United States Department of the Interior

FISH AND WILDLIFE SERVICE

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NOV 16 2001

Consultation No. 2-21-96-F-094-R1

Colonel James Uken
Director 56 Range Management Office
Luke Air Force Base
7224 North 139th Drive
Luke Air Force Base, Arizona 85309-1420

Dear Colonel Uken:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed military training administered by the U.S. Air Force (USAF) on the Barry M. Goldwater Range (BMGR) located in Maricopa, Pima, and Yuma counties, Arizona, and its effects on the Sonoran pronghorn (*Antilocapra americana sonoriensis)* in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA). This opinion will remain in effect until reinitiation is required as provided in 50 CFR §402.16.

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

The Court provided the Service 120 days to produce, in consultation with the defendants, revisions of the following biological opinions: USAF (August 1997), Army National Guard (ARNG) (September 1997), Bureau of Land Management (BLM) (December 1997), Marine Corps (April 1996), and National Park Service (NPS) (June 1997). The Court ordered that the Service, in consultation with the Federal agencies whose biological opinions have been remanded, must reconsider those portions of the opinions that have been found to be contrary to the dictates of the ESA. This includes the scope of the action area, analysis of the environmental baseline, and analysis of the effects of incidental take in context with a revised environmental baseline. On April 12, 2001, the Court granted the Service an extension until November 16, 2001, to complete this task.

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

CONSULTATION HISTORY

The consultation history included in the August 27, 1997, biological opinion for "Use of ground-surface and airspace for military training on the Barry M. Goldwater Range which may affect the endangered Sonoran pronghorn" is herein included by reference. Our 1997 opinion found that the proposed action was not likely to jeopardize the continued existence of the Sonoran pronghorn.

On October 30, 1997, Luke Air Force Base (Luke AFB) sent the Service a biological assessment (BA) with a finding that its activities may affect, but are not likely to adversely affect, the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), and peregrine falcon (*Falco peregrinus anatum*). The Service concurred with the USAF's findings for the peregrine falcon and the lesser long-nosed bat. The Service concurred with the findings on the pygmy-owl based on the USAF continuing to conduct pygmy-owl surveys, not destroying any potential habitat, and notifying the Service if pygmy-owls are detected on the BMGR.

On October 5, 1999, Congress passed the Military Lands Withdrawal Act (MLWA). The MLWA established the Marine Corps as the manager for the western half of the BMGR (lands under airspace R-2301W) and the USAF as the manager for the eastern segment of the BMGR. The lands are withdrawn from the public for Department of Defense (DoD) purposes until 2024. Before 1999, the USAF managed the entire BMGR with the BLM assigned the land management jurisdiction. This jurisdiction ends on November 6, 2001, and the MLWA initiates resource management pursuant to the Sikes Act. The MLWA also terminated DoD withdrawal of lands at Cabeza Prieta National Wildlife Refuge (NWR). However, the MLWA additionally stipulated that low-level military flights could continue over Cabeza Prieta NWR along corridors mutually designated by the Marine Corps, USAF, and Service, and the electronic instrumentation sites on Cabeza Prieta NWR, used to support military flight training, would also be continued.

As discussed in the introduction to this opinion, Civil Action No. 99-927 [ESH], *Defenders of Wildlife, et al. v. Bruce Babbitt, et al.* precipitated this remanded biological opinion and 4 others. In a February 12, 2001, order, Judge Ellen Huvelle ruled (in part), "...that the Fish and Wildlife Service has acted in a manner that is arbitrary and capricious and contrary to law by issuing biological opinions that fail to address the impact of each defendant's activities on the pronghorn when added to the environmental baseline, 50 C.F.R. §§ 402.02, 402.12(g), and fail to include in the environmental baseline the impacts of all Federal activities in the area in which defendants are proposing or engaging in action that may affect, directly or indirectly, the pronghorn, 50

C.F.R. §402.02." And the court "further ordered that this matter is remanded to Fish and Wildlife Service, which has 120 days from the date of the Order to reconsider, in consultation with defendants, those portions of the Biological Opinions that have been found to be contrary to the dictates of the Endangered Species Act."

On April 12, 2001, the deadline for completion of this task was extended by the Court to November 16, 2001. The Judge's order also required preparation of supplemental Environmental Impact Statements (EIS) for the Marine Corps Air Station-Yuma's (MCAS) Yuma Training Range Complex (YTRC) and Organ Pipe Cactus National Monument's (NM) General Management Plan, and, in regard to the Sonoran pronghorn recovery plan, required the Service to develop objective, measurable recovery criteria and schedules for implementing recovery actions. A draft supplemental EIS for the YTRC was produced in June 2001. This document clarified those actions that may affect Sonoran pronghorn and described how those effects would manifest.

On July 23, 2001, the Service met with personnel from Luke AFB to discuss the remanded biological opinion. The Service presented a brief summary of the current status of the Sonoran pronghorn, detailing the precarious state of the U.S. subpopulation, summarized effects of the action, and discussed possible conservation measures for the pronghorn.

The Service met again with Luke AFB and other agencies involved in management of the BMGR and the Sonoran pronghorn at an August 2, 2001, meeting of the Barry M. Goldwater Range Executive Council (BEC). We met to discuss the remanded biological opinions and measures we proposed to avoid or minimize adverse effects of proposed actions on the pronghorn.

On August 8, 2001, Luke AFB sent a letter to the Service detailing conservation measures to be included in their proposed action. The Service met with Luke AFB representatives on October 1, 2001, during which Luke AFB further clarified some aspects of their proposed action and implementation of conservation measures. On October 5, 2001, Major Dan Garcia of Luke AFB sent an e-mail to the Service detailing additional conservation measures to be included in their proposed action. On October 22, 2001, the Service provided a draft biological opinion to Luke AFB for their review. Luke AFB provided comments on the draft opinion to the Service on November 8, 2001.

BIOLOGICAL OPINION

I. DESCRIPTION OF PROPOSED ACTION

Proposed Action

The BMGR is the nation's second largest aerial gunnery training range (2,766,670 acres of restricted airspace) and has been used for developing and maintaining the combat readiness of

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the tactical air forces of the USAF, Marine Corps, Navy, and Army. The environmental management of the range changed from the BLM to the USAF under the MLWA. The final legislative EIS of 1999, evaluated the effects of continued military activities on the withdrawn land of 2,664,423 aces. The legislative EIS notes that almost 360,000 acres (13.5 percent of the acres within the BMGR) are or have been used to directly support military operations. The legislative EIS evaluates use of the BMGR for military activities until 2024. Of the 360,000 direct use acres, almost 180,000 acres serve as the active and inactive areas for receiving expended inert munitions and targets from air-to-air gunnery training. The remaining cumulative military surface use area is approximately 172,000 acres (about 6 percent of the total BMGR area). About 118,500 acres (nearly 69 percent) of this remaining cumulative surface use is located within the three USAF tactical ranges. The levels of surface disturbance associated with the 172,000 acres of military use vary from very low to complete. According to the USAF, about 140,163 acres, which is approximately 5.1 percent of the entire BMGR and 7.6 percent of the area not including Cabeza Prieta NWR, has been impacted by military activity. Military activities in the approximately 822,000 acres of Cabeza Prieta NWR are limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. Air-to-ground training operations occur only outside of Cabeza Prieta NWR. The USAF, Western Army National Guard Aviation Training Site (WAATS), and Navy/Marine Corps are the three principal agencies that use the BMGR for combat aircrew training. However, any other DoD entity can also use the BMGR. The eastern part of the BMGR is known as the Gila Bend segment. It contains approximately 1,650,000 acres of withdrawn land and 80,000 acres of USAF land purchased from the State Department sometime in 1997-1999. The airspace and lands are under the jurisdiction of the 56th Fighter Wing at Luke AFB.

Military activities occurring within the Gila Bend segment include use of airspace, four manned air-to-ground ranges, three tactical air-to-ground target areas (East TAC, North TAC, and South TAC), six auxiliary airfields (AUX-6, AUX-7, AUX-8, AUX-9, AUX-10, and AUX-11), Gila Bend Air Force Air Field (AFAF), Stoval Airfield, and explosive ordnance disposal areas.

Luke AFB manages use of the Gila Bend segment of the BMGR. Regular users of the Gila Bend segment include the USAF's 56th Fighter Wing, Luke AFB, Arizona; the 355th Fighter Wing, Davis Monthan AFB, Arizona; the 162nd Fighter Wing (Air National Guard), Tucson International Airport, Arizona; and the ARNG's WAATS and 1/285th Attack Helicopter Battalion, Silver Bell Heliport, Marana, Arizona. These units account for approximately 90 percent of the total use of the Gila Bend segment. The remaining use of the Gila Bend segment of the BMGR is accounted for by Air National Guard, Tucson, Arizona, and USAF Reserve units from other states; by Marine Corps and Navy units throughout the continental United States, Hawaii, and the Atlantic and Pacific fleets; by numerous transient military units from northern locations during winter months when their operations are hindered by weather; and aircrews of allied nations for which the U.S. government has agreed to provide fighter pilot training and large multiple unit exercise or special operations. Ranges on the Gila Bend segment of the BMGR are typically available from 0630-2330 hours, Monday through Friday, and 0800-1700 hours on two weekends per month, except on Federal holidays.

Three blocks of Federal Aviation Administration (FAA) designated restricted airspace, R-2301E, R-2304, and R-2305, overlie the majority of the Gila Bend segment. The USAF range and target installations within these blocks include: Air-to-Air Range, used for air combat and gunnery training; Manned Ranges 1-4, used to train pilots in precision air-to-ground delivery of practice, conventional ordnance, and special weapons; and the North, South, and East TACs, designed to simulate targets of opportunity for air-to-ground firing.

In fiscal year 1995, 50,074 sorties (1 sortie equals a take-off and a landing by one aircraft) were flown within R-2301E, R-2304, and R-2305. In fiscal year 1996, 61,895 sorties were flown in those three airspaces. In addition, 10,975 sorties were flown in R-2301W for a total of 72,870 sorties in BMGR airspace by 44 types of aircraft. The vast majority of these, 42,277 sorties, were flown in R-2301E in 1995, and 52,480 were flown in 1996. Of all airspace use on the Gila Bend segment in fiscal year 1995, F-16s accounted for approximately 68 percent of the sorties. A-10s were the second most frequent users and accounted for approximately 23 percent of the sorties. Helicopters of all types accounted for approximately 1 percent of the total sorties. Most helicopter flights (55 percent) occurred over R-2304 (Manned Range 3) and R-2305 (East TAC). Small fixed-wing aircraft accounted for less than 0.4 percent of the sorties. No major seasonal patterns of range use occur. However, each tactical range is normally closed to live-fire activity for about 2 months annually for maintenance and clearance by explosive ordnance disposal (EOD) personnel. Increased use by transient units during winter months more or less compensates for days lost to maintenance and holidays. Thus, a slightly greater amount of daily activity occurs in winter but on a smaller percentage of days. The fiscal year 2000 BMGR Range Utilization Report shows that for the record year there were approximately 23,585 sorties on the three TACs. Of these sorties, the USAF conducted approximately 20,312 (86 percent), the ARNG approximately 679 (3 percent), and the Marine Corps approximately 2503 (11 percent).

As shown in Figure 3-2 in the YTRC draft supplemental EIS, two USAF Military Training Routes (MTR), VR244 and VR260, cross Cabeza Prieta NWR. VR244 is 18 miles long and 4 miles wide. VR260 is 16 miles long and 4 miles wide. Authorized altitudes within these routes are 500 to 3000 feet above ground level (AGL). In fiscal year 1995, a total of 376 sorties were made in VR244. All flights were low-level navigation or Low Altitude Navigation and Targeting InfraRed for Night (LANTIRN) missions flown by USAF, Navy, or Marine fighter or attack aircraft except for two sorties for low altitude navigation by C-130s and two sorties by Cessnas for route reconnaissance. At an average speed of 420 knots, a flight of aircraft covers the 18 miles of VR244 over Cabeza Prieta NWR in about 2.2 minutes. At this speed, the 122 flights spent a combined total of approximately 4.5 hours (268 minutes) at low altitude over Cabeza Prieta NWR in fiscal year 1995. In the same year, a total of approximately 609 sorties were made in VR260. Approximately 85 percent of the sorties made through VR260 were by F-16s and other high performance attack aircraft and approximately 15 percent were by A-10s. At an average speed of 480 knots, a flight of high performance attack aircraft covers the 16 miles of VR260 over Cabeza Prieta NWR in about 2.0 minutes. At an average speed of 340 knots, a flight of A-10s covers the 16 miles of VR260 over Cabeza Prieta NWR in about 2.8 minutes. Thus, the total amount of time spent over Cabeza Prieta NWR in VR260 in fiscal year 1995 was

approximately 16.5 hours (992 minutes). No helicopters used VR244 or VR260 in fiscal year 1995.

Air-to-Air Range

The Air-to-Air Range lies entirely within R-2301E and consists of two flight training ranges, Air-to-Air High and Air-to-Air Low, each with assigned vertical and lateral airspace and surface boundaries. Air-to-Air High Range has a designated floor altitude of 11,000 feet and a ceiling altitude of 80,000 feet. Air-to-Air Low Range has an assigned altitude of surface to 10,000 feet, except for portions overlying Cabeza Prieta NWR, where by agreement with Cabeza Prieta NWR a minimum altitude of 1,500 feet AGL is observed even though the airspace is authorized for use to the surface. A variety of altitude blocks occur during Air Combat Maneuvering Instrumentation training depending on the nature of the activity and standard Air-to-Air High and Air-to-Air Low altitude restrictions.

Air-to-air target practice ammunition is used by F-16s of the Tucson Air National Guard utilizing the Agates target system and UH-60s of the U.S. Customs Service using a towed-banner target system. A total of 329 live fire air-to-air sorties were flown in 1995, all within the live aerial gunnery range. Except for the Agate target system, no towed darts are currently used on BMGR, though use of towed targets is authorized. Planes involved in air-to-air gunnery typically fire 100 rounds of ammunition. All ammunition is not necessarily expended during each sortie; thus a maximum of 32,900 rounds of ammunition were used in 1995.

A progression of non-firing training missions occurs on all Air-to-Air Ranges. Each level of training contains a series of air combat maneuvers that sequentially increase in degree of difficulty and required skill level of pilots. These programs, listed in order of most fundamental to the most complex include: basic flight maneuvers including turning, climbing, and descending; intercepts, where two aircraft on a common flight vector maneuver for identification of friendly/enemy aircraft; basic flight maneuvers include turning, climbing, and descending; air combat maneuvers; air combat tactics which combine air combat maneuvers with simulated combat; and dissimilar types of aircraft in simulated combat. Live aerial gunnery is permitted only within a designated area along the western end of R-2301E. At present, only the 162nd Fighter Wing, Tucson Air National Guard, practices live air-to-air gunnery on the Gila Bend segment using the Agates target system. A total of 329 aerial gunnery sorties were flown in 1995. An alternate live aerial gunnery range is located south of the primary range over the Cabeza Prieta NWR but can be scheduled for use only under special operational considerations. The alternate live aerial gunnery range has not been used for several years.

Air Combat Maneuvering and Instrumentation (ACMI) is used for simulated air-to-air combat training between friendly and simulated enemy fighter aircraft to improve aircrew combat maneuvering, tactics, and techniques. ACMI is a computerized telemetry/instrumentation system that monitors the relative positions and flight data of all aircraft engaged in a training mission. ACMI tracking sites, which are located on selected mountains around the BMGR, follow aircraft

in simulated combat and transmit flight data to the ACMI range master tracking instrumentation substation located on Childs Mountain north of Ajo. Combat activity is displayed via video simulation for inflight advisory comment and recorded for post-mission performance evaluation.

Aircraft Crashes, Rescues, and Clean Up

Inadvertent or emergency jettisons of any external stores outside of target areas are very rare and crashes of aircraft have usually averaged less than two per year on the Gila Bend segment of the BMGR. However, crashes are followed up with emergency rescue operations and then crash clean up. Rescue and clean up typically require ground and/or air operations, often in remote areas.

Manned Ranges 1-4

Manned Ranges 1, 2, 3, and 4 are used for delivery of simulated conventional and special weapons. Ranges 1, 2, and 4 lie within Range R-2301E; Target 3 lies within R-2305. Manned ranges are under direct operational control of a range control officer. Personnel are stationed in observation towers near the target for the purpose of scoring the accuracy of a weapons delivery using inert practice weapons with small spotting charges. Some are scored on a hit or miss basis; others are scored electronically showing degrees of accuracy. A combination of five target types, tactical strafe, strafe, bomb/rocket circle, special weapons delivery, and applied tactics orientation, comprise the manned target complex. Each target is approached at different airspeeds, angles, and altitudes by the attack aircraft.

All manned ranges have night operations capability for conventional ground attack maneuvers. The use of airborne flares, smudge pots, and lighted run-in lines facilitate night operations. Target hits are scored either by triangular reference to the flash emanating from the ignition of practice ordnance on contact or by the Acoustiscore System (noise-activated system for scoring ordnance delivery).

Manned ranges are closed for maintenance activities and decontamination activities by EOD personnel. These ranges are normally scheduled for a two-day clearance (a Thursday and Friday) every other month or every 50 use-days. Areas covered during these clearances include a 500-foot radius around each conventional target area. Additionally, a strip 50 feet wide along each side of the graded lead-in and lead-out to conventional targets, a 500-foot radius around the special weapons circle, and a strip 50 feet wide along each side of the lead-in to the special weapons circle out to one mile may also be cleared. Clearance involves removal of practice bomb, rocket, and flare fragments. Each manned range is also closed for approximately three weeks annually for more extensive decontamination procedures. During annual maintenance, areas cleared extend to a 2,000-foot radius around each conventional and applied tactics target, and a 4,000-foot radius around each special weapons target. Clearance also includes 100 feet on each side of special weapons target lead-ins and accessways. Every five years, clearance of manned ranges requires up to two weeks, during which the range is closed. Five year

decontamination extends to one nautical mile from the outer edge of each target or until fewer than five complete ordnance items per acre are found, whichever is greater. However, in a meeting with Luke AFB officials on July 24, 2001, they stated that the EOD sweep areas were being redefined for all areas due to the results of global positioning surveys and other efforts. The new criteria taking effect in August, 2001, changed the periodic cleanup to every 75 use-days, reducing the radii of all clearance distances, to include reducing the annual radius from 2,000 feet to 300 meters, and the 5-year radius from one nautical mile to the lesser of 1,000 meters or a density of 5 items per acre. These new criteria substantially reduce the land area covered by EOD operations (Colonel J. Uken, USAF, pers. comm. 2001).

Tactical Ranges

Three tactical ranges, North, South, and East TAC are present on the Gila Bend segment. These ranges are unmanned, diverse target complexes for air-to-ground firing that simulate combat staging areas. North and South TAC lie under the Air-to-Air High Range and are close to Manned Ranges 1, 2, and 4; South TAC abuts the ground boundary of the Air-to-Air Low Range. Training missions on adjacent ranges and targets require flights within North and South TAC to be confined to specific airspace (surface to 24,000 feet) and to be responsive to other range training schedules. East TAC is located in the northeastern corner of the Gila Bend segment and underlies R-2304 airspace with range air space extending from the surface to 24,000 feet.

North and South TAC present a composite of simulated combat target features that include: airfields with aircraft in revetments, on taxiways and runways, as well as control towers, hangars, and administrative buildings; field artillery batteries and missile launchers; truck convoys; railroad yards with trains; friendly/enemy tank groups and regiments; Maverick missile training targets (plywood and real tanks); simulated SCUD Launchers and ZSU23-4 anti-aircraft artillery; high explosive hills (targets for live high explosive bombs and rockets); and surface-to-air missile (SAM) sites with reveted missiles and associated radar equipment. Many targets are constructed of plywood and other common construction materials. Exceptions are simulated trains, convoys, buildings, and combat vehicles, that are made up of salvaged tanks, trucks, buses, jeeps, Sealand cargo containers and combat vehicles. The configuration and type of targets used can change when new combat scenarios require different target configurations. New targets are also continually added to replace old ones. Salvaged vehicles positioned on the TACs are conditioned by removal of all lubricants and coolants before being set up as targets.

Simulated combat and target features located on East TAC include: an airfield complex with runway, hangars, revetments, and storage buildings; SAM missile sites with reveted missiles and associated radar equipment; an intercontinental ballistic missile site consisting of a covered silo and associated buildings; a railroad yard with warehouse and simulated train; a single span bridge crossing a dry wash; enemy radar sites with reveted missiles; tanks and trucks randomly spaced along dirt roads; randomly spaced artillery pieces serving as heavy artillery for a forward battle staging area; forward battle area with friendly and enemy tanks deployed, mobile SAM unit artillery, and ZSU23/4 anti-aircraft artillery; Maverick missile training targets; high

explosive ordnance targets; and an enemy command centers containing antenna and automatic weapons. Other non-target, support combat features on East TAC include NATO Hill, an observation hill with helicopter landing pad, and water wells.

Authorized ordnance for delivery at selected North, South, and East TAC targets include gun/cannon ammunitions, white phosphorus spotting rockets, inert heavyweight bombs and shapes, high explosive bombs and rockets, and live Maverick and Hellfire missiles. A small amount of live ordnance is used at night on BMGR tactical ranges. Fewer than 5 percent of missions involve night use of live ordnance and approximately 90 percent of such night missions are flown into East TAC due to pronghorn clearance requirements. At times when East TAC is not available, North TAC is the preferred range, and South TAC is least preferred. In FY 01, tactical ranges were available for a total of 12,717 hours combined day and night use. The tactical utilization rates were: daytime 70.1 percent, nighttime 49.0 percent, combined total 64.4 percent.

	NTAC	STAC	ETAC
Day	72.4%	72.0%	65.6%
Night	48.1%	48.9%	50.0%
Total	65.8%	65.6%	61.5%

(from Range Utilization Spreadsheet for FY01 [RMO Common - Metrics folder])

A total of 604 sorties involving live bombs were flown on North and South TAC in 1995 by USAF planes. Typically an average of four bombs are dropped by each plane on one pass. A total of 114 sorties involving live Maverick missile firings on the target on North TAC were flown in 1995. In 1996, 74 Maverick missile firings occurred on North, South and East TACs.

At least two sites for Ground Forward Air Controllers are located on all ranges and are used in controlling aircraft for missions such as Close Air Support. The ranges are also used with Electronic Warfare equipment and Smokey SAM rockets to simulate enemy air defense for conducting training. A variety of anti-aircraft armament, SAM, and missile jamming systems can be deployed for units to employ electronic countermeasures, chaff (small fibers that reflect radar signals and temporarily hide aircraft from radar detection), and radar warning receiver equipment tactics.

Tactical ranges are used year-round except for scheduled range maintenance periods. Each tactical range is closed for a period of approximately eight weeks each year for range maintenance and EOD clearance. Currently scheduled maintenance periods are October to December for South TAC, January to March for North TAC, and March to May for East TAC. During annual maintenance prior to August 2001, an area 1,000 feet in radius from the edge of each target and 100 feet on each side of access ways was decontaminated. Every five years, decontamination extended to one nautical mile from the outer edge of each target or until fewer than five complete ordnance items per acre were found, whichever was less. New criteria taking effect August 2001 changed the annual radius from 1,000 feet to 300 meters, and from 100 feet

to 30 meters on each side of access ways. Most significantly, the 5-year radius was reduced from one nautical mile to the lesser of 1,000 meters or a density of 5 items per acre. These new criteria substantially reduce the land area covered by EOD operations (Colonel J. Uken, USAF, pers. comm. 2001).

Each tactical range contains one HE Hill target, where live, general purpose bombs and rockets are used. North and East TAC also each have one live Maverick missile target. In 1996, an average of 131 live bombs per month was dropped on the three tactical ranges combined. All ordnance expenditures were made on high explosive hills between 0700 and 2200 hours. Eleven Maverick missiles per month were fired on East TAC since April 2001 and no Mavericks were fired on NTAC.

Both the Air-to-Air and Air-to-Ground ranges allow the use of chaff and self-protection infrared decoy flares, expended in accordance with USAF regulations. Typically, Air-to-Air missions utilize more chaff and flares than Air-to-Ground missions with an average of 15 chaff and 10 flares deployed per aircraft per sortie. Night-time illumination flares are also used during night Air-to-Ground operations on all tactical ranges and occasionally on the manned ranges. Three to eight illumination flares are normally deployed per mission. Missions utilizing illumination flares account for about 20-30 percent of all night missions and are generally used by A-10 aircraft, though other aircraft use them.

Airborne and ground-based target identification lasers are used occasionally on the tactical ranges and manned ranges. Controlled use consists of aiming a laser light at a target and either providing the aircrew with the location of the target or providing a laser guided bomb to find the target.

Currently, the USAF has towers set up around the HE Hills in South and North TAC for monitoring purposes. Biologists survey the HE Hills from the towers (or other vantage points) before deliverance of live ordnance to determine if pronghorn are in the area. If pronghorn are detected, the mission is moved or called off. The maximum time allowed between missions is two hours. If subsequent missions occur after a two-hour time period, another pronghorn survey and clearance is required.

Monitoring is conducted on the NTAC and STAC with limited monitoring on Range 1 (i.e., the day following a Pronghorn sighting on Range 1). Monitoring includes visual observations with the aid of binoculars and spotting scopes, as well as telemetry surveillance to locate collared Pronghorn. Monitoring is done prior to live ordnance missions (Live Monitoring), every Monday and the day after Pronghorn are located on a range (Required Monitoring), prior to Maverick missions (MAV monitoring), and prior to Explosive Ordnance Disposal (EOD) detonations (EOD Dets Monitoring). Childs Valley on the Cabeza Prieta NWR (CV/CPNWR), adjacent to Range 1, is monitored weekly to track collared pronghorn near the tactical ranges.

If a pronghorn is located within a 5 km radius (i.e., safety zone) of HE hill, no high explosive ordnance deliveries are authorized on the affected range. In addition, no deliveries of any kind are authorized within 3 km radius of any pronghorn location for the remainder of the (2400) day. When animals are located, basic biological information is collected and reported to 56 RMO using report form 56 RMO Operating Instruction 1-1 Sonoran Pronghorn Monitoring. The data collected includes location of sighting, UTM coordinates, activity when sighted, number and composition of herd, number of fawns and last known direction of travel.

Strict compliance with the biological opinion is adhered to in all aspects of the monitoring activities. The protection of the pronghorn on the BMGR is paramount and several steps have been taken to evaluate and minimize potential impacts of USAF activities on this subspecies. If any ordnance is dropped on non-approved areas or targets, monitors respond to the site within 24 hours and conduct a systematic search of the area for evidence of pronghorn mortality. Monitors work together and with other range personnel to ensure all personnel are aware of pronghorn locations in an effort to minimize disturbance.

Auxiliary Airfields

Four abandoned auxiliary airfields, AUX-6, AUX-8, AUX-lO, and AUX-11 are present on the Gila Bend segment. Each of these airfields consists of a triangular configuration of runways on a 500- to 700-acre tract. AUX-8, AUX-lO, and AUX-11 are no longer used for any military activities. AUX-6 is used as a refueling and staging area for rotary-winged aircraft by WAATS and the 1/285th Attack Helicopter Battalion.

Stoval Airfield

Stoval Airfield is an abandoned auxiliary airfield located in the extreme northwest corner of the Gila Bend segment. This airfield is not currently used by the USAF, but is used by the Marines Corps for helicopter refueling and rearming and limited C-130 aircraft operations.

Explosives Ordnance Disposal

EOD personnel destroy dangerous unexploded ordnance on the ranges being cleared. The remaining scrap metal, along with recyclable scrap metal from target vehicles, is taken to one of four consolidation points where it is processed for recycling. Processing includes cutting, grinding, crushing, flash-burning, and other processes to reduce the physical size of materials and to neutralize any energetic residues. These consolidation points are 3-5 acre cleared sites surrounded by a ten-foot-high chain link fence. One site serves Manned Range 1 and North and South TACs. Another located on AUX 9 serves Manned Range 2. A third, located on AUX 11, serves Manned Range 4. A fourth serves Manned Range 3 and East TAC. Luke AFB EOD controls all access into these areas. Some explosive demolition work is occasionally performed at these sites.

Other Military Ground Uses

Military ground use in the Gila Bend segment outside of the above facilities is limited to roads and emergency situations. Sites utilized by the Ground Forward Air Controllers are accessible by roads/hiking. Use of the sites and use of Ground Forward Air Controllers is limited in scope and accounts for less than one percent of all missions on the BMGR.

Future use on the BMGR

The only expected significant change in use patterns on the Gila Bend segment is an approximately 10 percent increase in aircraft night operations. These night operations will occur between official sunset and 2330 hours Monday through Friday. Projected use may increase the range utilization rate from 49 percent to approximately 60 percent. No changes in the area of land impacted by military activities are expected.

Conservation Measures

The USAF proposes to implement the following conservation measures:

1. The EOD tactical range maintenance schedule be changed to further reduce potential effects to Sonoran pronghorn as follows: East TAC (March 15 - May 15), North TAC (January 1 - February 28), and South TAC (October 1- December 15).

2. All users will continue to be briefed on Sonoran pronghorn, the status of the species, the importance in reducing impacts to the species, and any mitigation measures that apply.

3. All vehicles will continue to be restricted to existing designated roads with the exception of EOD, Maintenance, or Environmental Sciences including cultural resources personnel conducting necessary activities which require them to leave designated roads.

4. All actions requiring new surface disturbance will continue to be limited in extent as much as possible and will be confined to existing roadways where feasible.

5. Low speed limits on roadways will continue to be implemented as appropriate to ensure that no Sonoran pronghorn are injured due to vehicles.

6. Continue Air Force funding for an on-going study with Arizona Game and Fish Department (AGFD) to determine the effects of military night operations on Sonoran pronghorn.

7. The USAF has started but still has to complete a study to determine the effects of military activities on Sonoran pronghorn during the fawning season. To reduce research study

effects to Sonoran pronghorn in the field, this study can be combined with another ongoing study.

8. The USAF will continue to coordinate with the Service offices at Cabeza Prieta NWR and the Arizona ESO on all pronghorn studies and monitoring efforts.

9. The USAF will update "Operating Instruction 1.1, Sonoran Pronghorn" monitoring to include the following new activities and procedures and will be implemented immediately:

- Monitor both North and South tactical ranges on the first fly day of the week (usually Monday), even if live ordnance is not scheduled for that day. This will ensure each range is monitored at least weekly, even if no animals were sighted in the previous weeks.
- If no animals are sighted on a tactical range on a particular day, a second day of monitoring will be required if animals were sighted there within the previous seven days. This will provide two non-sighting days before we stop monitoring a range for the week (if live ordnance is scheduled, this will negate that stipulation).

10. The USAF will examine vehicle roads in currently occupied pronghorn habitat and seasonally or permanently close unneeded routes (Figure 1). The San Cristobal Valley is closed to all recreation use. Access is permitted only with a special use permit issued from Range Management. Additionally, the USAF will close San Cristobal Valley to special use permits from March 15 - June 15 and will permanently close approximately 163 miles of roads and trails in the USAF portion of BMGR west of State Route 85 (SR 85) along with 32 miles of seasonal closures in coordination with the AGFD and the Border Patrol.

11. An annual report of the results of all monitoring efforts including the biological monitors annual report, the Range Use annual report, a summary of all range incidents and a brief summary of all contract and construction work in Sonoran pronghorn current habitat, and a complete and accurate record of any illegal take, will be submitted to the Service by March 1 of each year unless otherwise directed. This report will also describe in detail how each of the conservation measures were implemented.

12. The USAF will continue to assist in supporting research and active management to determine the limiting factors of this Sonoran pronghorn population. This will include the following 15 of the 51 recovery projects (Appendix 1) identified by the Sonoran Pronghorn Recovery Team:

1. Experimentally place small, portable, temporary waters in occupied habitat during the summer months, and evaluate their use and efficacy.

2. Develop an intensive monitoring program to quantitatively investigate pronghorn use of water tanks (i.e., permanent, semi-permanent, temporary, emergency).

3. Implement and monitor experimental forage enhancement project on BMGR.

4. Continue monitoring (and closing as needed) of military targets, relative to pronghorn locations, by contract biologists on NTAC and STAC on BMGR on live fire days.

5. Develop a study examining seasonal diets (e.g., fecal analysis).

6. Continue restrictions on types of use in important pronghorn habitat during critical periods of the year (e.g., Organ Pipe Cactus NM periodic seasonal closure of Pozo Nuevo Road; Cabeza Prieta NWR closure of public use of Chico Shunie Loop Road, Marine use of certain ground sites on BMGR).

7. Develop study to investigate potential contamination concerns from military activities on BMGR (e.g., soil/vegetation sampling; blood and tissue samples from captured pronghorn; sampling of other resident wildlife) for baseline data.

8. Deploy remote data loggers as needed to document use of water sources, travel corridors, and/or foraging areas by radio collaring pronghorn; and initiate AGFD/USAF study to evaluate effects of night missions on pronghorn behavior/activity.

9. Continue field work of University of Arizona and the Natural Resources Conservation Service for preparation of a vegetation association map for Organ Pipe Cactus NM, BLM, Cabeza Prieta NWR, BMGR.

10. Investigate effects of public use and other ground-based activity (e.g., military training, ordnance clean-up, law enforcement, archaeological surveys, etc.) on pronghorn.

11. Continue to promptly notify Cabeza Prieta NWR of all pronghorn mortalities; recovery team leader is maintaining a file on all reports and maintains a summary table of all mortalities and known facts.

12. Incorporate a habitat assessment component in currently used population survey technique to monitor annual change/variation in range condition, including weather data collection and fire reporting.

13. Evaluate pronghorn location data relative to available habitat using normalized digital vegetation index and/or other forms of satellite data.

14. Continue timely coordination with Recovery Team and Arizona ESO on all proposed changes on Tactical Ranges.

15. Experimentally provide mineral supplement blocks.

Luke AFB additionally proposes projects to be submitted to the Sonoran Pronghorn Recovery Team to study the effects of undocumented migrants on Sonoran pronghorn, vegetation transects to be done in the TACs and BMGR as recommended in an earlier study, and a soil analysis to be done at HE Hill to try to determine the causes of annual plant extra growth in these areas.

II. STATUS OF THE SPECIES

A. Description and Legal Status

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

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

B. Life History

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

Pronghorn consume a wide variety of plants. Fecal analysis indicated Sonoran pronghorn consume 69 percent forbs, 22 percent shrubs, 7 percent cacti, and 0.4 percent grasses (Service 1998a). However, Hughes and Smith (1990) reported cacti are the major diet component (44 percent). Consumption of cacti, especially chain fruit cholla (*Cylindropuntia fulgida*) (Pinkava 1999), provides a source of water during hot, dry conditions (Hervert *et al.* 1997b). Other important plant species in the diet of the pronghorn include pigweed (*Amaranthus palmeri*), ragweed (*Ambrosia* sp.), locoweed (*Astragalus* sp.), brome (*Bromus* sp.), and snakeweed (*Gutierrezia sarothrae*) (Service 1998a).

Sonoran pronghorn rut during July-September, and does have been observed with newborn fawns from February through May. Parturition corresponds with annual spring forage abundance. Fawning areas have been documented in the Mohawk Dunes and the bajadas of the Sierra Pinta, Mohawk, Bates, Growler, and Puerto Blanco mountains. Does usually have twins, and fawns suckle for about 2 months. Does gather with fawns, and fawns sometimes form nursery groups (Service 1998a). Hughes and Smith (1990) recorded an average group size of 2.5 animals; however, group size observed by Wright and deVos (1986) averaged 5.1, with the largest group containing 21 animals.

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

Causes of pronghorn mortality are often difficult to determine; however, some telemetered Sonoran pronghorn have been killed by coyotes, mountain lions, and bobcats. Some of these mortalities may have been influenced by dry periods, which predisposed pronghorn to predation (Service 1998a). Of 580 coyote scat examined on the Cabeza Prieta NWR, 5 contained pronghorn remains (Simmons 1969), but some or all of these remains may have resulted from scavenging carcasses. Hervert *et al.* (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain.

C. Habitat

Data collected from radio-collared animals and fecal pellet analysis have provided some data on habitat use by Sonoran pronghorn. All three Sonoran pronghorn sub-populations occur in Sonoran desert scrub vegetation communities (Turner and Brown 1982). Turner and Brown (1982) discussed seven subdivisions of the Sonoran Desert, two of which encompass the habitat of Sonoran pronghorn in the U.S. and the Pinacate Region of Sonora (Felger 2000). These are the Lower Colorado River Valley and the Arizona Upland subdivisions. Creosote (*Larrea*

tridentata) and white bursage (*Ambrosia dumosa*) are dominant perennials of the Lower Colorado River Valley subdivision. Plant species along major water courses include ironwood (*Olneya tesota*), blue palo verde (*Parkinsonia floridum*), and mesquite (*Prosopis velutina* and *P. glandulosa*). Species in the Arizona Upland include foothill palo verde (*Parkinsonia microphyllum*), catclaw acacia (*Acacia greggii*), chain fruit cholla, teddy bear cholla (*Cylindropuntia bigelovii*), buckhorn cholla (*C. acanthocarpa*), and staghorn cholla (*C. versicolor*).

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

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

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

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

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

D. Distribution and Abundance

United States

Prior to the identification of the subspecies known as the Sonoran pronghorn (Goldman 1945), specimens of pronghorn taken within its range were identified as other subspecies (AGFD 1981). Historically, the Sonoran pronghorn ranged in the U.S. from Arizona's Highway 15 to the east; the Altar Valley and the Tohono O'odham Nation (formerly the Papago Indian Reservation) to the north; and Imperial Valley, California, to the west (Nelson 1925, Monson 1968, Wright and deVos 1986, Paradiso and Nowak 1971) (Figure 2).

During an international boundary survey conducted from 1892 through 1894, pronghorn were found in every open valley along the international boundary from Nogales, Mexico to Yuma, Arizona (Carr 1971). In 1893, Mearns (1907) reported seeing a herd of 12 pronghorn near border monument 143 in the Baboquivari Valley and small numbers in the Santa Rosa Valley near monument 161 on what is now the Tohono O'odham Nation. Nelson (1925) stated that in 1923, local people reported that a few pronghorn were still ranging in the Santa Rosa Valley. Carr (1970) noted the "sighting of eight antelope near Pisinimo on the Papago Indian Reservation which most likely drifted north from Mexico," and that "there have been numerous rumors of antelope in the Papago country"; however, no recent reliable observations are known. Carr (1970) also stated that there "is a considerable amount of good Sonoran antelope habitat on the Papago Indian Reservation and particularly in the Great Plains area. However, Indian hunting and grazing practices prohibit a lasting resident antelope population." In 1894, pronghorn were abundant near monuments 178 and 179, and westward to Tule Well (Mearns 1907). In February 1894, Mearns observed them in the Lechuguilla Desert, as well. In the Colorado Desert (presumably west of the Gila and Tinajas Altas mountains), Mearns (1907) reported that pronghorn were not abundant. He observed pronghorn tracks in California at Gardner's Laguna, 6 miles south of monument 216, and 37 miles west of the Colorado River; and then again at Laguna Station, 7 miles north of monument 224 and 65 miles west of the Colorado River.

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

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

2001; J. Bright, AGFD, pers. comm. 2001). Table 2 presents observation data from transects and compares estimates derived from the three population models from 1992 through 2000.

Occasional sightings of pronghorn are recorded outside of the range defined by telemetry locations in Figure 3. For instance, a possible pronghorn sighting occurred east of Aztec and north of Interstate 8 in 1990 (Service 1998a). Two adult pronghorn were observed in 1990 (Service 1998a) in the northern San Cristobal Valley approximately 5 miles southeast of Mohawk Pass in the Mohawk Mountains. In 1987, a Border Patrol agent reported a pronghorn on the Tohono O'odham Nation, this sighting was not confirmed.

Bright *et al.* (2001) defined the present U.S. range of the Sonoran pronghorn as bounded by U.S. Interstate 8 to the north, the International Border to the south, the Copper and Cabeza Mountains to the west, and State Route (SR) 85 to the east. This area encompasses 2,508 mi^2 (Bright *et al.* 2001). Based on pronghorn location records from 1994-2001 (Figure 3), locations of pronghorn from 1983-1995, and observations by Carr (1972) and Hall (1981), pronghorn are believed to occur most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo Mountains (Daniel's Arroyo area). Wright and deVos (1986) stated that observations in the Growler Valley were frequent and that the Mohawk Valley, San Cristobal Valley, and BMGR support herds of 10 to 20 animals during most of the year. Also mentioned was a regularly observed herd of 7 to10 pronghorn in the Cameron tank area on BLM lands near Ajo.

Although observations of pronghorn were common along and east of SR 85 many years ago, Sonoran pronghorn have not been confirmed east of State Route 85 (SR 85) in Organ Pipe Cactus NM since 1972. The lack of recent observations east of the highway indicates that this heavily-used road currently poses a barrier to eastward movement. On June 12, 1996, however, an adult doe pronghorn was observed running west off the right-of-way at the approach of a vehicle on the north end of the Crater Range (R. Barry, Luke AFB, pers. comm. 1996). There also exists an unconfirmed report of four Sonoran pronghorn attempting to cross SR 85 in August 1993 approximately 1 mile north of the Organ Pipe Cactus NM visitor center. A juvenile crossed the highway (two lanes) to the east, but with the approach of a vehicle, ran back across the road to rejoin a group of three pronghorn (T. Ramon, Organ Pipe Cactus NM, pers. comm. 1993).

In recent years, the Tohono O'odham Nation has not been accessible to state and Federal biologists to survey for Sonoran pronghorn. A Border Patrol agent reported a pronghorn on the Nation lands in 1987 (Service 1998a), although unconfirmed, this is the last report of Sonoran pronghorn on the Nation. There are no recent records of pronghorn south of the Nation in Sonora. Carr (1970) reported that hunting and grazing on the Nation was not compatible with maintaining a viable population of pronghorn. Phelps (1981) reported that pronghorn had not been observed on the Nation for 10 years. These observations suggest that pronghorn are likely extirpated from the Nation and adjacent areas.

The sightability model population estimates from 1992 to 2000 show an alarming 45 percent decrease in sub-population size (Table 2). The estimates indicate a steady decline in sub-

population size, with the exception of the 1994 survey. The 1994 estimate may be somewhat inflated due to inconsistencies in survey timing (Service 1998a, Bright *et al.* 2001). The 1994 survey occurred in March (whereas those of other years occurred in December) and therefore the number may be slightly inflated because of the sightability of pronghorn at this time of year (J. Morgart, Service, pers. comm. 2001). Different population models may result in divergent estimates. Therefore, the inclusion of estimates obtained prior to 1992 in the analysis of population trends is not reasonable.

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

In 1996, a workshop was held in which a population viability analysis (PVA) was conducted for the U.S. sub-population of Sonoran pronghorn (Defenders of Wildlife 1998). A PVA is a structured, systematic, and comprehensive examination of the interacting factors that place a population or species at risk (Gilpin and Soulé 1986). For the Sonoran pronghorn PVA, these factors included impacts of inbreeding, fecundity, fawn survival, adult survival, impacts of catastrophes, harvest, carrying capacity, and numbers and sex/age composition of the present population. Based on the best estimates of demographic parameters at the time, the likelihood of extinction of Sonoran pronghorn was calculated as 1 percent in the next 25 years, 9 percent in the next 50 years, and 23 percent in the next 100 years. More severe threats include population fluctuation, periodic decimation during drought (especially of fawns), small present population size, limited habitat preventing expansion to a more secure population size, and expected future inbreeding depression.

Furthermore the PVA suggested that the current pronghorn population is extremely sensitive to fawn mortality, with the likelihood of extinction increasing markedly when fawn mortality exceeds 70 percent. Thus, a 30 percent fawn crop (30 fawns/100 does) each year is necessary to ensure the continuance of the population. This level of reproductive success has only been achieved in two of the last nine years. Fawn survival is correlated with precipitation (Hervert *et al.* 1997). With above average precipitation in 1998, 33 fawns per 100 does were produced (Bright *et al.* 2001). With similar conditions in the 2000-2001 season, a significant fawn crop is anticipated; and as of August 2001, an estimated 30-60 fawns are surviving. However, we continue to be concerned about the dramatic response of the U.S. pronghorn sub-population to seasonal or short-term drought and the possible effects of a longer-term or more serious drought, such as what occurred in the 1890s and 1950s (Rowlands 2000).

Mexico

Historically, Sonoran pronghorn ranged from the Arizona border south to Hermosillo and Kino Bay, west to at least the Sierra del Rosario, and east to the area south of the Baboquivari Valley on the Tohono O'odham Nation. The distribution in Baja California Norte is less clear, but observations by Mearns (1907) indicate they occurred in the Colorado Desert west of the Colorado River, as well. Nelson (1925) reported that a few herds in northwestern Sonora, Mexico, moved back and forth across the Arizona border. Ben Tinker reportedly counted 595 pronghorn in Sonora in November 1924 (Carr 1974). The herds counted by Carr ranged from the southern end of the Sierra del Rosario, south and east to the Sierra Blanca and the Rio Sonoyta, to the eastern side of the Sierra de San Francisco. On the basis of sightings and confiscated specimens, Monson (1968) stated that the Sonoran pronghorn persisted in some localities along the east side of the Pinacate Lava Flow southward to about 185 miles south near Guaymas.

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

Sub-populations of Sonoran pronghorn in Mexico had not been exhaustively surveyed until all suitable habitat within the current known range of the Sonoran pronghorn in Mexico was surveyed in December 2000 (Bright *et al.* 2001). Although the 1993 estimate was approximate, survey results suggested a decline in the sub-population of 16 percent from 1993 to 2000 (Table 3). The December 2000 estimate was 346 individuals. This estimate, together with the 2000 U.S. estimate, brings the total estimated size of the U.S. and Mexico Sonoran pronghorn populations to approximately 445 individuals (J.L. Bright *et al.*, AGFD, unpubl. data).

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

effectiveness as a barrier to pronghorn movement. The U.S. sub-population has experienced good fawn production and survival thus far in 2001; we do not know whether similar fawn production and survival is occurring in the Sonoran sub-populations in Mexico.

E. Threats

Barriers that Limit Distribution and Movement

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

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

Between Gila Bend and Lukeville, Arizona, SR 85 appears to be a barrier preventing pronghorn from dispersing eastward from their current range. Traffic volume and average speeds have increased substantially over the last 30 years as international trade and tourism have increased. The Arizona Department of Transportation increased the posted speed limit on SR 85 from 55 to 65 miles per hour (mph) in 1997, and 85th percentile traffic speed has increased from 68-71 mph in the same period (Organ Pipe Cactus NM 2001). This highway corridor is unfenced in Organ Pipe Cactus NM, allowing potential free movement of pronghorn and other wildlife, but has livestock fencing on both sides for most of the remaining mileage on BLM, Department of Defense (DoD), and private lands between Interstate 8 and Organ Pipe Cactus NM. Interstate 8, the Wellton-Mohawk Canal, agriculture, a railroad, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. De-watering of much of the Sonoyta River and barriers to pronghorn accessing the Gila River, such as Interstate 8 and the Wellton-Mohawk Canal, have caused significant loss of habitat and loss of access to water (Wright and deVos 1986). Agricultural, urban, and commercial development at Sonoyta, Puerto Penasco, and San Luis, Sonora, and Ajo, Yuma, and along the Gila River, Arizona, have

removed habitat and created barriers to movement. BLM grazing allotment fences in the Ajo area may have been a barrier to movement, but were modified after 1997 to allow safe passage of pronghorn (BLM, *in litt.* 2000). Fences between the BLM lands and Organ Pipe Cactus NM and Cabeza Prieta NWR are also designed to allow passage of pronghorn.

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

Human-caused Disturbance

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

Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human traffic, such as a person walking or running past pronghorn in an enclosed pen, a motorcycle driving past, a truck driving past, a truck blowing its horn while driving past, or a person entering a holding pen, caused an increased heart rate response in American pronghorn in half-acre holding pens (Workman *et al.* 1992). The highest heart rates occurred in female pronghorn in response to a person entering a holding pen, or a truck driving past while sounding the horn. The lowest heart rates occurred when a motorcycle or truck was driven past their pen. Other investigators have shown that heart rate increases in response to auditory or visual disturbance in the absence of overt behavioral changes (Thompson *et al.* 1968, Cherkovich and Tatoyan 1973, Moen *et al.* 1978).

A pronghorn can canter effortlessly at 25 mph, gallop without straining at 44 mph, and run flat out at speeds of 55-62 mph (Byers 1997). During an aerial reconnaissance, one herd of Sonoran pronghorn was observed 12 miles away from the initial observation location 1.5 hours later (Wright and deVos 1986). Hughes and Smith (1990) found that pronghorn immediately ran 1,310-1,650 feet from a vehicle and that military low-level flights (<500 feet AGL) over three pronghorn caused them to move about 330 feet from their original location. Krausman *et al.* (2001) examined effects of ground-based and aircraft military activities on Sonoran pronghorn at the North and South TACs at the BMGR and concluded that behavioral patterns were similar with and without presence of military stimuli. Military activities, both ground-based and aerial, were associated with some changes in behavior (e.g., from standing to trotting or running, or bedded to standing) but the authors concluded that these changes were not likely to be detrimental to the animals. Eighty-seven (4.1 percent) of the 2,128 events with ground-based

stimuli resulted in pronghorn changing their behavior to trotting or running; a total of 866 (41 percent) resulted in some change in behavior. Krausman *et al.* (2001) documented 149 direct overflights and 263 other overflights (in which the aircraft passed ≥328 feet to the side of the animal). Pronghorn changed their behavior 39 and 35 percent of the time during direct and other overflights, respectively. Unfortunately, we can not discern from Krausman *et al.* (2001) how pronghorn responded to low-level helicopter flights. No conclusions could be drawn about effects to fawns due to poor fawn productivity during the study. During times of drought, disturbances that cause pronghorns to startle and run would energetically have a more significant effect. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971).

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

American ranchers were running livestock by the early 1900s in much of the area that would later become Organ Pipe Cactus NM (Rutman 1997) and Cabeza Prieta NWR (Cabeza Prieta NWR files). Because there was no international boundary fence until 1947, livestock from both the U.S. and Mexico ranged freely across the border (Rutman 1997). Rutman (1997) estimates 1,000 head of burros and horses were present in 1942 on the southern half of Organ Pipe Cactus NM, and as many as 3,000 cattle on Organ Pipe Cactus NM at one time. Cattle were removed from Organ Pipe Cactus NM, Cabeza Prieta NWR, and the BMGR in 1979, 1983, and 1986, respectively (Service 1998a, Rutman 1997). Grazing continues to be an important use of former pronghorn habitat on the Tohono O'odham Nation. Wright and deVos (1986) stated that poor habitat conditions (caused in part by livestock grazing) still appeared to be the leading cause in the decline in Sonoran pronghorn numbers. In Sonora, livestock grazing occurs in ejidos (community ranches or farms) and other ranch lands throughout much of the range of the pronghorn. Cattle range farther in years with abundant annual growth, and are more limited to areas near water during hot and dry periods and seasons. In Arizona, cattle grazing continues on lands administered by the BLM in currently occupied pronghorn habitat near Ajo, Why, and Sentinel. The BLM is in the process of performing allotment analyses on these areas in terms of their current conditions and ongoing uses to determine if grazing is in compliance with the Arizona standards for rangeland health. If current grazing practices prove to be a factor in these areas not meeting established standards, then the BLM must change grazing through the permitting process to ensure significant progress is made towards achieving standards as required by grazing regulation 43 CFR 4180, and the Lower Gila South Resource Management Plan, as amended. Telemetry data indicate little use of BLM lands by pronghorn, despite the recent modification to BLM fences to make them pronghorn-friendly. The lack of pronghorn on BLM lands may be due to the more long-term effects of grazing in changing vegetation amount and type, thus reducing the suitability of the habitat for pronghorn.

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

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

Small Population Size and Aging Demographics

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

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

F. Recovery Plan

The 1982 Sonoran Pronghorn Recovery Plan (Service 1982) was revised in 1998 (Service 1998a). The recovery criteria presented in the revised plan entailed the establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years,

as well as the establishment of at least one other self-sustaining population in the U.S. to reclassify the subspecies to threatened.

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

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

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

III. ENVIRONMENTAL BASELINE

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

A. Definition of the Action Area

The "action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Within the U.S. portion of the Sonoran pronghorn's range, pronghorn interact to form one population in which interbreeding may occur. The U.S. population is effectively separated from populations in the Pinacate Region and on the Gulf Coast of Sonora by Mexico Highway 2 and the U.S.-Mexico boundary fence. Activities that may affect animals in any portion of the U.S. range of the pronghorn may affect the size or structure of the U.S. population, or habitat use within the U.S. range. The action area for this biological opinion is the range of the pronghorn within the U.S. (Figure 3), plus areas of the eastern segment of the Goldwater Range that are east of the current pronghorn range. Although this entire area is affected by the proposed action, effects are most evident where the Luke AFB activities occur, including areas under airspace R-2301E, R-2304, and R-2305, Manned Ranges, and the North, South, and East tactical ranges.

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

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

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

Climate is characterized by extreme aridity, mild winters, and hot summers. Approximately 2.7 inches of precipitation fall annually at Yuma, with slightly more than half of this occurring in the winter months (Turner and Brown 1982). Annual precipitation increases from west to east across the BMGR; at Aguajita/Quitobaquito, precipitation is 10.5 inches annually. Infrequent chubascos (tropical storms) bring heavy rains in September or October that can produce spectacular growth on warm-season perennial plants (Felger 2000).

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

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

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

C. Status of the Sonoran Pronghorn in the Action Area

Distribution

Figure 3 illustrates records of Sonoran pronghorn in Arizona from 1994-2001. Based on these locations and observed locations of pronghorn from 1983-1993, pronghorn are believed to occur most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo Mountains (Daniel's Arroyo area). All localities from 1994-2001 are south of Interstate 8, east of the Copper and Cabeza Prieta mountains, and west of SR 85 (Bright *et al.* 2001). Habitat north of Interstate 8 has not been surveyed to any extent for pronghorn, but habitat in this area is highly fragmented. Interstate 8 and the Wellton-Mohawk Canal are probably barriers to movement of pronghorn.

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

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

Population Size and Dynamics

Data on the size of the U.S. population of Sonoran pronghorn is presented in Tables 1 and 2. Before 1992, population estimates were not repeatable or accurate enough to be comparable or to discern trends in population size. However, anecdotal information in historic observations suggests a real decline. Observations of Mearns (1907) in the early 1890s suggested that pronghorn were locally common in what is now Cabeza Prieta NWR. From 1925-1968, however, population estimates ranged from only 50-105 individuals. Mearns (1907) observed pronghorn in the Lechuguilla Desert, in the Colorado Desert, and on what is now the Tohono O'odham Nation, as well. The pronghorn is not known to occur in these areas today; thus populations declined and the range contracted substantially during the early 20th century.

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

In 1995, there was abundant rainfall in the spring. Productivity of Sonoran pronghorn was between 1 and 1.4 fawns per doe. In July, the proportion of fawns to does was as high as 50 percent. However, as dry conditions set in from July to December, most fawns died. Recruitment for the year was only 12 fawns per 100 does (12 percent). Dry conditions continued in 1996 and 1997, during which no fawns were known to have been recruited into the population. The heavy and steady precipitation during winter of 1997-98 produced perhaps the best annual plant production since 1978, and good fawn recruitment occurred that year (33 fawns per 100 does). The spring of 1999 was drier than normal, and no fawns were known to have survived by December. Fawn production was 14 fawns per 100 does in 2000 (Bright *et al.* 2001). An exceptional fawn crop in 2001 of 30-60 fawns surviving as of October 2001 may reflect good precipitation in spring and summer of 2001 (J. Hervert, pers. comm. 2001). At a population viability analysis workshop conducted for the Sonoran pronghorn, recruitment at a level of 30 fawns per 100 does was deemed to be necessary for the subspecies to persist (Hervert 1996, Defenders of Wildlife 1998). Although there is a close relationship between fawn survival and precipitation, in the context of the last 100 years, the 1990s were not characterized by drought (Rowlands 2000); thus factors, in addition to precipitation, likely contributed to the population decline. However, the seasonal timing and intervals between rainfall events may be more significant than annual totals (J. Hervert, pers. comm. 2001).

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

Drought

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

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

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

Disease

Leptospirosis is a contagious, febrile (fever) disease caused by a spirochete bacteria (*Leptospira interrogans*) that affects mammals (including humans), birds, reptiles, amphibians, and insects. The infection is usually transmitted through skin or mucous membrane contact with the urine of infected animals and by contact with soil, water, or plants that have been contaminated by infected urine. It is believed that the bacteria may live outside the host organism for up to six

months under favorable conditions. In general, infections may be very mild and symptomless or may result in disease conditions, including fever, jaundice, hemoglobinuria (a disorder that destroys red blood cells, resulting in the presence of hemoglobin in the urine), renal failure, abortion, and/or death (Merck and Company 1986). Following an abortion caused by leptospirosis, fetal membranes may be retained and fertility may be impaired (Merck and Company 1986). Leptospirosis is considered a serious disease in the livestock industry. Confirmed cases of leptospirosis in the United States are relatively low, but because symptoms of the disease can be nonspecific, actual incidences of the disease may be higher.

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

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

Blood samples from U.S. Sonoran pronghorns were collected between 1994 and 2000 for serologic, hematologic, and serum chemistry testing. Samples collected in 1994 provided evidence of pronghorn exposure to *Leptospira interrogans* serovar *hardjo* (a strain of the

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

According to the USAF (1997), the range of the Sonoran pronghorn on the entire BMGR was estimated based on locations of radio telemetry data collected between November 19, 1983 and May 30, 1995, and on aerial survey sightings made in 1994. A total of 1,212 records were available. The boundaries of the pronghorn range were drawn using the greatest convex polygon method modified by considerations of habitat suitability. Total area is approximately 1,413,320 acres of which 88 percent are on the BMGR. Of that, approximately 50 percent is on Cabeza Prieta NWR, and approximately 38 percent is on the BMGR outside of the Cabeza Prieta NWR. Sonoran pronghorn range overlapped with the entire South TAC Range, more than half of the North TAC range, and a small part of Manned Range 1 and the Air-to-Air Live Fire Areas.

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

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

Before the Taylor Grazing Act of 1934, and land use designations such as Organ Pipe Cactus NM, the BMGR, and Cabeza Prieta NWR, unregulated cattle grazing was widespread in the current range of the pronghorn. Forage and precipitation is greater in the eastern portion of the current range, thus it is likely that grazing was more prevalent in BMGR-East, Cabeza Prieta NWR and Organ Pipe Cactus NM, than in BMGR-West (MCAS-Yuma 2001). However, cattle grazing presently occurs west of Volcan Pinacate and near the Sierra del Rosario in northwestern Sonora, which are as dry as much of BMGR-West; thus we suspect cattle grazing historically occurred throughout the current U.S. range. The degree to which cattle grazing may have affected soils and vegetation communities in this area is impossible to quantify. Humphrey (1987) compared vegetation in historic photos taken at boundary monuments in the early 1890s with photos taken in the 1980s and could not discern any temporal differences in vegetation in what is now Organ Pipe Cactus NM, Cabeza Prieta NWR, and BMGR. However, the changes may have occurred before 1890. In reference to monument 172 at the southern end of the Quitobaquito Hills, Humphrey notes "the entire region near the spring has probably been grazed

by domestic livestock since their introduction by the Spaniards in the early eighteenth century. Any grasses that might have grown there prior to that time had probably been grazed out long before the monument was erected." Organ Pipe Cactus NM (2001) discusses possible effects of long-term grazing in pronghorn habitat, and apparent evidence and impacts of grazing still visible at Organ Pipe Cactus NM 25 years after cattle were removed.

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

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

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

Numbers of undocumented migrants and smugglers have increased dramatically in the action area. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. A total of 25,074 pounds of marijuana were apprehended by Ajo Station agents in 2000 (U.S. Immigration and Naturalization Service 2001). In 2001, estimates of undocumented migrant traffic reached 1,000 per night in Organ Pipe Cactus NM alone (Organ Pipe Cactus NM 2001). These activities have resulted in route proliferation, off-highway vehicle (OHV) activity, increased human presence in backcountry areas, discarded trash, and abandoned vehicles. Habitat degradation and disturbance of pronghorn almost certainly results from these illegal activities. Increased illegal activities have precipitated increased law enforcement presence, particularly Border Patrol, with additional associated adverse effects. However, without Border Patrol efforts the impacts from undocumented migrants would be even greater.

E. Past and Ongoing Federal Actions in the Action Area

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

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

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

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

Federal Actions For Which Consultation Has Not Been Completed

Management at Cabeza Prieta NWR

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

driving on roads. Before entering, visitors must obtain a valid Refuge Entry Permit and sign a Military Hold Harmless Agreement.

Most of the Cabeza Prieta NWR is within the air space of the BMGR. Numerous low-flying aircraft cross the Cabeza Prieta NWR on their way to air-to-ground bombing and gunnery ranges located to the north. Low-level helicopter flights are limited to flight corridors and occur only in the spring and the fall; in FY 1995 this use represented 4.5 and 16.5 hours, respectively. However, such flights may cause pronghorn to flee (Workman *et al.* 1992). Some military training exercises over the Cabeza Prieta NWR may require limitations on travel and even short periods of closure to the public.

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

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

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

Tucson Sector of the Border Patrol

The Tucson Sector Border Patrol section 7 consultation is not yet complete (consultation number 2-21-99-I-138). This consultation encompasses all field activities conducted by the Border Patrol-Tucson Sector, as part of the program to detect, deter, and apprehend undocumented

migrants and drug traffickers. The Tucson Sector is comprised of nine stations: Ajo, Casa Grande, Tucson, Nogales, Sonoita, Naco, Douglas, Wilcox, and Phoenix. The activities within 8 of these stations, Phoenix excluded, are addressed by the consultation. Activities within the Ajo Station have the greatest potential to adversely affect pronghorn. Adverse effects may result from patrol road activities, drag road activities, off-road operations, aircraft overflights, and the use and maintenance of sensors.

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

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

Yuma Sector Border Patrol Beacon Stations

Recently, the Border Patrol has proposed the installation of at least six emergency beacon stations (panic buttons) on the BMGR. The stations will be comprised of a 30-foot pole illuminated with a beacon. The poles are mounted on a cement block that is approximately 5 ft^2 and 3 to 4 ft high. While the installation of the stations will result in little habitat disturbance, the presence of the electronic stations will increase human presence in these areas (undocumented migrants, and maintenance and rescue crews) and therefore represents an additional disturbance factor for pronghorns. The Border Patrol has initiated emergency consultation on this project as a means to reduce mortality of illegal migrants.

Federal Actions Addressed in Section 7 Consultations

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

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

BLM's Lower Gila South Management Area

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

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

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

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

BLM grazing allotments in the vicinity of Ajo, Arizona

The biological opinion (consultation number 2-21-94-F-192), issued December 3, 1997, addressed effects to pronghorn resulting from issuance of grazing permits on five allotments, four of which are located near Ajo and Why (Cameron, Childs, Coyote Flat, and Why allotments); and the fifth near Sentinel (Sentinel allotment). All but the Child's allotment were considered to be within the current distribution of the Sonoran pronghorn. According to the BLM, livestock use of the five allotments had been relatively low in the previous ten years. The effects of stocking the allotments at any level had not been analyzed. Monitoring of the Coyote

Flat and Why allotments had not occurred. The BLM permittees have not fully stocked the Cameron, Why, Sentinel, and Childs allotments for a sustained period of time. The Coyote Flat Allotment has been billed for full stocking. According to the BLM, monitoring data had not shown overutilization of the vegetation or a change in vegetation composition. The BLM estimated that if allotments were stocked at permitted levels, forage utilization rates could approach 40 percent. Preliminary data from the BLM and the AGFD showed that there is little dietary overlap between pronghorn and cattle. Because of this, the amount of forage on allotments, and the likely utilization levels, we found that adequate forage for the pronghorn should be available. Maintenance of livestock waters, fences, and other improvements may temporarily disrupt pronghorn activity. Pronghorn may also become entangled in livestock fences.

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

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

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

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

corridors for 5-17 days. Additional low-level fixed-wing aircraft corridors over Cabeza Prieta NWR are used for six days per course.

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

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

Implementation of MCAS's proposed mitigation (minimization) measures, the reasonable and prudent measures, and terms and conditions is unclear because of inadequate reporting by MCAS. The Service has only received annual reports for 1998 and a draft report for 1999. With few exceptions, these reports have not detailed, action by action, what steps MCAS-Yuma has taken to implement the opinion. In 1999, MCAS reported that no pronghorn habitat was modified, Range Management received no reports of Sonoran pronghorn encounters, and all air

and ground crews were briefed on the requirements of the opinion. The Service is not aware of any incidental take of pronghorn attributable to MCAS-Yuma YTRC activities. On March 18, 1998, an amendment was requested on the consultation by MCAS-Yuma. This request slightly changed the description of the equipment and personnel to be used in the Stoval Field exercise area. The Service determined that the changes would have no additional effects not already anticipated in the biological opinion.

Organ Pipe Cactus NM General Management Plan

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

To reduce adverse effects on pronghorn, Organ Pipe Cactus NM proposed the following: (1) pursue an agreement with Arizona Department of Transportation to establish a vehicle for continued communication regarding road-related issues, construct underpasses at known movement corridors to facilitate safe passage of pronghorn across the highway, and establish a program to explore other measures to better understand and subsequently reduce the impacts of SR 85 on pronghorn; (2) continue working with the Arizona Department of Public Safety to enforce the existing speed limit within Organ Pipe Cactus NM; (3) convert the bottom strands of Organ Pipe Cactus NM's north and south boundary fences to smooth wire to encourage pronghorn movements between Organ Pipe Cactus NM and surrounding areas; (4) educate motorists about the plight of pronghorn using a variety of interpretive media in an effort to encourage lower speeds and increased awareness of wildlife use of the highway corridor; (5) continue to serve as a member of the Interagency Core Working Group for Sonoran pronghorn recovery and implement activities outlined in the recovery plan, including development of a monitoring program; and (6) monitor visitor use and restrict access where necessary to minimize the potential for disturbance to pronghorn.

Recreational activities include hiking, camping, horse-back riding, and biking. These activities can disturb pronghorn and degrade habitat. Maintaining and/or adding hiking trails at Organ Pipe Cactus NM is likely to maintain or increase visitor presence in pronghorn habitat, resulting in long-term, moderate, adverse, regional disturbance to pronghorns. All proposed facilities would be located within areas of existing development and would involve relatively small tracts of land surrounded by larger areas of undisturbed habitat. However, development of facilities that result in increased visitor use may adversely affect the pronghorn. Increased use of some frontcountry and backcountry areas has the potential to adversely affect pronghorn if it causes an alteration in behavior or habitat use. Increased visitation to Organ Pipe Cactus NM was also

expected to result in increased traffic along SR 85, adding to the barrier effect of existing traffic patterns. Approximately 22 miles of SR 85 lie within Organ Pipe Cactus NM. The Service concluded that the highway is a deterrent to expanding pronghorn populations, and resulting modified behavioral patterns may lead to a reduction in genetic exchange, reduced viability, and a concomitant reduction in the ability of pronghorn to adapt to environmental change.

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

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

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

The biological opinion (consultation number 2-21-96-F-094), issued August 27, 1997, addressed military use of airspace and ground space on the eastern half of the BMGR by Luke AFB. At the time of the consultation, about two-thirds of the BMGR was located on lands managed primarily by the BLM, with the remaining third located within Cabeza Prieta NWR. Approximately 5 percent (7.6 percent, not including Cabeza Prieta NWR) of the range had been impacted by military activities. Military activities within the area of overlap with the Cabeza Prieta NWR

were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. The eastern part of the BMGR is known as the Gila Bend segment. Military activities occurring within the Gila Bend segment are managed by Luke AFB and included: airspace use, four manned air-to-ground ranges, three tactical air-to-ground target areas, four auxiliary airfields, Stoval Airfield, and explosive ordnance disposal/burn areas.

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

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

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

This biological opinion (consultation number 2-21-96-F-334), issued September 5, 2000, addressed all Border Patrol activities along the United States/Mexico border in Yuma County from the Colorado River to about the area of Pinta Sands at the south end of the Sierra Pinta Mountains. Border Patrol activities within the Yuma Sector/Wellton Station included helicopter and ground patrols; drag road preparation and assessment of road maintenance; remote sensor installation and maintenance; apprehensions and rescues; and assistance to other sectors and agencies. To reduce adverse effects on pronghorn, the Border Patrol agreed to implement the following measures: (1) purchase new, quieter MD600N helicopters to replace existing OH-06As; (2) contact the AGFD weekly for an update on weekend telemetry flights to avoid areas of pronghorn concentration; (3) modify helicopter flights to avoid fawning areas during the three peak months of the fawning season (April-June); (4) make confidential monthly reports to the manager of Cabeza Prieta NWR detailing the law enforcement actions and wildlife observations made during the previous month; (5) finalize the Memorandum of Understanding between the Border Patrol and Cabeza Prieta NWR to address objectives that will minimize potential conflicts including limiting of routine patrols and off-road use in wilderness and provide a

framework for cooperation; and (6) conduct an annual interagency meeting with Cabeza Prieta NWR, the Arizona ESO, and BLM to present the annual report and discuss ways to improve coordination.

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

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

The Border Patrol has not submitted an annual report of their activities, therefore, the Service has no information on implementation of the reasonable and prudent measures, terms and conditions, conservation recommendations, or conservation measures that were part of the proposed action. Additionally, the Service has been informed by Luke AFB representatives that the Border Patrol has graded additional drag roads in San Cristobal Valley. The Service is not aware of any incidental take attributable to Border Patrol activities in the Yuma Sector's Wellton Station resulting from the proposed action.

Western Army National Guard Aviation Training Site Expansion Project

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

This biological opinion did not address the pronghorn, but, in the Court's opinion, should have and was therefore remanded by the Court. Per the final EIS for WAATS, ARNG use of East

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

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

Historically, livestock grazing, hunting or poaching, and development along the Gila River and Rio Sonoyta were all probably important factors in the well-documented Sonoran pronghorn range reduction and apparent population decline that occurred early in the 20th century. Historical accounts and population estimates suggest pronghorn were never abundant in the 20th century, but recently, the estimated size of the population in the action area declined from 179 (1992) to 99 (2001). At 99 animals, maintenance of genetic diversity is questionable, and the population is in danger of extirpation due to human-caused impacts, or natural processes, such as drought or predation. The reason for the decline is not clear, but a combination of factors are likely responsible. The U.S. pronghorn population is isolated from other populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Rio Sonoyta, which likely were important sources of water and forage during drought periods, has been severed.

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

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

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

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

IV. EFFECTS OF THE PROPOSED ACTION

Effects of ongoing and proposed activities on the Sonoran pronghorn can be segregated into effects of ground-based activities and effects of overflights. 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 military overflights, pronghorn may exhibit a startle response or may flush from cover (Krausman *et al.* 2001, 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, Krausman *et al.* 1986), 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). In addition, overflights may involve delivery of chaff, flares, rockets, practice or live ordnance, and practice rounds that may affect pronghorn directly or may degrade its habitat. Aircraft crashes and crash rescue or clean up activities for expended ordnance or crash sites may also impact the pronghorn and its habitat.

Overview - Effects of Ground-Based Activities

Behavioral responses of wild ungulates to human activities range from none to panic flight and abandoning areas of disturbance, while physiological responses may include a variety of effects that can influence survival and reproduction (Geist 1971). deVos (1989) investigated the relationship of telemetered pronghorn localities to the proximity of "concentrated military activities" on the BMGR. Numbers of localities were found to be greater than expected,

particularly in areas within 660 feet of military zones, and were less than expected in areas 5,250 to 21,000 feet from military zones. This occurred despite the fact that many pronghorn were initially captured on Cabeza Prieta NWR and Organ Pipe Cactus NM, at points distant from military activity, and would not be expected to occur near military zones.

Hervert *et al.* (2000) investigated use of military target areas by pronghorn, and found that pronghorn showed a preference for some military target areas. The first 0.6 miles around targets were most preferred by pronghorn, and the authors concluded that pronghorn may be attracted to the airfield and HE Hill on the North TAC. The authors surmised that pronghorn may be attracted to these areas because of available water, forage, and greater visibility. They documented pronghorn drinking from water collected in a bomb crater in this area. The authors found that pronghorn may be attracted to areas with plywood targets, but appeared to avoid metal convoy target areas. Plywood targets were typically located on bajadas, and association with these targets may have been incidental to pronghorn preference for this habitat type.

Krausman *et al.* (2001) investigated effects of military overflights and ground-based activities on the pronghorn at North and South TACs. This is the only comprehensive study of the effects of military activities on the Sonoran pronghorn. The North and South TACs support some of the most intense military use on the BMGR, and, within the current range of the pronghorn, are where most live fire practice and live ordnance delivery occur. The ranges are used heavily by pronghorn; 21 (about 20 percent of the U.S. population) used the two TACs during the study by Krausman *et al.* (2001). Krausman *et al.* (2001) observed 2,128 ground-based events, 443 overflight events, and 594 occurrences of other air stimuli (flares, bombs, smoke) on the BMGR. In response to all stimuli, on days without stimuli, pronghorn foraged more and bedded less than on days with stimuli; the opposite was true for fawns. Krausman *et al.* (2001) only considered a change in behavior to trotting or running in response to stimuli as biologically significant. Eighty-seven (4.1 percent) of the 2,128 events with ground-based stimuli resulted in pronghorn changing their behavior to trotting or running. A total of 866 (41 percent) resulted in some change in behavior. Movements of more that 33 feet associated with ground-based stimuli were observed only once, in which a female moved during multiple stimuli, including 2 vehicles and military aircraft.

Krausman *et al.* (2001) also monitored noise levels at the BMGR. In regard to all forms of military activities, the authors concluded that: (1) behavioral patterns of pronghorn were similar with and without presence of military stimuli, (2) behavioral patterns of pronghorn exposed to military activity were similar to that of pronghorn not exposed to regular military activity, and (3) auditory characteristics are similar for ungulates that have and have not been exposed to sound pressure levels characteristic of military activity. Military activity was associated with changes in the behavior of pronghorn, but these changes did not likely influence animals in a detrimental manner. The authors found that because of low fawn productivity and recruitment, they could not draw specific conclusions about their behavior in the presence of military activity. Fawns were involved in 2 of the 6 instances pronghorn moved more than 33 feet. Fawns appeared to respond to military stimuli as do their mothers, which may be more sensitive to anthropogenic stimuli than other pronghorn.

Any activity that is detrimental to fawns is important to the conservation of the pronghorn because low fawn recruitment appears to limit population size. Hervert *et al.* (2000) investigated fawn survival on the BMGR versus Organ Pipe Cactus NM and Cabeza Prieta NWR, and found no difference in daily mortality rates of fawns between the BMGR and the other two areas. The authors concluded that their data do not support a hypothesis that fawn survival is affected by military training activities. However, military overflights and other ground activities (e.g., recreation, Border Patrol, undocumented immigrants) occur in all three areas to varying degrees; thus it is not possible to evaluate the effects of human activities, including military activities, on fawn survival, or to tease out the effects of ground-based or other types of military activities from other factors that may affect fawn survival.

Overview - Military Overflights

Overflights by themselves do not cause habitat degradation, but ungulates may respond with increased heart rates and may flee from aircraft in a response similar to ground-based stimuli (Weisenberger *et al.* 1996; Krausman *et al.* 1986, 1998, 2001; Workman *et al.* 1992; Hughes and Smith 1990). Krausman *et al.* (2001) is the only comprehensive evaluation of effects of military activities on the Sonoran pronghorn. The authors documented 149 direct overflights and 263 other overflights (in which the aircraft passed $\geq$ 328 feet to the side of the animal). Pronghorn changed their behavior 39 and 35 percent of the time during direct and other overflights, respectively. Krausman *et al.* (2001) only considered a change in behavior to trotting or running in response to stimuli as biologically significant. Pronghorn broke into a trot or run 3.7 percent of the time when exposed to direct overflights, and 1.6 percent of the time during overflights greater than 328 feet to one side of an animal. Pronghorn also ran during a crash of an F-16. Pronghorn trotted or ran in response to flares, bombs, and smoke 1.0 percent of the time. Of the 9 instances where pronghorn changed their behavior to trotting or running, only 2 of these resulted in animals moving more than 33 feet, including a crash of an F-16 crash, and one instance of an overflight at greater than 1,000 feet AGL. In response to all ground and air stimuli, on days without stimuli, pronghorn foraged more and bedded less than on days with stimuli. The opposite was true of fawns. Krausman *et al.* (2001) concluded that military activity was associated with changes in the behavior of pronghorn, but these changes did not likely influence animals in a detrimental manner.

The authors acknowledged that their conclusions were weak in regard to fawns, because of small sample sizes. Other questions remain unanswered as well. The authors observed few "low-level" (less than 1,000 feet AGL) flights; including 6 direct military overflights, 15 indirect military overflights (where the flight occurred more than 328 feet to the side of a pronghorn), and 14 other low-level direct and indirect overflights; thus the effects of this type of flight were not examined in any depth. Also, the authors did not distinguish between fixed-wing and helicopter flights. However, we suspect the authors observed few helicopter flights, and most overflights were probably fixed-wing aircraft at high elevation: most overflights in R-2301E are by fixed-wing aircraft greater than 1,500 AGL. Unfortunately, we can not discern from Krausman *et al.* (2001) how pronghorn responded to low-level helicopter flights.

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). 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, sonic booms and subsonic aircraft flyovers caused elevated heart rates (Workman *et al.* 1992). 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. Low-level flyovers by a Cessna 182 elicited apparent habituation in one pronghorn but not another.

Disturbance and flight of ungulates caused by a variety of sources are known to result in numerous physiological effects that can be adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971). Mule deer disturbed by snowmobiles and humans on foot expended from 0.2 to 5.0 percent of their daily metabolizable energy in each encounter (Freddy *et al.* 1986). Frequent disturbance imposes a burden on the energy and nutrient supply of animals (Geist 1978), which may be exacerbated in harsh environments such as the BMGR. Repeated stimuli commonly leads to habituation and reduced response (Harris 1943); however, animals should habituate reluctantly to stimuli that pose a threat (MacArthur *et al.* 1979). Despite these findings, overflights of bighorn sheep elicit only minor physiological response and a minor increase in stress (Krausman *et al.* 1998).

Effects of Ordnance Delivery

Direct death or injury to pronghorns could occur as a result of ordnance deliveries, other objects falling from aircraft, spent shells, live rounds, or pronghorn stepping on ordnance. Potential impacts of normal ordnance deliveries are limited to manned and tactical ranges except for air-to-air live ammunition (ball only). On manned ranges and most areas of tactical ranges, ordnance is limited to cannon fire and practice bombs and rockets. High explosive delivery is limited to HE Hills, one of which occurs on each of the tactical ranges. Live Maverick missiles are used on one target near the southern border of North TAC and one target in East TAC. Numerous targets throughout the ranges also receive various degrees of strafing.

East TAC and Manned Ranges 2, 3, and 4 are outside the known current range of Sonoran pronghorn based on telemetry data collected from 1994 through 2000. Based on these data, a few pronghorn have occurred near Manned Range 1. Therefore, pronghorn appear to be most at risk of death or injury from ordnance from live fire air-to-air training and from air-to-ground training on South TAC, North TAC, Manned Range 1, and the Air-to-Air Live Fire Areas.

The likelihood of practice bombs or inert ordnance affecting pronghorn is remote. Such ordnance or pieces thereof would have to fall on or otherwise strike an animal to kill or injure it.

Of greater concern are live bombs and strafing or cannon fire. In regard to high explosive ordnance delivery (but not strafing or practice bombs), Luke Air Force base has developed operating instructions for the pronghorn on North and South TACs. These instructions are implemented during any high explosive delivery of ordnance. The instructions require at least two monitors per tactical range during the daylight hours. The ranges are monitored visually and by telemetry daily (for animals with transmitters) for two hours before delivery begins. If there is a break in ordnance delivery of more than 2 hours, additional monitoring occurs. If a pronghorn is sighted, no strafing or training ordnance deliveries are made within 1.2 miles (3 km) and no live ordnance is delivered within 3.1 miles (5 km) of the pronghorn. No monitors are present at night, but live deliveries are only allowed if there is not a 2 hour or greater gap between ordnance deliveries and afternoon monitoring cannot be completed prior to 30 minutes after sunset or the end of civil twilight, whichever is earlier. The assumption is that activity at the targets will discourage pronghorn from moving onto targets into harm's way. However, if there is a break in the activity of more than 2 hours, animals may have moved into harm's way, requiring additional monitoring. Luke AFB has also committed to monitoring Manned Range 1 during ordnance delivery there (personnel stationed at towers at Manned Range 1 will be trained to look for and identify pronghorn and will halt activities if pronghorn are at risk).

No mortality or injury of pronghorn as a result of ordnance delivery or unexploded ordnance has been documented. However, on July 19, 1999, remains of a pronghorn were found about a 0.6 mile from a strafing target at the North TAC. There was evidence of bullet impact areas near the pronghorn (M. Coffeen, Service, pers. comm. 2001), despite the distance from the target. The carcass was sent to the Service's National Wildlife Health Center (NWHC) for necropsy. The lab reported that no lead residue and no metal fragments were found in the remains (Lynn Creekmore, NWHC, pers. comm. 1999). The animal, although probably dead only a week before it was found, had already been heavily scavenged, which made it impossible to determine cause of death. This animal may have been killed by strafing, but could have died from other causes, as well. Male pronghorn had been observed sparring for several days before the male pronghorn remains were found (B. Wirt, Luke AFB, pers. comm. 2001). The animal may have died during combat with another animal. Nonetheless, pronghorn in and near target areas are at risk of death or injury. Pronghorn commonly use the North and South TACs, and are attracted to water and, during favorable growing conditions, ephemeral forage (Hervert *et al.* 2000); thus considerable opportunity exists for interaction between pronghorn and military activities in these areas. During 374 hours of observing pronghorn on the North and South TACs, Krausman *et al.* (2001) noted 594 instances of flares, bombs, smoke, and strafing. Although we do not know what percentage of these instances were bombs or strafing, no injury or mortality of pronghorn were recorded.

North and South TAC are not monitored on days that only strafing is scheduled. Strafing in the absence of monitoring occurs on up to 40-50 days a year (D. Garcia, Luke AFB, pers. comm. 2001). Most strafing is high angle straf in which little or no ricochet or skip is expected. However, pronghorn that may wander onto strafing targets or other areas where bullets land could be killed or injured; which may have been the case in the 1999 incident described above, although it is just as likely that it died from other causes.

Effects of Vehicle Use

Potential injury or death to pronghorn from collisions with ground vehicles involved in military activities is unlikely because the majority of roads on the BMGR are unimproved and vehicle speeds are low. The only roads where collisions appear to be even remotely possible are those out to Manned Range 1, which is staffed on weekdays throughout the year except for times when the range is closed. Manned Range 1 is near the edge of the pronghorns' current range. The posted speed limit on the access road is 45 mph and the openness of the terrain makes a collision highly unlikely.

As discussed in the overview, vehicles may elicit a flight response in pronghorn, with possible associated physiological effects that can be adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971). However, Krausman *et al.* (2001) found that military activity, including vehicle use, was associated with changes in the behavior of pronghorn, but these changes did not likely influence animals in a detrimental manner.

Effects of Aircraft Crashes and Crash Rescue and Clean Up

Aircraft crash infrequently in currently occupied pronghorn habitat on the BMGR. Krausman *et al.* (2001) witnessed pronghorn response to a crash of an F-16. On February 16, 2000, five pronghorn were observed running at the moment of impact of an F-16 on the South TAC. The pronghorn were not visible before the crash, but ran more than 30 feet after the event. Pronghorn could potentially be hit by an aircraft or pieces of an aircraft, but this is highly unlikely. The noise and visual stimuli of a crashing aircraft is likely to be disturbing to pronghorn, and as witnessed by Krausman *et al.* (2001), they may flush or leave the area. Rescue operations and crash cleanup, involving emergency vehicles, trucks, and foot traffic are also expected to result in a flush response or pronghorn leaving the area. If natural fuels, such as dried annual plants, occur in abundance at the point of impact, a fire may result. However, because of generally low fuel loads in the desert scrub of the BMGR, a wildfire is not likely to carry far.

Effects of Flares and Chaff

Flares and chaff are dropped from aircraft during training events. The environmental effects of chaff and flares were evaluated by Air Force Air Combat Command (1997). The report concluded that chaff is unlikely to have any adverse effects to terrestrial wildlife, although adverse effects were possible in aquatic systems. If chaff fell in water, the effects of pronghorn using that water are unknown. The primary effect of flares was increased incidence of fire. On the BMGR, fuel loads are very low, making the likelihood of a flare-caused fire very low. However, in some years with abundant ephemeral vegetation, particularly in disturbed areas where nonnative annual plants are abundant, flares could ignite fires. If ignited, fires would not likely carry far due to discontinuity of fuels.

Habitat Destruction or Modification at Tactical Ranges, Manned Range 1, and Air-to-Air Live Fire Area

Luke AFB estimated the area within their target ranges that is affected by various impacts and also estimated the area of the U.S. Sonoran pronghorn range that is overlapped by these areas of impact. Category 1 includes areas regularly impacted by air-to-ground ordnance deliveries within manned and tactical target ranges. In these areas, habitat disturbance is the greatest and ranges from moderate to, at such sites as HE Hills, complete disturbance of soils and lack of vegetation. A total of 7,208 acres within South TAC, North TAC, and Manned Range 1 are affected within this category. Category 2 includes areas subject to regular range decontamination. The EOD clearances occur yearly on North and South TAC, and every two months on Manned Range 1. During range clearances, large six-wheeled drive trucks are driven across the desert at intervals ranging from 50 feet to 150 yards searching for ordnance items. Clean up activities result in vehicle tracks and other disturbance associated with removal/disposal of ordnance, crushing or destruction of vegetation, and disturbance of soils. However, these areas are not as disturbed as Category 1 areas. A total of 8,539 acres within South TAC, North TAC, and Manned Range 1 are affected within this category. Category 3 includes areas subject to 5-year range decontamination. A total of 74,098 acres within South TAC, North TAC, and Manned Range 1 are affected within this category. Similar types of activities and disturbance occur in Category 3 areas, but are less frequent and are less apparent than in Category 2 areas. Category 4 includes all roads in the eastern segment of the BMGR for which data were available. Road widths were liberally assumed to average 30 feet. A rough estimate was made due to the lack of current data. A total of 1,915 acres within South TAC, North TAC, and Manned Range 1 are impacted within this category. Roads are used for commutes into Manned Range 1 towers, access to ranges for operation of electronic warfare equipment, maintenance, resource management, and EOD activities; and occasional use by ground, forward air controllers. Ground spotters use existing roads to access areas for ground-based coordination with aircraft for targeting on an occasional basis. No other land-based training regularly occur on the Gila Bend segment of the BMGR. A total of 187,944 acres of the Air-to-Air Live Fire Areas are subject to potential effects from rare events of live air-to-air fire, and falling spent shells.

Disturbance of habitat due to military activities probably has mixed effects on pronghorn. In extremely affected areas, such as in active targets in Category 1, perennial forage may be absent or scarce. Activities in other Category areas may also remove or damage perennial forage resources. However, as discussed in the overview, pronghorn may be attracted to these disturbed areas because of available water, annual forage - which may grow in greater abundance in these areas, and greater visibility. Pronghorn have been observed drinking from water collected in a bomb crater (Hervert *et al.* 2000).

Effects of Noise and Aircraft Overflights

Sonoran pronghorn may be affected by noise from and visual impacts of aircraft overflights. Pronghorn have been exposed to aircraft overflights on BMGR since 1941. Pronghorn are exposed to military aircraft overflights on most of the eastern segment of BMGR. However, most aircraft maintain a minimum altitude of 500 feet, with more than 90 percent of flights over

800 feet AGL. Less than 12 percent of all flights over BMGR are supersonic and all supersonic flights occur at altitudes greater than 5,000 feet. Over Cabeza Prieta NWR, USAF aircraft maintain a minimum altitude of 1,500 feet with greater than 90 percent of flights occurring over 5,000 feet, except in MTRs, where aircraft may operate down to 500 feet AGL. Most helicopter use of the Gila Bend segment is in R-2304, which is outside the known range of Sonoran pronghorn. Helicopter flights over all of R-2301E, much of which overlies pronghorn range, were limited to 232 sorties in 72 flights in fiscal year 1995.

As discussed in the overview, Krausman *et al.* (2001) observed few biologically significant responses of pronghorn to overflights. Pronghorn broke into a trot or run 3.7 percent of the time when exposed to direct overflights, and 1.6 percent of the time during overflights greater than 328 feet to one side of an animal. Krausman *et al.* (2001) did not distinguish between fixed wing and helicopter flights; however, because most overflights in R-2301E are by fixed wing aircraft at >1,500 feet AGL, the data collected by them probably reflect responses to high-level jets.

Low-level helicopter flights are most likely to elicit biologically significant responses from pronghorn (see the overview, Workman *et al.* 1992, Weisenberger *et al.* 1996, Luz and Smith 1976). Luke AFB does not conduct helicopter flights, but authorizes such use of the tactical ranges by the Marine Corps and ARNG. Helicopter use may result in flight response by pronghorn away from low-level helicopter flight routes. Disturbance and flight of pronghorn may result in numerous physiological effects that can be adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971). Helicopter use by the Marine Corps and ARNG are being addressed in remanded biological opinions to those agencies.

In addition to noise and visual impacts from aircraft overflights, other military activities on the Gila Bend segment that may adversely affect pronghorn behavior include noise from practice and live ordnance, use of air-dropped flares during night training, and ground-based human activity on manned and tactical ranges. Krausman *et al.* (2001) monitored noise levels at the BMGR. The largest sound recorded was near HE Hill on the North TAC in 1998 that measured 121.8 decibels and had a duration of 59.1 seconds. Thirty-five of 737 hours monitored at this site had average sound levels of more than 70 decibels. At another site, 5 miles from the first site, noise levels were lower, and the maximum noise was 119.3 decibels. Krausman *et al.* 2001 did not specifically evaluate effects of noise on pronghorn at the BMGR. However, biologically significant responses to bombs, flares, and smoke were recorded infrequently (1.0 percent).

Krausman *et al.* (2001) found that because of low fawn productivity and recruitment, they could not draw specific conclusions about their behavior in the presence of military activity. Fawns appeared to respond to military stimuli as do their mothers, which may be more sensitive to anthropogenic stimuli than other pronghorn. The endangered and declining status of the pronghorn, the apparent heightened sensitivity of fawns and their mothers to disturbance, and the critical nature of fawn survival to population persistence suggests disturbance from aircraft overflights and other sources of noise or visual stimuli should be minimized during critical

fawning periods (March 15-July 15) and areas, and additional research and active management should be conducted to determine and mitigate the factors that are limiting this population.

Conservation Measures

Luke AFB has made substantial commitments to minimize the effects of their activities on the Sonoran pronghorn, and has additionally committed to implementing a variety of recovery projects recommended by the Sonoran Pronghorn Recovery Team. Proposed changes in the EOD schedule will change EOD activities on North and South TAC to outside of the critical period for fawns and their mothers. Sensitive species' briefings, limiting vehicles to designated routes, low speed limits, limiting surface disturbance, monitoring of tactical ranges and closing those ranges if pronghorn are at risk, and other commitments greatly reduce the effects of the proposed action on the Sonoran pronghorn. Harris Environmental (2000) monitored the TACs for 268 days between July 15, 1999, and July 14, 2000. HE hills on North TAC and South TAC had a 38 percent closure rate during the reporting period because of the presence of pronghorns. Additional monitoring measures proposed by Luke AFB will add up to 20 additional days of monitoring on North and South TACs per year (D. Garcia, pers. comm. 2001).

The proposed measures minimize, but do not eliminate, habitat disturbance associated with use of tactical ranges, Manned Range 1, EOD activities and other ground-based activities; and effects of military overflights and associated activities, of which the most important are effects of low-level helicopter flights. Monitoring of high-explosive ordnance delivery at the tactical ranges greatly reduces the chances of injury or mortality of pronghorn. However, of concern is strafing that occurs up to 40-50 days per year in the absence of monitoring. Pronghorn could be killed or injured at North or South TAC, and on Manned Range 1 as a result of this activity.

V. CUMULATIVE EFFECTS

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

Relatively small parcels of private and State lands occur within the currently-occupied range of the pronghorn near Ajo and Why, north of the BMGR from Dateland to Highway 85, and from the Mohawk Mountains to Tacna. State inholdings in the BMGR were recently acquired by the USAF. Continuing rural and agricultural development, recreation, vehicle use, grazing, and other activities on private and State lands adversely affect pronghorn and their habitat. MCAS-Yuma (2001) reports that 2,884 acres have been converted to agriculture near Sentinel and Tacna. These activities on State and private lands and along the Mexican border and the effects of these activities are expected to continue into the foreseeable future. Historic habitat and potential recovery areas currently outside of the current range are also expected to be affected by these same activities on lands in and near the action area in the vicinity of Ajo, Why, and Yuma.

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

VI. CONCLUSION

After reviewing the current status of Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed action and the cumulative effects, it is the Service's biological opinion that the action, as proposed, 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. Only minor amounts of Sonoran pronghorn habitat are expected to be lost or degraded.

2. Luke AFB will increase its monitoring of North and South TACs to ensure no adverse effects occur to pronghorn from bombing and strafing.

3. Luke AFB ground activities and helicopter usage that can adversely affect pronghorn will be monitored by the biological monitors to ensure no adverse effects occur.

4. Luke AFB will update operational instruction 1.1.

5. Luke AFB will close un-needed roads.

6. Luke AFB will contribute to recovery actions for the pronghorn.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to

listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

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

Amount or Extent of Take Anticipated

The Service anticipates that no more than 3 Sonoran pronghorn could be taken as an incidental result of the proposed action. The incidental take is expected to be 1 pronghorn in the form of death and 2 pronghorns in the form of harassment. This incidental take provision will be reviewed concurrent with subsequent reviews of the Barry M. Goldwater Integrated Natural Resources Management Plan which will occur every five years.

Effect of the Take

In the accompanying biological opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

Reasonable and Prudent Measures

The Service believes the following reasonable and prudent measure is necessary and appropriate to minimize impacts of incidental take of Sonoran pronghorn:

1. Expand efforts to monitor Sonoran pronghorn on the tactical ranges to minimize the likelihood of adverse impacts to the pronghorn from military training exercises.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the USAF must comply with the following term and condition, which implement the reasonable and prudent measure

described above and outline any required reporting/monitoring requirements. This term and condition is non-discretionary.

1. Within 30 days revise and implement the operating instruction on Sonoran pronghorn to include, in detail, the final changes from the October 5, 2001, correspondence with Luke AFB as detailed in conservation measure # 9.

If a dead, injured, or sick individual of a listed species is found on the BMGR, initial notification must be made to Service Law Enforcement, Federal Building, Room 105, 26 North McDonald, Mesa, Arizona, 85201 (telephone: 480/835-8289) within one working day of its finding. Additionally, Cabeza Prieta NWR must be contacted at 520/387-6483. These telephone contacts will be documented in telephone logs by the reporting agencies. Written notification must be made within five calendar days and include the date, time, and location of the finding, a photograph of the animal, and any other pertinent information. The notification shall be sent to Law Enforcement with a copy to the Arizona Ecological Services Field Office, 2321 W. Royal Palm Road, Suite 103, Phoenix, AZ 85021. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state possible. If possible, the remains shall be placed with educational or research institutions holding appropriate State and Federal permits. If such institutions are not available, the information noted above shall be obtained and the carcass left in place but protected from predators. Arrangements regarding proper disposition of potential museum specimens shall be made with the institution prior to implementation of the action. Injured animals should be transported to a qualified veterinarian by an authorized biologist. Should any treated animals survive, the Service shall be contacted regarding before any final disposition of the animals.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the action. If, during the course of the action, the anticipated level of take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Federal agencies must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures.

CONSERVATION RECOMMENDATIONS

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

1. Pursue funding for all research needs that are identified for implementation by USAF in the final revision of the Sonoran pronghorn recovery plan, as well as all research needs

that have been concurrently or subsequently identified by the Sonoran Pronghorn Recovery Team.

2. Conduct and/or fund research to determine the effects of low level flights by helicopters on free-ranging pronghorn and use the information to evaluate flight ceilings and low-level flight corridors over Cabeza Prieta NWR. The USAF should provide the Service with the results of any research in a timely manner.

3. Prepare a Sonoran pronghorn spreadsheet database from all historic sightings in USAF files and support an annual program of documenting Sonoran pronghorn sightings by employees that can be shared with other agencies and placed in the Sonoran pronghorn database that is being managed by Luke AFB.

4. Study the feasability of moving or adding targets north of the Crater Range for use when TAC targets are closed due to the presence of pronghorns.

5. Continue efforts to implement the use of modular targets and electronic scoring systems to reduce the number of strafing targets. Additionally, the USAF should continue to evaluate the development of a sensor training area where pilots can practice delivery of precision- guided munitions on no-drop, electronically scored, targets.

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

REINITIATION STATEMENT

This concludes formal consultation on the actions outlined in the project proposal. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if: (1) 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 that was not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and assistance throughout this consultation process. Any questions or comments should be directed to David Harlow of the Arizona ESO at 602-242-0210.

Sincerely,

Nancy M. Kaufman

Regional Director

Enclosures

cc (w/enclosures):
Manager, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
State Director, Bureau of Land Management, Phoenix, AZ
Field Office Manager, Yuma Field Office, Bureau of Land Management, Yuma, AZ
Field Office Manager, Phoenix Field Office, Bureau of Land Management, Phoenix, AZ
First Lieutenant William Fay, Arizona Army National Guard, Phoenix, AZ
Park Superintendent, Organ Pipe Cactus NM, Ajo, AZ
Ronald Pearce, Director of Range Management, Marine Corps Air Station, Yuma, AZ
Scott Bailey, Ecologist, Tohono O'odham Nation, Sells, AZ
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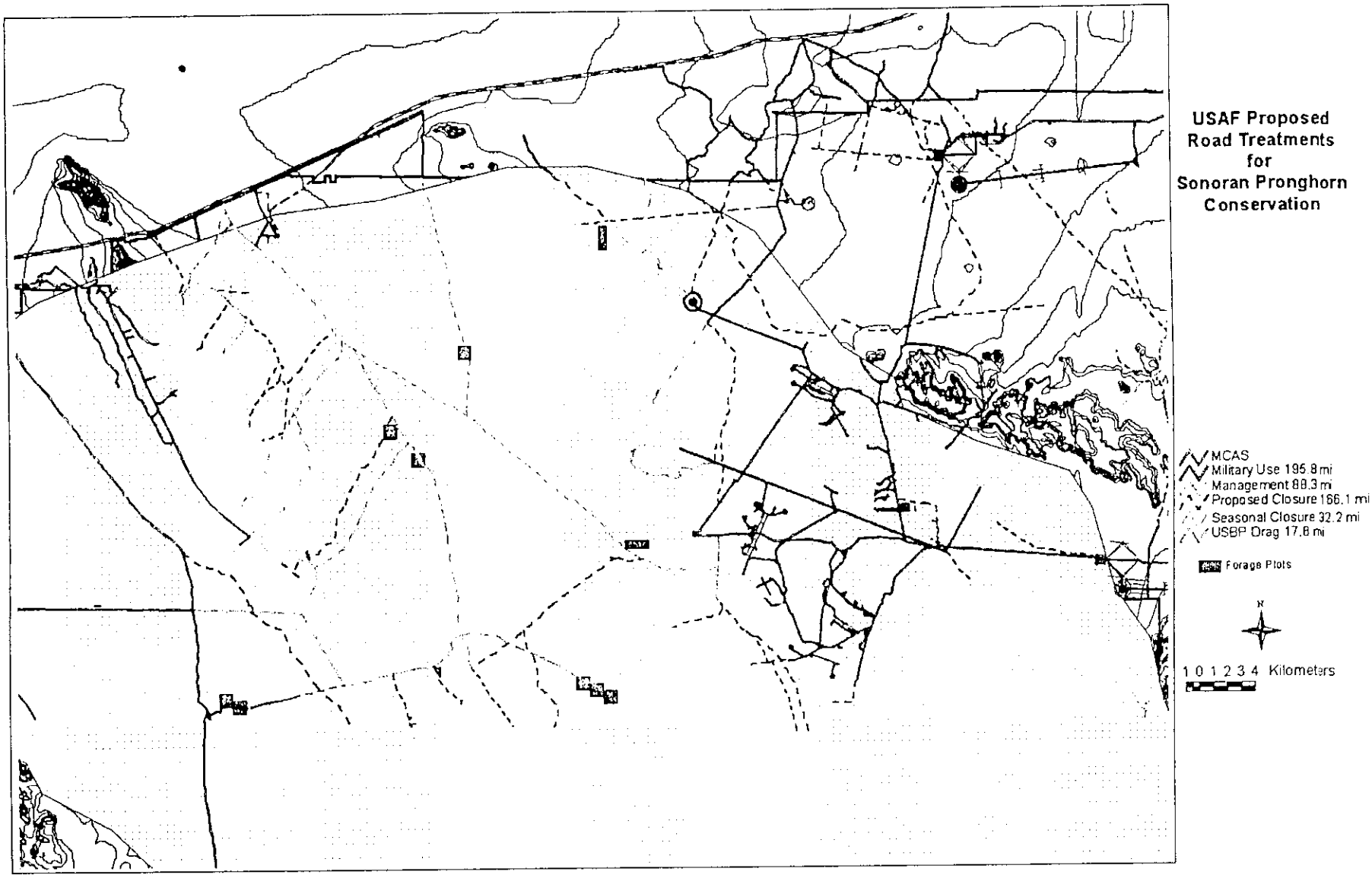

Figure 1. U.S. Air Force Proposed Road Closures under the Integrated Natural Resources Management Plan, Luke Air Force Base, 2001.

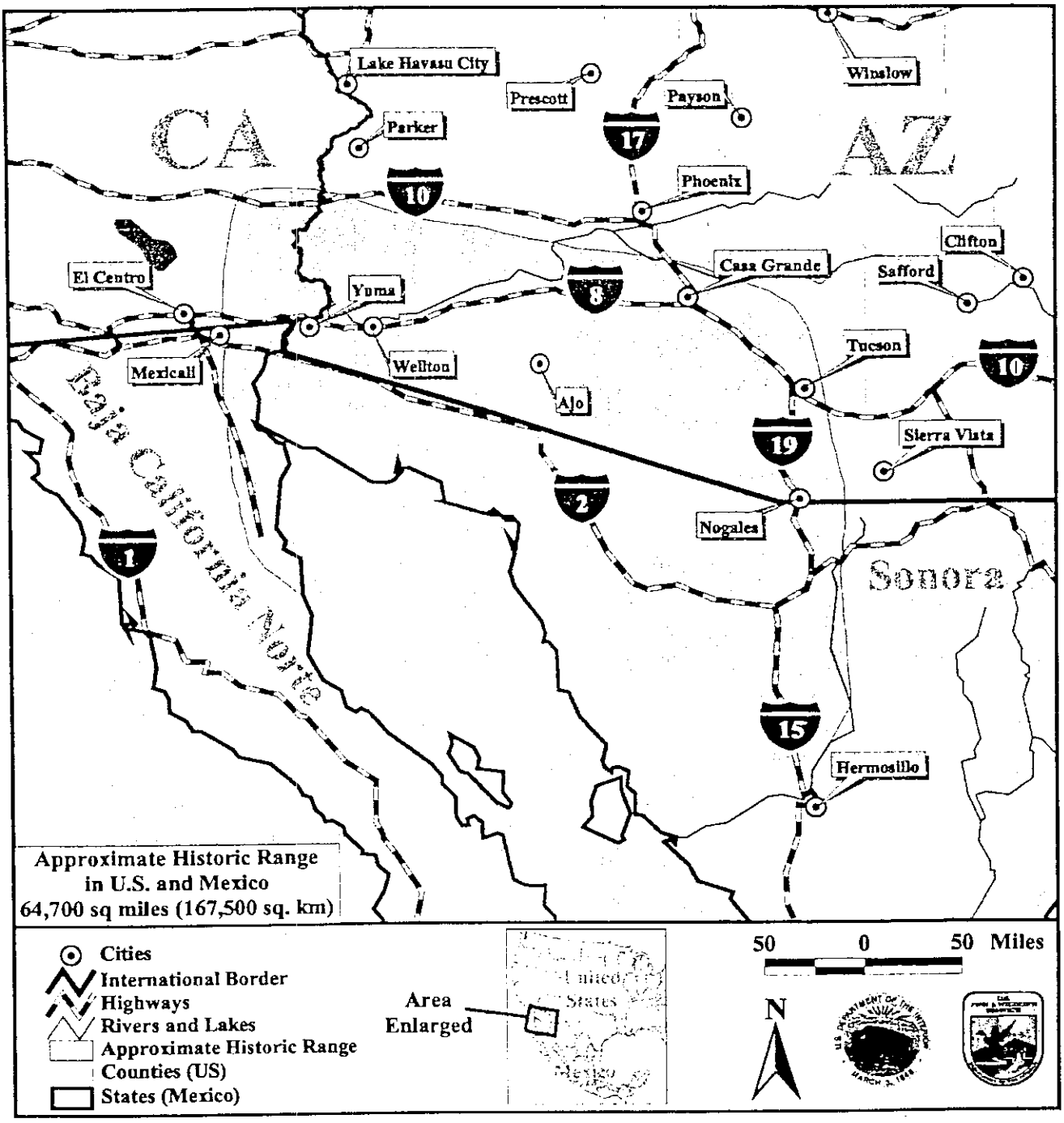

Figure 2. Historic range of Sonoran pronghorn in the United States and Mexico.

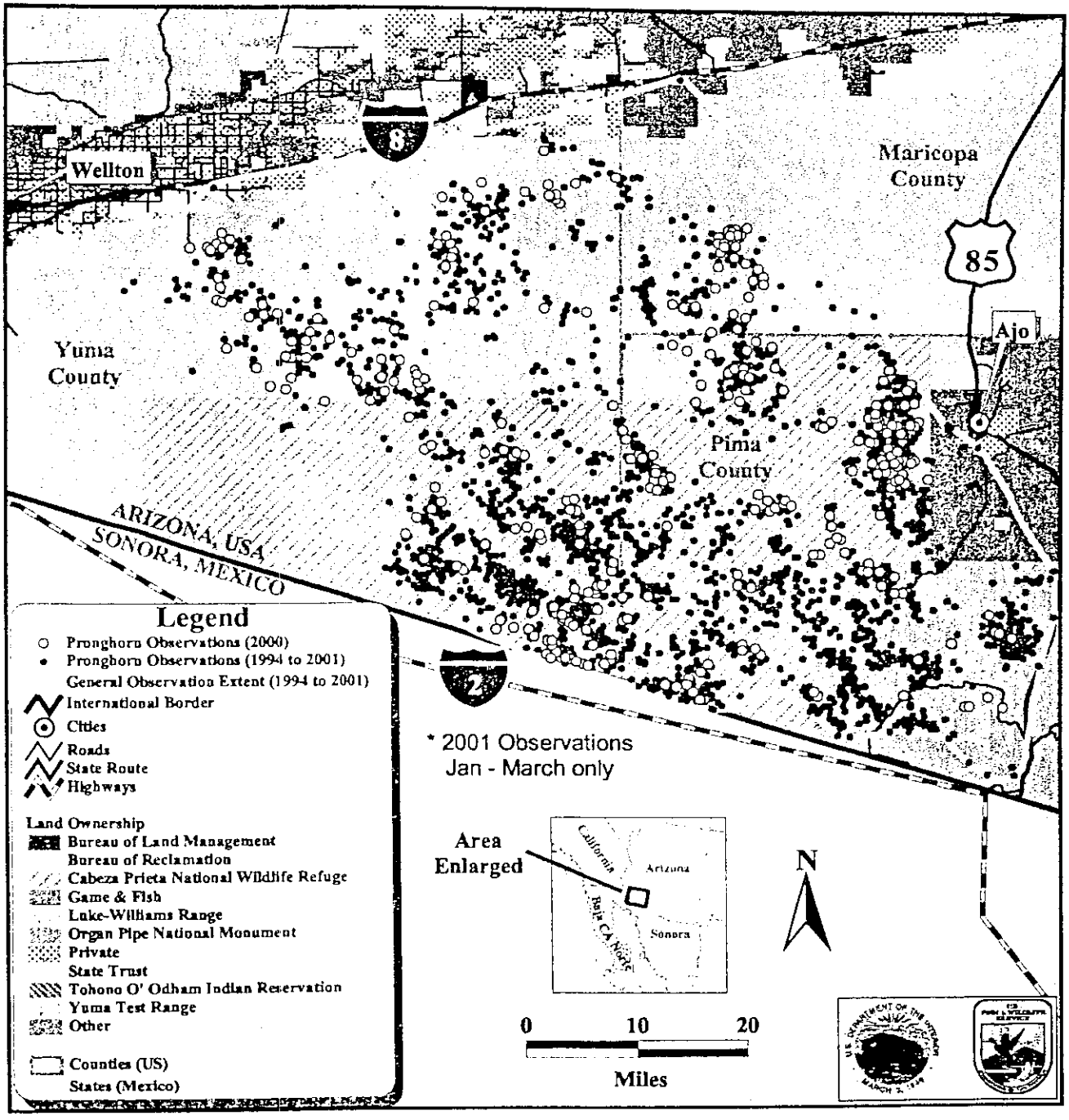

Figure 3. Current Sonoran pronghorn distribution in the United States: Records from 1994-2001.

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

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

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

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

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

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

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

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

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

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

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

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

Appendix 1. Sonoran pronghorn 51 recovery actions as presented to the Service's Region 2 Regional Director by the Sonoran Pronghorn Recovery Team.

Ranking		Sonoran Pronghorn Recovery Actions
Priority	Average	
1	1.00	Maintain active radiocollars on ~10% of the Sonoran pronghorn population for population monitoring and other study purposes
2	1.18	Experimentally place small, portable, temporary waters in occupied habitat during the summer months, and evaluate their use and efficacy
3	1.18	Develop a white paper that addresses the full range of captive breeding alternatives (e.g., capture alternatives; age and sex of wild caught animals; husbandry requirements, herd monitoring, holding facilities, transportation, release criteria, need for predator control, post-release monitoring, and etc.)
4	1.18	Continue biennial , or possibly annual, population survey of the U.S. subpopulation
5	1.18	Continue weekly aerial monitoring of radiocollared pronghorn (i.e., distribution, movements, mortality signals, fawn status, predator presence)
6	1.27	Develop an intensive monitoring program to quantitatively investigate pronghorn use of water tanks (i.e., permanent, semi-permanent, temporary, emergency)
7	1.27	Continue monitoring fawn recruitment while conducting weekly telemetry flights
8	1.27	Implement and monitor experimental forage enhancement project on BMGR
9	1.36	Identify, evaluate, and prioritize potential reintroduction sites in the U.S. and Mexico
10	1.36	Initiate biennial population surveys for the 2 Mexico subpopulations to be timed in conjunction with the U.S. survey
11	1.45	Continue monitoring (and closing as needed) of military targets, relative to pronghorn locations, by contract biologists on NTAC and STAC on BMGR on live fire days
12	1.45	Continue ongoing program of hauling water as needed to permanent tanks in currently occupied pronghorn habitat (e.g., Jose Juan Charco, Halliwill Catchment, etc.) until proposed pronghorn/water investigations are conducted and program can be quantitatively reevaluated
13	1.73	Develop a study looking at seasonal diets (e.g., fecal analysis)
14	1.73	Continue restrictions on types of use in important pronghorn habitat during critical periods of the year (e.g., OPCNM periodic seasonal closure of Pozo Nuevo Road; CPNWR closure to public use of Chico Shunie Loop Road, Marine use of certain ground sites on BMGR)
15	1.73	Contract with a population geneticist or American Zoological Association to conduct an analysis of what comprises a minimum population in order to maintain the gene pool and to assess at what point if the U.S. subpopulation continues to decline, all remaining pronghorn should be taken into captivity

16	1.82	Initiate study by AGFD to evaluate effects of Border Patrol helicopter flights on pronghorn
17	1.91	Develop study to investigate potential contaminant concerns from military activities on BMGR (e.g., soil/vegetation sampling; blood and tissue samples from captured pronghorn; sampling of other resident wildlife) for baseline data
18	1.91	Continue aggressively investigating and documenting all incidences of mortality (collared and uncollared) and likely causes
19	1.91	Deploy remote data loggers as needed to document use of water sources, travel corridors, and/or foraging areas by radiocollared pronghorn
20	1.91	Initiate AGFD/USAF study to evaluate effects of night missions on pronghorn behavior/activity
21	1.91	Experimentally mark a sample of coyotes with GPS collars to determine behavior and seasonal movements relative to pronghorn locations, free water, rainfall events
22	2.00	Develop a study to monitor/investigate influences of disease and other stressors on pronghorn
23	2.00	Assess effectiveness of current aerial population survey methodology and compare with current literature
24	2.00	Continue law enforcement activities designed to reduce illegal border traffic (e.g., foot and vehicle UDA's, drug smuggling) and as a consequence movement through pronghorn habitat
25	2.09	Investigate Culicoides sp. as a vector source in the transmission of bluetongue and EHD to pronghorn from cattle and other native ungulates
26	2.09	Continue field work by U of A and preparation of vegetation association map for OPCNM, BLM, CPNWR, BMGR
27	2.09	Develop a water balance study (e.g., double-labeling, water deprivation, use of pre-formed/metabolic water in diet) using a surrogate race of captive pronghorn
28	2.09	Expand genetic determinations to include Mexico as opportunity allows (e.g., Peninsular pronghorn and Sonoran subpopulations)
29	2.18	Investigate impacts of helicopters from other program activities (e.g., Marine Corps WTI, other military activities, U.S. Customs Service, other State and Federal management agencies) on pronghorn
30	2.18	Initiate periodic aerial surveys in Mexico at other times of the year than the population census to monitor herd size, composition, distribution, natality, etc.
31	2.18	Investigate effects of public use and other ground-based activity (e.g., military training, ordnance clean-up, law enforcement, land management agency activities such as grazing, firewood cutting, and mining) on pronghorn
32	2.18	Complete AGFD contract with Purdue University to look at taxonomic status using established genetic markers of Sonoran pronghorn relative to other races of pronghorn

33	2.27	Continue to promptly notify CPNWR of all pronghorn mortalities; recovery team leader keeps a file on all reports and maintains a summary table of all mortalities and known facts
34	2.27	Incorporate a habitat assessment component in currently used population survey technique to monitor annual change/variation in range condition
35	2.27	Complete range assessment of 4 allotments by the BLM and application of Standards and Guidelines to ensure adequate forage for pronghorn and habitat improvement
36	2.27	Evaluate pronghorn location data relative to available habitat using normalized digital vegetation index and/or other forms of satellite data
37	2.36	Develop a narrowly-defined and rigidly controlled coyote removal plan
38	2.36	Develop study to continue to evaluate water quality at bomb craters that fill with water and are frequented, at least seasonally, by pronghorn
39	2.36	Update the PVA in light of new, more quantified data on various aspects of pronghorn biology and PVA techniques
40	2.36	Evaluate occurrence of bluetongue and EHD in cattle and native ungulate species and their potential to serve as a reservoir for these diseases
41	2.45	Fix highway (e.g., Highway 85, Interstate 8), International Boundary, and other fences to make them pronghorn accessible or pronghorn barriers as determined necessary
42	2.45	Prepare a written protocol for dealing with injured or dead pronghorn including permit authority, agency and veterinarian contact numbers, notification protocol, transportation, housing and/or disposal procedures
43	2.55	Compile extant reports of pronghorn watering (documented and anecdotal), review of literature, and prepare a technical reviewed article
44	2.55	Continue timely coordination with Recovery Team and Phoenix Ecological Services Office on all proposed use changes on Tactical Ranges
45	2.55	Investigate blank spots in current pronghorn range distribution maps (e.g., targeted aerial surveys, remote sensing)
46	2.55	Experimentally provide mineral supplement blocks
47	2.55	Conduct a comprehensive literature review of pronghorn/barrier interactions and wildlife passage devices and designs (to include literature for other ungulate species when appropriate)
48	2.63	Develop a back-up plan in the event of a hoof and mouth outbreak
49	2.7	Construct and staff a Sonoran Desert greenhouse for producing key forage plants for transplanting
50	2.7	Assess all wildlife and livestock waters on 4 BLM allotments as to pronghorn accessibility and/or potential traps
51	2.9	Develop a medical kit with all necessary materials for treatment, salvage, and/or necropsy with description of procedures and handling of biological samples

Each recovery team member assigned a rank of high = 1, medium = 2, or low = 3 to each project. Since there are 51 projects and 3 rankings, exactly 1/3 of the projects were ranked high, medium, or low by individual team members. The assigned rankings were averaged and the lower the score, the higher the priority. In the event of a tie between 2 or more projects, the project with the lowest variance was ranked higher. The theoretical highest and lowest possible rank that can be achieved by a given recovery action is 1.0 and 3.0, respectively.