In Reply Refer To:
R2/ES-TE
CL 09-0015

November 16, 2001

Consultation No. 2-21-95-F-114R2

Mr. Ronald Pearce
Director of Range Management
Marine Corps Air Station
P.O. Box 99100
Yuma, Arizona 85369-9100

Dear Mr. Pearce:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed and ongoing activities by the Marine Corps Air Station-Yuma (MCAS-Yuma) in the Arizona portion of the Yuma Training Range Complex (YTRC) on the Barry M. Goldwater Range (BMGR), Yuma and Maricopa counties, and its effects on the Sonoran pronghorn (*Antilocapra americana sonoriensis*) and threatened Peirson's milkvetch (*Astragalus magdalenae peirsonii*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA).

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: Air Force (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.

Peirson's milkvetch was listed after the 1996 biological opinion on this action was issued and was not known to occur in the action area until recently. It is included in this formal consultation. Your original request asked for our concurrence that the proposed action may affect, but is not likely to adversely affect, the endangered lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*) and cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*),

which was proposed for listing as an endangered species at the time, and was subsequently listed as endangered in 1997. Our response to your requests for concurrence is in Appendix 1.

Your original request included conferencing on the flat-tailed horned lizard (*Phrynosoma mcallii*), which was proposed for threatened status at the time. The proposal to list the lizard was withdrawn in July 1997. The withdrawal was remanded to the Service in a July 31, 2001, decision by the Ninth Circuit Court of Appeals. On October 24, 2001, the District Court ordered the Service to reinstate the previously proposed listing rule within 60 calender days. Upon reinstatement, the 12-month ESA deadline for the final listing determination for the lizard shall commence. Refer to our April 1996 biological and conference opinion on MCAS-Yuma's YTRC, which included a conference on the lizard, for information on effects of the proposed action on the lizard and recommended actions to conserve the species. If the lizard is listed, MCAS-Yuma should coordinate with the Service to determine if further consultation is necessary.

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 the pronghorn and milkvetch, 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 in the Phoenix, Arizona, Ecological Services Field Office (ESO).

CONSULTATION HISTORY

Before consultation began on the MCAS-Yuma Arizona portion of the YTRC, the Service and MCAS-Yuma had previously consulted informally on some aspects of the proposed action, including AV-8B harrier activities (consultation number 2-21-89-I-195), and Weapons Tactics Instructor (WTI) course (consultation numbers 2-21-88-I-46, 2-21-88-I-48, and 2-21-90-I-180). In regard to AV-8B activities, the Service reviewed an environmental assessment (EA) on proposed activities and recommended that MCAS-Yuma initiate formal consultation. Informal consultation on the WTI course consisted of coordination and review of an EA addressing WTI (consultation number 2-21-87-I-126), a request for a species list by MCAS-Yuma and transmittal of that list to MCAS-Yuma by the Service (consultation number 2-21-88-I-46), a concurrence by the Service that the proposed WTI course would have no effect on the pronghorn (consultation number 2-21-88-I-48), and a request for informal consultation from MCAS-Yuma and a reply from the Service for more information on the proposed action (consultation number 2-21-90-I-195).

Informal consultation on the Arizona portion of the YTRC began on May 17, 1993, with the publication in the Federal Register of a notice of intent to prepare an Environmental Impact Statement (EIS) on the use of the YTRC. A coordination meeting at which the project was described and discussed was held on May 27, 1993, in Phoenix among the Service, MCAS-Yuma, BLM, and Arizona Game and Fish Department (AGFD). Alternatives included actions to improve training procedures, develop new training facilities, and reconfigure airspace in the western portion of the BMGR, Arizona, and at the Chocolate Mountains Aerial Gunnery Range, Imperial County, California. A second coordination meeting between the Service and MCAS-Yuma was held in Phoenix on June 24, 1993. An administrative draft EIS was distributed to the Service and other agencies and interested parties in July 1994. The Arizona ESO submitted comments to MCAS-Yuma on the administrative draft EIS in a letter dated August 5, 1994. Comments were from all concerned Service offices in Arizona, including Cabeza Prieta, Kofa, Cibola, Bill Williams, and Havasu National Wildlife Refuges (NWRs). Review and comment on project features in California were coordinated by the Service's Carlsbad ESO. The MCAS-

Yuma responded to our comments in a letter dated September 27, 1994. In a memorandum to the Carlsbad ESO, dated October 19, 1994, the Arizona ESO volunteered to take the lead on a programmatic consultation for the YTRC, including proposed activities in both Arizona and California. In a memorandum dated November 8, 1994, the Carlsbad ESO agreed. A third coordination meeting was held among the involved Service offices in Arizona and MCAS-Yuma on November 9, 1994. The results of that meeting were summarized in a memorandum from Dames and Moore to the meeting participants, dated December 6, 1994. Other scoping and coordination meetings with the public and other agencies were held to receive comment on and discuss the proposals (MCAS-Yuma 1995).

Separate draft biological assessments (BA) addressing proposals in the Arizona and California portions of the YTRC were received by this office on December 8, 1994, accompanied by a letter from MCAS-Yuma asking for our review and comment. As agreed upon, the draft BA for actions in California were forwarded to the Carlsbad ESO for their review. Service comments on the draft BA for the Arizona portion of the YTRC were sent to the Southwest Division, Naval Facilities Engineering Command, San Diego, in a letter dated February 3, 1995. This letter included comments from the Cabeza Prieta NWR and the Arizona ESO. The final BA was received by the Service with the October 13, 1995, request for initiation of consultation and conferencing. In addition to activities described in the draft EIS, the BA included proposed installation of 17 new threat emitters on the Tactical Aircraft Combat Training System (TACTS) Range within the BMGR.

Because the finalization of the two BAs (BMGR, Arizona, and the Chocolate Mountains Aerial Gunnery Range, California) were on different timetables, separate consultations were initiated for the California and Arizona portions of the YTRC. Consultation on actions in California were initiated in mid-1995 with the Carlsbad Field Office. The two opinions addressed different species: Mojave population of the desert tortoise on the Chocolate Mountains Aerial Gunnery Range versus Sonoran pronghorn and flat-tailed horned lizard on the BMGR. Thus, effects of the action in regard to listed and proposed species were easily separated at the state line. This is still the case.

During consultation, the Service informally requested from Bill Fisher (Naval Facilities Engineering Command, Southwest Division, San Diego, CA, January, 1996), and promptly received, clarifications on the proposed action. The Service met with the Sonoran Pronghorn Core Working Group on February 22, 1996, to discuss the proposed action. At that meeting, MCAS-Yuma revised proposed low-level helicopter flight routes and use of two stinger team operating areas to reduce potential adverse effects to the pronghorn. Further revisions in the helicopter corridors were made during a conference call on March 7, 1996, among the Service, AGFD, and MCAS-Yuma. One final change was made in the corridors on April 11, 1996, in response to concerns expressed by the Service about possible adverse effects to the lesser long-nosed bat.

On April 17, 1996, the Service issued its biological opinion on the MCAS-Yuma Arizona portion of the YTRC. The opinion found that the effects of the action were not likely to jeopardize the continued existence of the pronghorn or flat-tailed horned lizard. The Service also concurred with MCAS's determinations that the action may affect, but was not likely to adversely affect, the lesser long-nosed bat and cactus ferruginous pygmy-owl.

The Carlsbad ESO issued a biological opinion dated April 18, 1996, for the California portion of the YTRC. The opinion found that the proposed action was neither likely to jeopardize the continued existence of the desert tortoise, nor likely to result in adverse modification or destruction of critical habitat designated for the tortoise.

The section 7 process occurred concurrently with the National Environmental Policy Act process for the YTRC and the upgrade of the TACTS. A draft EIS for the YTRC was made available for public comment in October 1995. A draft EA for the TACTS was produced in June 1995. For the section 7 consultation, TACTS was folded into the proposed action for the YTRC and was addressed in the April 17, 1996, biological opinion. A final EIS for YTRC was produced in January 1997, and a record of decision was signed on September 24, 1998. A final EA for the TACTS was produced in August 1996 which approved placement of 12 threat emitters on the BMGR; five additional threat emitters were proposed in the YTRC EIS. All 17 were addressed in the biological opinion. The final EIS and record of decision were issued in 1997.

In a March 13, 1998, letter, MCAS-Yuma asked that the proposed action in the April 17, 1996, biological opinion be revised to clarify use of Stoval Field for use in training operations in support of WTI courses. The Service responded in a letter dated March 18, 1998, revising the proposed action as requested, followed by a determination that the revision did not change the conclusions in the biological opinion and did not precipitate a need to modify reasonable and prudent measures or terms and conditions. That revision was the first reinitiation of the biological opinion; this document represents the second modification of the opinion.

The concurrence for the cactus ferruginous pygmy-owl in the April 17, 1996, opinion required completion of surveys for the owl in accordance with Service protocols in suitable habitats at the proposed ground support area southwest of Stoval Field, in certain areas east or northeast of the Cabeza Prieta Mountains, and in suitable habitat in low-level flight corridors on Cabeza Prieta NWR. Surveys were conducted in February to April 1997, pygmy-owls were not detected. Pygmy-owl surveys were conducted in the best habitats on the eastern half of Cabeza Prieta NWR in early 2001. Two male pygmy-owls were located in early March 2001 near Papago Well on Cabeza Prieta NWR.

Term and condition 3a of the 1996 biological opinion required that MCAS-Yuma submit an annual report to the Service in which habitat disturbance and pronghorn occurrence and take would be documented, and which would additionally include recommendations for improving the terms and conditions. The first report was to be delivered by January 1, 1997; subsequent reports were to be delivered on January 1 of each following year. No report was received in 1997, 1998, or 2001. An annual report was received February 10, 1999, for activities in 1998. A draft report was received December 23, 1999, for activities in 1999, but no final report was received by the Service. The February 10, 1999, final report, and the December 23, 1999, draft reported no take of pronghorn or loss of pronghorn habitat. Although reporting by MCAS-Yuma has been incomplete, the Service is unaware of any pronghorn taken as a result of MCAS-Yuma activities.

On October 6, 1998, the Service published a final rule listing Peirson's milkvetch as a threatened species without critical habitat. In the final rule, Arizona was not recognized in either the current or historic range of the plant; although it was known to be extant in the Algodones Dunes in southeastern California and in the Gran Desierto of northwestern Sonora. A specimen of the plant was collected in April 1996 by Dale Turner, University of Arizona, in low dunes in the Yuma Desert on the western edge of the BMGR. The specimen was confirmed as Peirson's milkvetch by botanist Richard Felger of Tucson. Informal searches for the plant in 2001 at the Yuma Dunes, Pinta Sands, and near the collection site have not located additional plants.

On October 5, 1999, Congress passed the Military Lands Withdrawal Act (MLWA). The MLWA established the Marine Corps as the manager for the western portion of the BMGR (lands under airspace R-2301W) and the USAF as the manager for the eastern portion of the BMGR. The lands are withdrawn from the public domain for Department of Defense (DoD)

purposes until 2024. Before 1999, the USAF had managed the entire BMGR, and the BLM was assigned land management jurisdiction. This jurisdiction ends on November 6, 2001, and initiates resource management by DoD pursuant to the Sikes Act. The MLWA also terminated DoD withdrawal of lands at Cabeza Prieta NWR. However, the MLWA stipulated that low-level military flights could continue over the NWR along corridors mutually designated by the Marine Corps, USAF, and Service, and the electronic instrumentation sites on the 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 CFR §§ 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."

The Judge's order also required preparation of supplemental EISs for the 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 MCAS-Yuma to discuss the status of the pronghorn, effects of MCAS-Yuma's proposed actions, and possible conservation measures for the pronghorn. We met again with MCAS-Yuma and other agencies involved in management of the BMGR and the pronghorn at an August 2, 2001, meeting of the Barry M. Goldwater Executive Council (BEC). We met to discuss the remanded biological opinions and measures we proposed to avoid or minimize adverse effects of proposed actions. We requested from the agencies, including MCAS-Yuma, that they forward any changes in their proposed actions to us by August 6. An e-mail was received by the Service from MCAS-Yuma, on August 6, 2001, in regard to such changes, which are reflected herein. Service personnel met again with MCAS-Yuma representatives on August 17 and 30, and October 2, 2001, during which MCAS-Yuma clarified some aspects of their proposed action and we discussed implementation of the conservation measures. On October 19, 2001, the Service received MCAS-Yuma's October 15, 2001, letter which further clarified the proposed action and described additional conservation measures. On October 23, 2001, the Service provided a draft biological opinion to the Marine Corps for their review. The Marines provided comments on the draft opinion to the Service on November 7 and 8, 2001.

BIOLOGICAL OPINION

I. DESCRIPTION OF PROPOSED ACTION

Proposed Action

MCAS Yuma is the military manager and primary user of the western portion of the BMGR (BMGR-West) and the R-2301W restricted airspace. Most of the ground-based Marine Corps

activities addressed in this opinion are conducted within BMGR-West under the R-2301W airspace. R-2301W overlies BMGR-West and the western portion of the Cabeza Prieta NWR. Most Marine Corps training flights at the BMGR are conducted within R-2301W. A small number of Marine Corps training flights also use the R-2301E, R-2304, and R-2305 restricted airspaces that overlie the eastern portion of the BMGR (BMGR-East), which is managed by the USAF. A small number of Marine Corps ground-based activities addressed by this opinion occur within BMGR-East. High elevation (7,500 to 20,000 feet) flights also occur over airspace in northwestern Yuma County and southern La Paz County (Figure 1-2 of MCAS-Yuma 1995). This biological opinion addresses activities funded, authorized, or carried out by MCAS-Yuma in support of the YTRC in Arizona.

The primary objective of YTRC management is to maintain and advance the training conditions of the complex so that it continues to offer Marine and other service commanders the diversity and flexibility necessary to employ and exercise their units in all phases of tactical aviation to the fullest extent and under conditions that realistically simulate combat. Activities at the BMGR provide training in six categories, including: (1) anti-air warfare, (2) offensive air support, (3) assault support, (4) aerial reconnaissance, (5) electronic warfare, and (6) control of aircraft and missiles. The scope of training activities ranges from development of individual aircrew skills to complex tactical exercise scenarios involving a variety of aircraft and associated ground troops. A general summary of the proposed actions include: (1) reconfiguration of training airspace, (2) revisions to range operating procedures, (3) development of new or improved training facilities, (4) designation of new ground support areas, and (5) realignment of noncompatible, concurrent training activities. Project alternatives were organized into 14 sets of alternatives, including three that addressed YTRC airspace, five addressed proposals within the BMGR, and an additional six addressed activities in the Chocolate Mountains, California. The latter six sets of alternatives were addressed in the Service's April 18, 1996, biological opinion issued by the Carlsbad Field Office and will not be discussed further. The remaining eight sets of proposed alternatives were addressed in the April 17, 1996, biological opinion, and are addressed herein.

The following descriptions of existing and proposed actions supporting these training activities are taken from Dames and Moore (1995), MCAS-Yuma (1995, 1997, 2001), and discussions among our staffs.

1. AUX-2 Airfield Complex

Auxiliary Airfield-2 (AUX-2) supports training in forward airfield operations and related functions. AUX-2 consists of three 4,400-foot long asphalt runways in the shape of an equilateral triangle. Adjacent to the east-west runway is a landing control tower resembling the deck and control island of a U.S. Navy Landing Helicopter Assault ship. The northeast-southwest runway, known as the tactical landing zone, is used to train C-130 transport aircrews in landings and take-offs from unimproved surfaces. Helicopter crews use AUX-2 and the surrounding area for flight training at night with night-vision goggles. AUX-2 is also used by these aircrews and occasionally by AV-8B aircrews as a forward arming and refueling point. As part of the proposals in the YTRC EIS, a narrow-width runway/roadway would be constructed at AUX-2 for AV-8B roadway operations. This proposal is on hold pending funding, but is part of the proposed action. The existing C-130 runway was resurfaced and narrowed from 200 to 90 feet in 1998. Located adjacent to AUX-2 is a tow banner drop area for the controlled release of aerial-towed practice gunnery targets. AUX-2 and the tow banner drop area are located in the Yuma Desert, outside of the current range of the pronghorn, but within historic, and possibly recovery, habitat.

2. Moving Sands and Cactus West Targets

These targets support instruction in precision air-to-ground bombing. Both target complexes have bull's-eye type bombing targets with a current impact radius of 1,500 feet. Both include air-to-ground rocket, bomb, and strafing targets. The Moving Sands complex also contains laser targets and a Mobile Land Target. The latter is a remote-controlled movable target. MCAS-Yuma had maintained cleared run-in lines, approximately 11 miles in length, to guide pilots to the targets. Clearing of these run in lines ended after issuance of the April 17, 1996, biological opinion, although Border Patrol now uses them as vehicle routes. Ordnance delivery to the targets is limited to inert ordnance only. Inert bombs of up to 1,000 pounds and inert rockets are authorized, as well as the use of laser target designation. Explosive ordnance disposal (EOD) sweeps, including target area clearing and grading, are conducted as often as quarterly on both target complexes. In accordance with proposals in the YTRC EIS, new target scenarios have been added to the Moving Sands target. Modifications have yet to be made at the Cactus West target. These targets are located west of the Gila and Tinajas Altas mountains, and are thus outside of the current range of the pronghorn, but within historic and possibly recovery, habitat.

3. Parachute Drop Zone

A parachute drop zone, located near AUX-2, is used to receive training parachute cargo drops from C-130 transport aircraft. Cargo pallets are recovered from the drop zone with a tactical forklift designed to operate on rough ground. A proposal in the YTRC EIS included moving the parachute drop cargo recovery area from a relatively undisturbed site southwest of AUX-2 to a previously disturbed site southeast of AUX-2. This proposal has been implemented. The parachute drop zone is in the Yuma Desert, outside of the current range of the pronghorn, but within historic and possibly recovery, habitat.

4. Explosive Ordnance Disposal Operating Area

The EOD Operating Area, located approximately 1.5 mile south-southwest of AUX-2, is an authorized location for disposal of ordnance. The site is accessed via a road from AUX-2 and consists of an open burn area, a class A and B detonation area, and a white phosphorus detonation area. Approximately 6.5 square miles (mi^2) surrounding the operating area are designated as restricted to entry for safety purposes. The EOD Operating Area is located in the Yuma Desert, outside of the current range of the pronghorn, but within historic and possibly recovery, habitat.

5. Rifle and Pistol Range

A 30-lane rifle range and 20 lane pistol range, located near the entrance to the BMGR at County 19th, are used for small arms training. The ranges are located in the Yuma Desert, outside of the current range of the pronghorn, but within historic and possibly recovery, habitat.

6. Cannon Air Defense Complex

Located at the northwest corner of the BMGR, just off County 14th, this complex is the headquarters, training, and maintenance site for the 1st Light Anti-aircraft Missile Battalion stationed at MCAS-Yuma. Personnel are trained in the operation of HAWK phase III anti-aircraft missile systems using simulations. No missiles are launched from this site. The Cannon Air Defense Complex is located in the Yuma Desert, outside of the current range of the pronghorn, but within historic and possibly recovery, habitat.

7. Tactical Aircrew Combat Training System (TACTS)

TACTS is a transmitter/telemetry system used for training in aerial combat to track and record the flight performance of up to 36 aircraft. The system can also simulate electronic air warfare conditions and electronically track and score simulated air-to-ground strikes. The TACTS system includes a master tracking and relay site at Baker Peaks, 11 remote tracking sites, 36 mobile threat emitter sites, and 11 passive tactical target sites that present simulated tactical targets to aircrews. One of the 11 remote tracking sites is located in the Cabeza Prieta Mountains on Cabeza Prieta NWR. Mobile threat emitter sites consist of eight by 10-foot concrete pads adjacent to roads where portable electronic warfare equipment emits simulated tracking and targeting radar associated with enemy surface-to-air missiles. Seventeen new threat emitters and associated features were proposed in the YTRC EIS and TACTS EA. Five of the new sites are located adjacent to and are powered by existing transmission lines. Twelve other new threat emitters are powered by gas generators. These features have been constructed and are now operational. Most of the TACTS facilities are located west of the current range of the Sonoran pronghorn; however, several of the threat emitters and remote tracking sites, and the master tracking and relay site, are all in the western portion of the current pronghorn range.

8. Ground Support Areas

Ground support areas are located primarily in R-2301W (Figure 1) where ground units conduct land-based air control, air defense, electronic warfare, communications, forward area helicopter refueling and rearming, as well as other functions to help create a complex air to ground battlefield. The ground support areas are used primarily during WTI, but may be used anytime of the year. Most ground support areas are less than 0.39 mi^2. Nineteen existing ground support areas are proposed to be combined with adjacent lands into 3 larger, ground support zones. Another 18 existing and 5 new ground support areas will be maintained outside of the 3 support zones. Another 4 existing ground support areas were retired from use under the 1997 final EIS. In total, 32.9 mi^2 are devoted to ground support areas or zones. Changes adopted in the 1997 final EIS allowed new disturbance in 16.5 mi^2. Within the current range of the pronghorn, thirteen ground support areas would be combined with adjacent lands to comprise ground support zones 2 and 3. An additional 8 individual ground support areas occur in currently occupied habitat. Other ground support zones and areas are located in the Lechuguilla Desert and the Yuma Desert (historic habitat). The location of a proposed ground support area southwest of Stoval Field has been moved slightly north and east of the location evaluated in the 1996 biological opinion to avoid impacts to the Mohawk Mountains and Sand Dunes Area of Critical Environmental Concern. Stinger Teams, using non-firing Stinger, shoulder-fired anti-aircraft missiles, would also be located along existing routes during WTI courses held primarily in March-April and October-November of each year. Stinger teams use High-Mobility Multipurpose Wheeled Vehicles (HMMWVs) on roads and are authorized to park off-road within 25 feet of roads. The proposed action in 1996 included designation of ten Stinger Team Operating Areas, and on-foot movement of Stinger Teams to operation areas. However, under the current proposal, all Stinger Team operations will be conducted along existing roads. Stinger Teams operate primarily during WTI and use areas along routes in the Mohawk Valley (currently occupied habitat) and Lechuguilla Desert (historic habitat). In addition to the 32.9 mi^2 of existing or proposed ground support areas and Stinger Team operations, the Marine Corps also uses Stoval Field in the San Cristobal Valley, underlying R-2301E, as a forward arming and refueling point.

9. Military Road Use

Within R-2301W, roads have been identified and designated for military use. All roads shown on Figure 1 are approved for military training with the exception of jeep trails. The road system includes 237 miles of designated routes. Several of these roads traverse pronghorn habitat. A few routes not identified as training routes during the 1996 consultation, are now considered routes for military training. These include a road between the Mohawk Dunes and the Mohawk Mountains, a road from ground support area 21 around the Wellton Hills to support area 23, and a road from the Wellton Hills to the major northwest-southeast route that passes just west of the Copper Mountains.

10. Overflights of the BMGR and Cabeza Prieta NWR, particularly in airspace R-2301W

Approximately 11,000 training flights per year are carried out in R-2301W. Of these, fewer than 6,000 per year in recent years (1996-2000) occur over the current U.S. distribution of Sonoran pronghorn. Fixed-wing aircraft use is conducted throughout the year. Helicopter use occurs mostly from January through March and in September and October. Most fixed-wing sorties (one aircraft conducting a single flight, may include the use of any type of aircraft at any altitude of flight) occur during the day. Most helicopter sorties are flown at night; helicopters flown include the CH-46, CH-53, UH-1, and AH-1 (R. Pearce, MCAS-Yuma, pers. comm. 2001). All helicopter flights occur between 50 and 1,500 feet above ground level (AGL), with most flown <500 feet AGL. Approximately 18, 20, 23, and 39 percent of all fixed-wing flight time occurs at 200 to 1,500 feet AGL, 1,500 to 5,000 feet AGL, 5,000 to 10,000 feet AGL, and above 10,000 feet AGL, respectively. Helicopters tend to remain at a fairly constant elevation AGL. However, fixed-wing aircraft flight elevation does not mirror the terrain on the ground to any degree. Rather, aircraft stay at a fairly level elevation across mountain and valleys. As a result, elevation above ground level for any one flight will be higher in the valleys and lower over mountain ridges. Most supersonic flights occur above 5,000 feet. Outside of WTI, low-level (200 to 1,500 feet AGL for fixed-wing, 50 to 1,500 feet for helicopters) flights may occur anywhere at any time within R-2301W of the BMGR (does not include Cabeza Prieta NWR).

The WTI course is the Marine's graduate-level training in aviation weapons and tactics. During WTI courses, aircraft use portions of the entire BMGR, including R-2301E on the eastern half of the BMGR, WTI flight corridors on the Cabeza Prieta NWR, and areas such as the South, North, and East tactical ranges (TACs). Flights over the Cabeza Prieta NWR associated with WTI occur over roughly a 2-week period; during the March-April 2001 WTI, flights occurred over a 16 day period; in October 2000, WTI flights occurred for 9 days. On the NWR, low-level flights are restricted to specific corridors. Two corridors exist for fixed-wing aircraft and three corridor segments exist for helicopters. These low-level corridors are currently used only during WTI exercises, typically in October-November and March-April. Aircraft enter and exit Cabeza Prieta NWR at specific points in the corridors. During a WTI course, helicopter corridors are used for up to eight days, but 5 is more typical. Total WTI helicopter flight time in the corridors over Cabeza Prieta NWR varies between 5 and 10 hours per year; 50-100 percent of flights time is at night. Flight corridors over the NWR are shown in Figure 1 ("implemented low-level helicopter flight track" for helicopters, and "low-level fixed wing aircraft flight track" for fixed-wing aircraft). During WTI, helicopters also fly in corridors through R-2301W on the BMGR. Low-level fixed-wing corridors over the NWR are used for six days during WTI; about 15 percent of flight time is at night. The YTRC EIS included proposed use of low-level fixed-wing aircraft corridors over Cabeza Prieta NWR for up to 60 days per year; this would include use during WTI courses. When implemented, annual use of the low-level, fixed-wing corridors over Cabeza Prieta NWR will increase from 7 to 14 hours to a proposed 35 to 70 hours (MCAS-Yuma 1995,

2001). This alternative is on hold pending development of a Memorandum of Understanding with Cabeza Prieta NWR (MCAS-Yuma 2001).

Aircraft crash on the BMGR infrequently; less than once per year in recent years. 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.

11. Early Warning Control Training

This training provides personnel in a Marine Air Control System with initial and recurrent training experience necessary to deploy to tactical locations and to conduct combat operations. The training occurs in ground support areas/zones, typically in the Baker Peaks/East Copper Mountain area, but occasionally in other ground support areas. Training is scheduled irregularly and generally lasts one to three weeks.

12. LAAD Team Training

The primary emphasis of this training is to provide the Low Altitude Anti-aircraft Defense (LAAD) Battalion with an opportunity to gain experience in planning and deploying 2-man Stinger Teams and selection of Stinger tactical firing sites. As noted under the description of activities in ground-support areas, Stinger Teams reach tactical sites via existing roads.

13. Surface-to-Air Missile Training

The HAWK FIREX program, evaluated in the 1996 biological opinion as part of the proposed action, was a live-fire exercise designed to validate the performance of HAWK missiles and associated equipment. This program has been discontinued; however, MCAS-Yuma retains the option to use the missile firing site east of Baker Peaks for future surface-to-air missile launches. Future programs are likely to include firing missiles at aircraft drones flying over the Mohawk Valley, similar to the HAWK FIREX program.

Other DoD and Marine Corps training or testing exercises have occurred in the past and may do so in the future on the BMGR on an irregular basis. Such exercises could include aviation and/or ground units conducted in a manner similar to those described above. These exercises are likely to last 3-5 days.

All ongoing and planned activities in support of the YTRC by the Marine Corps on the BMGR that could affect the Sonoran pronghorn, Peirson's milkvetch, cactus ferruginous pygmy-owl, and lesser long-nosed bat are included in the proposed action as described herein. Detailed descriptions of the proposed action can be found in Dames and Moore (1995) and MCAS-Yuma (1995, 1997, and 2001).

Proposed Conservation Measures

The MCAS-Yuma proposes a number of measures to reduce adverse effects of the proposed action on the environment, including impacts to listed species and the flat-tailed horned lizard (Dames and Moore 1995; MCAS -Yuma 1995, 1997, 2001; letter from MCAS-Yuma to the Service dated October 15, 2001). Measures specifically designed to protect the flat-tailed horned lizard and its habitat are reviewed in the Service's April 17, 1996, biological and conference opinion, and will not be repeated here. The following are part of the proposed action:

1. MCAS-Yuma has designated a management representative and point of contact within the Range Management Department with the duty to ensure compliance with measures by all users of the BMGR. This representative will have the authority to halt activities that may be in violation of such measures. A single point of contact will receive and investigate reports of unauthorized use of the airspace and ground training areas on the Range. MCAS-Yuma will continue to provide a point of contact within the Range Management Department for addressing Service concerns about overflights or other issues pertaining to NWRs.

2. All military users, including aircrews and ground support personnel of the YTRC, will be briefed on federally listed threatened and endangered species that may be encountered during training. Vehicle speed limits will be identified as well as areas to be avoided in order to reduce chance encounters and possible harm to special status species. Aircrews will be informed of the provisions of the ESA concerning harassment of threatened and endangered species. As part of the overall training program, all personnel will be informed that intentional disturbance or harassment of threatened or endangered species is a violation of the ESA and could result in prosecution. Regulations will be published and military personnel will be educated to ensure limits of authorized use are understood.

3. Human sewage at base camps and other locations of troop concentrations will be contained and disposed of in a manner that meets all applicable disposal standards.

4. All litter generated by ground troops or other personnel will be policed and contained daily and will be carried off the ranges to approved landfill sites. Base camps and other troop concentration areas will be supported by the placement of commercial dumpsters for litter collection.

5. When training outside of ground support areas, small tactical units will move on foot to off-road training areas, carry out all trash from these locations, and bury human waste on site.

6. Military vehicles will be restricted to existing roads with three exceptions: (1) when operating in designated ground support areas, the parachute drop zone, or target areas, (2) in case of an emergency, and (3) when there is a bona-fide management need. Emergencies include operations such as search and rescue for downed aircrews or lost civilians. Bona-fide management needs will be limited to aircraft crash cleanup; access to develop new, approved facilities; natural resource restoration and revegetation; and other natural resource work or surveys where access by road or foot is impossible or impractical (B. Fisher, Southwest Division, pers. comm. 1996).

7. Roads designated for military use and the locations of ground support areas will be clearly marked with non-obtrusive posts and signs in the field and on maps issued to troops.

8. Vehicles and equipment from which hazardous materials may be spilled or leaked will be placed over temporary containment aprons of plastic and sandbags. A hazardous materials response plan and team in place at MCAS-Yuma will respond immediately to any spills at the air station or in the field.

9. In the event of an aircraft crash, determination of appropriate site cleanup and restoration procedures will be coordinated with the responsible agencies within 24 hours.

10. MCAS-Yuma will establish a system for monitoring military compliance with the restrictions for limiting vehicle use to designated roads and ground support areas.

11. MCAS-Yuma will establish an annual conference with representatives of agencies involved with land and resource management on the BMGR and with interested members of the public. The purposes of the conference will include reviewing the previous year's training activities, disclosing the military record for compliance with environmental regulations, and receiving input from agencies and the public about YTRC operations and environmental issues. The Barry M. Goldwater Executive Committee (BEC) and Partnership Group, which meet several times a year, serve this function for MCAS-Yuma and Luke Air Force Base (AFB).

12. In areas with highly erodible soils, actions requiring new surface disturbance will be limited in areal extent as much as possible and confined to established roadways when feasible.

13. Where new roadways and ground support areas are established, cross- or through-drainages of existing washes (e.g., dip crossings) will be provided to the extent practical so as to not alter natural drainage or create ponding conditions.

14. All construction work and operational activities will be planned and completed to minimize increases in the potential for sheet, gully, and rill erosion. All earthwork will be shaped in a manner that will permit storm runoff with a minimum of erosion. Other measures to minimize erosion may include the construction of temporary and/or permanent berms, dikes, dams, sediment basins, and slope drains.

15. Precautions will be taken to prevent the pollution of soils and drainageways from discarded materials, sediments, muddy water, or other polluting materials.

16. All discarded matter (including but not limited to human waste, trash, garbage, oil drums, fuel, ashes, equipment, concrete, and chemicals) that is generated by development and operation of ground support areas will be removed or disposed of in a manner consistent with Federal and State regulations. Ground support areas will be maintained in a sanitary condition at all times.

17. Storage areas for petroleum products and other chemicals used during construction activities or military operations will be located or protected so that spills will not contaminate soils, enter drainageways, or impact ground water. Hazardous or toxic waste generated on site will be disposed of in a manner consistent with Federal and State guidelines.

18. Ground disturbing activities within the Gran Desierto Dunes, Tinajas Altas Mountains, and Mohawk Mountains/Sand Dunes Areas of Critical Environmental Concern will be limited to the maximum extent possible consistent with the training mission.

19. Vehicle use in passes through mountain ranges will be limited to the minimum necessary for training. A single road will be designated for vehicle travel through mountain passes. Other roads in passes should be obscured or at least blocked or posted to ensure closure from use.

20. Abandoned Marine Corps ground support areas within one-quarter mile of the proposed Camino del Diablo Backcountry Byway that were previously disturbed by military activities will be managed to promote revegetation by native plant communities.

21. MCAS-Yuma will cooperate with Luke AFB in an evaluation of potential adverse effects to pronghorn from ordnance delivery and unexploded ordnance at target sites on the North and South TACs. The results of the evaluation will be used to develop mitigating measures. This measure has been implemented in regard to monitoring of the tactical ranges during high explosives delivery, but no evaluation has been completed, and additional mitigation measures have not been developed.

22. The Air Force is responsible for management of the eastern portion of the BMGR, which includes the North and South TAC air-to-ground target areas. As a user of these target areas, the MCAS-Yuma complies with all range operating procedures and rules established by the Air Force, including those governing environmental protection. As the manager of these assets, the Air Force is staffed and funded to manage the range. Staffing and funding are driven by many factors, including environmental protection requirements.

23. In coordination with other federal agencies, the MCAS-Yuma will study the potential effects of chaff on Sonoran pronghorn with an emphasis on the possible toxic conditions of chaff contamination in waters located on the BMGR and Cabeza Prieta NWR. By the middle of fiscal year 2002, a study design will be provided to the Service for review. If adverse effects are identified, the report on the study will include recommendations for reducing or eliminating adverse effects of chaff on Sonoran pronghorn. In coordination with the Service, the MCAS-Yuma will implement operationally feasible recommendations within two years of the date of the final report.

24. The Marine Corps will support its fair share of the 51 management and research projects developed by the Sonoran Pronghorn Recovery Team to promote recovery of the subspecies. These projects may be conducted in coordination with other agencies. Projects will be prioritized in the Goldwater Range Integrated Natural Resources Management Plan, and implemented as appropriate beginning in fiscal years 2002 and 2003 (to the extent that funding is available).

25. The MCAS-Yuma will support closure of the Mohawk Valley area of the BMGR to public use from March 15 to July 15 beginning in 2002 to reduce the potential for human disturbance of Sonoran pronghorn during the period that is critical to early fawn survival. The MCAS-Yuma will also support the permanent closure of roads within this area that are not needed for administrative agency use. The roads selected for closures will be identified by October 1, 2002, in coordination with the Service and other agency partners participating in the ongoing development of the BMGR Integrated Natural Resources Management Plan. By March 15, 2003, routes will be signed, and permanently closed routes will be blocked with physical barriers. The MCAS-Yuma will construct an interpretive kiosk at the entrance to BMGR on the road from Tacna. Text for the kiosk will be prepared in coordination with the Service and will describe regulations for public use of the range.

26 The MCAS-Yuma will provide the Arizona ESO and the Cabeza Prieta NWR an annual monitoring report that provides information on the prior year's implementation progress for the conservation measures described above as well as terms and conditions or reasonable and prudent alternatives, if any, listed in this biological opinion. The report will also include the date and location of any Sonoran pronghorn observed by MCAS-Yuma personnel, including observations of injured or dead Sonoran pronghorn. Reports that may be produced in association with implementation of the conservation measures or the biological opinion will be appended to the annual monitoring report. The first annual report will be submitted by March 1, 2002.

II. STATUS OF THE SPECIES

Peirson's Milkvetch

Peirson's milkvetch is a stout, erect, short-lived perennial up to 27 inches in height. Leaves are 2-6 inches long with 3-17 small, oblong, widely spaced leaflets. Leaves and stems are covered by fine silky hairs that give the plant a grayish-green appearance. The flowers are purple and arranged in 8-17 racemes. The pods are 0.8-1.4 inch long, inflated, and with a triangular beak. The seeds are the largest (0.2 inch) of any North American *Astragalus* (Barneby 1964, Munz 1974, Felger 2000). Peirson's milkvetch was listed as a threatened species, without critical habitat, on October 6, 1998 (63 FR 53596, 1998).

Peirson's milkvetch is a dune endemic that has been reported from the slopes and hollows of sand dunes in the Borrego Valley and Algodones Dunes in southeastern California (Barneby 1964, Munz 1974), the Gran Desierto of northwestern Sonora (Felger 2000), and from one location in the Yuma Desert, Yuma County, Arizona. The plant has not been found in the Borrego Valley for many years and portions of the habitat there have been converted to a landfill (Service 1998c). The species is known to be extant at the Algodones Dunes, and was widespread in that dune system in 1977 (WESTEC 1977) and abundant in 2001 (Dr. Art Phillips, pers. comm. 2001).

In the Gran Desierto, Felger (2000) reports the species occurs from dunes south of Sierra Blanca westward to at least the vicinity of the Sierra del Rosario. In May 2001, J. Rorabaugh (pers. comm. 2001) observed this species growing in the swales of low dunes just west of Cerro Luna, southeast of Pozo Nuevo. However, the species was not found in dunes south of the Sierra Blanca or near the Sierra del Rosario.

In Arizona, the species is known from two specimens collected on the BMGR about 2 miles northwest of the Yuma Dunes (D. Turner, University of Arizona, pers. comm. 2000). The specimens were collected April 12, 1996, from a partially stabilized, low dune where they occurred with *Baileya pauciradiata, Oenothera deltiodea, Schismus arabicus, Abronia villosa,* and *Hesperocallis undulata.* The specimen was deposited in the herbarium at University of Arizona and subsequently identified by Richard Felger. The Yuma Dunes were visited by J. Rorabaugh (Arizona ESO) in February 2001 and then again by K. Reichhardt (BLM-Yuma) in March 2001. Rorabaugh and Reichhardt visited the collection locality in April 2001. No Peirson's milkvetch were observed at these times. During extensive surveys for flat-tailed horned lizards in the Yuma Desert in 1985 (Rorabaugh *et al.* 1987), no Peirson's milkvetch were found, despite favorable growing conditions (J. Rorabaugh, pers. comm. 2001). Warren and Laurenzi (1987) also did not find Peirson's milkvetch in the Yuma Desert. The best habitats for this plant are probably in the largely unstable dunes within a few miles north of the Boundary Hills, which are located on the international boundary at Monument 198; however, Turner's 1996 collection suggests it should be looked for elsewhere in the Yuma Desert where partially stabilized, low dunes occur.

Felger (2000) reports another subspecies (*A. m. magdalenae*) from near the head of the Gulf of California in "extreme southwestern Arizona", a variety that could easily be confused with Peirson's milkvetch. Felger (2000) notes that leaflets are widest at the middle in var. *magdalenae*, versus the leaflets being widest above the middle in *peirsonii.* Felger (2000) also describes var. *magdalenae* as being a coastal dune species, whereas var. *peirsonii* is a species of inland dunes.

The final rule listing the species stated that the primary threat to the plant and its habitat is off-highway vehicle (OHV) use and recreational development associated with it. Approximately 75 percent of the Algodones Dunes have been, until recently, open to OHVs and 75-80 percent of all known colonies of Peirson's milkvetch in California lie within this open area. In 1977, no seedlings of Peirson's milkvetch or any other sensitive dune plant species, were found in areas of heavy OHV use (WESTEC 1977). Areas of intense OHV use are almost devoid of plant cover (Luckenbach and Bury 1983). In 1990, colonies of Peirson's milkvetch could not be found in areas of heavy OHV use, and in areas of moderate use, colonies had lower reproductive success and poorer health than comparable populations located in areas closed to OHVs (Service 1998c). The Northern Algodones Dunes Wilderness was designated in 1994, and includes 32,240 acres or about 25 percent of the dune system. OHVs are prohibited in this area. As a result of a recent court settlement, BLM closed another 48,000 acres of the dunes to vehicular use, pending consultation with the Carlsbad ESO.

In the Yuma Desert in Arizona, the public is prohibited from entering that portion of the BMGR that includes the Yuma Dunes and other suitable habitat on the Range. Military activities are largely limited to existing routes; however, the Border Patrol routinely drives off-road through this area and has been responsible for route proliferation in the Yuma Desert. Off-road vehicle use by smugglers is an additional problem. Visits to the Yuma Dunes and the Peirson's milkvetch collection site in February and April 2001 revealed some evidence of OHV activity in both areas, but it is not occurring at levels approaching those observed in the Algodones Dunes (J. Rorabaugh, pers. comm. 2001). Another potential threat to Peirson's milkvetch in the Yuma Desert is invasion of nonnative plants, particularly Sahara mustard (*Brassica tournefortii*), but also Russian thistle (*Salsola tragus*) and Mediterranean grass (*Schismus arabicus* and *S. barbatus*), that may compete with Peirson's milkvetch, or that may become dense enough in some years to carry fire.

Sonoran Pronghorn

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.* 1997b). 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. 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 defined as the range of the pronghorn within the U.S. (Figure 3), plus areas of the western half of the BMGR that are west of the current pronghorn range. Although this entire area is affected by the proposed action, effects are most evident where the YTRC activities occur, including areas under airspace R-2301W, Stoval Field, the WTI flight corridors, and the North, South, and East TACs.

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 and an Integrated Natural Resources Management Plan. 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 Peirson's Milkvetch in the Action Area

Within that action area, Peirson's milkvetch is only known to occur in low, partially stabilized dunes in the Yuma Desert, approximately 6.25 miles south-southeast of the AUX-2 airfield. These dunes are part of a dune ridge that extends from just south of County 19th, west of the BMGR boundary, south-southeast to the international boundary. Within a mile or two of the border the dunes are larger and less stabilized, which may provide better habitat for Peirson's milkvetch, but the species has not been found there to date. The species is only apparent in years when precipitation has been sufficient to support germination and growth. Nevertheless, it seems unlikely that Peirson's milkvetch is common in the Yuma Desert, otherwise it would have been recorded by others working in the area (Warren and Laurenzi 1989, Rorabaugh, *et al.* 1987, K. Reichhardt, pers. comm. 2001). The only other potential habitat in the action area is at Pinta Sands at Cabeza Prieta NWR; however, the species has not been reported from Cabeza Prieta NWR (Felger 1997).

The plant and its habitat or potential habitats in Arizona have been largely protected from human activities due to restrictions on public access on the BMGR, the remoteness and difficulty of accessing dune habitats on the BMGR and at Cabeza Prieta NWR, and the focusing of military activities outside of areas likely to be inhabited by Peirson's milkvetch. Off-road vehicle activity by Border Patrol, undocumented migrants, and smugglers is probably the primary human-caused effect on the species in Arizona, at least on the BMGR. The dune ridge where Peirson's milkvetch was found extends northwest onto lands owned and managed by the Arizona State Land Department just south of County 19th and west of Avenue 4E. The dunes in this area have

been heavily impacted by sand and gravel mining, OHVs, trash dumping, target practice, and other activities. If Peirson's milkvetch occurs or occurred in this area, it has likely been adversely affected by these activities. The portion of dune ridge or system that extends onto State Lands is relatively small, probably less than 5 percent of total dune habitat from the international border to County 19th.

D. 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 diseases are often fatal in wild ruminants, causing extensive hemorrhaging. Cattle infected with BTV typically show no clinical signs, but abortion or the birth of abnormal calves may occur if the cow becomes infected during gestation (Merck and Company 1986). Pronghorn infected in the wild with EHD have been observed to have convulsions, "running fits," and ataxia (the inability to coordinate voluntary muscular movements); experimental infections additionally showed signs of anorexia, dyspnea (difficult or labored breathing), and central nervous system depression (Hoff and Trainer 1981). With both diseases, reproduction of wild ruminants may be adversely affected if does are infected during gestation, resulting in early absorption of the fetus, uncomplicated abortion, and higher susceptibility of fawns to infection, usually resulting in death. Additionally, does who have survived an infection "may succumb to the stress of pregnancy as a result of their earlier infection" (Hoff and Trainer 1981).

Blood samples from U.S. Sonoran pronghorns were collected between 1994 and 2000 for serologic, hematologic, and serum chemistry testing. Samples collected in 1994 provided evidence of pronghorn exposure to *Leptospira interrogans* serovar *hardjo* (a strain of the leptospirosis-causing bacteria carried by cattle and sheep) and a high seroprevalence (the rate at which a specific population tests positive for particular antibodies) to BTV and EHD, in both the 1994 and 1997 samples (National Wildlife Health Center, *in litt.* 1999). Results from the AGFD's winter 1997-1998 serology study showed a high seroprevalence for BTV and EHD. Of the nine serum samples, seven animals tested positive for BTV and all nine were positive for EHD; all were negative for leptospirosis (AGFD, *in litt.* 1998; University of Arizona, Arizona Veterinary Diagnostic Lab, *in litt.* 1998). Five additional samples were collected in December 2000 and evaluated at the Arizona Veterinary Diagnostic Lab at the University of Arizona. All five samples tested positive for both BTV and EHD (one sample was considered a "weak" positive) (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).

E. 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.

F. 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

Peirson's Milkvetch

The MCAS-Yuma proposes use of a road that extends into the area where Peirson's milkvetch was found. However, no OHV use, construction, ground support, or other activities are proposed in habitats or potential habitats of Peirson's milkvetch. Project features that are located near, but not in, dune habitats include the existing explosives ordnance operating area southwest of AUX-2 (the operating area and its access road occupy about 4 acres), a new rifle range northeast of the

BMGR entrance on County 19th, and the Cactus West Target, which is located just east of the Yuma Dunes. An aircraft could potentially crash into habitat of Peirson's milkvetch, but the likelihood of this is remote. If such a crash occurred, plants could be destroyed by the crash and during rescue or crash cleanup.

The MCAS-Yuma's policy of no public use in the areas of the BMGR potentially occupied by Peirson's milkvetch benefits the plant by protecting it and its habitats from OHV and other human uses. MCAS-Yuma will soon have law enforcement officers in place on the BMGR to enforce use restrictions, which should provide further protection for the plant. The Border Patrol does not need authorization from MCAS-Yuma to operate on the BMGR. Nevertheless, MCAS-Yuma is working with Border Patrol and other agencies through the BEC and the flat-tailed horned lizard Management Oversight Group to address potential effects of Border Patrol and smuggling activities on the natural resources of the BMGR.

Sonoran Pronghorn

The draft supplemental EIS (MCAS-Yuma 2001), which evaluates effects of MCAS activities on the pronghorn, only evaluated activities within the current range of the pronghorn. Herein, we also describe and evaluate effects of MCAS-Yuma activities in historic habitat (currently occupied habitat plus the Lechuguilla Desert and Yuma Desert). The previous biological opinion on the proposed action stressed that our analyses of effects on the pronghorn from military activities were often inconclusive or uncertain because a lack of information about how pronghorn respond to such activities. Our knowledge is still incomplete in this regard, but monitoring of the tactical ranges during military activities, better information on the effects of overflights, noise from practice and live ordnance delivery, and ground-based activities (Krauseman *et al.* 2001), and a longer history of monitoring the pronghorn population and behavior have improved our ability to evaluate effects of the 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 their 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 practice or live ordnance, chaff (small fibers that reflect radar signals and temporarily hide aircraft from radar detection), flares, and live rounds that may affect pronghorn directly or may degrade its habitat. Aircraft crashes and crash rescue or clean up activities may also impact the pronghorn and its habitat.

Ground-Based Activities

Overview

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.

Ground-based Activities in the Yuma Desert

Figure 3 displays pronghorn localities from 1994-2001. All proposed and ongoing activities in the Yuma Desert, west of the Gila and Tinaja Altas mountains, including the Cannon Air Defense Complex, rifle range, EOD operating area, AUX-2, Cactus West and Moving Sands targets, parachute drop zone, and four proposed ground support areas are outside of the current range of the pronghorn, and thus would not affect the survival of the pronghorn or occupied habitat. The Yuma Desert is within the historic range of the pronghorn and might be considered as a reintroduction site in the future as part of a recovery program, or pronghorn could expand into this area on their own (Service 1982). However, the area is considerably more arid than the areas currently occupied, and pronghorn were probably not common in the Yuma Desert historically (Mearns 1907). Nevertheless, disturbance, such as foot and vehicle traffic at ground support areas, grading and use of targets, activities at AUX-2, the EOD operating area, and rifle range, could degrade habitat by removing cover and forage, and pronghorn could avoid these areas because of the presence of humans, noise, vehicles, or other disturbance, if pronghorn were translocated into or recolonize the area. However, these activities would affect a small proportion of the area west of the Gila and Tinajas Altas mountains (less than one percent of the approximately 315 mi^2 of potentially suitable habitat in this area) and, as a result, have a minimal effect on the recovery potential of the pronghorn.

Ground-based Activities in the Lechuguilla Desert

Ground support areas; Stinger Team operating areas; TACTS targets, instrument sites, airfields, and threat emitters; and roads existing or proposed west of the Baker Peaks, Copper Mountains, and Cabeza Prieta Mountains and east of the Gila and Tinajas Altas mountains (Lechuguilla Desert) are west of all pronghorn localities shown on Figure 3 (a few unconfirmed sightings in the 1990s of pronghorn were recorded west of the Cabeza Prieta Mountains). A greater potential exists for pronghorn to occur in this area as compared to the Yuma Desert (Service 1994), but if pronghorn use the area, it is not as important as other areas to the east and southeast (see Figure 3). The reason why this area is not used, or not used as heavily as areas to the east and southeast is unknown, but could be related to differences in forage or cover availability. This area is subject to more ground-based and aerial military activities than portions of Cabeza Prieta NWR and Organ Pipe Cactus NM that are frequently used by pronghorn. A road that runs along the east side of the Gila and Tinajas Altas mountains to Tinajas Altas is also used heavily by recreationists. The greater level of military activity in the Lechuguilla Desert, combined with recreational use, could conceivably contribute to this relatively low use by pronghorn.

The greatest impact from ongoing and proposed ground-based military activities in the Lechuguilla Desert would likely result from activities in ground-support areas. Base camps, mobile radar sites, communications facilities, and anti-aircraft missile sites at support areas or zones all contribute to localized extensive habitat disturbance caused primarily by heavy vehicle and equipment tracks and foot traffic of up to hundreds of troops (MCAS-Yuma 1995). Sixteen ground-support areas occur in this area and cover approximately 6.24 mi^2 of potential pronghorn habitat. Four of the sixteen ground support areas are proposed to be closed (approximately 1.6 mi^2) and managed to promote revegetation by native plant communities (MCAS-Yuma 1995). However, a large ground-support zone (zone 1) is proposed on the east side of the Gila and Tinajas Altas mountains. This zone would consolidate seven of the existing ground support areas plus adjacent areas into a contiguous area of approximately 7.9 mi^2. Total area devoted to ground support proposed in the Lechuguilla Desert is approximately 11.4 mi^2. This area, which

would all be subject to new or ongoing surface disturbance, represents approximately 4 percent of the land area in the Lechuguilla Desert south of Interstate 8 and north of the international border. In existing support areas, ground activities would likely focus on previously disturbed areas, but over time additional new disturbance would occur incrementally. Ultimately, the entire 11.4 mi^2 could be disturbed by one or more activities.

Other proposed and ongoing ground-based activities in the Lechuguilla Desert are expected to cause minimal disturbance to pronghorns and their habitat. The Stinger Teams would operate along existing routes, but could disturb small areas of habitat when they pull off the road. Vehicles and troops could result in some pronghorn flushing from cover and moving some distance away (Workman *et al.* 1992, Wright and deVos 1986). But because pronghorn are absent or very rare in this area, the probability of teams encountering them is very low. Flushing or disturbance of pronghorn as a result of other activities, such as military and recreational vehicle use of roads, use of TACTS airfields, and construction and maintenance of the TACTS threat emitter sites is similarly low. Threat emitters have been installed so that hazardous radiation will not reach ground levels and thus will not affect pronghorn (MCAS Yuma 2001).

Ground-based Activities East of the Baker Peaks, and Copper and Cabeza Prieta Mountains

Numerous pronghorn have been located in recent years in R-2301W on the BMGR and Cabeza Prieta NWR east of the Baker Peaks, and the Copper and Cabeza Prieta mountains (Figure 3). In this area, ongoing and proposed military ground-based activities have the greatest potential for adversely affecting pronghorn. Of those activities, existing and proposed ground support areas would likely cause the greatest habitat disturbance and potential for disturbing pronghorn. MCAS-Yuma (2001) reports the following disturbance from ground support areas and zones in the "current range" of the pronghorn: (1) ground support areas in the Mohawk Valley (4.51 mi^2), (2) ground support zones 2 and 3 (2.22 mi^2), and (3) ground support area southwest of Stoval Field (0.39 mi^2), for a total of 7.12 mi^2. However, as defined in MCAS-Yuma (2001), most of ground support zones 2 and 3 are excluded from the current range of the pronghorn. Although, no recent records exist for these areas, pronghorn have occurred nearby and no apparent barriers to movement into the areas exist; thus they are considered part of the current range of the pronghorn (Bright *et al.* 2001). We estimate the area within ground support areas and zones in the current range of the pronghorn totals about 12.1 mi^2. The proposed ground support area near Stoval Field is previously disturbed (MCAS-Yuma 2001); however, use as a ground support area will preclude habitat recovery. We expect that on other support areas, uses would be concentrated in certain areas, but an incremental increase in habitat degradation is anticipated over time and previously disturbed areas would not recover. Ground support activities may also cause disturbance to individual animals or discourage use of the area (Workman *et al.* 1992). Approximately 2,508 mi^2 of Sonoran pronghorn habitat occurs in the U.S. (Bright *et al.* 2001); existing and proposed ground support areas would affect approximately 0.48 percent of currently occupied U.S. pronghorn habitat.

Ground support areas 43, 44, 45, 46, and 67, in the southern portions of the Mohawk Valley are in an area used frequently by Sonoran pronghorn. These areas are not used as heavily as many ground support areas. MCAS-Yuma anticipates that use in these 5 areas will be for emitting electronic threats or to track aircraft. These activities involve up to 12 personnel using equipment mounted on up to four vehicles at one, all, or any combination of sites. Typically, a site is used from 8-12 hours per day; a deployment may last up to 36 hours. Between March 15 and July 15, a key period for fawn survival, use occurs for about 6 days. These activities are sedentary and produce minimal noise, which should be of minimal disturbance to pronghorn. However, pronghorn are expected to move away from vehicles and personnel during these training activities. Repeated off-road use into the ground support areas will cause an incremental

degradation of habitat over time. MCAS-Yuma has committed to monitoring the sites in accordance with their Integrated Natural Resources Management Plan, and will report the results of that monitoring in an annual report to the Service.

Ground-based activities outside of the ground support areas and east of the Baker Peaks and Copper and Cabeza Prieta mountains include Stinger Team operations along roads, TACTS range threat emitters, a transmission line along an existing road, use of existing roads, and TACTS range instrument sites. As described above for these proposed activities in the Lechuguilla Desert, the effects of these activities on pronghorn habitat are, for the most part, expected to be minimal and will likely cause minimal disturbance to pronghorn, because they are very localized, and in the case of Stinger Team operations, are temporary (6-8 hours) in nature. Of greatest concern would be Stinger Team operations in the southern or southeastern portion of the Mohawk Valley. In comparison to the Lechuguilla Desert, pronghorn are more likely to be encountered on roads and other project sites, thus the potential is greater for disturbing animals or for causing habitat disturbance that may currently affect pronghorn survival.

Generators in use at mobile and fixed TACTS range threat emitter sites produce 40 decibels of noise at about 80-90 feet. The generators are operated for about 40 hours per month (MCAS-Yuma 2001). Six fixed threat emitters are located in the vicinity of recent pronghorn locations in the southwestern portion of the Mohawk Valley; other fixed and mobile threat emitter sites are located in the Lechuguilla Desert. The effect of this generator noise on pronghorn is unknown. Generators are refueled about once every 20 days. Truck and foot traffic in the Mohawk Valley during these periodic refuelings may result in pronghorn flushing or dispersing away from work areas and access roads.

Two forage enhancement plots are planned along an east-west road in the Mohawk Valley near the boundary with Cabeza Prieta NWR. These areas, when in use, are expected to attract pronghorn. They will only be watered when forage is not otherwise available, thus they may become crucial foraging areas for pronghorn. There is some potential that Stinger Teams operating along this road during the March-April WTI could disturb pronghorn in these areas or flush them temporarily to other areas. Based on fawn locations from 1995-2001, important areas for fawns and their mothers exist in the southeastern portion of the Mohawk Valley on BMGR and around the south end of the Mohawk Dunes (Figure 4). Fawns and their mothers may be particularly sensitive to disturbance in the spring (Krausman *et al.* 2001).

Missile Exercises

MCAS-Yuma does not currently authorize HAWK missile exercises; however, other surface to air missile testing may occur from the Baker Peaks launch site in the future. Missiles would likely be aimed at drone aircraft over the Mohawk Valley. Shrapnel from missiles and aircraft parts could impact pronghorn in this area. A very small potential exists for shrapnel to strike and kill or injure a pronghorn. Because no missile exercises are planned and if they occur would be infrequent and of irregular occurrence, injury or mortality of pronghorn as a result of an impact by HAWK missile shrapnel is considered very unlikely. Disturbance of pronghorn could occur as result of personnel accessing the Baker Peaks site or as a result of noise during launches or impact with drone aircraft.

Military Overflights

Overview

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 ≥ 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).

Helicopter Overflights in R-2301W and R-2301E

With the finalization of the EIS in 1997, MCAS reduced the number of WTI helicopter corridors across Cabeza Prieta NWR from 11 to three and the nautical miles of corridors from 146 to 137. All helicopter flights are at 50 to 1,500 AGL (MCAS-Yuma 1995); although most are <500 feet AGL (R. Pearce, pers. comm. 2001). Helicopter flights over Cabeza Prieta NWR occur only during WTI courses (March-April and October-November). During the 5-8 days of a typical WTI course, 20-40 overflights occur (MCAS-Yuma 2001). Flights consist of two to eight helicopters (200 to 300 feet between aircraft) that traverse the corridors from west to east through to the North, South, and/or East TACs, where they may deliver ordnance to existing target areas. The helicopters return to MCAS-Yuma via northern routes outside the Cabeza Prieta NWR. Sixty percent of flights occur at night (MCAS-Yuma 1995). A typical flight of 4 aircraft takes approximately 30 minutes to traverse the WTI course on the Cabeza Prieta NWR. Thus, at a frequency of one flight per day for 5 days, approximately 2.5 hours of flight time over the Cabeza Prieta NWR occurs per WTI course. Additional flight time for a total of up to 5 hours is sometimes needed, thus total annual flight time for both WTI courses is approximately 5-10 hours (MCAS-Yuma 1995, 2001).

Elsewhere in R-2301W, outside of Cabeza Prieta NWR and east of the Gila Mountains, up to 200 helicopter sorties occur per month, both at night and during the day, particularly in March, April, October, and November (MCAS-Yuma 1995). Non-WTI helicopter use in this area is not restricted spatially or seasonally; however, most non-WTI helicopter flights do not travel east of "Combat Village" on the east side of the Copper Mountains. Ron Pearce (pers. comm. 2001) reported the following hours of helicopter flight time (by groups of 1-8 helicopters) in R-2301W east of the Gila and Tinajas Altas ranges, not including WTI: from July 2000-July 2001, monthly hours of helicopter flight time ranged from 1-46.8, with a mean of 14.3. This is considered typical. During WTI, helicopters fly in corridors east of the Gila Mountains to targets on BMGR-East (Figure 1). During spring 2001 WTI, total flight time by groups of helicopters east of the Copper Mountains was 43 hours (does not include flight time along the Interstate 8 corridor). Helicopters or groups of helicopters spent 4.5 hours on the ground during spring 2001 WTI at ground support areas or in other environmentally approved sites, which often include 1-2 sites in the Mohawk Valley. Helicopters do not hover, except when landing (R. Pearce, pers. comm. 2001). From March 15-July 15, a key period for fawn survival, total time spent transiting the Mohawk and San Cristobal valleys annually averages about 15 hours (by groups of 1-8 helicopters), though it can go as high as 25 hours. Total free-flight time (not in corridors) by groups of helicopters in the Mohawk Valley annually averages about 5 hours, though it can go as high as 10 hours.

As discussed in the overview, helicopters are expected to elicit greater response from pronghorn than fixed wing aircraft, and pronghorn are less likely to habituate to helicopter overflights. Although no studies have examined the effects of helicopter overflights on Sonoran pronghorn, based on work with other ungulates, Sonoran pronghorn would be expected to move greater distances and respond for a longer period of time to helicopters than to fixed-wing aircraft

(Workman *et al.* 1992, Weisenberger *et al.* 1996, Luz and Smith 1976). Adverse effects of helicopter overflights may include elevated metabolism and corresponding energetic and nutrient stress, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971, 1978; Freddy *et al.* 1986), conditions that are likely to be exacerbated during drought, and for fawns and their mothers that appear to be more sensitive to disturbance (Krausman *et al.* 2001). In general, areas or times of year with greater use by low-level helicopters will have the potential for the greatest disturbance to pronghorn. Also, in areas where helicopters fly particularly low or hover, and thus create more noise and heightened visual stimuli, disturbance to pronghorn would be expected to be greater (Weisenberger *et al.* 1996, Workman *et al.* 1992).

Disturbance of pronghorn on Cabeza Prieta NWR as a result of military helicopter overflights would be nonexistent for approximately 10 months out of each year because military helicopters only fly over the Cabeza Prieta NWR during the WTI courses. However, during those courses, and in the flight corridors, pronghorn would be exposed to 20-40 flights by groups of 2-8 helicopters over a 5-8 day period. Elsewhere in R-2301W east of the Gila and Tinajas Altas mountains, the frequency of helicopter flights is greater and occurs year-round. Because of the essentially continual presence of helicopters on the BMGR west of the tactical ranges, pronghorn are more likely to be disturbed by such activity, but they are also more likely to habituate to this type of disturbance, than on Cabeza Prieta NWR.

Helicopter flights over the Mohawk and San Cristobal valleys overlay an area of significant use by pronghorn (Figure 5). This level of pronghorn use is not as intense as in portions of Cabeza Prieta NWR or Organ Pipe Cactus NM, nevertheless animals in this area would be subjected to continual low-level helicopter overflights. We can not rule out the possibility that the lower level of use by pronghorn in these areas may be related to the frequency and continual nature of helicopter overflights. However, because of relatively low precipitation; habitat in the Mohawk Valley may be of lower quality as compared to areas further east and south. Thus a lower density of pronghorn in the Mohawk Valley may simply reflect this difference in habitat. Data on fawn locations from 1995-2001 indicate that areas of the southeastern portion of the Mohawk Valley, the southern end of the Mohawk Dunes, and an area in the central Mohawk Valley are important areas for fawns (Figure 4). In the San Cristobal Valley, use by fawns and their mothers is concentrated in the north-central part of the valley, with scattered locations to the south. Fawns and their mothers are sensitive to disturbance (Krausman *et al.* 2001); thus low-level helicopter flights in these areas are of particular concern. The critical period for fawn survival is March 15-July 15. Landing sites could also occur in these areas and would be especially disturbing to fawns and their mothers.

Figure 5 displays an overlay of pronghorn localities on proposed helicopter flight corridors over Cabeza Prieta NWR. The Service and MCAS-Yuma worked together during consultation in 1996 to revise the original low-level helicopter flight proposal, presented in the biological assessment and draft EIS, to reduce effects on pronghorn. Of particular concern were existing and proposed corridors along the western slope of the Sierra Pinta Mountains, especially at the south end, existing and proposed corridors over the Antelope Hills and the southern end of the Granite Mountains, and a proposed corridor that passed over an area of concentrated pronghorn use on the north end of the Sierra Pinta Mountains. Revisions included elimination of the route along the west slope of the Sierra Pinta Mountains, combining two proposed routes into route 3C and locating that route north of the Antelope Hills, and moving the turning point between routes 2A and 2B to the south to avoid a pronghorn use area at the north end of the Sierra Pinta Mountains. Concerns over possible adverse effects to the lesser long-nosed bat resulted in elimination of route 2D and creation of route 3G (Appendix 1). This change is considered neutral in regard to effects to pronghorn. In response to concerns about possible adverse effects to pronghorn on the western slope of the Granite Mountains, MCAS-Yuma agreed to raise the

minimum flight elevation from 50 to 500 feet AGL in route 3F. The net effect of these changes were beneficial; however, it also resulted in helicopter flights over Pinta Sands and the south end of Childs Mountain, which had not been under helicopter routes previously. These changes were incorporated into the 1997 final EIS and 2001 supplemental EIS.

We are concemed about low-level helicopter flight routes over high-use pronghorn areas, particularly where and when fawns are present. Figure 5 illustrates that the eastern portion of route 3B, route 3C, 3G, and to a lesser extent, 2C, all overlie important pronghorn use areas. Route 3F also overlies important areas along the base of the Granite Mountains, but, as discussed above, raising the minimum flight elevation to 500 feet AGL, minimizes these concerns.

Pronghorn are expected to be present in these routes of concern year-round, but they are likely to use valley areas more in the winter and spring and bajadas in the summer. Data on fawn locations from 1995-2001 (Figure 4), indicate that the eastern base of the Sierra Pinta Mountains on route 1B, and Childs Valley and western base of Childs Mountain on route 3G are particularly important for fawns. The pivot point between routes 3B and 3C passes just to the north of an important area for fawns, and the pivot point between 2A and 2B passes between two high use areas for fawns. The March-April WTI would occur while fawns and their mothers are present in these areas. Krausman *et al.* (2001) suggested that female pronghorn with fawns may be more sensitive to disturbance than males or adult females without fawns.

In conclusion, helicopter flights at 50–1,500 feet AGL occur over pronghorn habitat in the Mohawk and San Cristobal valley and in corridors through Cabeza Prieta NWR. Effects of low-level helicopter flights on Sonoran pronghorn have not been studied; however, based on studies of other ungulates, pronghorn are expected to react more intensely to helicopters, particularly low-level, hovering helicopters, than fixed-wing aircraft. Responses may include running from aircraft, which may be energetically stressful and cause a variety of adverse physiological effects that are likely exacerbated during times of drought, or critical periods for fawns. Low-level helicopter flights in 2 areas of the WTI flight corridors, in the southeastern portion of the Mohawk Valley and Mohawk Dunes, and in the north-central San Cristobal Valley may adversely affect fawns and their mothers.

Fixed-Wing Aircraft Overflights

An average of approximately 11,000 fixed-wing aircraft sorties occur annually in airspace R-2301W, including Cabeza Prieta NWR. This figure represents a reduction from an annual rate of over 30,000 in the late 1980s. Thus, a reduction in overflights, coupled with a similar reduction in the use of ground support troops, has occurred during the current period of pronghorn decline (MCAS, *in litt.* 2001). However, since the mid-1990s the number of sorties occurring over the current U.S. distribution of the Sonoran pronghorn has remained relatively unchanged. Comparison of sortie rates in this subarea reveals only a 2 percent decrease from 1996 to 2000 (MCAS-Yuma 2001).

Of the fixed-wing sorties which currently occur, 18 percent are low-level (200 to 1,500 AGL) flights. Most flights occur during the day and are fairly evenly distributed among months of the year. Low-level flights over the Cabeza Prieta NWR occur only during WTI courses and only in two corridors four nautical miles in width (Figure 1). Typically, 5-10 flights of 4-8 aircraft occur per day for six days during each WTI course; 85 percent of those occur during daylight hours. Aircraft transit time through the Cabeza Prieta NWR averages 7 minutes, thus total flight time over the Cabeza Prieta NWR by groups of aircraft is 3.5-7.0 hours per WTI course, and 7.0 to 14.0 hours per year. Distribution of flights in the two corridors is roughly equal. MCAS-Yuma proposes to authorize use of the two corridors for up to 60 days per year, including the 12 days of

WTI courses as well as other times of the year. Flight time in the corridors would increase to as much as 70 hours per year.

Approximately 6,000 fixed-wing sorties occur annually in R-2301W west of the Gila and Tinajas Altas mountains (MCAS-Yuma 2001). Most of these flights are probably audible and may be visible to pronghorn. Approximately 0.3 percent of low-level fixed-wing flights in R-2301W authorized by MCAS-Yuma occur over the Cabeza Prieta NWR (this would increase to approximately 1.8 percent under the proposed action); however, the importance of Cabeza Prieta NWR for the pronghorn is disproportionate to the rest of R-2301W (Figure 3). The western portions of the corridors, from the Cabeza Prieta Mountains west to the boundary of Cabeza Prieta NWR, and routes aircraft would take to travel from MCAS-Yuma to Cabeza Prieta NWR, are outside of areas where pronghorn were recorded from 1983 to 2001. The central and eastern portions of the southern corridor passes over the Pinta Sands area, the base of the Sierra Pinta range, an area between the Antelope Hills and the Bryan Mountains, and a portion of Growler Valley, all of which are frequented by pronghorn. The eastern portion of the northern corridor crosses the following areas that yielded significant numbers of localities from 1983 to 2001: the Growler Valley, Charlie Bell Pass, the base of the Granite Mountains, and the west side of Childs Mountain. Behaviors of some pronghorn exposed to low-level fixed-wing overflights in these corridors may be temporarily disrupted or some animals may flee short distances (Hughes and Smith 1990; J. Hervert, pers. comm. 1996; Workman *et al.* 1992). Proposed use of these corridors outside of the March-April and October-November WTI courses and for up to five times the current annual flight time will increase exposure of pronghorn on the Cabeza Prieta NWR and potential disturbance to them as a result of this activity.

Low-level flights during the March-April WTI course have the greatest potential to disturb fawns and their mothers. Fawn locations from 1995-2001 (Figure 4) indicate the following areas under the low-level fixed-wing corridors on Cabeza Prieta NWR are most important for fawns and their mothers: (1) south end of the Sierra Pinta Mountains, (2) Childs Valley and west side of Childs Mountain, and (3) north end of the Sierra Pinta Mountains. The first two are also in low-level helicopter corridors.

In conclusion, fixed-wing aircraft flights are a common occurrence over R-2301W, although low-level (<1,500 feet AGL) flights make up only 18 percent of such flights. As discussed in the overview, pronghorn may flee from aircraft or elicit other behaviors, but Krausman *et al.* (2001) noted few biologically significant responses to fixed-wing aircraft (primarily flights above 1,000 AGL) and concluded that such overflights, and other military activity they observed did not influence Sonoran pronghorn in a detrimental manner. The greatest potential for adverse effects to pronghorn are in regard to low-level fixed-wing flights in areas important for fawns and their mothers, which appear to be more sensitive to disturbance than other pronghorn.

Aircraft Crashes and Crash Rescue and Cleanup

Aircraft have crashed in currently occupied pronghorn habitat on the western side of the BMGR less than once per year in recent years. 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 western BMGR, a wildfire is not likely to carry far.

Ordnance, Flare, and Chaff Delivery and Strafing

Aircraft delivery of ordnance, flares, and chaff, and strafing occurs on the BMGR and may affect pronghorn and their habitat. During WTI courses, aircraft authorized by MCAS-Yuma fly through the R-2301W airspace and deliver live ordnance on established targets in the North, South, and East TACs. North and South TACs are within the current range of the pronghorn; East TAC is in the historic range. Habitat on the targets is degraded from a long history of use by the military. As a result, the potential for habitat damage from ordnance delivery is low; although continued use precludes habitat recovery. Pronghorn frequently use the North and South TACs and ordnance or shrapnel could potentially strike and kill or injure a pronghorn. In addition, pronghorn could be killed or injured during an encounter with unexploded live ordnance on the ground.

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 0.6 miles from a strafing target at the North TAC. There was evidence of bullet impact pock marks near the pronghorn (M. Coffeen, Service, pers. comm. 2001), despite the distance from the target. The date of the incident (outside of WTI) suggests that if the animal was strafed, it was not the result of MCAS-Yuma activities. 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.

In regard to high explosive ordnance delivery (but not strafing or practice bombs), Luke AFB has developed operating instructions for the pronghorn on North and South TACs. These instructions are implemented during any high explosive delivery of ordnance, including WTI. 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 explosive ordnance deliveries are made within 1.2 to 3.1 miles 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 (during which pronghorn may move onto targets) and afternoon monitoring cannot be completed prior to 30 minutes after sunset or the end of civil twilight, whichever is earlier. This monitoring has not documented any injury or mortality of pronghorn on the tactical ranges, and it may have prevented such injury or mortality. However, if only strafing is scheduled for a particular day, no monitoring is required. Thus, no measures are in place to minimize possible take from strafing missions on days in which no high explosive ordnance delivery occurs.

Strafing in the absence of monitoring occurs about 40-50 days per year (D. Garcia, Luke AFB, pers. comm. 2001). However, we do not know on how many of those days MCAS-Yuma conducts strafing only missions. Take could also conceivably occur as a result of a practice bomb dropping on a pronghorn; however, this is very unlikely.

The effects of chaff and flares were evaluated by USAF 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 western half of 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.

Conservation Measures

In addition to species-specific measures previously discussed, many proposed general conservation actions have minimized, and will continue to minimize, effects of the proposed action to the pronghorn and its habitat. A user-education program that includes information about regulations and protection for listed species, restricting vehicle use to existing roads except in specific areas or in the case of an emergency or bona-fide management need, monitoring of regulation compliance, construction practices that reduce erosion and limit disturbance of drainages, and pollution and hazardous materials control measures would all act to reduce possible adverse effects to the pronghorn. MCAS-Yuma's commitment to eliminate public access in the Mohawk Valley from March 15 to July 15 is an important step to reduce human disturbance during a period that is critical for fawn survival. Monitoring and reporting of implementation of the biological opinion and conservation measures will allow the Service and others to track the effects of the action and determine whether those effects match what was anticipated herein. MCAS-Yuma has committed to "support its fair share of the 51 management and research projects developed by the Sonoran Pronghorn Recovery Team". However, we do not know in what form they will support projects, which projects MCAS-Yuma will target, or when such support will materialize. Thus the value of this commitment to recovery of the pronghorn is unclear.

The proposed measures minimize, but do not eliminate, habitat disturbance and disturbance of pronghorn that would result from activities in ground support areas and zones, other ground-based activities, effects of low-level helicopter flights over the Mohawk and San Cristobal valleys and Cabeza Prieta NWR, and delivery of ordnance at the North and South TACs. Historic, and potential recovery, habitat in the Lechuguilla and Yuma deserts would also be affected by ground-based activities and military overflights.

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.

Potential Peirson's milkvetch habitat occurs on lands owned and managed by Arizona State Lands Department, just west of the BMGR. Continued degradation of habitat quality is expected here as a result of sand and gravel operations, OHVs, trash dumping, and other activities. These lands may be sold in the future for development.

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 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 Peirson's milkvetch and Sonoran pronghorn, the environmental baseline for the action area, the effects of ongoing and proposed military activities by MCAS-Yuma, and the cumulative effects, it is the Service's biological opinion that proposed and ongoing activities by MCAS-Yuma in the Arizona portion of the YTRC are not likely to jeopardize the continued existence of Peirson's milkvetch and Sonoran pronghorn. No critical habitat has been designated for these species, thus, none will be affected.

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 Marine Corps 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 Marine Corps have a continuing duty to regulate

the activity covered by this incidental take statement. If the Marine Corps (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 Marine Corps 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)]

Sections 7(b)(4) and 7(o)(2) of the ESA generally do not apply to listed plant species. However, limited protection of listed plants from take is provided to the extent that the prohibits the removal and reduction to possession of Federally listed endangered plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of endangered plants on non-Federal areas in violation of State law or regulation or in the course of any violation of a State criminal trespass law.

Amount or Extent of Take Anticipated

The Service anticipates that no more than 6 Sonoran pronghorn could be taken as an incidental result of the proposed action. The incidental take is expected to be in the form of harassment which, as state above, constitutes more than mere disturbance of a pronghorn. 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. Modify low-level helicopter use to avoid areas of significant pronghorn use to minimize adverse effects from helicopters on the pronghorn and its habitat, particularly areas important for fawns and their mothers.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Marine Corps must comply with the following terms and conditions, which implement the reasonable and prudent measure descried above and outline any required reporting/monitoring requirements. This term and condition is non-discretionary.

1.1 Revise low-level helicopter use in R2301W, R2301E, and Cabeza Prieta NWR as shown in Figure 6.

1.2 Between March 15 and July 15 of each year, all helicopters using R-2301W, except those participating in WTI, will remain west of 113 degrees, 53 minutes, or on designated transit routes, or above 1,000 feet AGL.

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 measure, with its implementing terms and conditions, is 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 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. Continue to fund and support basic research, inventory, and monitoring of the pronghorn.

2. Fund or staff projects in Appendix 2, especially funding of projects 3, 5, 6, 11, 14, 21, 26, 27, 35, 36, 38, 39, 44, and 51.

3. Eliminate use of ground support areas 43, 44, 45, and 67 because they are in significant use areas of the pronghorn, including areas used by fawns and their mothers.

4. Coordinate with Luke AFB to implement more intensive monitoring of the North and South TACs. In particular, beginning in fiscal year 2002, MCAS-Yuma should provide the necessary assistance to ensure that Luke AFB monitors the tactical ranges according to established protocols when only strafing is scheduled for a particular day.

5. Work with the Service, BLM, and other parties to develop and implement a recovery plan for Peirson's milkvetch.

6. Fund comprehensive surveys for Peirson's milkvetch in potential habitats during times suitable for plant growth on the BMGR.

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 use of the Arizona portion of the YTRC by the MCAS-Yuma. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to a listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

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,

/s/ 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
Colonel James Uken, Barry M. Goldwater Executive Council, Luke Air Force Base, AZ
Park Superintendent, Organ Pipe Cactus NM, Ajo, AZ
First Lt. William Fay, Arizona Army National Guard, Phoenix, AZ
Scott Bailey, Ecologist, Tohono O'odham Nation, Sells, AZ
Peter Ruiz, Director of Natural Resources, Tohono O'odham Nation, Sells, AZ
Mark Stermitz, Department of Justice, Washington, D.C.
Supervisor, Fish and Wildlife Service, Phoenix, AZ
Assistant Supervisor, Fish and Wildlife Service, Tucson, AZ
Regional Solicitor, Department of the Interior, Albuquerque, NM
Regional Section 7 Coordinator, Fish and Wildlife Service, Albuquerque, NM

LITERATURE CITED

Arizona Game and Fish Department. 1981. The Sonoran pronghorn. Special Report No. 10. Arizona Game and Fish Department, Phoenix, AZ.

Arizona Game and Fish Department. 1985. Interim report on the Sonoran pronghorn (*Antilocapra americana sonoriensis*). Oct. 1983 - March 1985. Arizona Game and Fish Department, Phoenix, AZ.

Barneby, R.C. 1964. Atlas of North American *Astragalus*. Memoirs of the New York Botanical Garden 13:1-1188.

Berger, J., D. Daneke, J. Johnson, and S. Berwick. 1983. Pronghorn foraging economy and predator avoidance in a desert ecosystem: Implications for the conservation of large mammalian herbivores. Biological Conservation 25:193-208.

Bleich, V.C., R.T. Bowyer, A.M. Pauli, R.L. Vernoy, and R.W. Anthes. 1990. Responses of mountain sheep to helicopter surveys. California Fish and Game 76:197-204.

Bowles, A.E. 1995. Responses of wildlife to noise. *In* R.L. Knight and K.J. Gutzwiller, eds., Wildlife and Recreationists. Island Press, Washington D.C.

Bright, J.L., J.J. Hervert, L.A. Piest, R.S. Henry, and M. T. Brown. 1999. Sonoran pronghorn 1998 aerial survey summary. Nongame and Endangered Wildlife Program Technical Report No. 152. Arizona Game and Fish Department, Phoenix, AZ.

Bright, J.L., J.J. Hervert, and M.T. Brown. 2001. Sonoran pronghorn 2000 aerial survey summary. Technical Report No. 180. Arizona Game and Fish Department, Phoenix, AZ.

Byers, J.A. 1997. American Pronghom, Social Adaptations and the Ghosts of Predators Past. University of Chicago Press, Chicago, IL.

Carr, J.N. 1970. Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.

Carr, J.N. 1971. Progress report-Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.

Carr, J.N. 1972. Progress report-Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.

Carr, J.N.. 1974. Complete report-Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.

Cherkovich, G.M., and S.K. Tatoyan. 1973. Heart rate (radiotelemetric registration) in macaques and baboons according to dominant-submissive rank in a group. Folia Primatol 20:265-273.

Dames and Moore. 1995. Biological assessment for the Marine Corps Use of the Barry M. Barry M. Goldwater Range, Arizona. Report to Marine Corps Air Station, Yuma, AZ.

Defenders of Wildlife. 1998. Population viability analysis workshop for the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) in the United States. Defenders of Wildlife unpublished manuscript, Washington, D.C.

deVos, J.C. 1989. Evaluation of Sonoran pronghorn movements around military activity sites on the Barry M. Goldwater Air Force Range. Report to Luke Air Force Base, Phoenix, AZ.

deVos, J.C. 1990. Selected aspects of Sonoran pronghorn research in Arizona and Mexico. *In* P.R. Krausman and N.S. Smith, eds., Proceedings of the Symposium: Managing Wildlife in the Southwest. Tucson, AZ.

deVos, J.C. 1998. Habitat selection patterns by Sonoran pronghorn in southwest Arizona. *In* T.J. Tibbetts and G.J. Maender, eds., First Conference on Research and Research Management in Southern Arizona: Extended abstracts. Organ Pipe Cactus National Monument and Cooperative Park Studies Unit, University of Arizona, Tucson, AZ.

Ehrlich, P.R., and J. Roughgarden. 1987. The Science of Ecology. MacMillan Publishing Co., New York, N.Y.

Felger, R.S. 1980. Vegetation and flora of the Gran Desierto. Desert Plants 2(2):87-114.

Felger, R.S. 1997. Checklist of the vascular plants of Cabeza Prieta National Wildlife Refuge, Arizona. Drylands Institute, Tucson, AZ.

Felger, R.S. 2000. Flora of the Gran Desierto and Rio Colorado of Northwestern Mexico. University of Arizona Press, Tucson, AZ.

Fox, L.M., P.R. Krausman, M.L. Morrison, and R.M. Kattnig. 1997. Nutritional content of forage in Sonoran pronghorn habitat, Arizona. Masters Thesis, University of Arizona, Tucson, AZ.

Fox, L.M., P.R. Krausman, M.L. Morrison, and R.M. Kattnig. 2000. Water and nutrient content of forage in Sonoran pronghorn habitat, Arizona. California Fish and Game 86(4): 216-232.

Freddy, D.J., W.M. Bronaugh, and M.C. Fowler. 1986. Responses of mule deer to disturbance by persons afoot and snowmobiles. Wildlife Society Bulletin 14:63-68.

Geist, V. 1971. A behavioral approach to the management of wild ungulates. *In* E. Duffey and A.S. Watts, eds., The Scientific Management of Animal and Plant Communities for Conservation. Symposium of the British Ecological Society No. 11. Blackwell Science Publications, Oxford, U.K.

Geist, V. 1978. Behavior. *In* L.L. Schmidt and D.L. Gilbert, eds., Big Game in North America. Stackpole Books, Harrisburg, PA.

Gilpin, M.E. and M.E. Soulé. 1986. Minimum viable populations: processes of extinction. *In* M.E. Soulé, ed., Conservation Biology: The science of scarcity and diversity. Sinauer Associates, Sunderland, MA.

Goldman, E.A. 1945. A new pronghorn from Sonora. Proceedings of the Biological Society, Washington 58:3-4.

Hall, E.R. 1981. The Mammals of North America. John Wiley and Son, New York, NY.

Harris, J.D. 1943. Habituary response decrement in the intact organism. Psychology Bulletin 40:385-422.

Hecht, A. and P.R. Nickerson. 1999. The need for predator management in conservation of some vulnerable species. Endangered Species Update 16:114-118.

Hervert, J.J. 1996. Deposition; Defenders of Wildlife *et al.* vs Sheila Widnal *et al.* Recorded by Bort Court Reporting Services, Yuma, AZ.

Hervert, J.J., L.A. Piest, R.S. Henry, and M.T. Brown. 1997a. Sonoran pronghorn 1996 aerial survey summary. Nongame and Endangered Wildlife Program Technical Report No. 124. Arizona Game and Fish Department, Phoenix, AZ.

Hervert, J.J., L.A. Piest, W. Ballard, R.S. Henry, M.T. Brown, and S. Boe. 1997b. Sonoran pronghorn population monitoring: progress report. Nongame and Endange red Wildlife Program Technical Report No. 126. Arizona Game and Fish Department, Phoenix, AZ.

Hervert, J.J., J.L. Bright, M.T. Brown, L.A. Piest, and R.S. Henry. 2000. Sonoran pronghorn population monitoring: 1994-1998. Nongame and Endangered Wildlife Program Technical Report No. 162. Arizona Game and Fish Department, Phoenix, AZ.

Hoff, G.L. and D.O. Trainer. 1981. Hemorrhagic Diseases of Wild Ruminants. *In* J.W. Davis, L.H. Karstad, and D.O. Trainer, eds, Infectious Diseases of Wild Mammals. Iowa State University Press, Ames, Iowa.

Hughes, K.S., and N.S. Smith. 1990. Sonoran pronghorn use of habitat in Southwest Arizona. Report to Cabeza Prieta National Wildlife Refuge, Ajo, AZ.

Humphrey, R.R.. 1987. 90 Years and 535 Miles, Vegetation Changes Along the Mexican Border. University of New Mexico Press, Albuquerque, NM.

Inouye, R.S. 1991. Population biology of desert annual plants. *In* G.A. Polis, ed., The Ecology of Desert Communities. University of Arizona Press, Tucson, AZ.

Johnson, B.K., F.G. Lindzey, and R.J. Guenzel. 1991. Use of aerial line transect surveys to estimate pronghorn populations in Wyoming. Wildlife Society Bulletin 19:315-321.

Kindschy, R.R., C. Sundstrom, and J.D. Yoakum 1982. Wildlife habitats in managed rangelands - the Great Basin of southeastern Oregon: pronghorn. General Technical Report PNW-145. U.S. Department of Agriculture, Northwest Forest and Range Experimental Station, Portland, OR.

Klein, K. 2000. Mass smugglings of immigrants on the increase. March 13, Desert Sun, Palm Springs, www.thedesertsun.online.com.

Krausman, P.R., B.D. Leopold, and D.L. Scarbrough. 1986. Desert mule deer response to aircraft. Wildlife Society Bulletin 14:68-70.

Krausman, P.R., M.C. Wallace, C.L. Hayes, and D.W. DeYoung. 1998. Effects of jet aircraft on mountain sheep. Journal of Wildlife Management 62:1246-1254.

Krausman, P.R., L.K. Harris, and J. Francine. 2001. Long-term study of the noise effects of military overflights on the Sonoran pronghorn, Barry M. Goldwater Range, Luke Air Force Base, Arizona. U.S. Air Force Contract F41624-98-C-8020-P00003.

Leftwich, T.J., and C.D. Simpson. 1978. The impact of domestic livestock and farming on Texas pronghorn. Pronghorn Antelope Workshop Proceedings 8:307-320.

Luckenbach, R.A., and R.B. Bury. 1983. Effects of off-road vehicles on the biota of the Algodones Dunes, Imperial County, California. Journal of Applied Ecology 20:265-286.

Luz, G.A., and J.B. Smith. 1976. Reactions of pronghorn antelope to helicopter overflight. Journal of Acoustical Society of America 59(6):1514-1515.

Marine Corps Air Station-Yuma. 1995. Yuma Training Range Complex, Draft Environmental Impact Statement. U.S. Department of Defense, Marine Corps Air Station, Yuma, AZ.

Marine Corps Air Station-Yuma. 1997. Yuma Training Range Complex, Final Environmental Impact Statement. U.S. Department of Defense, Marine Corps Air Station, Yuma, AZ.

Marine Corps Air Station-Yuma. 2001. Yuma Training Range Complex draft supplemental environmental impact statement. U.S. Department of Defense, Marine Corps Air Station, Yuma, AZ.

MacArthur, R.A., R.H. Johnston, and V. Geist. 1979. Factors influencing heart rate in free-ranging bighorn sheep: A physiological approach to the study of wildlife harassment. Canadian Journal of Zoology 57:2010-2021.

Mearns, E.A. 1907. Mammals of the Mexican boundary of the United States, Part 1. Bulletin of the U.S. National Museum 56:XVT530.

Merck and Company. 1986. The Merck Veterinary Manual, Sixth Edition. Merck and Company, Inc., Rahway, NJ.

Moen, A.N., M.A. DellaFera, A.L. Hiller, and B.A. Buxton. 1978. Heart rates of white-tailed deer fawns in response to recorded wolf howls. Canadian Journal of Zoology 56:1207-1210.

Monson, G. 1968. The desert pronghorn. *In* Desert Bighorn Council Transactions. Las Vegas, NV.

Munz, P.A. 1974. A Flora of Southern California. University of California Press, Berkeley, CA.

Nelson, F.W. 1925. Status of the pronghorn antelope, 1922-1924. U.S. Department of Agriculture Bulletin No. 1346.

Norrix, L.W., D.W. DeYoung, P.R. Krausman, R.C. Etchberger, and T.J. Glattke. 1995. Conductive hearing loss in bighorn sheep. Journal of Wildlife Diseases 31:223-227.

Nowak, R.M., and J.L. Paradiso. 1983. Walker's mammals of the world. 4th Ed. Vol. II. Johns Hopkins University. Press, Baltimore, MD.

Officer, J.E. 1993. Kino and agriculture in the Pimeria Alta. Journal of Arizona History 34:287-306.

Organ Pipe Cactus National Monument. 2001. Draft supplemental environmental impact statement, re-analysis of cumulative impacts on the Sonoran pronghorn. Organ Pipe Cactus National Monument, Ajo, AZ.

Paradiso, J.L., and R.M. Nowak. 1971. Taxonomic status of the Sonoran pronghorn. Journal of Mammalogy 52(4):855-858.

Phelps, J.S. 1981. Habitat of the Sonoran pronghorn. *In* The Sonoran pronghorn. Special Report No. 10. Arizona Game and Fish Department, Phoenix, AZ.

Pinkava, D.J. 1999. Cactaceae Cactus Family, Part Three. In: Vascular Plants of Arizona: Cactaceae - Cylindropuntia. Journal of the Arizona- Nevada Academy of Science 32(1):32-47.

Reed, J.M., P.D. Doerr, and J.R. Walters. 1986. Determining minimum population sizes for birds and mammals. Wildlife Society Bulletin 14:225-261.

Reichenbacher, F.W., and R.B. Duncan. 1989. Sanborn's bat and rare plant studies at Barry M. Goldwater Bombing Range, Yuma County, AZ. Final Report. F.W. Reichenbacher and Associates, Tucson, AZ.

Richter-Dyn, N., and N.S. Goel. 1972. On the extinction of a colonizing species. Theoretical Population Biology 3:406-433.

Rorabaugh, J.C., C.L. Palermo, and S.C. Dunn. 1987. Distribution and relative abundance of the flat-tailed horned lizard (*Phrynosoma mcallii*) in Arizona. Southwestern Naturalist 32(1):103-109.

Rowlands, P.G. 2000. Low temperature and other climatic trends at Organ Pipe Cactus National Monument. *In* W.L. Halvorson and B.S. Gebow, eds., Creative Cooperation in Resource Management, extended abstracts. U.S. Geological Survey, Western Ecological Research Center, Sonoran Desert Field Station, University of Arizona, Tucson, AZ.

Rutman, S. 1997. Dirt is not cheap: livestock grazing and a legacy of accelerated soil erosion on Organ Pipe Cactus National Monument, Arizona. *In* J. M. Feller and D. S. Strouse, eds., Environmental, economic, and legal issues related to rangeland water developments. The Center for the Study of Law, Science and Technology, Arizona State University, Tempe, AZ.

Samuel, M.D., and K.H. Pollock. 1981. Correction of visibility bias in aerial surveys where animals occur in groups. Journal of Wildlife Management 45(4):993-997.

Scott, M.D. 1990. Determining a minimum genetically viable population size for Yellowstone pronghorns. Proceedings Pronghorn Antelope Workshop 14:26-27.

Sheridan, T.E. 2000. Human ecology of the Sonoran Desert. *In* S.J. Phillips and P.W. Comus, eds., A natural history of the Sonoran Desert. Arizona-Sonora Desert Museum Press, Tucson, AZ.

Simmons, N.M. 1969. The social organization, behavior, and environment of the desert bighorn sheep on Cabeza Prieta Game Range, Arizona. PhD Dissertation, University of Arizona, Tucson, AZ.

Stellijes, K.B. 1999. The bluetongue triangle. Agricultural Research Magazine, July 1999.

Stockwell, C.A., and G.C. Bateman. 1987. The impact of helicopter overflights on the foraging behavior of desert bighorn sheep (*Ovis canadensis nelsoni*) at Grand Canyon National Park. Report to the National Park Service.

Thompson, R.D., C.V. Grant, E.W. Pearson, and G.W. Corner. 1968. Cardiac response of starlings to sound: effects of lighting and grouping. American Journal of Physiology 214:41-44.

Turner, R.M. and D.E. Brown. 1982. Sonoran desertscrub. *In* D.E. Brown, ed., Biotic communities of the American Southwest-United States and Mexico. Desert Plants 4(1-4):181-222.

U.S. Air Force Combat Command. 1997. Environmental effects of self-protected chaff and flares. U.S. Air Force, Headquarters Air Combat Command, Langley Air Force Base, VA.

U.S. Fish and Wildlife Service. 1982. Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1994. Sonoran pronghorn recovery plan revision (*Antilocapra americana sonoriensis*). Technical/agency draft. U.S. Fish and Wildlife Service, Region 2, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1998a. Final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1998b. Final programmatic environmental assessment for the future management of Cabeza Prieta National Wildlife Refuge and draft comprehensive conservation plan. U.S. Fish and Wildlife Service, Albuquerque, NM.

U.S. Fish and Wildlife Service. 1998c. Endangered and threatened wildlife and plants; determination of endangered and threatened status for five desert milk-vetch taxa from California. Federal Register 63(193):53596-53615.

U.S. Fish and Wildlife Service. 2001. Draft recovery criteria and estimates of time for recovery actions for the Sonoran pronghorn: a supplement and amendment to the 1998 final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.

U.S. Immigration and Naturalization Service. 2001. Draft report, environmental assessment for the proposed expansion of the Ajo U.S. Border Patrol Station, Why, Arizona. Immigration and Naturalization Service, Washington D.C.

Warren, P., and A. Laurenzi. 1987. Rare plant survey of the Yuma District. Report to the Bureau of Land Management, Yuma, AZ.

Weisenberger, M.E., P.R. Krausman, M.C. Wallace, D.W. DeYoung, and O.E. Maughan. 1996. Effects of simulated jet aircraft noise on heart rate and behavior of desert ungulates. Journal of Wildlife Management 80(1):52-61.

WESTEC. 1977. Survey of the sensitive plants of the Algodones Dunes. Report to the Bureau of Land Management, Riverside, California.

Wildeman, G., and J.H. Brock. 2000. Grazing in the southwest: history of land use and grazing since 1540. *In* R. Jemison and C. Raish, eds., Livestock management in the American southwest: ecology, society, and economics. Elsevier Science, Amsterdam, The Netherlands.

Workman, G.D., T.D. Bunch, J.W. Call, F.C. Evans, L.S. Neilson, and E.M. Rawlings. 1992. Sonic boom and other disturbance impacts on pronghorn antelope (*Antilocapra americana*). Report to the U.S. Air Force, Hill Air Force Base, UT.

Wright, R.L,. and J.C. deVos. 1986. Final report on Sonoran pronghorn status in Arizona. Contract No. F0260483MS143, Arizona Game and Fish Department, Phoenix, AZ

Yoakum, J.D., B.W. O'Gara, and V.W. Howard, Jr. 1996. Pronghorn on western rangelands. *In* P.R. Krausman, ed., Rangeland wildlife. The Society for Range Management, Denver, CO.

Figure 1: see separate file

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

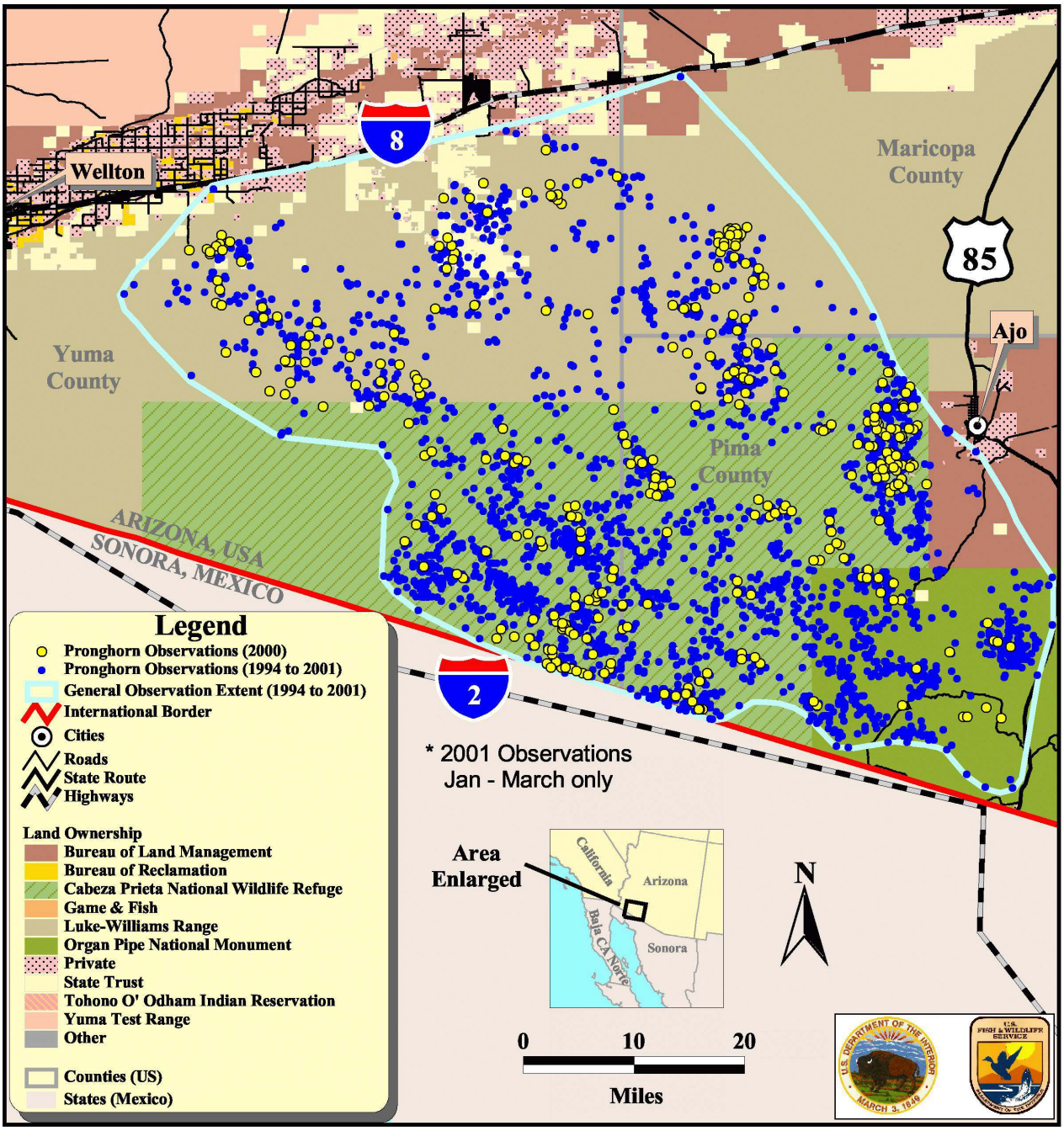

Figure 3. Current Sonoran pronghorn distribution in the United States: Records from 1994-2001.

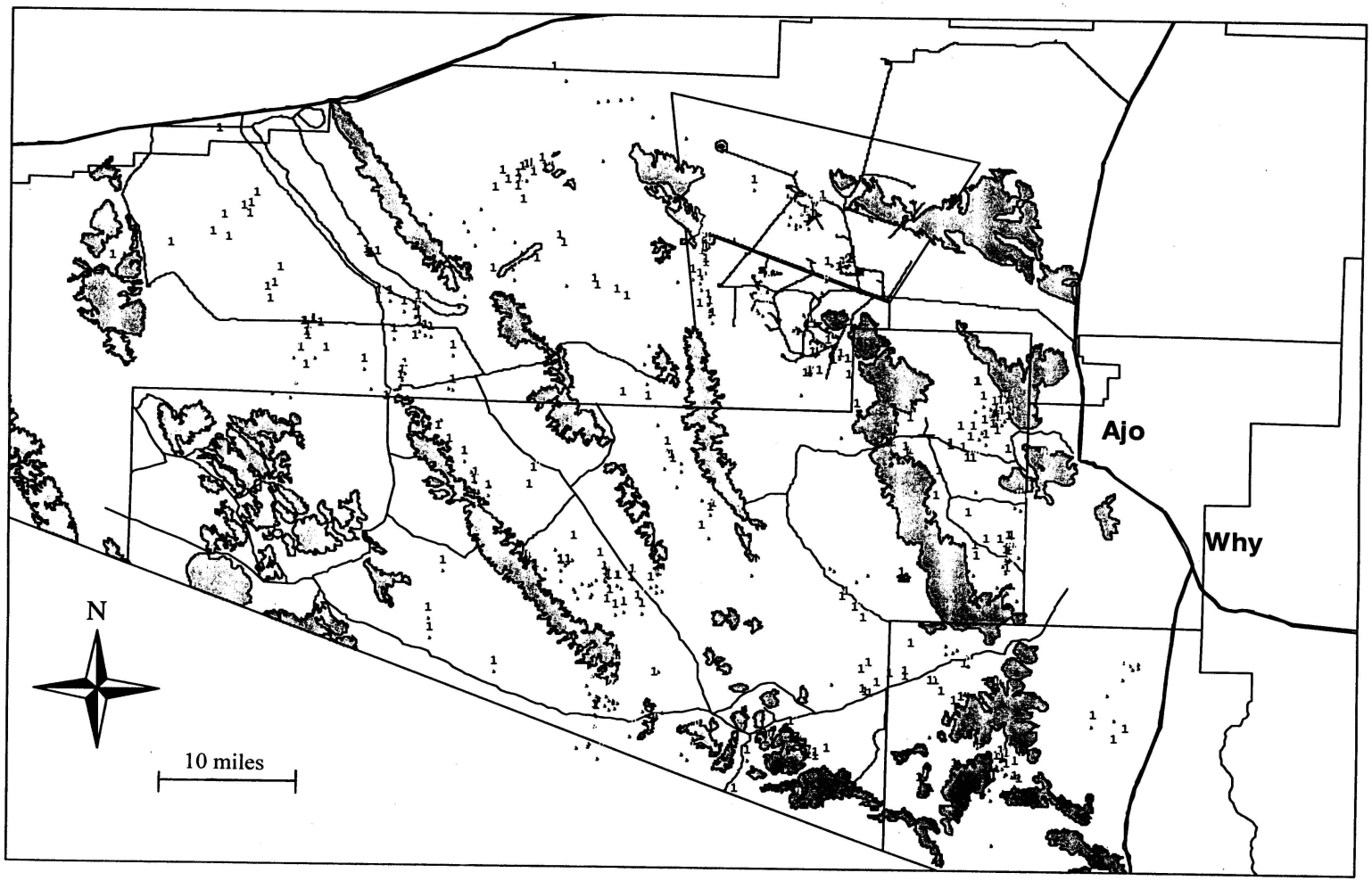

Figure 4. Locations of telemetered does with fawns, February through August, 1995-2001. "1" indicates a single fawn; a dot represents twins.

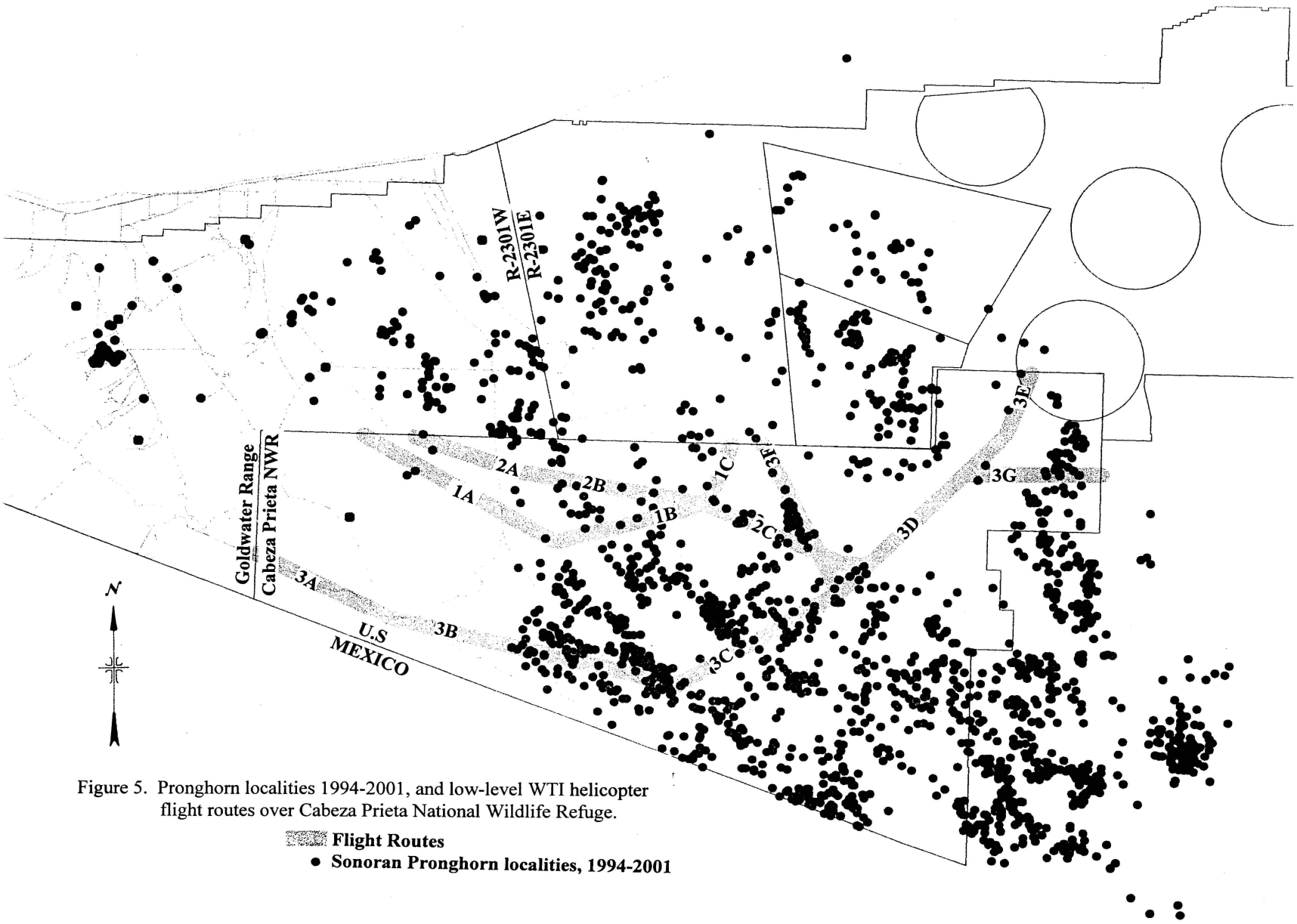

Figure 5. Pronghorn localities 1994-2001, and low-level WTI helicopter flight routes over Cabeza Prieta National Wildlife Refuge.

Flight Routes

- **Sonoran Pronghorn localities, 1994-2001**

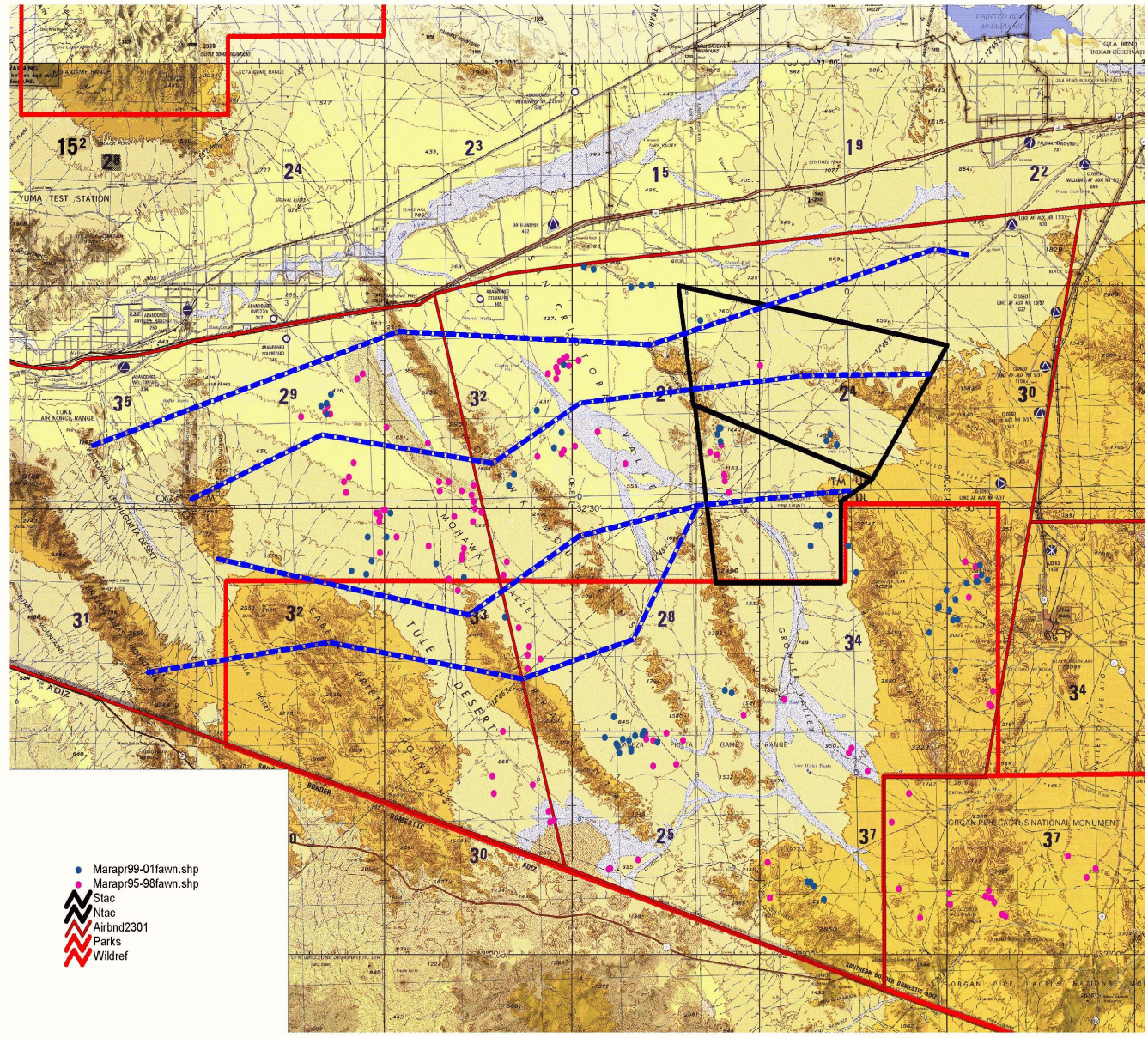

Figure 6. MCAS-Yuma Helicopter Routes.

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. Response to requests for concurrence on the cactus ferruginous pygmy-owl and lesser long-nosed bat.

Cactus ferruginous pygmy-owl

The Service listed the Arizona population of the cactus ferruginous pygmy-owl on March 10, 1997. The Service designated as critical habitat approximately 731,712 acres of riverine riparian and upland habitat in Pima, Cochise, Pinal, and Maricopa counties in Arizona on July 12, 1999. On September 21, 2001, the District Court of Arizona, in *National Association of Home Builders et al. v Gale A. Norton et al.*, vacated the critical habitat designation for the pygmy-owl and remanded it back to the Service for further consideration. In Arizona, cactus ferruginous pygmy-owls are known to occur in the Arizona upland subdivision of Sonoran desert scrub (Turner and Brown 1982), characterized by leguminous trees such as palo verde (*Parkinsonia* sp.), ironwood (*Olneya tesota*), and mesquite (*Prosopis* sp.); and large columnar cacti such as saguaro (*Carnegia gigantea*) and organ pipe cactus (*Stenocereus thurberi*); as well as mesquite and shrub invaded semi-desert grasslands. Historically, most records of pygmy-owls were from riparian cottonwood forests and mesquite bosques; however, most recent records in Arizona are from rich stands of Arizona upland Sonoran desert scrub (Johnson, *et al.* 2000, Monson 1998). Unifying habitat characteristics among habitats used by pygmy-owls in Arizona include fairly dense woody thickets or woodlands with trees and/or cacti large enough to provide nesting cavities. This type of habitat is often found along desert washes or on bajadas.

The BMGR overlaps portions of the historic range of the pygmy-owl. An historic record exists of a pygmy-owl from Cabeza Prieta Tanks in the western portion of Cabeza Prieta NWR (Monson 1998); and in 2001 two male pygmy-owls were detected near Papago Well on the eastern side of Cabeza Prieta NWR. Surveys were conducted at the Bryan Mountain/Monreal Well, the Agua Dulce Mountains, and Growler Peak on the Cabeza Prieta NWR in 1993 and 1994. No pygmy-owls were detected. Unconfirmed detections of pygmy-owls were reported from the Johnson Well area of the Sand Tank Mountains in 1992 and 1994 (U.S. Army Corps of Engineers 1995; T. Tibbitts, Organ Pipe Cactus NM, pers. comm. 1994), and from the East TAC in 1995 (B. Barry, pers. comm. 1995). While there are no confirmed current records for pygmy-owl within its boundaries, the BMGR overlaps historic habitat and, based on information provided in Dames and Moore (1995), contains potentially suitable habitat for pygmy-owls. However, due to low habitat quality, occurrence of pygmy-owls on BMGR R-2301W is unlikely. No low-level fixed wing or helicopter flight corridors are located or proposed over Papago Well, where pygmy-owls were confirmed this year. The nearest helicopter corridor is 3C (Figure 3), the southern edge of which is about 2 miles north of Papago Well.

The 1996 biological opinion contained a concurrence for the pygmy-owl that was based upon completion of surveys for pygmy-owls in suitable habitats in areas north and east of the Cabeza Prieta Mountains under airspace R-2301W, in flight corridors and areas of R-2301E used during WTI courses for low level flights, low level flight corridors within Cabeza Prieta NWR and one mile on either side of the corridors, and in the proposed ground support area southwest of Stoval Field. If pygmy-owls were found, certain restrictions on authorized activities would need to be implemented to eliminate significant adverse effects. Surveys were conducted from February 18

to March 4 and April 17-20, 1997, mostly in Cabeza Prieta NWR under low-level helicopter flight corridors 1 and 3 (Figure 3) (Aigner and Koehler 1997). Surveys focused on mixed cactus/palo verde associations within these areas. A total of 122 hours of survey time was expended. No pygmy-owls were detected. Unfortunately, no surveys were conducted near Stoval Field, suitable habitats north and east of the Cabeza Prieta Mountains outside of Cabeza Prieta NWR, areas, including the tactical ranges, portions of R-2301E used during WTI, or other low-level flight corridors, as recommended in the 1996 biological opinion.

Surveys were designed around the survey protocol at the time (Corman 1995); however, Aigner and Koehler (1997) extended the time period in the morning by as much as 1.25 hour, and in the evening began surveys up to one hour early. The spacing between calling points was greater (3,280 feet) than that recommended in Corman (1995) (no more than 350 feet between points), but the authors provide evidence that pygmy-owls could be heard in their study area for that distance. The survey protocol was revised in 2000 (AGFD and Service 2000). In addition, the Service and AGFD have established pygmy-owl survey zones 1-3, that prioritize the need for surveys. Zone 1 encompasses all recent pygmy-owl locations; Zone 2 includes the current known range of the pygmy-owl outside of Zone 1; and Zone 3, which includes additional areas within the historic range of the pygmy-owl where there is a low potential for occurrence. In the action area, Zone 1 is found in Organ Pipe Cactus NM. Zone 2 is all of Pima County not included in Zone 1, and portions of the action area in Maricopa County are in Zone 3. No Zone 1, 2, or 3 areas are located in Yuma County. The Service recommends clearance surveys, as described in AGFD and Service (2000), for any Federal action that may affect suitable habitats in Zones 1, 2, or 3. The surveys by Aigner and Koehler (1997) do not conform to the current protocol for project clearances in that only one or two visits were made to each site (3 spring surveys and two fall surveys are recommended in the 2000 protocol), surveys were carried out earlier or later than recommended, weather conditions were not recorded (surveys should not be carried out during adverse weather - 2000 protocol), and survey stations should be no more than 1,310 feet apart.

The Marine Corps determined in their 1995 biological assessment that the proposed project is "...unlikely to affect and will not jeopardize the continued existence of the species...". The proposed project is within historic range for the pygmy-owl, and pygmy-owls are known to occur near one of the low-level flight corridors. Although Aigner and Koehler (1997) did not survey all areas recommended in the 1996 biological opinion, the areas surveyed probably have the greatest potential to support pygmy-owls that may be affected by the proposed action. Nevertheless, accurately assessing potential effects to pygmy-owls without adequate survey information is problematic.

The Service believes that if pygmy-owls, other than the birds at Papago Wells, occur in the action area, they are likely to occur in the eastern portion of Cabeza Prieta NWR or under R-2301E, where precipitation is greatest and vegetation is more characteristic of known, currently occupied habitat. If these areas are the most likely areas to support the pygmy-owl, then the component of the proposed action most likely to affect pygmy-owls would be low-level helicopter flights in corridors over Cabeza Prieta NWR and into the tactical ranges. If a helicopter flew over a pygmy-owl or nest at low elevation (e.g. 50-200 feet), the wind generated

by the helicopter and associated noise and visual stimuli would likely cause birds to flush. Nests would most likely be protected because pygmy-owls are cavity nesters and most nests are located in saguaro cavities, which would be resistant to wind damage. Of greatest concern would be low-level flights during the spring WTI course (March-April), which corresponds to when pygmy-owls are nesting. However, helicopter flights are relatively rare events (5-8 days and 5-10 hours of flight time during each WTI course) and occur only in corridors in Cabeza Prieta NWR. Pygmy-owls are apparently very rare at Cabeza Prieta NWR and are not known from BMGR, thus the likelihood of interaction between helicopters and pygmy-owls is low.

The Service concurs with MCAS-Yuma's determination that the proposed action may affect, but is not likely to adversely affect, the cactus ferruginous pygmy-owl. We base this determination on the following:

1. Based on limited survey work, only 2 recent records of pygmy-owl occur in the action area, and these birds are not expected to be affected by the proposed action.

2. Pygmy-owls are unlikely to occur on BMGR R-2301W due to poor habitat quality.

3. In the unlikely event that a low-level helicopter may fly over a pygmy-owl or its nest, the bird may flush, but would not be harmed, and nests would be protected because they occur in cavities, primarily saguaro cavities, that are resistant to wind damage.

Lesser long-nosed bat

The lesser long-nosed bat was listed (originally, as Sanborn's long-nosed bat) as endangered on September 30, 1988 (53 FR 38456). No critical habitat has been designated for this species. The lesser long-nosed bat is a small leaf-nosed bat. It has a long muzzle and a long tongue. These features are adaptations to collect nectar from the flowers of columnar cactus, such as the saguaro and organ pipe cactus, and from paniculate agaves (e.g., *Agave palmeri*) (Hoffmeister 1986). This migratory species is found throughout its historic range from southern Arizona, through western Mexico, and south to El Salvador. It has been found in roosts in southern Arizona from the Picacho Mountains southwest to the Agua Dulce Mountains, southeast to the Peloncillo Mountains and the Animas Mountains in New Mexico, and south to Mexico. Arizona roosts are occupied from late April to early November (Cockrum 1991; Sidner 1999, 2000); although the species has been recorded in winter at hummingbird feeders in Tucson (Sidner and Houser 1990).

The bats arrive in southwestern and south-central Arizona in April, and occupy three known maternity roosts until July or August when most bats move to southeastern Arizona. Adult females, most of which are pregnant, and their recent young are the first to arrive in April. They form maternity colonies at lower elevations near concentrations of flowering columnar cacti. Adult males are known mostly from the Chiricahua Mountains, but also occur with adult females and young of the year at maternity sites (Service 1994).

Loss of roost and foraging habitat, as well as direct taking of individual bats during animal control programs, particularly in Mexico, have contributed to the current status of the species. Suitable day roosts and suitable concentrations of food plants, are the two resources that are critical for the lesser long-nosed bat (Service 1994). As indicated above, the lesser long-nosed bat consumes nectar and pollen of paniculate *Agave* flowers and the nectar, pollen, and fruit produced by a variety of columnar cacti. Caves and mines are used as day roosts. The factors that make roost sites usable have not yet been identified; narrow or specialized requirements may not be necessary for day roosts. Whatever the factors are that determine selection of roost locations, the species appears to be sensitive to human disturbance. Instances are known where a single brief visit is sufficient to cause a high proportion of lesser long-nosed bats to temporarily abandon their day roost and move to another. Perhaps most disturbed bats return to their preferred roost in a few days. However, the sensitivity suggests that the presence of alternate roost sites may be critical when human disturbance occurs. Interspecific interactions with other bat species may also influence lesser long-nosed bat roost requirements.

Lesser long-nosed bats appear to be opportunistic foragers and efficient fliers, capable of flight speeds up to14 mph (Sahley *et al.* 1993). They often forage in flocks. The lesser long-nosed bat is known to fly long distances from roost sites to foraging sites. Night flights from maternity colonies to flowering columnar cacti have been documented in Arizona at 15 miles, and in Mexico at 25 miles and 38 miles (one way) (Dalton *et al.* 1994; V. Dalton, Tucson, pers. comm., 1997; Y. Petryszyn, University of Arizona, pers. comm., 1997). A substantial portion of the lesser long-nosed bats at the Pinacate Cave in northwestern Sonora (a maternity colony) probably fly 25-31 miles one way to foraging areas in Organ Pipe Cactus NM (Service 1994). Horner *et al.* (1990) found that lesser long-nosed bats commuted 30-36 miles round trip between an island maternity roost and the mainland in Sonora; the authors suggested these bats regularly flew at least 47 miles each night. Lesser long-nosed bats have been observed feeding at hummingbird feeders many miles from the closest potential roost site (Petryszyn, pers. comm. 1997).

Known major roost sites include 17 large roosts in Arizona and Mexico (Service 1994, Service files). According to surveys conducted in 1992 and 1993, the number of bats estimated to occupy 16 of the 17 sites was greater than 200,000. A recently discovered roost in Cochise County may support an additional 25,000 bats. Major maternity roost sites are known from Arizona (3) and Mexico (9). According to the same surveys, the maternity roosts are occupied by a total of more than 150,000 lesser long-nosed bats. The numbers above indicate that, although many of these bats are known to exist, the relative number of known large roosts is quite small. Disturbance of these roosts and the food plants associated with them could lead to the loss of the roosts. Limited numbers of matemity roosts may be the critical factor in the survival of this species.

The action area is largely west and north of what is considered to be the known range of the lesser long-nosed bat. However, the range delineation is based on roost records and roosts of lesser long-nosed bats may be difficult to find. Lesser long-nosed bats can travel 38 miles or more from their day roost while foraging. The project area contains potential foraging habitat, and portions of the action area occurs within the foraging range of the bat. The closest records of lesser long-nosed bats to military activities proposed in the YTRC are maternity colonies in the Growler Mountains at Cabeza Prieta NWR, Slate Mountains at Organ Pipe Cactus NM, and at Volcan Pinacate,

Sonora; and roosts in the Agua Dulce Mountains within Cabeza Prieta National Wildlife Refuge (Dames and Moore 1995; Service files). All of these roosts are within foraging distance of either ground-based activities or low-level flight corridors associated with this project.

Potential roosts of the BMGR were surveyed in 1994 (Dalton *et al.* 1994). No lesser long-nosed bats or their potential roosts were found, with the exception of one possible transitory shelter. Potential roosts on Cabeza Prieta NWR have been surveyed to a lesser extent resulting in the discovery of the roosts in the Agua Dulce Mountains and in the Growler Mountains. No ground-disturbing activities are proposed on the Refuge or at or near any known roosts.

Disturbance of bats as a result of noise could occur due to low-level fixed-wing and helicopter flights. Dalton and Dalton (1993) investigated the effects of low-level (500 feet AGL) military jet flights on the lesser long-nosed bat in a mine that served as a day roost at Organ Pipe Cactus NM. Bats exposed to low-level flights exhibited no acute responses (panic flights, falling young bats, or startle responses). No significant differences in bat orienting responses were noted before, during, or after jet flights, but depressed levels of bat flights were noted for up to 30 minutes following the jet noise. Low-level jet noise attenuated rapidly within the roost, particularly the high frequency sounds to which bats are particularly sensitive. The authors note that extrapolation of the results to other sites with different terrain or mine tunnel geometry may not be valid. They also find that the study did not address any potential long-term effects to the bat colony. As discussed in the Effects of the Proposed Action for the Sonoran pronghorn, wildlife typically respond more to helicopter flights than fixed-wing aircraft. A helicopter flying very low over a bat roost could produce noise as well as high winds that could potentially disturb bats. However, none of the low-level helicopter flight routes are near any known roosts. The closest low-level helicopter route to a known roost is route 3C (Figure 3), the southern boundary of which passes within approximately 3 miles of a maternity roost in the Agua Dulce Mountains. During consultation in 1996, the Service expressed concern that a proposed low-level helicopter corridor through the southern end of the Growler Mountains could cause disturbance to a nearby maternity roost. In response to this concern, MCAS-Yuma eliminated the route and created route 3G that passes over the Growler Mountains farther to the north (Figure 3). The closest low-level (200 to 1500 feet AGL) fixed wing aircraft corridor to a roost passes within about 2.5 miles of a roost in the Agua Dulce Mountains. These routes are only used during WTI, which takes place during March-April, and then again during October-November. The bats are only present in southwestern Arizona from April to July or August, thus only overflights during the spring WTI has any potential to affect lesser long-nosed bats, and only if it occurs in April.

Helicopter overflights also have potential to disturb foraging lesser long-nosed bats. A 38-mile foraging radius from the maternity roost in the Growler Mountains and Organ Pipe Cactus NM, and roosts in the Agua Dulce Mountains covers the WTI helicopter flight corridors and extends into the Mohawk Mountains, well into the Mohawk and San Cristobal valleys, the Lechuguilla Desert, and to the southern end of the Tinajas Altas Mountains outside of Cabeza Prieta NWR. The large maternity roost at Volcan Pinacate is slightly more than 38 miles from R-2301W outside of Cabeza Prieta NWR, but is well within 38 miles of the WTI low-level helicopter flight corridors. Foraging bats normally fly not much higher than the tops of trees or saguaros. However, helicopters may fly as low as 50 feet, and approximately 40 percent of helicopter sorties

are flown at night. The wind and noise generated by such a low-level, large helicopter could be considerable. Lesser long-nosed bats flying beneath a helicopter at 50 feet AGL would likely be blown to the ground or into trees, shrubs, or cacti and possibly injured. Bats could also potentially collide with helicopters flying at low levels. The primary season of concern would be the March-April WTI course, which includes low-level helicopter flights through Cabeza Prieta NWR, and low-level flights elsewhere in R-2301W and R-2301E outside of Cabeza Prieta NWR from April to July or August. Collectively, annual peak numbers of lesser long-nosed bats from the three maternity roosts and the roosts in the Agua Dulce Mountains typically number roughly 130,000 (Service files). Thus, the likelihood of low-level nocturnal helicopter sorties encountering a foraging lesser long-nosed bat is high.

Most fixed-wing aircraft flights occur during the day and all are above 200 feet. Although noise associated with low-level fixed-wing flights may be intense, it is of short duration and the winds associated with low-level helicopter flights are absent. Although we do not know how noise affects foraging lesser long-nosed bats, there is much less chance of adverse effects to foraging lesser long-nosed bats from fixed-wing aircraft as compared to low-level helicopter flights.

Bats are occasionally killed during collisions with communications towers. Fifty four bats of seven species were found dead below a television tower in Florida (Crawford and Baker 1981). Hebert *et al.* (1995) noted bat kills below communications towers in Canada, Florida, Missouri, North Dakota, and Tennessee. They also note a bat found dead below a 115KV transmission line. The susceptibility of lesser long-nosed bats to collision with towers is unknown, and we are not aware of any lesser long-nosed bats found dead under communications towers, powerlines, or other structures. However, there is some potential for lesser long-nosed bats to collide with antennae, towers, and powerlines associated with TACTS.

South, North, and East TACs are within the foraging distance of several lesser long-nosed bat roosts. Aircraft flights during WTI arrive at and deliver ordnance to the three tactical ranges. Use of the tactical ranges for delivery of ordnance is restricted to specific targets (Gary Blake, personal communication). Such targets have been in use for long periods of time and much of the vegetation at the target areas has already been impacted. The locations of the target areas remain the same and are not changed on the tactical ranges. The targets are estimated to represent three percent of the area of the tactical ranges. No random deliverance of ordnance, including strafing, occurs on the tactical ranges. As a result, vegetation is severely affected at the targets, but outside of the targets, effects are minimal or absent. Because new target areas are not proposed, no significant new disturbance is anticipated to vegetation or foraging habitat of the bat. However, continued use of the target areas will prevent recovery of vegetation communities. In the absence of ordnance delivery it is unknown how long such a recovery would take. But natural recovery of severely disturbed soils and then reestablishment of saguaros capable of flowering and providing nectar and fruit for lesser long-nosed bats is a process that would likely take centuries.

The Service does not concur with MCAS-Yuma's determination that the proposed action may affect, but is not likely to adversely affect, the lesser long-nosed bat. We base this determination on the following:

1. The range of foraging lesser long-nosed bats are likely to overlap a large portion of the action area, and lesser long-nosed bats are relatively common in the area from April to July or August.

2. Low-level night flights by helicopters, particularly during WTI in April, are likely to fly over foraging lesser long-nosed bats. Winds created by helicopters at 50-200 feet may blow bats onto the ground or into trees, shrubs, or cacti and injure them.

3. Continued use of the tactical ranges prevents recovery of lesser long-nosed bat foraging habitat.

Because we do not concur with your determination for the lesser long-nosed bat, we recommend that MCAS-Yuma request initiation of formal consultation on this species. Should project plans change, or if additional information on the distribution of listed or proposed species or critical habitat becomes available, the conclusions herein may need to be reconsidered.

Literature Cited

Aigner, P.A., and C.E. Koehler. 1997. Final report, survey for the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*) in low-level helicopter flight corridors of the Barry M. Goldwater Range and Cabeza Prieta National Wildlife Refuge. Report to Tierra Data Systems, Reedley, CA.

Arizona Game and Fish Department and U.S. Fish and Wildlife Service. 2000. Cactus ferruginous pygmy-owl survey protocol. Arizona Game and Fish Department and U.S. Fish and Wildlife Service, Phoenix, AZ.

Cockrum, E.L. 1991. Seasonal distribution of northwestern populations of the long-nosed bats, *Leptonycteris sanborni*) family Phyllostomatidae. Anal. Instit. Biol. Univ. Nac. Autonoma de Mexico, Ser. Zool. 60:181-202.

Corman, T. 1995. Cactus ferruginous pygmy-owl preliminary survey protocol. Arizona Game and Fish Department, Phoenix, AZ.

Crawford, R.L., and W.W. Baker. 1981. Bats killed at a north Florida television tower: a 25 year record. Journal of Mammalogy 62:651-652.

Dalton, V.M., and D.C. Dalton. 1993. Assessment of the impacts of low level military aircraft on *Leptonycteris curasoae*, an endangered bat, at Organ Pipe Cactus NM, Arizona. Report to Luke Air Force Base, AZ and Organ Pipe Cactus NM, Ajo, AZ.

Dalton, V.M., D.C. Dalton, and S.L. Schmidt. 1994. Roosting and foraging use of a proposed military training site by the long-nosed bat, *Leptonycteris curasoae*. Contract Nos DACA65-94-M-0831 and DACA65-94-M-0753. Report to the Luke Air Force Natural Resources Program. 34pp.

Dames and Moore. 1995. Biological assessment for the Marine Corps Use of the Barry M. Goldwater Range, Arizona. Report to Marine Corps Air Station, Yuma, AZ.

Hebert, E., E. Reese, and L. Mark. 1995. Avian collisions and electrocutions: an annotated bibliography. California Energy Commission Publication P700-95-001.

Hoffmeister, D.F. 1986. Mammals of Arizona. University of Arizona Press, Tucson, AZ.

Horner, M.A., T.H. Fleming, and M.D. Tuttle. 1990. Foraging and movement patterns of a nectar feeding bat: *Leptonycteris curasoae*. Bat Research News 31:81.

Johnson, R.R., J.E. Cartron, L.T. Haight, R.B. Duncan, and K.J. Kingsley. 2000. A historical perspective on the population decline of the cactus ferruginous pygmy-owl in Arizona. Pages 17-26 *in* J.E. Cartron and D.M. Finch (eds) Ecology and Conservation of the Cactus Ferruginous Pygmy-Owl in Arizona. USDA, Forest Service, General Technical Report RMRS-GTR-43.

Monson, G. 1998. Ferruginous pygmy-owl. Pages 159-161 *in* Glinski, R.L., ed., The Raptors of Arizona, University of Arizona Press, Tucson.

Sidner, R. 2000. Report of activities under permit TE-821369-0. Report to the US Fish and Wildlife Service, Albuquerque, NM.

Sidner, R. 1999. Ninth annual monitoring report of bats, especially the lesser long-nosed bat (*Leptonycteris curasoae*), with emphasis upon roostsites on the Fort Huachuca Military Reservation, Cochise County, Arizona, May - October 1998. Report to Fort Huachuca, AZ. Contract #DABT63-98-T-0093.

Sahley, C.T., M.A. Horner, and T.H. Fleming. 1993. Flight speeds and mechanical power outputs in the nectar feeding bat, *Leptonycteris curasoae* (Phyllostomidae: Glossophaginae). J. Mammal. 74:594-600.

Sidner, R., and F. Houser. 1990. Lunar philia in nectar-feeding bats in Arizona. Bat Research News 31(4):15.

Turner, R.M. and D.E. Brown. 1982. Sonoran desertscrub. In: D.E. Brown (ed.). Biotic communities of the American Southwest-United States and Mexico. Desert Plants 4(1-4):181-222.

U.S. Army Corps of Engineers. 1995. Administrative Draft Environmental Impact Statement, Western Army National Guard Aviation Training Site Expansion. Prepared for the National Guard Bureau and Arizona National Guard, U.S. Army Corps of Engineers, Los Angeles District.

U.S. Fish and Wildlife Service. 1994. Lesser long-nosed bat recovery plan. Albuquerque, New Mexico. 49pp.

Appendix 2. 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.