achievable. Key to achieving recovery of the endangered pronghorn population in Arizona will be a drastic reduction in human disturbance to pronghorn and their habitat caused by CBV and corresponding enforcement activities.

EFFECTS OF THE PROPOSED 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.

The net effect of proposed Sonoran pronghorn recovery and management activities on Sonoran pronghorn will be significantly beneficial; however, some aspects of these activities have the potential to adversely affect Sonoran pronghorn. Specifically, Sonoran pronghorn may be injured or killed during capture and release operations or by collision with vehicles associated with the project. Other adverse effects to Sonoran pronghorn may include visual and auditory disturbance from human, vehicular, and aircraft presence associated with the proposed action. Additionally, some Sonoran pronghorn habitat could be disturbed by ingress and egress to capture, release, monitoring, water, and feed sites. Adherence to strict protocols included in the proposed action will minimize the risk of injury or death of pronghorn associated with capture and release operations. Adherence to policies of land management agencies, such as speed limits of 25 miles per hour (or less) and traveling only on authorized roads, will reduce disturbance to pronghorn and their habitat, as well as the risk of pronghorn being struck by vehicles. The anticipated long-term benefits of the project include: 1) providing captive bred animals to augment wild populations; 2) increasing forage and water for Sonoran pronghorn; 3) improving health of Sonoran pronghorn; and 4) providing critical information regarding Sonoran pronghorn status and health to the Sonoran Pronghorn Recovery Team and land and wildlife managers to make important decisions regarding pronghorn management and recovery.

Overview of effects of ground-based activities, overflights, and capture and handling

The Sonoran pronghorn is sensitive to human presence and both ground-based activities and overflights can affect pronghorn and their habitat. Ground-based activities can destroy or degrade forage and cover, and result in behavioral or physiological changes that may be detrimental (Geist 1971, Freddy et al. 1986, Workman et al. 1992). In response to overflights, pronghorn may exhibit a startle response or may flush from cover (Krausman et al. 2004, Hughes and Smith 1990, Workman et al. 1992, Luz and Smith 1976). Pronghorn may alter use of areas to avoid aircraft noise or disturbance (Bleich et al. 1990), or may exhibit other physiological or behavioral responses that could be detrimental (Bowles 1995, Norrix et al. 1995, Stockwell and Bateman 1987, Berger et al. 1983). Research suggests jet overflights cause minor disturbance to pronghorn (e.g., interruption of grazing; Luz and Smith 1976, Hughes and Smith, 1990, Workman et al. 1992; as cited in Krausman et al. 2004). However ground activities and hovering and

noise from helicopters elicit stronger responses and higher heart rates than jet overflights (Luz and Smith 1976, Berger *et al.* 1983, Workman *et al.* 1992; as cited in Krausman *et al.* 2004).

Similar to those of other ungulates, observations and studies of Sonoran pronghorn response to ground-based activities and overflights have shown a range of reactions. Krausman *et al.* (2004) reported that Sonoran pronghorn reacted to ground disturbances (vehicles or people on foot) with a change in behavior 39 percent of the time, resulting in the animals running or trotting away 2.6 percent of the time. Furthermore, they reported that Sonoran pronghorn reacted to direct fixed-wing overflights with a change in behavior 41 percent of the time, resulting in the animals running or trotting away 3.7 percent of the time. Wright and deVos (1986) noted that Sonoran pronghorn exhibit “a heightened response to human traffic” as compared to other subspecies of pronghorn. They noted that “once aware of an observer, Sonoran pronghorn are quick to leave the area. One herd was observed 1.5 hours later 11 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, Sonoran pronghorn ran from the observer’s vehicle and continued to run until they were out of sight.

More recently, staff at OPCNM (2013) documented that Sonoran pronghorn on OPCNM experienced some form of potential disturbance once every 4 hours 10 minutes. Actual disturbance responses took place once every 6 hours 15 minutes. Potential disturbance events resulted in the pronghorn running, about once every 8 hours 20 minutes. Vehicles approaching within one mile occurred once every 12 hours 30 minutes. Half of these resulted in pronghorn running, but for the other half, the driver was contacted by radio and advised to drive slowly (<10 mph) past the observation area.

Preliminary information from an ongoing study on the effects of human disturbance on Sonoran pronghorn indicates that pronghorn consistently exhibit visual responses to human activity, particularly vehicles traveling on a road within several kilometers. Although some instances have been noted where a pronghorn did not exhibit a visual response (for example, one buck did not appear disturbed by three vehicles driving at least 25 miles per hour about 1.5 kilometers [0.93 mile] away); most observations indicate that pronghorn exhibit a spectrum of responses, from standing vigilant to running from the stimulus. For example, eight Sonoran pronghorn were observed running a short distance and then vigilant towards utility vehicle noise 3.4 kilometers [2.11 miles] away. Another eight Sonoran pronghorn were observed running from several trucks traveling fast (> 25 mph). Pronghorn were initially vigilant when the vehicles were 1.3 kilometers [0.81 mile] away but soon started running, travelling over 3.6 kilometers [2.24 miles] in under five minutes until they were out of sight of the observers (email from Stephanie Doerries, University of Arizona, May 7, 2014).

Disturbance and flight of ungulates are known to result in numerous 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.

Sonoran pronghorn are known to be challenging animals to capture and handle due their susceptibility to stress. Capture and handling of Sonoran pronghorn can cause injury and mortality to the animals. During captures of wild Sonoran pronghorn, some have been injured by the capture net while others have experienced high temperatures that have led to death. To date, several hundred pen-raised pronghorn have been captured from the pen. Of these, one pronghorn died during the handling and processing portion of the capture operation and two others died during early transport. These deaths occurred due to injury, negative drug reactions, and/or other stressors. Over years of working with and handling these animals, the AGFD and FWS have improved and fine-tuned capture and handling protocols thereby reducing the risk of injury or death. This has resulted in significantly improved outcomes for Sonoran pronghorn.

Effects from Capture and Release of Pen-Raised Pronghorn

Capture, handling, transportation, and release of pen-raised pronghorn may result in pronghorn injury (e.g., broken bones) which may lead to mortality during any part of the operation. Also, pronghorn are susceptible to stress during capture and handling which can result in elevated temperature and death. Although there are inherent risks to pronghorn from these operations, they are a critical component of Sonoran pronghorn recovery and every year animals must be captured and sorted to 1) maintain the appropriate demographic and genetic composition of each pen (or half of pen) and 2) release pen-raised animals into the wild for recovery purposes. Risks to Sonoran pronghorn from these operations will be significantly reduced by a number of measures, including following strict protocols described in the proposed action.

In addition to the effects above, capture operations may result in disturbance to wild pronghorn from the visual and auditory stimulus from people, vehicles, and helicopters traveling through and staged in Sonoran pronghorn habitat. Such disturbance can cause pronghorn to startle and/or flee, travel further distances to find suitable foraging, watering, and resting areas, and result in stress and short-term denial of access to habitat, all of which can result in adverse physiological effects or injury to pronghorn. Fleeing behavior can cause fawns to be abandoned or separated from their mothers, which can leave them vulnerable to predator attack or cause physiological stress that results in death. This potential disturbance, however, will only occur once a year for a relatively short period of time (about one week). Additionally it will occur outside of the fawning season during a cool time of the year when pronghorn are generally less susceptible to the risks associated with stress.

Furthermore, Sonoran pronghorn may be injured and/or killed by collision with vehicles associated with the project; however, this risk will be minimized by adhering to speed limits on within the pronghorn range. As the Sonoran pronghorn populations increase, the risk of collision with animals also increases.

Effects from Capture of Wild Pronghorn

The effects of capture and handling of wild pronghorn are very similar to the effects described in the section above, with a few exceptions. For example, there are increased risks of injury and/or mortality to wild pronghorn during capture because of the need to approach target animals from a helicopter and the use of net guns. Approaching target animals by helicopter causes pronghorn to run during which animals may be injured or overheat. Also, if nets land incorrectly, pronghorn may sustain injuries (e.g., broken bones) that may lead to death. Risks to Sonoran pronghorn from these operations will be minimized by

adhering to strict protocols described in the proposed action. Because the capture of wild Sonoran pronghorn is not as important to overall recovery as capture of pen-raised pronghorn, the benefits of capturing wild Sonoran pronghorn should be carefully weighed against the risks to determine if their capture will significantly contribute to recovery of the species.

Effects from Surveying and Monitoring Wild Pronghorn

Biennial surveys conducted by fixed-wing planes may result in some disturbance Sonoran pronghorn due the relatively low altitude at which they fly (200 AGL). Because, however, these surveys only occur every two years and take seven to eight days to complete, this potential disturbance will be relatively short-lived and occasional.

Monitoring via periodic aerial and ground telemetry, as well as by using motion-activated cameras, may also result in some disturbance to pronghorn. Aerially telemetry is conducted much more frequently than aerial surveys (i.e., about every other week). However, because aerial telemetry is conducted from fixed-wing planes at least 1,000 AGL to avoid disturbance to pronghorn, we anticipate this activity will have minimal effects on the species. Vehicle use and personnel on the ground associated with ground telemetry and the use of motion-activated cameras may disturb pronghorn during ingress and egress to monitoring sites or during monitoring itself. That said, ground telemetry is only conducted occasionally, therefore potential disturbance from this activity will be infrequent. Setting and checking cameras is normally done in conjunction with other pronghorn management activities (checking waters, irrigating forage plots, and adding alfalfa hay) and therefore should add only a nominal amount disturbance to baseline conditions.

Vehicles used for monitoring activities could also collide with pronghorn causing injury and/or death. However, adherence to speed limits should reduce this risk. Vehicular activity associated with monitoring will be along authorized roads; therefore habitat disturbance from vehicles should be insignificant.

Effects from Maintaining Forage Enhancements and Water and Providing Feed

Continuing to provide perennial water through maintaining waters and providing supplemental feed should benefit the pronghorn population by increasing adult and fawn survival and fawn recruitment (the survival of fawns to breeding age) during periods of drought and poor forage production (Hervert et al. 2000, Bright and Hervert 2005, CPNWR 2006). Providing water for pronghorn is a widespread, accepted management practice (O'Gara and Yoakum 1992, Yoakum 1994) and use of free-standing water sources by Sonoran pronghorn is well documented (Hervert et al. 2000, Morgart et al. 2005). Fox et al. 2000 suggested Sonoran pronghorn water intake from forage was not adequate to meet minimum water requirements. The availability of free water to pronghorn is vital, particularly during drought periods when preformed water (i.e. water bound in plant tissue) is scarce. Access to water is essential for digestion of food and for keeping the body cool. Drinking free-standing water also enables pronghorn to consume and use forage of higher nutritional quality. Historically, Sonoran pronghorn had much greater access to greenbelts and perennial water sources, such as the Gila and Sonoyta rivers. Currently, however, lack of access to these areas, drought conditions, and significant amounts of human activities throughout the pronghorn range make it necessary to augment the natural supply of water and forage to avoid extirpation of pronghorn in the U.S. Given that fawns, pregnant does, and lactating does have greater water and energy requirements than the species on average, the need for perennial water and enhanced forage to maintain population recruitment is apparent. A 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). Maintaining and operating forage enhancements and offering supplemental feed should provide nutritious forage and aid in fawn growth and survival.

Implementation of certain components of the water, forage enhancement, and supplemental feed program may, however, result in disturbance to pronghorn and their habitat. Nearly all of these effects are already considered in Biological Opinion #22410-2006-F-0416 and its reinitiation (R001) issued on August 22, 2006 and November 21, 2013, respectively, to Cabeza Prieta National Wildlife Refuge. These biological opinions address the construction, operation, and maintenance of many Sonoran pronghorn waters and forage enhancement plots, as well as the operation of the supplemental feed program. A brief summary of the effects of these activities is provided below.

Pedestrian, vehicle, and helicopter activity associated with maintenance and operation of waters, forage enhancements, and the supplemental feed program may result in long-term intermittent disturbance (visual and auditory) to Sonoran pronghorn. Some disturbance, however, will be minimized by a number of conservation measures included in the aforementioned biological opinions.

Vehicles associated with maintenance and operations of waters, forage enhancements, and the supplemental feed program could also collide with pronghorn causing injury and/or death. However, because there is a 25 mph speed limit throughout most of the project area (5 to 15 mph if pronghorn are detected near access roads), we believe the chances of such collisions are low. Developed waters could adversely affect pronghorn if they harbor and spread harmful pathogens to pronghorn and/or 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 (as this was addressed in the 2006 biological opinion, it will not be discussed further in this opinion). Habitat disturbance from maintenance and operation of waters, forage enhancements, and the supplemental feed program will be extremely minimal as vehicle ingress and egress will be on authorized roads.

Although certain aspects of the water and supplemental feed program may have adverse effects on pronghorn, overall the program will greatly benefit the species. The program will provide water and food sources for pronghorn within migratory routes and help buffer the effects of human disturbance on the U.S. pronghorn population, particularly during stressful drought periods. Furthermore, the program should increase adult and fawn survival and recruitment, which is critical to recovery of the species.

Effects from Maintaining and Monitoring Captive Breeding Pens

Maintaining and monitoring the captive breeding pens may result in disturbance to wild Sonoran pronghorn, primarily from vehicular ingress and egress to the pens. Ingress and egress for monitoring and feeding pen-raised pronghorn normally only occurs once daily and therefore represents a very small percentage of baseline traffic activity on the roads leading to the pens. Ingress and egress to the pen for maintenance purposes generally only occurs occasionally, like when the pen has been damaged by monsoon rains. Vehicles associated with pen monitoring and maintenance activities could also collide with pronghorn causing injury and/or death. However, adherence to speed limits should reduce this risk. Vehicular ingress and egress to the pens will be along authorized roads; therefore habitat disturbance from vehicles should be insignificant.

Disturbance may also occur to pronghorn in the pen from pen maintenance and monitoring activities, however, personnel take precautions to minimize such disturbance. Furthermore, disturbance to pen-

raised pronghorn does not generally result in significantly adverse effects due the fact that pronghorn are in excellent condition due to having access to food and water year-round.

Effects to Sonoran Pronghorn Recovery with the Project

As stated in the “Status of the Species” section above, current downlisting criteria for Sonoran pronghorn are: 1) the establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years; and 2) the establishment of at least one other self-sustaining population in the U.S. Currently, there are no delisting criteria. The proposed action will help achieve both downlisting criteria because, although certain aspects of the proposed activities may have adverse effects on Sonoran pronghorn, the overall pronghorn recovery and management program will benefit the species by: 1) providing captive bred animals to augment wild populations; 2) increasing forage and water for Sonoran pronghorn; 3) improving health of Sonoran pronghorn; and 4) providing critical information regarding Sonoran pronghorn status and health to the Sonoran Pronghorn Recovery Team and land and wildlife managers to make important decisions regarding pronghorn management and recovery. These benefits will significantly aid in increasing endangered Sonoran pronghorn population numbers in Arizona and in establishing at least one other self-sustaining population in the U.S. Delisting criteria have not been established, therefore it is difficult to analyze the potential impacts of the proposed action on Sonoran pronghorn recovery (delisting). That said, because the project will have significant beneficial effects to pronghorn, it is highly likely that the project will contribute to moving this species towards both downlisting and recovery (delisting) of the species.

CUMULATIVE EFFECTS - SONORAN PRONGHORN

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 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 range of the endangered 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 most significant concern to pronghorn is the high level of CBV activity in the action area. CBV activity and its effects to pronghorn and pronghorn habitat is described under the “*Human-caused Disturbance*” and “*Habitat Disturbance*” portions of the “Threats” section under “Status of the Species” for Sonoran pronghorn. CBV activity has resulted in route proliferation, off-highway vehicle activity, increased human presence in backcountry areas, discarded trash, abandoned vehicles, cutting of firewood, illegal campfires and arson fires, and increased chance of wildfire. Habitat degradation and disturbance of pronghorn have resulted from these CBV activities. Although CBV activity levels are still high, the

trend in overall CBV apprehensions and drive-throughs has declined in recent years within the action area likely due to increased law enforcement presence, the border fence, and the status of the economy in the U.S. Despite high levels of CBV activity and law enforcement response throughout the action area, pronghorn in the U.S. have managed to increase since 2002 in part due to releases from the captive breeding pen and the construction of forage plots and waters. However, pronghorn use of areas subject to high levels of CBV and law enforcement activity appear to have declined. We expect CBV activities and their effects on pronghorn to continue for the foreseeable future.

CONCLUSIONS - SONORAN PRONGHORN

After reviewing the current status of the Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our biological opinion that 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 net effect of the proposed action will be highly beneficial to Sonoran pronghorn. The anticipated long-term benefits of the project include: 1) providing captive bred animals to augment wild populations; 2) increasing forage and water for Sonoran pronghorn; 3) improving health of Sonoran pronghorn; and 4) providing critical information regarding Sonoran pronghorn status and health to the Sonoran Pronghorn Recovery Team and land and wildlife managers to make important decisions regarding pronghorn management and recovery.
2. There is a risk that project-related activities may injure or kill Sonoran pronghorn (from capture operations or vehicular activity associated with any project component); however, this risk will be reduced by adhering to capture protocol and speed limits.
3. Although the proposed action could result in some disturbance to Sonoran pronghorn, much of the disturbance will be intermittent and measures included in the proposed action will help avoid and minimize disturbance to Sonoran pronghorn. These measures include conducting aerial telemetry at or above 1,000 AGL and adhering to speed limits.
4. An insignificant amount of Sonoran pronghorn habitat will be adversely impacted.
5. As explained above, we anticipate that the proposed project may aid in achieving both downlisting criteria (1) the establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years and 2) the establishment of at least one other self-sustaining population in the U.S.), as well as overall species recovery.
6. The proposed project will have an appreciable beneficial impact on the population at the range wide scale. Thus, the proposed action is expected, directly or indirectly, to increase appreciably the likelihood of both survival and recovery of the Sonoran pronghorn in the wild by increasing the reproduction, numbers, or distribution of the species.
7. Recovery is the process that stops the decline of an endangered or threatened species by removing or reducing threats. Recovery ensures the long-term survival of the species in the wild. At that point, the species is recovered, and protection of the ESA is no longer necessary. The project and its effects will increase the likelihood of recovery of the Sonoran pronghorn.

The adverse effects that may occur in the action area do not reach the scale where recovery of the species would be significantly delayed or precluded. 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 – SONORAN PRONGHORN

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. “Take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of “take” in the Act means an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering (50 CFR 222.102). “Harass” is defined in regulation as “an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering” (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 Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be undertaken by the FWS so that they become binding conditions of any grant or permit issued to the AGFD, as appropriate, for the exemption in section 7(o)(2) to apply. The FWS has a continuing duty to regulate the activity covered by this incidental take statement. If the FWS (1) fails to assume and implement the terms and conditions or (2) fails to require the AGFD to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the AGFD must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement. [50 CFR § 402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

We anticipate the proposed action will result in incidental take of 26 Sonoran pronghorn over the life of project (5 years). More specifically, we anticipate the following:

- 1) Incidental take of a total of 20 pen-raised Sonoran pronghorn over the life of the project (5 years) in the form of directly mortality or injury due to capture and release operations associated with the captive breeding pens. This mortality or injury may include death or injury of pen-raised Sonoran pronghorn during actual capture, handling, transport, and release operations; and/or death of pen-raised Sonoran pronghorn post-release (i.e., from capture myopathy that may occur soon after release and up to two weeks post-capture);
- 2) Incidental take of a total of 4 Sonoran pronghorn over the life of the project (5 years) in the form of directly mortality or injury due to capture and release operations of wild pronghorn; and
- 3) Incidental take of two wild Sonoran pronghorn over the life of the project in the form of harassment from project activities that disturb Sonoran pronghorn (e.g., surveys, monitoring, pen maintenance) and/or direct injury or mortality from collision with a vehicle associated with the project.

In accordance with the § 17.84 Special rules—vertebrates section of the Final rule for the establishment of a nonessential experimental population of Sonoran Pronghorn in southwestern Arizona (FWS 2011): (5) Any employee or agent of the U.S. Fish and Wildlife Service, the Arizona Department of Game and Fish, and the tribes listed in paragraph (v)(4) of this section, who is designated for such purpose may, when acting in the course of official duties, take a Sonoran pronghorn [within the nonessential experimental population boundary] if such action is necessary to: (i) Aid a sick, injured, or orphaned Sonoran pronghorn, including rescuing such animals from canals; (ii) Dispose of a dead Sonoran pronghorn specimen, or salvage a dead specimen that may be useful for scientific study; (iii) Move a Sonoran pronghorn for genetic purposes or to improve the health of the population; or (iv) Capture and release a Sonoran pronghorn for relocation, to collect biological data, or to attach, service, or detach radio-telemetry equipment. (6) Any taking pursuant to paragraphs (v)(3) through (v)(5) of this section must be reported as soon as possible by calling the U.S. Fish and Wildlife Service, Arizona Ecological Services Office, 201 N Bonita Avenue, Suite 141, Tucson, AZ 85745 (520/670–6150), or the Cabeza Prieta National Wildlife Refuge, 1611 North Second Avenue, Ajo, AZ 85321 (520/387–6483). Upon contact, a determination will be made as to the disposition of any live or dead specimens.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat for the reasons stated in the Conclusions section. If there is a significant decline in the numbers of wild pronghorn, the effects of the level of take of wild pronghorn may need to be reconsidered.

REASONABLE AND PRUDENT MEASURES and TERMS AND CONDITIONS

The following Reasonable and Prudent measures are necessary and appropriate to minimize take of Sonoran pronghorn:

- 1) Assess the need to capture wild Sonoran pronghorn;
- 2) Continuously assess capture protocols;
- 3) Reassess the capture operation in the event that Sonoran pronghorn are thought to be in distress;
and
- 4) Monitor and report on capture operation results.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of section 9 of the Act, FWS must ensure that AGFD complies with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting and monitoring requirements. These terms and conditions are non-discretionary.

- 1) The following Term and Condition implements Reasonable and Prudent Measure Number 1:

Prior to capture-planning efforts for the year, AGFD shall assess the need to capture wild Sonoran pronghorn with the Sonoran Pronghorn Recovery Coordinator at CPNWR and, as

appropriate, other members of the Sonoran Pronghorn Recovery Team. Consensus among AGFD, FWS-CPNWR, and other appropriate parties must be reached that it is in the best interest of Sonoran pronghorn recovery to proceed with the capture of wild pronghorn (i.e., the benefits of collaring wild pronghorn outweigh the risks of capturing them);

2) The following Term and Condition implements Reasonable and Prudent Measure Number 2:

Following a capture event, AGFD shall reassess capture protocols with the head veterinarian, the Sonoran Pronghorn Recovery Coordinator at CPNWR, and other appropriate parties to ensure the safest and most effective capture protocols are in place. Because captures of pen-raised animals occurs annually, capture protocols for pen operations shall be assessed every year. Because captures of wild pronghorn occur occasionally, capture protocols for wild pronghorn shall be assessed prior to and following wild captures whenever they occur.

3) The following Term and Condition implements Reasonable and Prudent Measure Number 3:

During captures of wild pronghorn, in the event that one Sonoran pronghorn is injured, killed, or experiences a temperature during capture and handling operations that is likely to result in death, AGFD and the veterinarian must coordinate with the Sonoran Pronghorn Recovery Coordinator at CPNWR (who will be on-site) to jointly determine whether to proceed with captures of additional animals. The following conditions must be met to continue with capture operations: 1) all standard protocols (outlined in the Description of the Proposed Action) must be followed unless doing so will cause additional injury to Sonoran pronghorn; 2) consensus among on-site AGFD and FWS-CPNWR personnel, as well as the on-site veterinarian must be reached that it is in the best interest of Sonoran pronghorn recovery to continue with the capture operations (i.e., the benefits of collaring a pronghorn outweighs the risks of continuing with capture operations); 3) the cause of the injury, death, and/or high temperature of the aforementioned pronghorn is known (with reasonable certainty) and on-site AGFD and FWS-CPNWR personnel, and the on-site veterinarian are reasonably certain that risk of injury or death to another pronghorn can be avoided or minimized.

4) The following Term and Condition implements Reasonable and Prudent Measure Number 4:

AGFD shall monitor and report on capture results. The report shall be submitted electronically to FWS-AESO annually after all capture activities have been completed for the season/year. At a minimum, the report will include a description of the results of the capture, handling, transport, and release operations (including the number of animals that were captured, handled, transported, and released, as well as the number of animals that showed signs of distress, were injured, or that died during and up to two weeks post release) and a brief discussion of what was effective and not effective. In the event that an activity is determined to not be effective (i.e., it resulted in undue stress or injury to pronghorn), the report will also include a description of how that aspect of the capture operations will be modified to reduce the risk of undue stress or injury to pronghorn during the next capture operation. If the annual AGFD Section 6 Performance Report and/or 10(a)(1)(A) permit report contain the aforementioned information, this/these report(s) may be electronically submitted in lieu of a separate report. However, the report(s) must include this biological opinion's reference number (02EAAZ00-2015-F-0045).

Review requirement: The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the reasonable and prudent measures provided. FWS must ensure that AGFD immediately provide an explanation of the causes of the taking and review with the FWS-AESO the need for possible modification of the reasonable and prudent measures.

Disposition of Dead or Injured Listed Species

Upon finding a dead or injured threatened or endangered animal, initial notification must be made to the FWS's Division of Law Enforcement, 2450 West Broadway, Mesa, Arizona (480-967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible condition.

In addition to the above, the 2014 Final Incident Response Protocol for Sonoran pronghorn will be followed.

CONSERVATION RECOMMENDATIONS – SONORAN PRONGHORN

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.

1. We recommend that FWS supports AGFD personnel's continued participation on the Sonoran Pronghorn Recovery Team and in implementing and supporting recovery actions identified by the Sonoran Pronghorn Recovery Team.

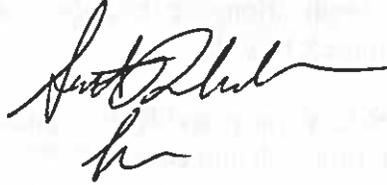
In order for the FWS to be kept informed of actions minimizing or avoiding adverse effects or benefitting listed species or their habitats, the FWS requests notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the action outlined in the consultation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (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 or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

In keeping with our trust responsibilities to American Indian Tribes, we encourage you to continue to coordinate with the Bureau of Indian Affairs in the implementation of this consultation and, by copy of this biological opinion, are notifying the following Tribes of its completion [Tohono O'odham Nation].

We appreciate the FWS's efforts to identify and minimize effects to listed species from this project. Please refer to the consultation number, 02EAAZ00-2015-F-0045 in future correspondence concerning this project. Should you require further assistance or if you have any questions, please contact Erin Fernandez (520) 670-6150 (x238) or Jean Calhoun (x223).



Steven L. Spangle

cc (hard copy):

Field Supervisor, Fish and Wildlife Service, Tucson, AZ (2 copies)
Jean Calhoun, Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ

cc (electronic copy):

Sid Slone, Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
James Atkinson, Sonoran Pronghorn Recovery Team Leader, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
Rijk Morawe, Chief of Natural and Cultural Resources Management, Organ Pipe Cactus National Monument, Ajo, Arizona
Edward Kender, Field Manager, Bureau of Land Management, Phoenix, Arizona
Ron Tipton, Bureau of Land Management, Phoenix, Arizona
Chairperson, Tohono O'Odham Nation, Sells, AZ (Attn: Karen Howe)
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ, pep@azgfd.gov
Regional Supervisor, Arizona Game and Fish Department, Yuma, AZ (Attn: John Hervert)
Raul Vega, Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ

filename: SPH Fed Aid BO 11.18.14.ef.docx

LITERATURE 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.
- Berger, J., D. Daneke, J. Johnson, and S. Berwick. 1983. Pronghorn foraging economy and predator avoidance in a desert ecosystem: Implications for the conservation of large mammalian herbivores. *Biological Conservation* 25:193-208.
- Bleich, V.C., R.T. Bowyer, A.M. Pauli, R.L. Vernoy, and R.W. Anthes. 1990. Responses of mountain sheep to helicopter surveys. *California Fish and Game* 76:197-204.
- Bowles, A.E. 1995. Responses of wildlife to noise. In R.L. Knight and K.J. Gutzwiller, eds., *Wildlife and Recreationists*. Island Press, Washington D.C.
- 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. Ockenfels. 2007. *Arizona's Pronghorn Antelope, A Conservation Legacy*. Arizona Antelope Foundation. 190 pp.
- 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.
- 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.
- 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.
- Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and snowmobiles. *Wildlife Society Bulletin* 14:63-68.
- 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.
- Gerstenzang, J. 2006. Bush visits border, urges Senate action. *Los Angeles Times*, May 19, 2006.
- Goldman, E.A. 1945. A new pronghorn from Sonora. *Proceedings of the Biological Society, Washington* 58:3-4.
- 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.
- Howard, S. M. S., S. Rutman, R. Tietjen, and M. Sturm. 2014. Inventory and Assessment of Undesignated Vehicle Routes on Department of the Interior Lands in the SBI_{net} Ajo-1 Project Area and Vicinity, Southwestern Arizona. Natural Resource Technical Report NPS/ORPI/NRTR—2014/900. National Park Service, Fort Collins, Colorado.
- 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.
- Intergovernmental Panel on Climate Change. 2007. Summary for policymakers of the synthesis report of the IPCC fourth assessment report. Draft copy, 16 November 2007.
- 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.

- Jorgenson, J.T. 1988. Environmental impact of the 1988 winter Olympics on bighorn sheep of Mt. Allan. Biennial Symposium of the Northern Wild Sheep and Goat Council 6:121-134.
- Kaseloo, P. A., and K. O. Tyson. 2004. Synthesis of Noise Effects on Wildlife Populations. (FHWA-HEP-06-016). Washington, DC.
- Keay, J. M., J. Singh, M. C. Gaunt, and T. Kaur. 2006. Fecal glucocorticoids and their metabolites as indicators of stress in various mammalian species: a literature review. *Journal of Zoo and Wildlife Medicine* 37:234-244.
- Kerley, L. L., J. M. Goodrich, E. N. Smirnov, D. G. Miquelle, H.B. Quigley, and M.G. Hornocker. 2002. Effects of roads and human disturbance on Amur tigers. *Conservation Biology* 16(1):97-108.
- 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. 2005. Sonoran pronghorn habitat use on landscapes disturbed by military activities. *Wildlife Society Bulletin* 33(1):16-33.
- 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.
- Landon, D.M., P.R. Krausman, K.K.G. Koenen, and L.K. Harris. 2003. Pronghorn use of areas with varying sound pressure levels. *The Southwestern Naturalist* 48(4):725-728.
- Larkin, R. P. 1996. Effects of Military Noise on Wildlife: A Literature Review, Technical Report 96/21, U.S. Army Construction Engineering Research Laboratory, Champaign, Illinois.
- 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.
- Luz, G.A., and J.B. Smith. 1976. Reactions of pronghorn antelope to helicopter overflight. *Journal of Acoustical Society of America* 59(6): 1514-1515.
- Manci, K. M., D. N. Gladwin, R. Villella, and M. G. Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis Ft. Collins, Colorado. 88 pp.

- 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.
- 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.
- Nelson, F.W. 1925. Status of the pronghorn antelope, 1922-1924. U.S. Department of Agriculture Bulletin No. 1346.
- Norrix, L.W., D.W. DeYoung, P.R. Krausman, R.C. Etchberger, and T.J. Glatke. 1995. Conductive hearing loss in bighorn sheep. Journal of Wildlife Diseases 31:223-227.
- 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.
- _____. 2013. Threatened, endangered and sensitive species: Annual summary of activities. Resources Management Division, Organ Pipe Cactus National Monument, Ajo, Arizona. 35 pp.
- Paradiso, J.L., and R.M. Nowak. 1971. Taxonomic status of the Sonoran pronghorn. Journal of Mammalogy 52(4):855-858.
- Radle, A. L. 1998. The effect of noise on wildlife: A literature review. In World Forum for Acoustic Ecology Online Reader. University of Oregon, Eugene, OR.
- 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.
- 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.
- Seager, R., M. Ting, T. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. *Science* 316:1181-1184.
- 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.
- Stankowich, T. 2008. Ungulate flight responses to human disturbance: A review and meta-analysis. *Biological Conservation* 141:2159-2173.
- Stockwell, C.A., and G.C. Bateman. 1987. The impact of helicopter overflights on the foraging behavior of desert bighorn sheep (*Ovis canadensis nelsoni*) at Grand Canyon National Park. Report to the National Park Service.
- 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.
- 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.
- _____. 1998. Final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.
- _____. 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.
- _____. 2011. Endangered and threatened wildlife and plants; final rule for the establishment of a nonessential experimental population of Sonoran Pronghorn in southwestern Arizona. *Federal Register* 76(87): 25593-25611.
- Weiss, J.L., and J.T. Overpeck. 2005. Is the Sonoran Desert losing its cool? *Global Change Biology* 11:2065-2077.
- 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.

TABLES AND FIGURES

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

Date	Population estimate (95 percent CI ^a)	Source
1925	105	Nelson 1925
1941 ^b	60	Nicol 1941
1957	<1,000	Halloran 1957
1968	50	Monson 1968
1968-1974	50 - 150	Carr 1974
1981	100 - 150	Arizona Game and Fish Department 1981
1984	85 - 100	Arizona Game and Fish Department 1986
1992	179 (145-234)	Bright et al. 1999
1994	282 (205-489)	Bright et al. 1999
1996	130 (114-154)	Bright et al. 1999
1998	142 (125-167)	Bright et al. 1999
2000	99 (69-392)	Bright et al. 2001
2002	21 (18-33)	Bright and Hervert 2003
2004	58 (40-175)	Bright and Hervert 2005
2006	68 (52-116)	Unpublished data
2008	68 ^c	Unpublished data
2010	85	Unpublished data
2012	159	Unpublished data

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

^b Population estimate for southwestern Arizona, excluding Organ Pipe Cactus National Monument.

Table 2. Comparison of endangered Sonoran pronghorn population surveys in the U.S., 1992-2012.

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)	Other estimate
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	N/A	N/A	99 (69-392)	
Dec 02	18	18	N/A	N/A	21 (18-33) ^c	
Dec 04	39	51	N/A	N/A	58	
Dec 06	51	59	N/A	N/A	68 (52-116)	
Dec 08	N/A	N/A	N/A	N/A	N/A	68 ^d
Dec 10	N/A	N/A	N/A	N/A	N/A	85
Dec 12	N/A	N/A	N/A	N/A	N/A	159

^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

^d Due to poor visibility and low pronghorn sighting rate (some radio-collared pronghorn were detected from their transmitter signals but not seen during the surveys) caused by inclement weather during the surveys and having to resurvey some areas during better weather, the usual survey estimator was not used because it would have lacked accuracy. The estimate of 68 was based on individual seen and missed on the survey and on several recent telemetry flights.

Table 3. Comparison of Sonoran pronghorn population surveys in Mexico, 2000-2009.

Date	<u>Pronghorn observed</u>			<u>Population estimate</u>		
	West of Highway 8 (Mexico)	Southeast of Highway 8 (Mexico)	Total	West of Highway 8 (Mexico)	Southeast of Highway 8 (Mexico)	Total
Dec 2000						346
Dec 2002			214			280
Dec 2004	30	439	469	59	625	684
Feb 2005						
Jan 2006			486			634
Dec 2007	35	325	360	50	354	404
Dec 2009	53	258	311	101	381	482
Dec 2011	30	167	197	52	189	241
Dec 2013	--	372	372	--	434	434

Figure 1. Endangered Sonoran pronghorn range in southwestern Arizona, United States.

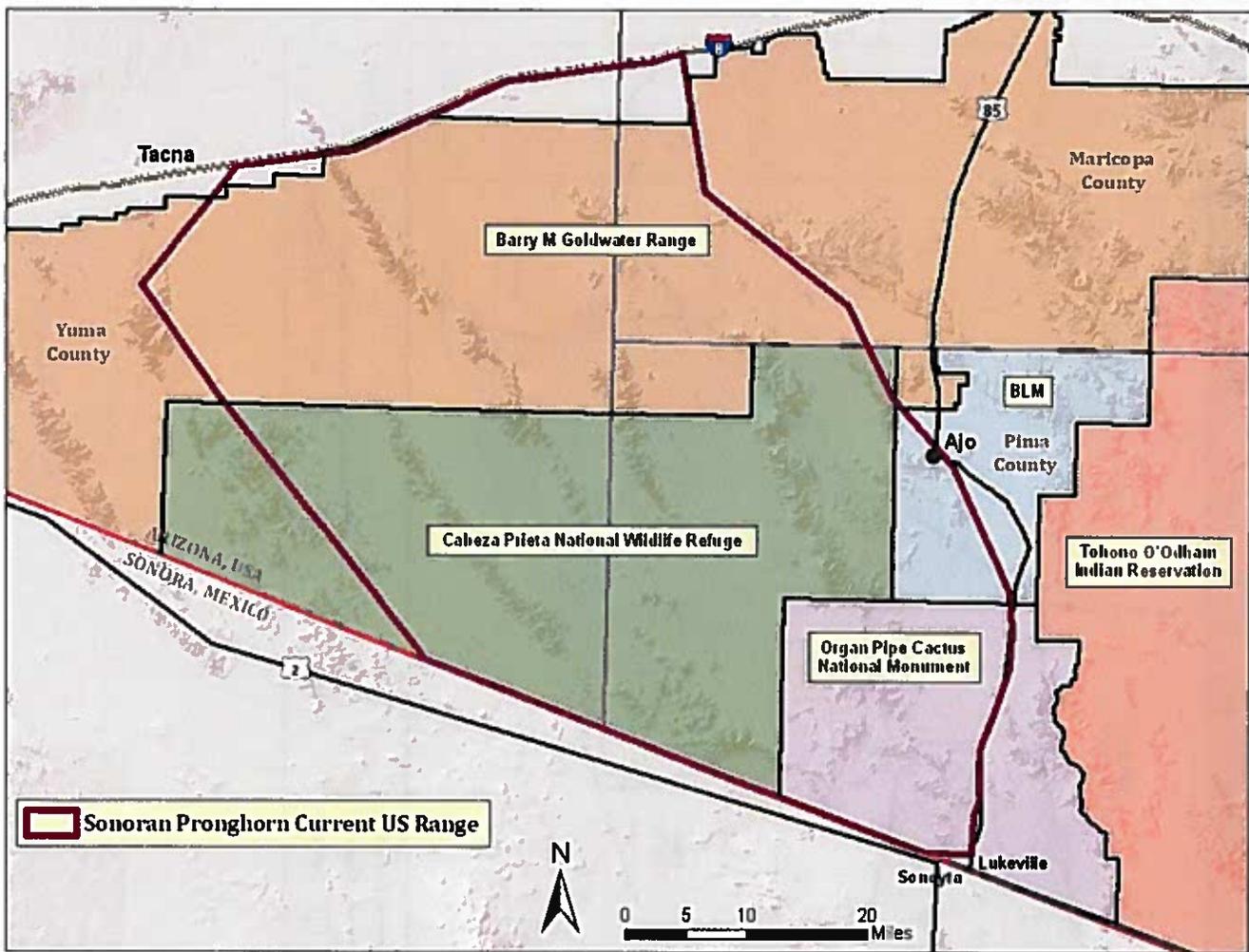


Figure 2. 10(j) Nonessential Experimental Population area for Sonoran pronghorn in southwestern Arizona, United States.

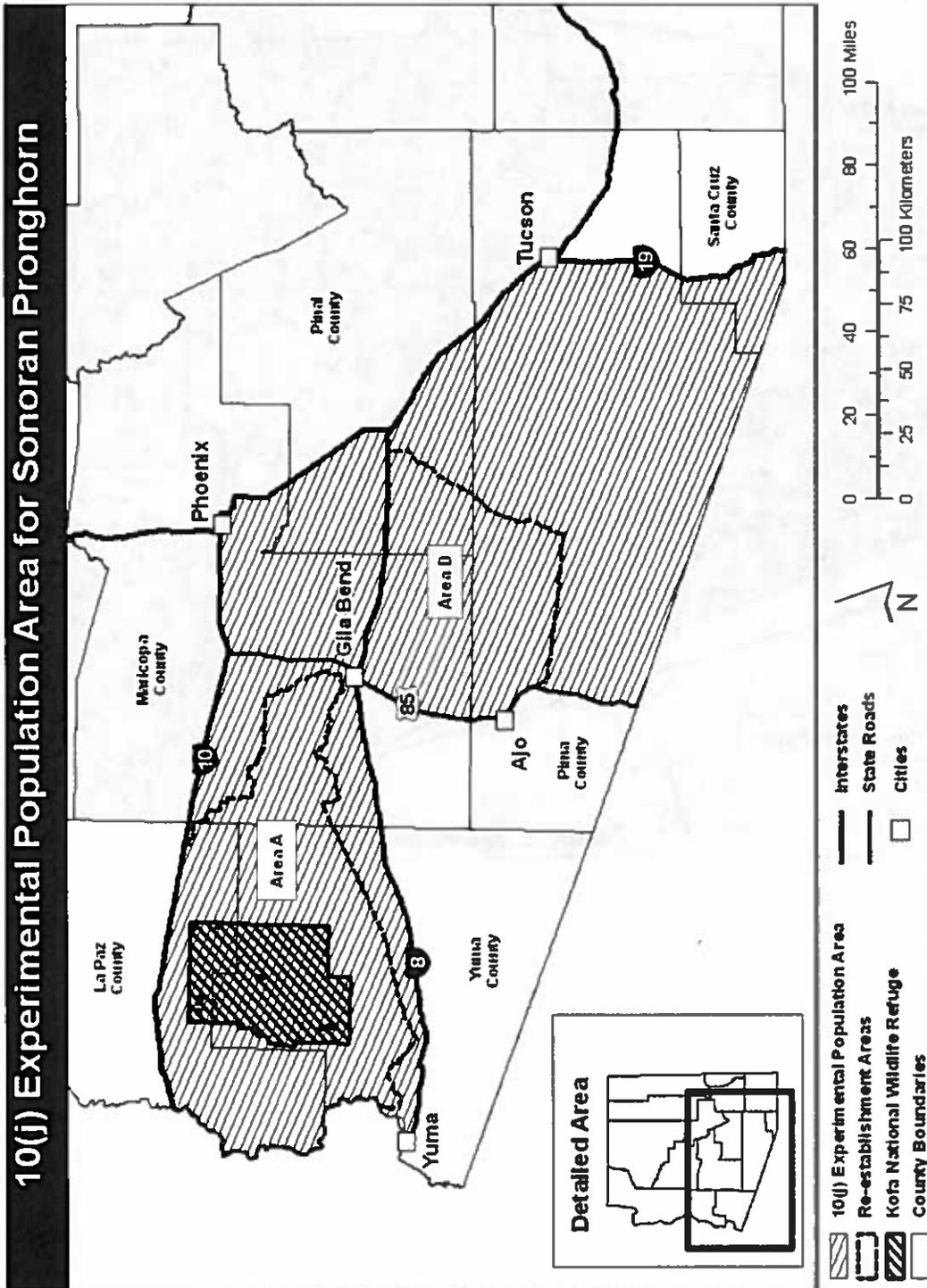
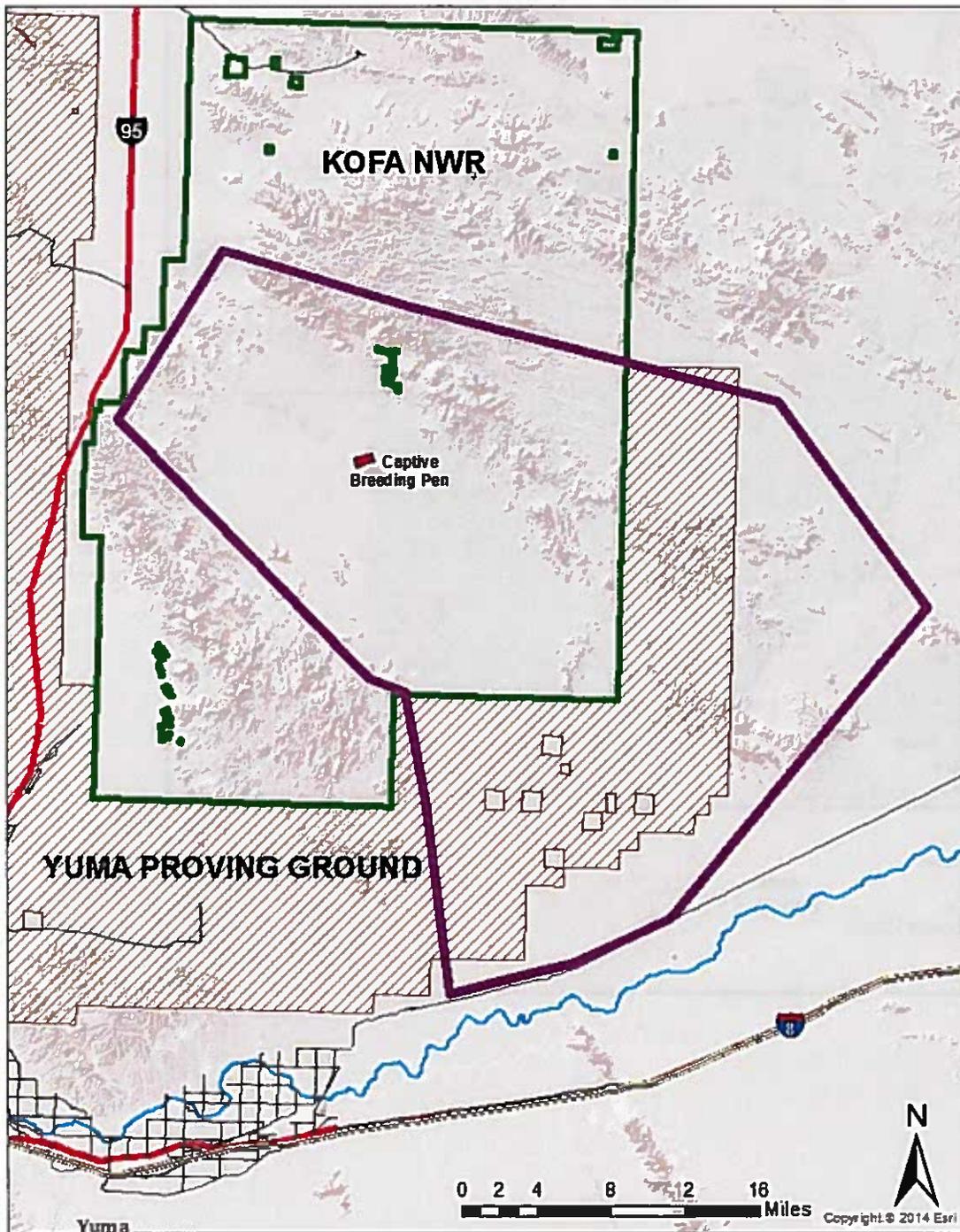


Figure 3. Historical range of Sonoran pronghorn in the United States and Mexico.



Figure 4. Current nonessential experimental Sonoran pronghorn range Kofa NWR, YPG, and surrounding areas in Arizona (note: the extent of the pronghorn range is based on telemetry data in 2013 and 2014, and is likely to change as pronghorn continue to disburse and new data is collected).



Appendix A: Concurrence for the Lesser Long-Nosed Bat

Species Information

A complete description of the biology of the lesser long-nosed bat appears in our 1997 Lesser Long-Nosed Bat Recovery Plan and 2007 Lesser Long-Nosed Bat 5 Year Review. The rangewide status and environmental baseline of the species appears in our Biological Opinion on SBInet Ajo-1 Tower Project, Ajo Area of Responsibility, U.S. Border Patrol, Tucson Sector, Arizona (22410-F-2009-0089).

Determination of Effects

We concur with your determination that the proposed action may affect, but will not likely adversely affect, the lesser long-nosed bat. We base our concurrence on the following:

- The proposed action will not impact lesser long-nosed foraging or roosting habitat.
- No night-time activities will occur; therefore the project will not result in disturbance to foraging lesser long-nosed bats.
- Low-level survey and capture flights will only occur during the season in which bats are absent from this portion of their range. Therefore, no disturbance to roosting lesser long-nosed bats will occur from survey and capture flights. Telemetry flights will occur at least 1,000 feet AGL; therefore significant levels of disturbance to roosting lesser long-nosed bats are not anticipated from telemetry flights. Ground based activities will not occur within or near roost sites; therefore no disturbance to roosting lesser long-nosed bats will occur from ground-based activities.
- The aforementioned level of effects are insignificant and discountable and will not reduce the potential to achieve recovery of the lesser long-nosed bat.

