United States Department of the Interior

Fish and Wildlife Service

Arizona Ecological Services Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer To:
AESO/SE
02EAAZOO-2012-F-0170

November 6, 2012

Mr. Christopher J. Colacicco, Director
U.S. Customs and Border Protection
Border Patrol Facilities and Tactical Infrastructure
Program Management Office
1300 Pennsylvania Avenue NW
Washington, DC 20229

Dear Mr. Colacicco:

Thank you for your request for formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (ESA). Your request was received by us on April 02, 2012, and was supplemented with additional information, as requested in our letter of May 15, 2012, with a revised Biological Assessment (BA) dated July 2012. At issue are possible effects of the proposed Tactical Infrastructure Maintenance and Repair Program (TIMR) along the U.S./Mexico international border in Arizona.

The U.S. Customs and Border Protection (CBP) concluded that the proposed project "may affect, and is likely to adversely affect" the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*), the endangered Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*), the endangered Sonoran tiger salamander (*Ambystoma tigrinum stebbinsi*), and the threatened Chiricahua leopard frog (*Lithobates chiricahuensis*) and its designated critical habitat. These species and critical habitat are the subject of this Biological Opinion (BO).

CBP also concluded that the proposed action "may affect, but is not likely to adversely affect" the Canelo Hills ladies' tresses (*Spiranthes delitescens*), Cochise pincushion cactus (*Escobaria robbinsiorum*), Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) and designated critical habitat, desert pupfish (*Cyprinodon macularius*), Gila chub (*Gila intermedia*) and designated critical habitat, Gila topminnow (*Poeciliopsis occidentalis occidentalis*), Quitobaquito pupfish (*Cyprinodon eremus*) and designated critical habitat, Sonoran chub (*Gila ditaenia*) and designated critical habitat, New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*), masked bobwhite

(*Colinus virginianus ridgwayi*), Mexican spotted owl (*Strix occidentalis lucida*) and designated critical habitat, southwestern willow flycatcher (*Empidonax traillii extimus*) and proposed critical habitat, Yuma clapper rail (*Rallus longirostris yumanensis*), jaguar (*Panthera onca*), lesser long-nosed bat (*Leptonycteris yerbabuenae*), and ocelot (*Leopardus pardalis*). We concur with your

determination on these species and provide our rationale in Appendix A. CBP has determined that there would be no effect to all other listed species and their designated or proposed critical habitats that occur within the action area for the TIMR Program.

This BO is based on information provided in CBP's BA addressing the proposed TIMR Program along the U.S./Mexico international border in Arizona, the draft Environmental Assessment (EA) addressing the proposed TIMR Program, telephone conversations and meetings between our staffs, and other sources of information found in the administrative record supporting this BO. Literature cited in this BO is not a complete bibliography of all literature available on the types of activities included in the TIMR Program or the species addressed in this consultation. A complete administrative record of this consultation is on file at this office.

CONSULTATION HISTORY

May 24, 2011: FWS and CBP met to discuss the proposed project.

August 12, 2011: CBP provided a preliminary draft EA and preliminary draft BA.

August 15, 2011: The Department of the Interior (DOI) formally requested location maps or geographical information system data for infrastructure discussed in the EA and BA; CBP declined to provide this information.

August 29, 2011: FWS provided comments to CBP on the preliminary draft EA and preliminary draft BA.

September 22, 2011: FWS received CBP's response to comments on the preliminary draft EA.

September 23, 2011: CBP made a draft EA available for public review and comment.

October 19, 2011: FWS and CBP held a teleconference to discuss consultation on the proposed project.

October 21, 2011: FWS provided comments on the draft EA.

November 09, 2011 through March 15, 2012: FWS and CBP held various meetings and discussions related to this consultation, and both agencies reviewed and commented on various drafts of the BA for this project.

March 22, 2012: FWS provided comments to CBP on the final draft BA.

April 02, 2012: FWS received CBP's request for initiation of formal consultation, along with a revised BA dated April 2012.

May 15, 2012: FWS submitted a 30-day letter to CBP requesting additional information needed to start formal consultation.

June 13, 2012: FWS received a detailed CBP response to the 30-day letter.

June 21, 2012: FWS met with CBP to discuss the revised BA dated April 2012 and detailed CBP response dated June 13, 2012.

July 11, 2012: FWS received a revised BA dated July 2012.

August 31, 2012: FWS provided a draft BO to CBP for review and comment.

September 12 and 19, 2012: FWS received comments on the Draft BO from CBP.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

A complete description of the proposed action is found in your April 02, 2012 letter, the July 2012 BA, and the September 2011 public draft EA, and is incorporated herein by reference. The purpose of this project is to ensure that the physical integrity of the existing tactical infrastructure and associated supporting elements continue to perform as intended and assist the United States Border Patrol (USBP) in securing the U.S./Mexico international border in Arizona. The need for the proposed Tactical Infrastructure Maintenance and Repair Program (TIMR) is to ensure that the effective level of border security provided by the installed tactical infrastructure is not compromised by acts of sabotage, acts of nature, or a degradation of integrity due to a lack of maintenance and repair. CBP must ensure that tactical infrastructure functions as it is intended, which assists CBP with its mission requirements. Tactical infrastructure would be maintained to ensure USBP agent safety by preventing potential vehicular accidents by minimizing and eliminating hazardous driving conditions.

The Department of Homeland Security (DHS) and CBP propose to initiate a Selective Maintenance and Repair Program (TIMR Program) to maintain and repair certain tactical infrastructure along the U.S./Mexico international border in the State of Arizona. The scope of the TIMR Program includes reactive maintenance and repair activities (e.g., resolving damage from intentional sabotage or severe weather events) and preventative/scheduled maintenance and repair activities designed to ensure environmental sustainability (e.g., culvert replacement, drainage and grate cleaning, preventative measures to prevent soil erosion) over the functional life of the covered infrastructure. All maintenance and repair activities would be coordinated by the CBP Facilities Management and Engineering (FM&E) Sector Coordinator and managed by the Project Management Office's Maintenance and Repair Supervisor.

The tactical infrastructure proposed to be maintained and repaired consists of fences and gates, roads and bridges/crossovers, drainage structures and grates, lighting and ancillary power systems, and communication and surveillance tower components (including, but not limited to Remote Video Surveillance System [RVSS] and Secure Border Initiative (SBI*net*) towers, which shall hereafter be

referred to as towers). Figure 1 depicts the general area where the existing tactical infrastructure components covered in this Biological Opinion (BO) are found. The tactical infrastructure occurs in both USBP sectors in Arizona: Tucson and Yuma. The Tucson Sector is entirely within Arizona, and a portion of the Yuma Sector is in Arizona (see Figure 1).

To accommodate changes in the location of border security threats, requests from landowners and land managers, and other changing situations, the location and amount of tactical infrastructure to be maintained and repaired under the proposed action, as described in this BO, could change over time. However, the best management practices (BMPs) and conservation measures (CMs) that are described in this document, and the associated thresholds that would result in further coordination with the FWS, were developed to apply to and address the potential impacts of all tactical infrastructure currently included in the program or that might be included in the future. If CBP proposes to add maintenance and repair of other existing tactical infrastructure within the suitable habitat for any species for which this BO determines the proposed action could result in adverse affects, then CBP will further discuss and coordinate such maintenance and repair with FWS prior to initiating those actions to determine if reinitiation of this consultation is warranted. An exception to this is related to the Pima pineapple cactus. CBP has agreed to a conservation measure for this species which would address any additional impacts from added infrastructure, removing the need for reinitiation related to the Pima pineapple cactus.

This BO addresses the maintenance and repair of existing tactical infrastructure along the U.S./Mexico international border in Arizona. However, the maintenance and repair of existing tactical infrastructure assets for which environmental compliance (National Environmental Policy Act compliance, not necessarily ESA compliance) has been completed are not included within the scope of the Program or this BO. In addition, tactical infrastructure assets that are covered by a waiver issued by the Secretary are also excluded from the scope of this BO[1]. This BO also does not address maintenance and repair of any tactical infrastructure located on Tribal lands in southern Arizona. Compliance with section 7 of the ESA for construction or installation of new tactical infrastructure also is not addressed in this BO.

Project Location

With one exception, the tactical infrastructure addressed in this BO exists along or within 50 miles of the U.S./Mexico international border in Arizona, and most of the maintenance and repair activities associated with the Program would occur within 25 miles of the border. In addition, one road to be maintained under the Program is located 50 to 60 miles north of the border, near Three Points, Arizona, north of Highway 86 and south of the Roskruge Mountains. To accommodate changes in missions, requests from landowners and managers, and other changing situations, additional existing roads and other tactical infrastructure within the action area may be added to this program in the future and maintained and repaired as described in this consultation, including additional coordination with the FWS as appropriate.

[1] Under the April 1, 2008, waiver, the Secretary, pursuant to his authority under Section 102(c) of the Illegal Immigration Reform and Immigrant Responsibility Act of 1996, as amended, exercised his authority to waive certain environmental and other laws in order to ensure the expeditious construction of tactical infrastructure along the U.S./Mexico international border.

Project Implementation

Tactical infrastructure plays an important role in the CBP border enforcement strategy. The FM&E Border Patrol Facilities Tactical Infrastructure (BPFTI) Program Management Office (PMO) team would be responsible for the program planning, design, and implementation of maintenance and repair of all tactical infrastructure assets under the TIMR Program. The BPFTI PMO employs interdisciplinary technical staff, including CBP, sector, and contracted personnel, to participate in developing, reviewing, and implementing sector work plans. The BPFTI PMO would be responsible for formulating standard design specifications, which would consider BMPs and CMs, including those that prevent or minimize effects to listed species (see Best Management Practices and Conservation Measures sections below). They would also assess the condition of the existing tactical infrastructure to determine the priority and type of maintenance and repair needed. Within the BPFTI PMO, highly trained, full-time maintenance and repair program managers (PMs) and interdisciplinary subject matter experts (SMEs), including environmental specialists, are assigned to each USBP sector. The sector BPFTI maintenance and repair PMs are responsible for scheduling maintenance and repair activities and ensuring appropriate BMP measures are incorporated into all aspects of maintenance and repair activities. The environmental specialists and other SMEs would provide technical expertise to determine the BMPs that need to be implemented for specific maintenance and repair activities, depending on the environmental conditions and presence of listed species and their habitat.

The TIMR Program consists of preliminary planning, work plan development, work plan authorization, and plan execution. The process for developing the maintenance and repair work plan involves the steps listed below (also see Figure 2a and 2b for the work plan flowchart), which specifically focus on including BMPs that are applicable to threatened and endangered species.

Preliminary Maintenance and Repair Planning

- Step 1. USBP Sector personnel (USBP agents and field maintenance staff) and sector BPFTI maintenance and repair PMs identify and recommend maintenance and repair needs. This includes work scopes negotiated with Federal land managers and formally documented in interagency agreements. The BPFTI PMO has identified the CBP-managed tactical infrastructure assets that currently require periodic maintenance and repair, and additional infrastructure that is necessary to support CBP's missions will be identified in the future. The BPFTI PMO has also determined whether or not CBP has appropriate real estate instruments (e.g., easements, special use permits, and license agreements) and environmental clearances. Under the BPFTI Selective Maintenance and Repair Program, maintenance and repair would only be scheduled for tactical infrastructure assets with the appropriate approvals.

- Step 2. A team consisting of CBP BPFTI PMO and supporting contracted interdisciplinary SMEs, including the environmental SME, would participate in determining the appropriate BMPs and best technical approach for ensuring desired specifications. CBP is continuously developing and refining maintenance and repair techniques based on new technologies and their effectiveness. As a starting point, CBP has adopted manufacturer recommendations, regulatory guidelines, and requirements from land management agencies. Section 7

consultation falls under this step and the BMPs developed to minimize or avoid effects to listed species are an integral element of the program.

Work Plan Development

- Step 3a. The USBP sector BPFTI maintenance and repair PMs would develop a work plan of maintenance and repair activities for specified time intervals (e.g., quarterly, semi-annually, or some other time interval in accordance with the terms and condition of contracts and availability of funding). In coordination with USBP sector leadership, the maintenance and repair PMs would identify and prioritize maintenance and repair activities needed to remedy tactical infrastructure functional deficiencies. At the same time, the USBP sector BPFTI maintenance and repair PMs would define the maintenance and repair work scope and methods, incorporating all applicable BMPs, as provided by the environmental SME in Step 3b.

- Step 3b. The sector environmental SMEs would determine if species-specific BMPs need to be included in the work plan (see Figure 2b). The sector environmental SME would first determine if the activities fall within the range of a listed species. If any threatened or endangered species potentially occur in the geographic location of the maintenance and repair activities included in the work plan, the environmental SME would then determine if the activities are within the thresholds of BMPs specific for each listed species. If the activities are within those thresholds, the sector environmental SME would provide the applicable BMPs to the BPFTI maintenance and repair PMs for inclusion in the maintenance and repair work plan. If the environmental SME determines that any activity in the work plan is outside of the thresholds of the BMPs, and thus not covered by this BO and associated consultation, CBP would consult on the planned activities as required by section 7 of the ESA. General BMPs would be included for all maintenance and repair activities in the work plan, regardless of location or time period of activities.

  To determine which listed species must be considered for each activity, whether the BMP thresholds apply, and which species-specific BMPs must be implemented for each activity, the environmental SME would evaluate all available sources of data, including prior survey data, aerial photographs, site visits, previously developed environmental documentation, and information from contracted biologists. The environmental SMEs would determine if a survey conducted by a qualified biologist is required prior to maintenance and repair activities to determine if threatened or endangered species habitat is present or if required by a BMP. If necessary, the environmental SMEs would coordinate further with the FWS on an as-needed basis to clarify any compliance requirements, and would request updated information on the status and location of listed species within the action area annually or as needed. The environmental SMEs would ensure and endorse that all BMPs are incorporated into the work plan for maintenance and repair activities, where necessary.

- Step 3c. The USBP sector BPFTI maintenance and repair PMs would coordinate with appropriate landowners regarding the development of work plans and the scheduling of maintenance and repair activities. The environmental SMEs would coordinate with land

management agencies to ensure that all applicable agency-specific BMPs contained in Memoranda of Understanding or other agreements developed with those agencies to describe how maintenance will be conducted have been incorporated into the work plan.

Work Plan Authorizations

- Step 4. The USBP sector BPFTI maintenance and repair PMs would develop cost estimates for the proposed maintenance and repair work plans based on scope, work method, and applicable BMPs. Once the work plan costs have been finalized and vetted within the USBP sector level, the work plan would be submitted to the CBP chain-of-command for approval. The environmental SME's concurrence with the appropriate BMP measures will be required before the work plan is reviewed by the CBP chain-of-command. The required funding is only then provided once the work plan is approved by the BPFTI PMO.

Work Plan Execution

- Step 5. Work Plan activities would be performed by fully trained and qualified sector personnel (both CBP in-house and contractors) who have been trained by CBP on BMP importance and implementation. Where necessary according to species-specific BMPs and CMs, CBP would hire a qualified biologist to monitor maintenance and repair activities, to ensure that (listed) species or their habitat are not present.

- Step 6. A CBP BPFTI maintenance and repair team member (i.e., Sector PM, environmental SME, or Contracting Officer) or their representatives would inspect the completed work and ensure it was completed to the prescribed design specifications and that the standards and the required BMPs and CMs were followed.

- Step 7. CBP BPFTI maintenance and repair team members, including CBP, sector, and contractor personnel, would provide suggestions for future work plans based on the execution and outcomes of tactical infrastructure maintenance and repair and would support the interdisciplinary technical team in developing improved maintenance and repair solutions in the future.

Appropriate environmental training is a prerequisite for personnel actively engaged in the CBP BPFTI Selective Maintenance and Repair Program. CBP has developed a series of on-the-job training sessions to ensure that all team members are fully aware of their job responsibilities to ensure the appropriate BMPs are properly implemented. These personnel would receive additional environmental training on an as-needed basis, appropriate to their role in tactical infrastructure maintenance and repair. This approach fully incorporates CBP's efforts to integrate their environmental compliance policies and practices.

CBP will provide an annual report to FWS within three months of the end of the calendar year for all TIMR activities that took place within the range of listed species. The report will include the CMs and BMPs that were implemented, any federally-listed species observed at or near project sites, any monitoring of endangered species for which the BO determines there will be an adverse effect, and any take as outlined within the incidental take statements below. CBP and the FWS Arizona

Ecological Services Office will meet annually either in person or via teleconference to discuss this report.

Implementation Based on Land Ownership

The TIMR Program addresses tactical infrastructure that occurs within or crosses multiple privately owned land parcels; and public lands managed by the Department of the Interior (U.S. Bureau of Land Management, National Park Service, FWS), U.S. Department of Agriculture (i.e., U.S. Forest Service [USFS]), and U.S. Department of Defense. CBP will develop a comprehensive protocol for coordinating the necessary maintenance and repair activities within the different types of landownership.

CBP-owned Tactical Infrastructure: CBP would undertake necessary maintenance and repair activities in accordance with the planning process discussed previously to ensure the continuity of the intended functionality of the existing tactical infrastructure and to protect invested resources as responsible stewards of Federal resources entrusted to CBP.

Tactical Infrastructure Assets on Lands Managed by Other Federal Agencies: CBP will establish mutually agreed-upon processes for performing maintenance and repair activities on tactical infrastructure on lands managed by the agencies listed above. CBP is committed to work through the appropriate permit-granting authority established within these agencies to ensure that CBP proposed maintenance and repair activities would be accomplished in a manner that is mutually beneficial to all agencies. As an example of this commitment, CBP is developing a Memorandum of Understanding with the National Park Service that will describe how maintenance and repair of roads and other tactical infrastructure on Organ Pipe Cactus National Monument (OPCNM) will be conducted. Similar agreements will be developed with other land management agencies as required.

This BO does not address activities within San Bernardino National Wildlife Refuge (NWR), as CBP currently has no requirements to maintain tactical infrastructure within or around that refuge or adjacent private property, including areas where threatened, endangered, or proposed species occur. If, in the future, CBP needs to maintain roads or other infrastructure on that refuge that has not already been waived or has otherwise addressed ESA issues, CBP will develop a maintenance agreement with the refuge and consult as required by the ESA.

Tactical Infrastructure Assets on Private Lands: CBP would conduct maintenance and repair activities on privately held properties under voluntary cooperation from private landowners. No maintenance and repair would occur without a consent agreement in place between CBP and cooperating landowners.

Tactical Infrastructure Assets on Tribal Lands: This BO does not address any maintenance or repair activities to be conducted by CBP on Tribal lands. CBP will formally seek consultations with the representatives of federally-recognized Native American tribes to undertake the necessary maintenance and repair of tactical infrastructure assets on Tribal land. At that time, CBP also will complete any consultation activities required by the ESA related to Tribal lands.

Project Components

CBP proposes to conduct the following forms of tactical infrastructure maintenance and repair for existing tactical infrastructure, including fences and gates, roads and bridges/crossovers, drainage structures and grates, designated open observation zones, lighting and ancillary power systems, and communication and surveillance tower components. All maintenance and repair activities would be coordinated by the CBP FM&E Sector Coordinator in close coordination with the sector and managed by the Project Management Office's Maintenance and Repair Supervisor. The maintenance and repair activities are necessary to repair damages caused by natural disasters, normal deterioration due to wear and tear, and intentional destruction or sabotage. Maintenance and repair standards to be followed during this work are provided in Appendix C of the EA that addresses the Program and are incorporated herein by reference. Tactical infrastructure covered by the Secretary's waiver or prior National Environmental Policy Act (NEPA) and/or ESA analyses (e.g., staging areas, boat ramps) are not part of the Program addressed in this BO and are not discussed.

The following sections include current estimates of the amount of existing tactical infrastructure in southern Arizona and the portion of that infrastructure to be included in the Program. To accommodate changes in the location of border security threats, requests from landowners and land managers, and other changing situations, the location and amount of tactical infrastructure to be maintained and repaired within the action area could change over time. However, the nature of the maintenance and repair activities and the BMPs will continue to apply as outlined in this consultation, including additional coordination with FWS as indicated above. CBP and their contractors will obtain water needed for maintenance and repair activities from existing permitted CBP wells, municipal water supplies, or private sources. The water requirements for maintenance and repair activities to be conducted by each USBP station will be minimal and will not result in the need for any new appropriations of water.

Almost all maintenance and repairs would be conducted from existing roads and other disturbed areas. Heavy equipment would occasionally need to be driven off of existing roads and other disturbances outside of existing footprints would be required very infrequently to repair or replace drainage and erosion-control structures and to conduct other repairs. These disturbances would usually occur within 20 feet of roads or other infrastructure, but might need to occur farther away for some repairs. Measures to address the impacts of any disturbance that might occur outside of the existing footprint of the infrastructure are outlined in this BO.

Fences and Gates

As part of the TIMR Program, fences and gates would be inspected on a routine basis to ensure gate mechanisms operate correctly and fence components are in good working condition. Maintenance and repair of fences and gates would occur as required. As part of preventative maintenance and repair of access roads, inspection, maintenance, and repair would occur approximately every 3 months and reactive maintenance and repair would occur following intentional sabotage or weather events.

Maintenance and repair of existing fences and gates consists of welding metal fence components, replacing damaged or structurally compromised components, reinforcing or bracing foundations, repairing burrowing activities under fences and gates, repairing weather-related damages, and removing vegetation and accumulated debris. The TIMR Program would also include repairing or replacing gate-operating equipment (e.g., locks, opening/closing devices, motors, and power supplies). There are approximately 250 miles of fence on nontribal lands in Arizona. The fencing consists of primary border fencing and a variety of perimeter security fencing for protecting sensitive infrastructure. Approximately 5 percent of the total is analyzed as part of the TIMR Program.

Some earth moving could be necessary for fence and gate maintenance. To replace damaged or structurally compromised portions of fences and gates, heavy equipment might be needed for filling, compacting, and trenching. On-road haul trucks and cranes, or other such equipment could be required to replace heavy fence and gate parts. All necessary erosion-control BMPs would be adopted to ensure stabilization of the project areas.

Access Roads and Integrated Bridges/Crossovers

During maintenance and repair of access roads, integrated bridges/crossovers would be inspected, maintained, and repaired, as required. Drainage management structures would be inspected regularly during the rainy season and preventative maintenance and repair would occur to ensure operability. After weather events, reactive maintenance and repair would occur to ensure the structures are clear of debris and blockages.

Maintenance and repair of access roads and bridges would consist of filling in potholes, regrading road surfaces, implementing improved water drainage measures, applying soil stabilization agents, controlling vegetation and debris, and adding lost road surface material to reestablish intended surface elevation needed for adequate drainage.

CBP currently uses approximately 1,100 miles of road within the region of analysis. This represents an estimated 17.5 percent of all local roads within the area, although the exact number of miles of roads used within Arizona could change over time to accommodate CBP needs. Approximately 500 miles (8 percent) of local roadways within 25 miles of the U.S./Mexico international border in Arizona are covered under this BO. These roads have not been subject to previous NEPA analysis or waived from analysis. The remaining 600 miles of roads used by CBP are not covered under the BO because CBP does not have rights to maintain them, they are covered under previous NEPA analysis and/or section 7 consultations, or they have been waived from analysis. Major changes to roadway networks and major upgrades to existing roadways (i.e., paving of previously unpaved roads or widening of existing roads) would require separate consultation under section 7 of the ESA.

Maintenance of the existing roads will be in accordance with proven maintenance and repair standards. All of the standards CBP is adopting are developed based on comprehensive engineering analysis, proven BMPs adopted by other Federal agencies, and mitigation measures derived from extensive consultation with both regulatory and resource agencies. These maintenance and repair standards are provided in Appendix C of the EA, and are incorporated herein by reference.

Earth moving could be necessary for access road and integrated bridge/crossover maintenance. Heavy equipment would be needed for activities such as grading, filling, and compacting. The majority of proposed maintenance and repair is planned for graded earth roads (see Appendix C of the EA for pictures and additional details on these road types). Because of their lack of formal construction design, these two roadway types are subject to the greatest deterioration if left unmaintained. When subjected to heavier traffic, rutting occurs, which in turn is exacerbated by runoff that further erodes roads. Unmanaged storm water flow also causes erosion to occur, washing out complete sections of road and, in many instances, making roads impassable.

Grading with the use of commercial grading equipment would be used to restore an adequate surface to graded earth roads (see Appendix C of the EA for pictures and additional details on these road types). USBP sector personnel and contract support personnel well-versed in grading techniques would be employed for such activity. A poorly regraded surface quite often results in rapid deterioration of the surface. The restored road would be slightly crowned and absent of windrows in the gutter line to avoid ponding and channeling within the road during rain events. Any associated roadside drainage would be maintained to ensure that runoff is relieved from the road surface quickly and effectively without creating further erosion issues. The addition of material to these roads would be kept to the minimum needed to achieve the proposed objective. All necessary erosion-control BMPs would be adopted to ensure stabilization of the project areas.

Drainage Management Structures

Maintenance and repair of drainage management structures would consist of cleaning blocked culverts and grates of trash and general debris and repairing or replacing nonfunctional or damaged drainage management structures when necessary. Adding, resizing, replacing, or repairing culverts or flow structures would occur, as necessary, to maintain proper functionality; and riprap, gabions, and other erosion-control structures would be repaired, resized, or added to reduce erosion and improve water flow. In addition, maintenance and repair of low-water crossings would occur when necessary to maintain proper functionality. All debris and trash removed from culverts and grates would be hauled away to an appropriate disposal facility. An estimated 250 such structures associated with the tactical infrastructure are to be maintained and repaired in Arizona. Approximately 20 percent of those culverts, grates, and other structures are analyzed as part of the Program; additional structures might be included under this Program in the future as CBP identifies additional roads and other tactical infrastructure that they must maintain; coordination to address the affects of these additional structures is outlined in this BO.

Low-water crossings consist of riprap at the edges and articulated matting or some similar hardened material in the middle. The function of the riprap is to protect the articulated matting from being washed away and enhance the stability and longevity of the materials. Maintenance and repair requirements would consist of restoring damaged or displaced riprap. Articulated matting would be restored, replaced, or strengthened to maintain its functionality. Built-up debris could also be removed to create a sustainable, efficient low-water crossing.

Heavy equipment such as on-road haul trucks and cranes would be required for replacing culverts, low-water crossings, and riprap for the maintenance and repair of drainage structures. For in-water

work, all necessary BMPs would be adopted to ensure stabilization of the project areas. No in-water work will occur in streams or other water bodies within designated critical habitat or other occupied habitat of listed fish and aquatic plant species. Monitoring and other measures and BMPs, as outlined in this BO, will be implemented for actions within the Program that occur in drainages, including drainages upstream from stock tanks and other waters, within the range of listed aquatic and riparian species.

Vegetation Control

Trimming and other vegetation control in suitable habitat of threatened or endangered bird species will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure. Control of vegetation would be achieved by trimming, mowing, and applying selective herbicides. Vegetation control within the footprint of the tactical infrastructure would not be scheduled during the migratory bird nesting seasons to the extent feasible. CBP would conduct surveys for nesting migratory birds and nests if maintenance occurred during the nesting season. If CBP determines that vegetation clearing must be conducted within suitable habitat of threatened or endangered species, they will further consult with the FWS.

Vegetation encroaching upon roads and bridges would be maintained to ensure visibility and to sustain safe driving conditions for USBP agents during travel. In areas deemed too difficult to mow, such as under guardrails, within riprap, and immediately adjacent to bodies of water within the proposed setbacks, herbicides would be used if appropriate. Appropriate BMPs would be followed for all herbicide use. Herbicides safe for aquatic use would be used within aquatic systems. Application of terrestrial and aquatic herbicide would be made with products approved by the U.S. Environmental Protection Agency (USEPA) and the relevant Federal land management agency, where appropriate. Certified USBP sector or contract support personnel would use all herbicides in accordance with label requirements. Herbicide use would be part of an integrated approach that uses minimal quantities of herbicide. Heavy equipment needed would include mowers, trimmers, and equipment necessary for mechanical grubbing. BMPs would be used to stabilize the work areas and avoid impacts on biological resources.

Lighting and Ancillary Power Systems

Preventative maintenance and repair of lighting systems would occur approximately every 2 to 3 years and all lights would be replaced. Maintenance and repair of ancillary power systems would occur according to manufacturer specifications. Maintenance and repair would consist of the replacement of burned-out light bulbs, restoring/replacement of damaged power lines or onsite power-generating systems (e.g., generators, fuel cells, wind turbine generators, and photovoltaic arrays), repair and replacement of associated electrical components, and, where necessary, vegetation clearing and debris removal. Heavy equipment potentially needed to maintain lighting and ancillary power systems includes lifts, track-hoes, backhoes, and flatbed trucks. Approximately 12 percent of the estimated 550 lighting and ancillary power systems are analyzed as part of the TIMR Program.

Communication and Surveillance Towers

Maintenance and repair of communication and surveillance tower components would occur on an as-needed basis following regular inspections. Communication and surveillance tower components are mounted on a combination of monopoles, water towers, radio towers, telephone poles, and buildings. The physical structures of the communication and surveillance tower components would be repaired and maintained (e.g., painting and welding to maintain existing metal towers), as necessary. Heavy equipment potentially needed to maintain lighting and ancillary power systems includes lifts, track-hoes, backhoes, and flatbed trucks. Maintenance and repair of secondary power-generation systems would consist of the replacement of burned-out light bulbs, restoration or replacement of damaged power lines, repair and replacement of associated electrical components, and, where necessary, vegetation control and debris removal. Between 50 and 60 of the towers used by CBP (or approximately 75 percent) are analyzed as part of the TIMR Program.

Each of the towers has a small footprint; none exceeds 10,000 square feet. Access roads to the tower are included in the road mileage discussed previously.

Equipment Storage

The maintenance and repair of the existing tactical infrastructure, as previously described, requires the use of various types of equipment and support vehicles. Such equipment could include graders, backhoes, tractor mowers, dump trucks, flatbed trucks, and pick-up trucks. When assigned to an activity, the equipment will be stored within the existing footprint of the maintenance and repair location or at a staging area previously designated for such purposes by CBP. The analysis of

staging areas occurred in previous environmental evaluations or was exempt under the Secretary's waiver. BMPs would be used to avoid impacts on wildlife and threatened and endangered species once equipment is moved.

In summary, the proposed action under the TIMR Program includes the following extent of tactical infrastructure: 12.5 miles of fence; 500 miles of roads; 50 culverts; approximately 60 lighting and ancillary power systems; and 50 – 60 towers (communication and surveillance).

Best Management Practices

Best Management Practices (BMPs) will be implemented for all Program activities. These measures will be implemented by CBP as part of the proposed action and are listed below. As described in the "Project Implementation" section of the "Description of the Proposed Action", CBP will use an established planning and work development process to identify the BMPs that must be implemented for each project. To identify species-specific BMPs that must be implemented, environmental SMEs will identify which species potentially occur in the geographic location of each maintenance and repair activity using information such as that shown in Appendix C of the BA and Figures 4 – 10 of this BO. They will then consider other available sources of information, such as prior survey data, aerial photographs, site visits, and previously developed environmental documentation, to evaluate whether suitable habitat for threatened and endangered species could occur at each project location. The environmental SME will also determine if a survey conducted by a qualified biologist is required

prior to maintenance and repair activities to determine if habitat is present or if it is required by a BMP. If necessary, the environmental SMEs will further coordinate with the FWS to clarify any compliance requirements.

Land Use

1. CBP will notify all land managers at least 5 days in advance of any scheduled maintenance and repair activities on their lands.

Geology and Soil Resources

1. Silt fencing and floating silt curtains should be installed and maintained to prevent movement of soil and sediment and to minimize turbidity increases in water.
2. Implement routine road maintenance practices to avoid making windrows with the soils once grading activities are complete and use any excess soils on site to raise and shape the road surface.
3. Only apply soil-binding agents during the late summer/early fall months to avoid impacts on federally-listed species. Do not apply soil-binding agents in or near (within 100 feet) surface waters (e.g., wetlands, perennial streams, intermittent streams, washes). Only apply soil-binding agents to areas that lack any vegetation.
4. Obtain materials such as gravel, topsoil, or fill from existing developed or previously used sources that are compatible with the project area and are from legally permitted sites. Do not use materials from undisturbed areas adjacent to the project area.

Vegetation

1. Herbicide and pesticide applications must be made under the supervision of a licensed applicator. A log of the chemical used, amount used, and specific location must be maintained.
2. If mechanical methods are used to remove invasive plants, the entire plant should be removed and placed in a disposal area. If herbicides are used, the plants will be left in place. All chemical applications on federally-managed land must be used in coordination with the Federal land manager. Training to identify non-native invasive plants will be provided for CBP personnel or contractors, as necessary.
3. If the tactical infrastructure maintenance and repair activities will take place on a Federal agency's land, the appropriate agency's herbicide policy must be followed for vegetation control. Contractors applying herbicides must verify that the appropriate agency's policy is being followed, if it exists. This information should be requested from the contracting officer's technical representative (COTR).
4. New guidance from the USEPA on herbicide application in riparian areas is imminent. Check with COTR on the status of these regulations prior to applying herbicide in such areas.

5. Coordinate with the CBP environmental SME to determine if the maintenance activities occur in a highly sensitive area or an area that poses an unacceptable risk of transmitting diseases and invasive species. If it is determined that maintenance activities occur in such an area, follow the CBP cleaning protocol for all equipment used.
6. A fire prevention and suppression plan will be developed and implemented for all maintenance and repair activities that require welding or otherwise have a risk of starting a wildfire.
7. Identify fill material, sandbags, hay bales, and mulch brought in from outside the project area by its source location. Use sources that are sterile or weed-free.
8. Clearly demarcate the perimeter of all new areas to be disturbed using flagging or temporary construction fencing. Do not allow any disturbance outside that perimeter. Riparian vegetation should be protected during maintenance activities.
9. Avoid the removal of mature trees providing shade or bank stabilization within the riparian area of any waterway during maintenance or repair activities.
10. If vegetation must be removed, use hand tools, mowing, trimming, or other removal methods that allow root systems to remain intact to prevent disturbance that encourages establishment of invasive plant species. In addition, all soils that are disturbed outside the project footprint within endangered species habitat will be restored to pre-activity levels. This BMP does not apply to any non-native, invasive vegetation control that may occur as part of the TIMR Program.
11. Vegetation targeted for retention will be flagged for avoidance to reduce the likelihood of being treated.
12. Periodic inspections of tactical infrastructure by the CBP SME will be conducted to evaluate and document conditions, including erosion, and to ensure that prescriptions are followed and performed in the appropriate community types. As necessary, maintenance will be scheduled to minimize erosion and correct other adverse conditions.
13. Clearing of riparian vegetation will not occur within 100 feet of aquatic habitats to provide a buffer area to protect the habitat from sedimentation.

Wildlife

1. If hollow bollards are necessary, cover hollow bollards (i.e., those that will be filled with a reinforcing material such as concrete) to prevent wildlife from entrapment. Deploy covers (and ensure they remain fully functioning) when the posts or hollow bollards arrive on the site and are unloaded, until they are filled with reinforcing material.
2. Ensure temporary light poles and other pole-like structures used for maintenance activities have anti-perch devices to discourage roosting by birds.
3. Clearing of riparian vegetation will not occur within 100 feet of aquatic habitats to provide a buffer area to protect the habitat from sedimentation.

4. Minimize animal collisions during maintenance and repair activities by not exceeding speed limits of 35 miles per hour (mph) on major unpaved roads (i.e., graded with ditches on both sides) and 25 mph on all other unpaved roads. During periods of decreased visibility (e.g., night, poor weather, curves), do not exceed speeds of 25 mph.
5. Do not permit pets owned or under the care of the contractor or sector personnel inside the project boundaries, adjacent native habitats, or other associated work areas.
6. To prevent entrapment of wildlife species, ensure excavated, steep-walled holes or trenches are either completely covered by plywood or metal caps at the close of each work day or provided with one or more escape ramps (at no greater than 1,000-foot intervals and sloped less than 45 degrees) constructed of earth fill or wooden planks.
7. Each morning before the start of maintenance activities and before such holes or trenches are filled, ensure they are thoroughly inspected for trapped animals. Ensure that any animals discovered are allowed to escape voluntarily (by escape ramps or temporary structures), without harassment, before maintenance activities resume; or are removed from the trench or hole by a qualified person and allowed to escape unimpeded.

Threatened and Endangered Species and Other Protected Species

General BMPs

1. Coordinate with COTR or environmental SME to determine which threatened and endangered species could occur in the vicinity of maintenance activities. In areas where there are no threatened and endangered or other species concerns, the personnel performing the maintenance activity are responsible for monitoring the implementation of general maintenance and repair BMPs to avoid impacts on the environment.
2. To protect individuals of listed species within the project area, suspend work in the immediate vicinity of the individual until it moves out of harm's way on its own, or enlist a qualified specialist (individuals or agency personnel with a permit to handle the species) to relocate the animal to a nearby safe location in accordance with accepted species-handling protocols.
3. Vegetation control outside the immediate footprint of the tactical infrastructure within suitable habitat and within the range or designated critical habitat of threatened and endangered species will be limited. If a threatened or endangered species, primary constituent element (PCE), or other indicators of suitable habitat occur within the project area, then further consultation with FWS will be required.
4. Develop and implement a training program to inform TIMR maintenance personnel of the listed species that occur within the TIMR Program area, penalties for violation of State or Federal laws, implementation of included CMs/BMPs, and reporting requirements.
5. Check visible space underneath all vehicles and heavy equipment for listed species and other wildlife prior to moving vehicles and equipment at the beginning of each workday and after vehicles have idled for more than 15 minutes.

6. Coordinate with the CBP environmental SME to determine if the maintenance activities occur in a highly sensitive area or an area that poses an unacceptable risk of transmitting diseases and invasive species. If it is determined that maintenance activities occur in such an area, follow the CBP cleaning protocol for all equipment.

7. Equipment staging areas shall be located at previously used staging areas or at least 0.3 miles away from known, occupied sites of listed aquatic species.

8. CBP will not use surface water from aquatic or marsh habitats for maintenance and repair projects, if that site supports aquatic federally-listed species or if it contains non-native invasive species or disease vectors based on the best available information provided by FWS.

9. CBP will not use surface water from untreated sources, including water used for irrigation purposes, for maintenance and repair projects located within one mile of aquatic habitat for federally-listed aquatic species. Groundwater or surface water from a treated municipal source will be used when within one mile of such habitats.

Migratory Bird BMPs

1. Initial mechanical and chemical vegetation clearing and subsequent mechanical vegetation control should be timed to avoid the migration, breeding, and nesting timeframe of migratory birds (February 1 through September 1). Herbicide retreatments could occur throughout the year. When initial mechanical and chemical vegetation control must be implemented during February 1 through September 1, a survey for nesting migratory birds will be conducted immediately prior to the start of activities. If an active nest is found, a buffer zone (300 ft. [91 m.]) will be established around the nest and no activities will occur within that zone until nestlings have fledged and abandoned the nesting area.
2. A survey for migratory birds will also be conducted prior to all other maintenance and repair activities to be implemented during the nesting period in areas where migratory birds might be nesting.
3. If maintenance is scheduled during the migratory bird-nesting season, take steps to prevent migratory birds from establishing nests in the potential impact area. These steps could include covering equipment and structures and use of various excluders (e.g., noise). If appropriate, birds can be harassed to prevent them from nesting on the site. Once a nest is established, they cannot be harassed until all young have fledged and left the nest site. If nesting birds are found during the supplemental survey, defer intrusive maintenance activities until the birds have left the nest. Confirmation that all young have fledged should be made by qualified personnel.

Species-Specific BMPs

Fishes: Desert pupfish, Gila chub, Gila topminnow, and Sonoran chub.

1. No in-water work will occur within streams or other waterbodies with known occurrences or designated critical habitat without further consultation with the FWS.

2. Cleaning or modification of culverts and other work within drainages that could cause sedimentation or otherwise affect water quality or quantity will not occur within, or within 0.25 miles upstream of, critical habitat or other suitable habitat (such as stock tanks) without further consultation with the FWS.
3. Use of herbicides will not occur in streams or other waterbodies with known occurrences within the range or designated critical habitat unless approved by the FWS.

Perennial plants: Canelo Hills ladies'-tresses, Cochise pincushion cactus, Huachuca water umbel, and Pima pineapple cactus.

1. No ground disturbance will occur outside the existing footprint of tactical infrastructure in suitable habitat or designated critical habitat of Canelo Hills ladies'-tresses, Huachuca water umbel, and Cochise pincushion cactus, and areas within 0.25 miles upstream of suitable habitat or critical habitat of Canelo Hills ladies'-tresses and Huachuca water umbel, without further consultation with the FWS.
2. Use of herbicides will not occur within areas of suitable habitat within the range or designated critical habitat of threatened or endangered plant species (see Table 1 and Appendix B [of the BA]) unless approved by the FWS.
3. Cleaning or modification of culverts and other work in drainages that could cause sedimentation or otherwise affect water quality or quantity will not occur within, or within 0.5 miles upstream of, areas where Canelo Hills ladies' tresses or Huachuca water umbel occur without further consultation with the FWS.

Chiricahua Leopard Frog

1. During the active season of the species (May through September) within designated critical habitat and within dispersal range of the species (1, 3, or 5 miles depending on persistence of water in the aquatic system) from designated critical habitat, a qualified biologist will monitor ground-disturbing maintenance activities and use of heavy equipment immediately prior to and during maintenance activities. Monitoring will occur prior to and during activities located within one mile overland of critical habitat or other locations where this species might occur, 3 miles of that habitat along ephemeral drainages in that habitat, and 5 miles of that habitat along perennial streams in that habitat. If a Chiricahua leopard frog is found in the project area and is in danger of being harmed (e.g. in the path of vehicles or foot traffic), work will cease in the area of the frog until either the qualified biological monitor can safely move the individual to a nearby location in accordance with FWS Endangered Species Permit requirements, or it moves away on its own.
2. In-water work within critical habitat of the species will occur during the active season (May through September) so that frogs can escape to the best of their ability. (This BMP may conflict with Sonoran tiger salamander BMP #2. In areas where there is overlap between Sonoran tiger salamander and Chiricahua leopard frog ranges, CBP will base TIMR Program activity implementation on the species most likely to occur in the area and on the potential for

effects to either species). In addition, maintenance will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered.

3. A site-specific storm water pollution prevention plan (SWPPP) and a spill protection plan will be prepared and regulatory approval sought, as required by regulations, for maintenance and repair activities that could result in sedimentation and that occur within 0.3 miles of suitable habitat. This will include, but is not limited to, placing straw bale type sediment traps at the inlet of ponds or stock tanks and upstream of drainages known to be occupied by the species or within critical habitat of the species.
4. To prevent the spread of amphibian diseases among drainages via water or mud on maintenance vehicles and equipment, all maintenance work within Chiricahua leopard frog critical habitat shall conform to amphibian disease prevention protocols as described in the Recovery Plan for the Chiricahua leopard frog. Equipment would either be disinfected between uses at different sites or rinsed and air dried.
5. Any use or storage of chemicals or fuels will be kept 0.3 miles away from critical habitat and other locations where this species occurs.
6. Routine road maintenance practices will be implemented to avoid prolonged establishment of road and tire ruts within and adjacent to Chiricahua leopard frog critical habitat.
7. Use of herbicides will not occur within 0.3 miles of Chiricahua leopard frog critical habitat or other suitable habitat within the range of this species, unless approved by the FWS.
8. Prior to any in-water work within critical habitat of this species, CBP will contact FWS personnel at the Arizona Ecological Services Office to determine if frogs will be salvaged and placed in holding facilities until work is complete. Capture, movement, and holding of frogs would be accomplished by a permitted biologist at the expense of CBP under all appropriate State and Federal permits, including permit conditions to ensure minimal harm or mortality.

Sonoran Tiger Salamander

1. A qualified biologist will monitor all ground-disturbing maintenance activities and use of heavy equipment that occurs within 0.1 mile of Sonoran tiger salamander suitable habitat (i.e., cattle ponds and tanks with standing water) within the range of this species, immediately prior to and during the maintenance activity. This monitoring will occur for all maintenance and repair activities to be conducted in vegetated or undisturbed areas. Burrows of fossorial animals identified by the monitor will be left intact if possible. If a Sonoran tiger salamander is observed, the monitor will photograph the dorsal side of the salamander if possible without handling the salamander, record the geographic coordinates of its location, and report the location to the Arizona Ecological Services Office of the FWS within 72 hours. If the salamander is in danger of being harmed (e.g. in the path of vehicles or foot traffic), work will cease in the area of the species until either the qualified biological monitor can safely move the individual to a nearby location in accordance with the FWS Endangered Species Permit requirements, or it moves away on its own.

2. In-water work within the range of this species will occur during period of low or no flow to minimize the chance of encountering a salamander (This BMP may conflict with Chiricahua leopard frog BMP #2. In areas where there is overlap between Sonoran tiger salamander and Chiricahua leopard frog ranges, CBP will base TIMR Program activity implementation on the species most likely to occur in the area and on the potential for effects to either species). In addition, maintenance will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered.
3. A site-specific SWPPP will be prepared and regulatory approval sought, as required by regulations, for maintenance and repair activities that could result in sedimentation and that occur within 0.3 miles of suitable habitat within the range of this species. This will include, but is not limited to, placing straw bale type sediment traps at the inlet of ponds or stock tanks known to be occupied by the species.
4. Use of herbicides will not occur within 0.3 miles of Sonoran tiger salamander suitable habitat within the range of this species, unless approved by the FWS.
5. Maintenance vehicles and equipment will be operated at speeds of 25 mph or less within 0.3 miles of Sonoran tiger salamander suitable habitat within the range of this species during the breeding season (January through June).
6. All maintenance activities within 0.3 miles of Sonoran tiger salamander suitable habitat within the range of this species will be conducted during daylight hours.
7. To prevent the spread of amphibian diseases among drainages via water or mud on maintenance vehicles and equipment, all maintenance work within known, occupied Sonoran tiger salamander habitat shall conform to amphibian disease prevention protocols as described in the Recovery Plan for the Sonoran tiger salamander (see Appendix B). Equipment would either be disinfected between uses at different sites or rinsed and air dried.

New Mexico Ridge-nosed Rattlesnake

1. Maintenance vehicles will not exceed a speed of 15 to 20 mph during periods of elevated roaming and foraging activities from July through August within New Mexico ridge-nosed rattlesnake habitat (i.e., pine-oak woodlands at high elevations of 1,475 and 2,800 meters [5,600 to 9,000 feet]).

Birds: Masked bobwhite, Mexican spotted owl, Southwestern willow flycatcher, and Yuma clapper rail.

1. No maintenance and repair activities will be conducted within areas classified as protected activity centers of Mexican spotted owls during the nesting season.
2. Vegetation control in suitable habitat of threatened or endangered bird species (see Table 2 for a description of suitable habitat and nesting season for each species) will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure. This limited vegetation control will be conducted outside of the nesting season (see Table 2). This restriction does not apply to areas where protocol surveys

have been conducted and it has been determined that the area is not occupied and does not contain PCEs.

3. For all other maintenance activities to be conducted within suitable habitat of a threatened or endangered bird species during the nesting season (see Table 2), the following avoidance measures will apply. A qualified biologist will conduct a survey for threatened and endangered birds prior to initiating maintenance activities. If a threatened or endangered bird is present, a qualified biologist will survey for nests approximately once per week within 1,300 feet (Mexican spotted owl) or 500 feet (all other species) of the maintenance area for the duration of the activity. If an active nest is found, no maintenance will be conducted within 1,300 feet (Mexican spotted owl) or 300 feet (all other species) of the nest until the young have fledged.

Lesser Long-nosed Bat

1. Removal of columnar cacti (i.e., saguaro and organ pipe) and agave will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure. Prior to conducting any maintenance or repair activity outside of the existing disturbed footprint of tactical infrastructure within the range of this species, a qualified biologist will conduct a survey to identify and flag all columnar cactus (i.e., saguaro and organ pipe) and agave to be avoided.

2. No maintenance and repair activities will be conducted within 0.5 miles of any known lesser long-nosed bat roost from mid-April through mid-September. FWS will provide CBP with an updated list and maps of known lesser long-nosed bat roosts.

3. For maintenance and repair activities that will take place greater than 0.5 miles and less than 5 miles from any known lesser long-nosed bat roost, limit activities to daylight hours, from mid-April through mid-September only, to avoid effects on bats in bat roosts. If night lighting is unavoidable: (1) minimize the number of lights used; (2) place lights on poles such that they are pointed down toward the ground, with shields on lights to prevent light from going up into sky, or out laterally into landscape; and (3) selectively place lights so they are directed away from native vegetation.

Sonoran Pronghorn

1. Minimize the number of daily vehicle trips required for maintenance to reduce the likelihood of disturbing Sonoran pronghorn in the area or injuring an animal on the road. The use of vehicle convoys, multi-passenger vehicles, and other methods are appropriate. This can be adjusted if additional personnel and equipment will complete the work faster and thus reduce the time of the disturbance.

2. During maintenance activities, if a Sonoran pronghorn is observed by a maintenance crew upon arrival at the work site and within 1 mile of the work site, delay beginning use of heavy mobile equipment (road grader, dump trucks, etc) until the animal(s) move greater than one mile from the work site. When driving on roads, stop the vehicle if pronghorn are observed in front of or forward of the vehicle. As their distance from the road extends and it is

obvious that the pronghorn is (are) departing, proceed forward at reduced speed of 10 to 15 mph.

3. No Program activities will occur during the fawning season (March 15 to July 31) within suitable Sonoran pronghorn habitat (i.e., Sonoran desert scrub communities) within the range of this species. Some flexibility with these dates is possible, depending on forage conditions. If CBP determines that TIMR activities is needed in these areas during the fawning season, exceptions to working during the fawning season may be granted through coordination with the FWS and other the relevant Federal land managers, depending on forage conditions.

Water Resources

1. The environmental SME must be consulted to determine the need for site-specific SWPPPs, spill protection plans, and regulatory approvals. Site-specific SWPPPs and spill protection plans will be prepared and regulatory approval sought, if necessary, in cases of highly sensitive work sites and large scopes of work that pose a significant risk. Where a site-specific SWPPP is not necessary, the personnel performing the maintenance will comply with a generic SWPPP and spill protection plan that covers most routine maintenance and repair activities. Prior to arrival on the work site, key personnel will understand correct implementation of these BMPs and their responsibility to address deficiencies.
2. The environmental SME will determine and provide locations that have the potential for wetlands or other waters of the United States. If no current existing U.S. Army Corps of Engineers (USACE) jurisdictional determination is available, a delineation will be conducted and jurisdictional determination will be obtained from the USACE. Prior to conducting any activities that have the potential to affect wetlands and other waters of the United States, all Federal and state Clean Water Act (CWA) Section 404 individual or applicable nationwide permits and 401 and other applicable permits will be obtained.
3. Prepare and implement a SWPPP prior to applicable maintenance activities (greater than 1 acre of exposed dirt or as required by property owner or land manager). Implement BMPs described in the SWPPP to reduce erosion. Consider areas with highly erodible soils when planning the maintenance activities and incorporate measures such as waddles, aggregate materials, and wetting compounds in the erosion-control BMPs.
4. Coordinate with the environmental SME to determine which maintenance activities occur within the 100-year floodplain. Maintenance activities within the 100-year floodplain will be conducted in a manner consistent with Executive Order (EO) 11988 and other applicable regulations.
5. All maintenance contractors and personnel will review the applicable CBP-approved spill protection plan and implement it during maintenance and repair activities.
6. Coordinate with the environmental SME to ensure that CWA permits are in place for any changes to existing boat ramps.
7. Contact the environmental SME to coordinate with waterway permitting agencies when performing work below the ordinary high water mark.

8. Wastewater from pressure washing must be collected. A ground pit or sump can be used to collect the wastewater. Wastewater from pressure washing must not be discharged into any surface water.
9. If soaps or detergents are used, the wastewater and solids must be pumped/cleaned out and disposed of in an approved facility. If no soaps or detergents are used, the wastewater must first be filtered or screened to remove solids before being allowed to flow off site. Detergents and cleaning solutions must not be sprayed over or discharged into surface waters.
10. If the surrounding area has dense, herbaceous cover (primarily grasses) and there are no listed plant species or habitat for such, the wastewater (with or without detergent) can be discharged directly to the grassy area without collection or filtering, as long as it is well dispersed and all the wastewater can percolate into the grass and soil. If wastewater runs off the grassy area, it must be filtered.
11. Prevent runoff from entering drainages or storm drains by placing fabric filters, sand bag enclosures, or other capture devices around the work area. Empty or clean out the capture device at the end of each day and properly dispose of the wastes.
12. Avoid contaminating natural aquatic and wetland systems with runoff by limiting all equipment maintenance, staging, laydown, and dispensing hazardous liquids (e.g., fuel and oil) to designated upland areas.
13. Avoid contamination of ground and surface waters by collecting concrete wash water in open containers and frequently disposing of it on site by application as a binder to riprap areas. Avoid contamination of ground and surface waters by storing any water that has been contaminated (e.g., with maintenance materials, oils, equipment residue) in closed containers on site until removed for disposal. In upland areas, storage tanks must be on-ground containers.
14. Avoid contamination of ground and surface waters by ensuring that water tankers that convey untreated surface water do not discard unused water where it has the potential to enter any aquatic or wetland habitat.
15. Cease work during heavy rains and do not resume work until conditions are suitable for the movement of equipment and materials.
16. Uncured concrete should not be allowed to enter the water.
17. Work should be done from the top of the bank or a floating barge, when practicable. Heavy equipment use within the active flowing channel should be avoided.
18. Floating dock components containing foam must be encapsulated to prevent the introduction of foam particles into the water.
19. For all in-water work in streams, sediment barriers will be used to avoid downstream effects of turbidity and sedimentation.
20. Do not pressure wash more than the area to be painted or treated (e.g., for graffiti removal) each day.

21. If the purpose of cleaning is for graffiti removal, spot clean, steam clean, or scrape dirty areas rather than pressure washing entire sections of fence or levee wall.
22. Operate pressure-washing equipment according to manufacturer's recommendations.
23. Except for emergency repairs required to protect human life, limit work within drainages to dry periods to reduce effects on downstream water quality.
24. Riprap should be placed on a layer of geotextile fabric to prevent underlying sediment from being washed out through the openings of the riprap.
25. Riprap should be keyed into the wash/streambed to ensure its stability and effectiveness.

Noise

1. All Occupational Safety and Health Administration requirements will be followed with respect to maintenance and repair noise impacts. Ensure all motorized equipment possess properly working mufflers and are kept properly tuned to reduce backfires. Ensure all motorized generators will be in baffle boxes (a sound-resistant box that is placed over or around a generator), have an attached muffler, or use other noise-abatement methods in accordance with industry standards. For activities involving heavy equipment, seasonal restrictions might be required to avoid impacts on threatened or endangered species in areas where (listed) species or their potential habitat occur. See species-specific BMPs.

Roadways and Traffic

1. Access maintenance sites using designated, existing roads. Do not allow any off-road vehicular travel outside those areas. Ensure all parking is in designated disturbed areas. For longer-term projects, mark designated travel corridors with easily observed removable or biodegradable markers.
2. All contractors and maintenance personnel will operate within the designed/approved maintenance corridor.

Hazardous Materials and Waste Management

1. Where hazardous and regulated materials are handled, workers should collect and store all fuels, waste oils, and solvents in clearly labeled closed tanks and drums within a secondary containment system that consists of an impervious floor and bermed sidewalls capable of containing the volume of the largest container stored therein.

2. All paints and cleaning materials should be approved by the appropriate land manager.

3. Use a ground cloth or an oversized tub for paint mixing and tool cleaning. Properly dispose of the wastes.

4. Enclose spray-painting operations with tarps or other means to minimize wind drift and to contain overspray.

5. Clean paintbrushes and tools covered with water-based paints in sinks plumbed to a sanitary sewer or in portable containers that can be dumped into sanitary sewer drains. Never clean such tools in a natural drainage or over a storm drain.

6. Brushes and tools covered with non-water-based paints, finishes, thinners, solvents, or other materials must be cleaned over a tub or container and the cleaning wastes disposed of or recycled at an approved facility. Never clean such tools in a natural drainage or over a storm drain.

7. Implement proper and routine maintenance of all vehicles and other maintenance equipment such that emissions are within the design standards of all maintenance equipment.

8. Use water-based paints instead of oil-based paints. Look for the words "Latex" or "Cleanup with water" on the label. Do not rinse into natural drainages (e.g., creeks, irrigation canals, wetlands) or storm drains.

9. Do not use paints more than 15 years old. They could contain toxic levels of lead.

10. Use ground or drop cloths underneath painting, scraping, sandblasting, and graffiti removal work. Properly dispose of the waste and scraps collected on the drop cloth.

11. Minimize site disturbance and avoid attracting predators by promptly removing waste materials, wrappers, and debris from the site. Any waste that must remain on site more than 12 hours should be properly stored in closed containers until disposal.

Conservation Measures

Conservation measures are defined by FWS as actions to benefit or promote the recovery of species that are included by a Federal agency as an integral part of the proposed action (U.S. Fish and Wildlife Service 1998a). Conservation measures are meant to offset potential adverse effects and take that may result from a proposed action, despite the implementation of BMPs. The following conservation measures (CMs) were developed through coordination with DOI agencies and land managers to offset potential impacts to Sonoran pronghorn, Pima pineapple cactus, Sonoran tiger salamander, and Chiricahua leopard frog.

1) In areas where maintenance and repair activities took place under the TIMR Program within 0.3 miles of the critical habitat for Chiricahua leopard frogs, CBP will conduct one additional monitoring visit (by a permitted biologist) following the first significant rainfall event after implementation of TIMR Program activities to determine the effectiveness of BMPs implemented and any incidental take that may have occurred as described in the Incidental Take Statement below. Results of this monitoring will be included in CBP's annual report to FWS.

2) In general, implementation of the BMPs outlined in the BA and this BO should avoid or minimize any potential for take of Pima pineapple cacti or habitat. However, over the life of the project, should CBP need to work outside the existing footprint of the described tactical infrastructure and impact suitable habitat, CBP will compensate for loss of Pima pineapple

cactus habitat by purchasing 1 credit from a conservation bank approved by the FWS Arizona Ecological Services Office for each acre of suitable Pima pineapple cactus habitat lost. For purposes of this conservation measure, suitable habitat is defined as: transition zone between the semi-desert grasslands and Sonora desert scrub on alluvial bajadas (lower slopes of mountains characterized by loose alluvial sediments and poor soil development) and slopes of less than 10 percent grade at elevations between 701 to 1,402 meters (2,300 to 4,600 feet). CBP will include an estimate of acreage of Pima pineapple cactus habitat lost in its annual report to FWS and purchase credits in the conservation bank within 2 years of when the habitat loss occurred.

3) In areas where maintenance and repair activities took place under the TIMR Program within 0.3 miles of the known occupied habitat for Sonoran tiger salamander, CBP will conduct one additional monitoring visit (by a permitted biologist) following the first significant rainfall event after the implementation of TIMR Program activities to determine the effectiveness of BMPs implemented and any incidental take that may have occurred as described in the Incidental Take Statement below. Results of this monitoring will be included in CBP's annual report to FWS.

4) CBP will provide funding in the total amount of $100,000 over the life of the project, which can be used by FWS to implement priority recovery actions for the Sonoran pronghorn as determined by the Sonoran Pronghorn Recovery Team (i.e. to construct or maintain wildlife waters or forage enhancement plots within the range of the Sonoran pronghorn). CBP will work with FWS to determine the most effective and efficient timeline and mechanism for utilizing this funding.

5) CBP will collaborate with land managers and applicable agencies to establish a mechanism for interagency cooperation regarding maintenance and repair of pronghorn recovery infrastructure such as fencing, water systems, drainage structures, forage enhancement plots, etc., when such activities occur in the area of ongoing CBP maintenance and repair activities, and which would not require significant additional resources on the part of CBP.

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. The action area for this BO encompasses a 14- to 50-mile-wide corridor extending north of the U.S./Mexico international border in addition to the location of the road north of Three Points (see Figures 3a and 3b), plus the current range of the pronghorn within the U.S. (Figures 4 and 5). It includes the location of all tactical infrastructure covered by the TIMR Program and all areas that could be directly and indirectly affected by maintenance and repair activities. The existing tactical infrastructure crosses public lands and multiple privately owned land parcels. The action area does not include Tribal lands in Arizona.

Management of much of the action area is by Federal agencies. The BMGR (roughly 1.6 million acres) is managed by Luke Air Force Base and the Marine Corps Air Station (MCAS)-Yuma primarily for military training. OPCNM manages 329,000 acres in the southeastern corner of the

action area for scenic, ecological, natural, and cultural values. CPNWR lies along the border west of OPCNM and encompasses 860,000 acres. CPNWR is managed to protect, maintain, and restore the diversity of the Sonoran Desert. Most of the refuge and OPCNM are designated as wilderness. The BLM manages lands near Ajo for recreation, grazing, and other multiple uses in accordance with the Lower Gila Resource Management Plan. OPCNM and CPNWR are critically important for Sonoran pronghorn recovery because of their management for protection of natural resources. Lands on the BMGR are managed primarily for military training, and although important recovery is ongoing on these lands and the Department of Defense has generously contributed to the recovery program both on and off the BMGR, changing military priorities could, in the future, limit the value of the BMGR for Sonoran pronghorn recovery. In the eastern portion of the action area, Federal lands managed by the FWS (Buenos Aires National Wildlife Refuge), U.S. Forest Service (Coronado National Forest), National Park Service (Coronado National Memorial), and the Department of Defense (Fort Huachuca) make up the majority of the action area. However, there are also trust lands managed by the State Land Department and areas of private ownership.

Terrain, Vegetation Communities, and Climate in the Action Area

The western portion of the action area is characterized by broad alluvial valleys separated by block-faulted mountains and surface volcanics. The Yuma Desert on the western edge of the BMGR is part of a broad valley that includes the Colorado River. Major drainages and mountain ranges run northwest to southeast. Major drainages flow mostly northward to the Gila River, although southern portions of OPCNM and the southern slope of the Agua Dulce Mountains drain south to the Río Sonoyta.

Climate in this portion of the action area is characterized by extreme aridity, mild winters, and hot summers. Approximately 2.7 inches of precipitation fall annually at Yuma, with slightly more than half of this occurring in the winter months (Brown 1982). Annual precipitation increases from west to east across the BMGR; at Aguajita/Quitobaquito, precipitation is 10.5 inches annually. The vegetation community of the western portion of the BMGR has been classified as the lower Colorado River Valley subdivision of Sonoran Desert scrub (Brown 1982). It is the largest and most arid subdivision of Sonoran Desert scrub. The Arizona Upland subdivision of Sonoran Desert scrub is found in the Growler, Puerto Blanco, Ajo and Bates mountains, and surrounding bajadas.

In the eastern portion of the action area, lands are characterized by higher elevation areas including major mountain ranges such as the Baboquivari, Santa Rita, Huachuca, and Chiricahua mountains. Valleys surrounding these mountain ranges primarily support grasslands, and are also characterized by river systems such as the Santa Cruz River and the San Pedro River. Drainages within the valleys support important riparian communities. Vegetation communities in the eastern portion of the action area include Madrean Oak woodlands, some coniferous forests, and semidesert grasslands. Summers can be hot in this portion of the action area, but not as hot as the western deserts. Winter temperatures are variable, but are often subfreezing, especially at the higher elevations. Precipitation in the eastern portion of the action area is much greater than in the western deserts and ranges from 11 to 22 inches of annual precipitation.

Monsoon thunderstorms play an important role throughout the action area. The intense monsoon thunderstorms are often associated with flooding. Flooding and runoff from monsoon storms regularly impacts the tactical infrastructure included in the proposed action, necessitating the maintenance and repair activities that are included in the TIMR Program.

SONORAN PRONGHORN

STATUS OF THE SPECIES

Description, Legal Status, and Recovery Planning

The Sonoran subspecies of pronghorn (*Antilocapra americana sonoriensis*) was first described by Goldman (1945) and is the smallest of the four subspecies of pronghorn (Nowak and Paradiso 1983, Brown and Ockenfels 2007). The subspecies was listed throughout its range as endangered on March 11, 1967 (32 FR 4001) under the Endangered Species Preservation Act of October 15, 1966 without critical habitat. Three sub-populations of the Sonoran pronghorn are extant: 1) a U.S. sub-population in southwestern Arizona, 2) a sub-population in the Pinacate Region of northwestern Sonora, and 3) a sub-population on the Gulf of California west and north of Caborca, Sonora. The three sub-populations are predominantly geographically isolated due to barriers such as roads and fences, and, in the case of the two Sonora sub-populations, by distance.

The 1982 Sonoran Pronghorn Recovery Plan (FWS 1982) was revised in 1998 (FWS 1998). The recovery criteria presented in the revised plan entailed the establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years, as well as the establishment of at least one other self-sustaining population in the U.S. to reclassify the subspecies to threatened. Actions identified as necessary to achieve these goals include the following: 1) enhance present sub-populations of pronghorn by providing supplemental forage and/or water; 2) determine habitat needs and protect present range; 3) investigate and address potential barriers to expansion of presently used range and investigate, evaluate, and prioritize present and potential future reintroduction sites within historical range; 4) establish and monitor a new, separate herd(s) to guard against catastrophes decimating the core population, and investigate captive breeding; 5) continue monitoring sub-populations and maintain a protocol for a repeatable and comparable survey technique; and 6) examine additional specimen evidence available to assist in verification of taxonomic status. In 2002, a supplement and amendment to the 1998 Final Revised Sonoran Pronghorn Recovery Plan was prepared (FWS 2002). The FWS concluded that data do not yet exist to support establishing delisting criteria. Tasks necessary to accomplish reclassification to threatened status (as outlined in the 1998 plan) should provide the information necessary to determine if and when delisting will be possible and what the criteria should be. Survival of the Sonoran pronghorn is precarious and is likely dependent on drastic and untested methods (Krausman et al. 2005). In order for recovery actions to be effective, providing an environment of reduced impacts related to anthropogenic activities is essential.

The Sonoran pronghorn is a rare and difficult species to study and monitor. As with most endangered species, there is a lack of extensive studies related to the life history requirements of this species. Studies typically are limited by low samples sizes and difficulty of repeat observations due

to the species' rarity. Low sample sizes and limited observations hinder biologists' abilities to obtain statistically rigorous data or adequate data for peer-reviewed scientific publications. The most recent, comprehensive publications related to Sonoran pronghorn were associated with the 2005 Wildlife Society Bulletin (Krausman et al. 2005). Since that time, managers have learned much, but, due to lack of resources, time, and incomplete data, this information is typically exchanged informally, rather than through published literature. Most of the existing information on Sonoran pronghorn is not contained in the peer-reviewed literature (Krausman et al. 2005). This is likely to continue until more resources are available or adequate data is gathered to meet the requirements for publication in a peer-reviewed journal. However, all information that contributes to our understanding of endangered and threatened species' life history requirements and impacts to the species is vital to our management of the species, be it peer-reviewed or personal communications and grey literature from the professionals working with these species in the field. The best available scientific and commercial data comes from a number of sources including published literature, agency reports, and personal communications with land managers and agency personnel. The FWS has used the best available information related to the Sonoran pronghorn in our analysis below.

Life History and Habitat

Sonoran pronghorn inhabit one of the hottest and driest portions of the Sonoran Desert. They forage on a large variety of perennial and annual plant species (Hughes and Smith 1990, Hervert et al. 1997a, FWS 1998). During drought years, Hughes and Smith (1990) reported cacti were the major dietary component (44 percent). Consumption of cacti, especially chain fruit cholla (*Cylindropuntia fulgida*, Pinkava 1999), provides a source of water during hot, dry conditions (Hervert et al. 1997a). 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*) (FWS 1998). Pronghorn will move in response to spatial limitations in forage availability (Hervert et al. 1997b). Water intake from forage is not adequate to meet minimum water requirements (Fox et al. 2000), hence pronghorn need, and readily use, both natural and artificial water sources (Morgart et al. 2005).

Sonoran pronghorn rut during July-September, and does have been observed with newborn fawns from February through May. Parturition corresponds with annual spring forage abundance. Fawning areas have been documented in the Mohawk Dunes and the bajadas of the Sierra Pinta, Mohawk, Bates, Growler, and Puerto Blanco mountains. Does usually have twins, and fawns suckle for about two months. Does gather with fawns, and fawns sometimes form nursery groups (FWS 1998). Sonoran pronghorn form small herds of up to 21 animals (Wright and deVos 1986).

Telemetry locations of 35 Sonoran pronghorn demonstrated that during 1995-2002, pronghorn used creosote/bursage and palo verde/mixed cactus vegetation associations less than expected or equal to availability. Pronghorn use of palo verde/chain fruit cholla associations and desert washes occurred more than expected. However, during the cool and wet winter on 1997-1998, pronghorn were found in creosote/bursage associations more than expected (Hervert et al. 2005). In contrast, during 1983-1991, pronghorn used creosote/bursage and palo verde mixed cacti associations more than expected (deVos and Miller 2005). Differences between these study results may be due in part to differences in precipitation and forage patterns between these periods. The earlier period was wetter

with greater forage availability in flats and valleys where creosote/bursage associations predominate. In wet winters and early spring pronghorn are often found in flats and valleys, such as Pinta Sands, the Mohawk Dunes west of the Mohawk Mountains, and the west side of the Aguila Mountains. In late spring and summer, pronghorn then move from the flats and valleys upslope into bajadas and often south or southeast where palo verde associations, chain fruit cholla, and washes are more common. Movements are most likely motivated by the need for thermal cover provided by leguminous trees and water available in succulent chain fruit cholla (Hervert et al. 1997a). Home range size of Sonoran pronghorn during 1995-2002 ranged from 16.6 to 1,109 square miles, with an average of 197 $\pm$ 257 square miles (Hervert et al. 2005).

From 1995-2002, adult mortality rates varied from 11-83%. Adults were killed by coyotes, bobcats, mountain lions, capturing efforts, drought, and unknown causes (Bright and Hervert 2005). However, during 1983-1991, apparently a more favorable period for pronghorn during which the population grew significantly, mean annual survival of females and males was 96% $\pm$ 0.04 and 92% $\pm$ 0.04 (deVos and Miller 2005). Disease may affect mortality, but has not been thoroughly investigated (Bright and Hervert 2005). Hervert et al. (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain. Drought may be a major factor in the survival of adults and fawns (Bright and Hervert 2005). Three radio-collared pronghorn died in July and August of 2002 with no obvious cause of death. Given that 2002 was one of the driest years on record, the proximate cause of these mortalities was likely heat stress and/or malnutrition resulting from inadequate forage conditions due to drought.

Distribution and Abundance

United States

Historically, the Sonoran pronghorn ranged in the U.S. from approximately the Santa Cruz River in the east, to the Gila Bend and Kofa Mountains to the north, and to Imperial Valley, California, to the west (Mearns 1907, Nelson 1925, Monson 1968, Wright and deVos 1986, Paradiso and Nowak 1971; Figure 6). Bright et al. (2001) defined the present U.S. range of the Sonoran pronghorn as bordered by Interstate 8 to the north, the International Border to the south, the Copper and Cabeza mountains to the west, and State Route (SR) 85 to the east (see Figure 4). This area encompasses 2,508 square miles (Bright et al. 2001). Sonoran pronghorn are estimated to be currently limited to < 25% of their historical habitat in Arizona and northern Sonora, Mexico (Krausman et al. 2005).

Figure 4 shows the current range of the Sonoran pronghorn and Figure 5 provides geographical distribution of Sonoran pronghorn identified by FWS and Arizona Game and Fish Department (AGFD) on radio telemetry surveys from 1994 through 2001. Data collected and maintained by AGFD from radio-collared individual pronghorn are used to obtain location, distribution, and habitat use information. Unfortunately, the currently radio-collared subset of the U.S. population of Sonoran pronghorn under-represents OPCNM. Most of the current radio collars were put on animals released from the captive breeding facility on Cabeza Prieta National Wildlife Refuge (CPNWR), and most of those animals have stayed in that general region. Wild pronghorn with radio

collars are usually captured on CPNWR or Barry M. Goldwater Air Force Range (BMGR), because the landscape is safer for both the pronghorn and the capture helicopter, than in OPCNM. While wild Sonoran pronghorn collared outside of OPCNM have often moved into OPCNM in the past, this has not been the case in recent years.

While Mearns (1907) suggested that pronghorn may have been common in some areas in the late 1800s, evidence suggests that the sub-population declined dramatically in the early 20th century. Sub-population estimates for Arizona, which only began in 1925, have never shown the pronghorn to be abundant (Table 3). 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; Bright and Hervert 2003, 2005) using aerial line transects (Johnson et al. 1991). Sub-population estimates from these transects have been derived using three different estimators (Table 4); currently the sightability model (Samuel and Pollock 1981) is considered the most reliable estimator (Bright et al. 1999, 2001). Table 4 presents observation data from transects and compares estimates derived from the different population models from 1992 through 2010.

The sightability model population estimates from 1992 to 2000 showed a 45 percent decrease in sub-population size (Table 4). 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 (FWS 1998, Bright et al. 2001).

High fawn mortality in 1995 and 1996 and the death of half (8 of 16) of the adult, radio-collared pronghorn during the 13 months preceding the December 1996 survey corresponded to five consecutive six-month seasons of below normal precipitation (summer 1994 through summer 1996) throughout most of the Sonoran pronghorn range, which likely contributed, in part, to observed mortality (Bright et al. 2001, Hervert et al. 1997a).

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

Although drought was likely the proximate cause of the dramatic decline of the U.S. sub-population in 2002, anthropogenic factors almost certainly contributed to or exacerbated the effects of the drought. Historically, pronghorn likely moved to wetted areas and foraged along the Río Sonoyta, Sonora, and the Gila and probably Colorado rivers during drought. These areas are no longer

accessible to the U.S. population due to fences, Interstate 8, Mexico Highway 2, and other barriers. The rate of decline in the U.S. sub-population from 2000-2002 (79 percent) was also much greater than that observed in either the sub-population southeast of Highway 8 (18 percent decline) or the El Pinacate sub-population (26 percent) during the same period (see discussion of Mexican sub-populations in the next section). Observations of forage availability suggest the El Pinacate sub-population experienced the same severe drought that occurred on the Arizona side (T. Tibbitts, J. Morgart, pers. comm. 2003). Yet that sub-population fared much better than its U.S. counterpart. The high level of human activities and disturbance on the U.S. side, including activities such as undocumented alien, i.e., cross border violator (CBV) traffic, smugglers, and required law enforcement response, as compared to what occurs in the El Pinacate area, may be a contributing factor in the differing rates of decline observed north and south of the border. See the section entitled "Drought" in the Environmental Baseline and "Cumulative Effects" for further discussion.

The December 2004, 2006, 2008, and 2010 aerial surveys resulted in an estimated 58, 68, 68, and 85 (this 2010 estimate does not include the 17 pronghorn released from the pen in December 2010, see below), respectively, pronghorn in the U.S. sub-population (Tables 3 and 4). As of 2012, we suspect that the wild population now numbers over 100, and could be as high as 120 (personal communication, 8/29/2012, Jim Atkinson, CPNWR). This is a substantial increase brought on by the implementation of ongoing recovery measures and improved range conditions (as a result of increased rainfall) since 2002. The 2006 to 2010 estimates included a number of captive-born individuals that were released into the wild (see below). Also, though the exact ratio is unknown, during the 2008 and 2010 surveys observers noted a skewed sex ratio (approximately 2: 1) with more males than females; this affects the rate at which the population may increase.

Though the U.S. Sonoran pronghorn population has increased significantly since 2002, the increase is not as great as the Sonoran Pronghorn Recovery Team (Team) had predicted given the adequate to favorable range conditions since 2002 as well as tremendous multi-agency recovery efforts, including providing waters and forage enhancement plots, implementing seasonal restrictions on public access to pronghorn habitat during the critical fawning season, and a captive breeding program. The Team has suggested a number of reasons for this, including high cross border activity, drought, and forage conditions beyond what is compensated for with the implementation of recovery actions. Information provided by land managers in OPCNM suggest off-road vehicle tracks have been seen progressively increasing in extent and density since 2002, throughout that portion of the pronghorn's range U.S. range (electronic mail from Tim Tibbitts, OCPNM and member of the Sonoran Pronghorn Recovery Team, September 21, 2009). It has been well documented that human presence in wildlands can disturb animals, causing them to unnecessarily expend energy avoiding people, thereby potentially reducing reproductive success (e.g., Manville 1983, van Dyke et al. 1986, Goodrich & Berger 1994, Primm 1996; as cited by Kerley et al. 2002) or increasing the likelihood of fatal encounters with humans (Kasworm and Manley 1990, Saberwal et al. 1994, Khramtsov 1995, Mattson et al. 1996; as cited by Kerley et al. 2002). Failure of the wild U.S. pronghorn population to rebound to numbers more in line with historical levels since the 2002 population decline is considered by some Team members to be evidence that human disturbance, particularly off-road driving related to cross-border activities, continue to affect the population, inhibiting its ability to recover. However, it is important to note that pronghorn are likely more resilient to impacts associated with human disturbance and similar stressors during periods of improved forage and water

resources. Unfortunately, in recent times, these periods have occurred less often and their occurrence is unreliable. Therefore, in our best professional judgment

and based on current observations and predicted climate changes, it is likely that the effects of human disturbance and similar stressors on Sonoran pronghorn will be exacerbated by poor habitat conditions for much of the duration of the proposed TIMR project.

In addition, the low number of females also likely impacts this population's ability to rebound. With efforts to improve forage and water availability and the release of individuals from the captive pens, we may see an improving population trend. If not, factors other than the reduced number of females may be the primary cause of slow population growth or negative population trends.

Semi-captive Breeding Facility

As part of a comprehensive emergency recovery program, a total of 11 adult pronghorn (10 females and one male) were initially captured (from Sonora and Arizona) and placed into a semi- captive breeding pen at CPNWR in 2004. The breeding program has been very successful and as of January 2012, there were 48 pronghorn in the enclosure. Since establishing the program, 16 pronghorn older than current year have died in the pen due to various causes, including one confirmed case of epizootic hemorrhagic disease, two from malnutrition prior to the introduction of alfalfa hay in the pen, two from bobcat predation, one from entanglement in the fence, and two from capture operations. Eight deaths were from unknown causes and although disease was suspected, it could not be confirmed. Sonoran pronghorn have been released from the pen every year since 2006; as of January 2012, a total of 73 individuals have been released, many of which are known to still be alive.

The objective is to produce at least 20 fawns each year to be released into the current U.S. population, and to establish additional U.S. populations at Kofa NWR and BMGR-East, east of SR 85. The additional populations will be established as experimental, nonessential populations under section 10(j) of the Act. A final Environmental Assessment and final 10(j) rule were published in April and May, 2011, respectively. In December 2011, 13 Sonoran pronghorn were moved from the CPNWR breeding pen to the newly built breeding pen in the King Valley on Kofa NWR. One of the animals died due to capture myopathy, leaving 12 (10 does and 2 bucks) in the pen for breeding purposes.

Mexico

Historically, Sonoran pronghorn ranged in Sonora from the Arizona border south to Hermosillo and Kino Bay, west to at least the Sierra del Rosario, and east to the area south of the Baboquivari Valley on the Tohono O'odham Nation (Nelson 1925, Carr 1974, Monson 1968; Figure 6). The distribution in Baja California is less clear, but observations by Mearns (1907) indicate they occurred in the Colorado Desert west of the Colorado River, as well. Sonoran pronghorn are currently extant in two sub-populations in Mexico, including: (1) Pinacate sub-population west of Highway 8 near the Pinacate Lava flow; and (2) north and west of Caborca and southeast of Highway 8 (see Figure 4).

Sub-populations of Sonoran pronghorn in Sonora had not been thoroughly surveyed until the December 2000 surveys (Bright et al. 2001), at which time 346 pronghorn were estimated to occur

in Sonora. Although the 1993 estimate was approximate, survey results suggested a decline in the sub-populations of 16 percent from 1993 to 2000 (Table 5). Since 2000, the two Mexico sub-populations have been resurveyed biennially, with the exception of the winters of 2004/05 and 2005/06, when they were surveyed both years. In December 2002, a total (both El Pinacate and southeast of Highway 8) of 214 pronghorn in 32 groups were seen for a tentative population estimate of 280, indicating further decline. Only 19 pronghorn were observed in the Pinacate area for an estimate of 25, which is a decline of 26% from the 2000 estimate. Surveys conducted in December 2004 and February 2005 demonstrated that the population southeast of Highway 8 increased to 625 (439 observed), while the Pinacate population increased to 59 (30 observed) (684 total estimated, 469 total observed). In 2004, several capture-related mortalities occurred in Sonora associated with efforts to capture pronghorn to stock the breeding pen in Arizona. Since then, capture protocols were examined and improved. In January 2006, surveys indicated that pronghorn numbers remained relatively steady with an estimated total of 634 (486 observed) individuals (combined for both populations). Nine of these were captured, of which five were fitted with radio-collars and released and four were transferred to the semi-captive breeding facility in the U.S.

In December 2007, surveys indicated pronghorn numbers declined with an estimated total of 404 (360 observed) individuals combined for both sub-populations (including 354 pronghorn [325 observed] in the area southeast of Mexico Highway 8 and 50 [35 observed] to the west of the highway). Of these pronghorn, four pronghorn (three does and 1 buck) from the Pinacate Biosphere Reserve were captured and fitted with GPS radio collars. The male was found dead during a subsequent telemetry flight; his death was likely capture-related as his temperature rose dangerously high during the collaring effort. The decrease in Sonoran pronghorn population in Sonora from 2006 to 2007 is likely attributable, at least in part, to drought conditions in the pronghorn range in Mexico. During the aerial surveys, observers noted many extremely dry areas and some areas where the vegetation appeared dead in the pronghorn range. Additionally, an increasing number of fences and mine expansion within the range of the southeastern pronghorn population may be adversely affecting this population.

In December 2009, surveys indicated pronghorn numbers increased somewhat with an estimated total of 482 (311 observed) individuals combined for both sub-populations (including 381 pronghorn [258 observed] in the area southeast of Mexico Highway 8 and 101 [53 observed] to the west of the highway). In December 2011, surveys indicated pronghorn numbers declined drastically with an estimated total of 241 (197 observed) individuals combined for both sub-populations (including 189 pronghorn [167 observed] in the area southeast of Mexico Highway 8 and 52 [30 observed] to the west of the highway).

Population Viability Analysis

In 1996, a workshop was held in which a population viability analysis (PVA) was conducted for the U.S. sub-population of Sonoran pronghorn (Defenders of Wildlife 1998). A PVA is a structured, systematic, and comprehensive examination of the interacting factors that place a population or species at risk (Gilpin and Soulé 1986). Based on the best estimates of demographic parameters at the time, the likelihood of extinction of Sonoran pronghorn was calculated as one percent in the next 25 years, nine percent in the next 50 years, and 23 percent in the next 100 years. More severe threats

include population fluctuation, periodic decimation during drought (especially of fawns), small present population size, limited habitat preventing expansion to a more secure population size, and expected future inbreeding depression. At populations of less than 100, population viability declined at an increasingly steep rate. To maintain genetic diversity over the long term, a population of at least 500 is desirable (Defenders of Wildlife 1998). The likelihood of extinction increased markedly when fawn mortality exceeded 70 percent. Thus, a 30 percent fawn crop (30 fawns/100 does) each year is necessary to ensure the continuance of the U.S. sub-population. The authors concluded that "this population of the Sonoran pronghorn, the only one in the U.S., is at serious risk of extinction." The authors made these conclusions prior to the severe drought and decline in the species in 2002. On the other hand, Hosack et al. (2002) found that some management actions were possible that could improve the chances of population persistence significantly. Actions that would ameliorate the effects of drought or minimize mortality of pronghorn were of particular importance for improving population persistence.

More recent work by Horne (2010) attempted to account for uncertainty that can affect the outcome of PVAs. He conducted a series of PVAs to address various sources of uncertainty. Regardless of the degree or type of uncertainty, active management related to captive populations and establishing additional populations increased the viability of wild Sonoran pronghorn. However, without such active management, the wild population has a high probability of dropping to abundance levels that are unsustainable and a low probability that the population would ever reach an abundance that is higher than 100 females (Horne 2010).

Threats

Barriers that Limit Distribution and Movement

Highways, fences, railroads, developed areas, and irrigation canals can block access to essential forage or water resources. Interstate 8, the Wellton-Mohawk and Palomas Canals, agriculture, a railroad, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. Brown and Ockenfels (2007) report that numerous railroad and highways bisect what was former contiguous pronghorn habitat, often dividing these rangelands into parcels too small to support, viable, long-term populations of pronghorn in Arizona. Furthermore, they state that railroads and paved highways are especially restrictive, as in addition to acting as intimidating barriers in their own right, they are often fenced on both sides of the right-of-way.

Highways 2 and 8 in Sonora, and SR 85 between Gila Bend and Lukeville, Arizona support a considerable amount of fast-moving vehicular traffic, are fenced in some areas, and are likely a substantial barrier to Sonoran pronghorn (a pen-raised radio-collared male is known to have crossed SR 85 and Mexican Highway 2; however, this is considered highly unusual). NPS records include a Sonoran pronghorn found dead just east of SR 85 along Ajo Mountain Drive in 1972. It was suspected to have been struck and killed by a vehicle (electronic mail from Tim Tibbitts, OPCNM, September 1, 2011). More recently, in 2003/2004 John Hervert (AGFD) investigated a Sonoran pronghorn mortality found a few hundred feet from Interstate 8. It had a broken leg, and so vehicle collision was suspected. deVos and Miller (2005) reported that Sonoran pronghorn used areas

within 0.6 miles of roads less than those greater than 0.6 miles from roads, demonstrating that non-highway roads can also be restrictive.

Canals have been the cause of four pronghorn deaths since 2008. Three pen-raised pronghorn drowned in the Palomas Canal in 2008 and one pen-raised pronghorn drowned in the Wellton Canal in 2010. De-watering of reaches of the Río Sonoyta and lower Gila River has also caused significant loss of habitat and loss of access to water (Wright and deVos 1986). Agricultural, urban, and commercial development at Sonoyta, Puerto Peñasco, and San Luis Río Colorado, Sonora; in the Mexicali Valley, Baja California; and at Ajo, Yuma, and along the Gila River, Arizona, have further removed habitat and created barriers to movement.

Human-caused Disturbance

A variety of human activities occur throughout the range of the pronghorn that have the potential to disturb pronghorn or its habitat, including livestock grazing in the U.S. and Mexico; military activities; recreation; poaching and hunting; clearing of desert scrub and planting of buffelgrass (*Pennisetum ciliare*) in Sonora; gold mining southeast of Sonoyta, dewatering and development along the Gila River and Río Sonoyta; cross-border violator (CBV) activity across the international border and associated required law enforcement response; and roads, fences, canals, and other artificial barriers.

Of the aforementioned human activities, in the U.S. range of the pronghorn, CBV activity and required law enforcement response is the most significant current source of disturbance to Sonoran pronghorn and its habitat. As a result of increased presence of the USBP in the Douglas, Arizona area, and in San Diego (Operation Gatekeeper) and southeastern California, CBV traffic has shifted into remote desert areas, such as CPNWR, OPCNM, and BMGR (Klein 2000). In 2001, estimates of CBVs reached 1,000 per night in OPCNM alone (OPCNM 2001), and an estimated 150,000 people entered the monument illegally from Mexico (Milstead and Barns 2002). Apprehensions of CBVs in the USBP Ajo Station, Tucson Sector increased from 21,300 in 1999 to 22,504 in 2006. The numbers of CBV apprehensions from fiscal year (FY) 2007 to FY 2011 have decreased since 2006, and are shown by location in Table 6. The number of apprehensions and drive-throughs in the Ajo Station's overall Area of Responsibility (AOR) declined after the construction of the border vehicle fences on OPCNM in 2006 and CPNWR in 2009, but has increased since the implementation of the SBI*net* towers and infrastructure became operational in 2010. In the approximately one year since the SBI*net* towers have been operational, the number of apprehensions of CBVs have increased by 85% within OPCNM and 183% in CPNWR. This increase is believed to be attributable to increased CBV activity, as well as increased USBP effort, tactical infrastructure, and technology in the area which have improved USBP's ability to detect and apprehend CBVs (personal communication with USBP, September 1, 2011).

In fiscal year 2005, the Yuma Sector of USBP apprehended record numbers of CBVs, and from October 1, 2005 to May 2006, 96,000 arrests were made, which was a 13% increase over the same time period in 2005 (Gerstenzang 2006). The Wellton Station of the Yuma USBP Sector made 2,080 apprehensions in fiscal year 2005 and 3,339 apprehensions from October 2005 to February 2006 (personal communication with USBP, February 10, 2006). Apprehensions in recent years have

declined in the Wellton Station AOR (see Table 6). Overall, a dramatic decline in apprehensions in the Yuma Sector, particularly in the western portions of the sector, is attributed to USBP presence at Camp Grip, increased numbers of agents, and recently completed tactical infrastructure.

As USBP has been able to successfully gain control of more urban areas, CBV activity has shifted to more remote areas, such as CPNWR and OPCNM. Both CBV and USBP activities have resulted in increased human presence in and increased degradation of Sonoran pronghorn habitat, including direct impacts to habitat from vehicles, but also a reduction in access to forage availability, particularly during drought and other periods of poor range conditions. Much of the CBV traffic travels through the southern passes of the Growler Mountains that lead either through or by all of the forage enhancements and the captive rearing pen in the Child's Valley, with potential to impact these recovery projects and use of the area by pronghorn (personal communication with Curtis McCasland, CPNWR, 2007).

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

The Camp Grip Forward Operating Base (FOB), located within the action area and current range of the pronghorn, was established in 2005. In 2011, FWS completed an analysis of whether the Camp Grip FOB resulted in impacts on Sonoran pronghorn movement patterns. FWS analyzed available AGFD Sonoran pronghorn location data from radio-collared animals and results of this analysis were inconclusive as to whether Camp Grip had any impact on Sonoran pronghorn movement; however, as described above under “Distribution and Abundance” there are very few radio-collared animals and documenting pronghorn movement can be difficult. These inconclusive results were also in part due to the many complex factors involving Sonoran pronghorn movement, including artificial feeding and watering of the animals across the species’ range. Initial data from radio-collared pronghorn locations appeared to indicate a potential reduction in use of areas in the vicinity of Camp Grip (electronic mail from Mark Sturm, OPCNM, August 31, 2011). Data from 2012 have shown several occurrences of pronghorn in the vicinity of Camp Grip. This may be due to the increased number of pen-reared pronghorn that have been released and that have been exposed on a more regular basis to human activity at the pens (electronic mail from Jim Atkinson, CPNWR, October 5, 2012). Data also indicate a northerly shift in habitat use since Ajo-1 SBI*net* implementation, which coincides with

a documented increase in impacts. This result is despite the presence of abundant and good habitat conditions in areas nearer the border during 2011.

Prior to 2002, Sonoran pronghorn used the 90,000 acre Valley of the Ajo extensively during the fawning period (March 15-July 31); they primarily entered the Valley through an extremely critical and narrow mountain pass located near Bates Well. During the winter of 2001-2002, NPS stationed a ranger at Bates Well in a small (about 18-foot) temporary Federal Emergency Management Agency trailer, with no outdoor lighting or generators, to provide visitor security in the north part of OPCNM during the park's peak visitation period, which occurs prior to the Sonoran pronghorn fawning period. Beginning in 2002, USBP began to use the Bates Well site (i.e., the former Bates Well FOB) seasonally during the summer months. The NPS continued to use Bates Well for short periods during the late fall and winter in support of coordinated law enforcement efforts until ultimately discontinuing its use entirely in 2005. Because pronghorn traditionally used the Bates Well and Valley of the Ajo areas during the spring and summer months, it is unlikely that the NPS fall and winter presence at Bates Well between 2001 and 2005 had a significant effect on pronghorn use of the area. From 2005 to 2010, USBP was the sole occupant at Bates Well. Over time, USBP occupancy of this site increased (the site could accommodate eight people); ultimately this site was occupied nearly year round. Furthermore, USBP brought in generators that ran continuously and lights that operated throughout the night.

As part of the SBI*net* Ajo-l Tower Project Biological Opinion issued December 10, 2009 (File Number 22410-2009-F-0089), the Bates Well FOB was moved in early 2011 to the current Ajo Station tactical camp site. Since the establishment of the FOB at Bates Well and its subsequent relocation, no pronghorn have been documented entering the Valley of the Ajo through the Bates Well migration corridor. The establishment of the Bates Well FOB coincided with a drastic decline in pronghorn numbers (attributable to drought and an increase in border activity). Documenting pronghorn movement in this area is difficult because radio-collared individuals generally do not occur in the northwestern OPCNM (see "Distribution and Abundance" section under "Status of the Species" for Sonoran pronghorn). Changes in use of the Bates Well area by pronghorn may be in part due to decreased population size; however, the increased human presence at Bates Well, particularly during the fawning period, may have acted to prevent Sonoran pronghorn movements through the area and into the Valley of the Ajo. Since 2002, the population has increased and pronghorn continue to avoid the Bates Well migration corridor. Soundscape data show traffic levels have doubled on Bates Well Road over the past two years (electronic mail from Mark Sturm, OPCNM, August 31, 2011). Considering the sensitivity of pronghorn to human activity and the ongoing use of the area, reduced pronghorn use of the Bates Well area may be tied to the high level of human activity associated with the site. This is a narrow valley limiting the area that pronghorn could potentially use. If resource availability is limited and pronghorn resources are available in this area, human activities will likely be more impacting due to the lack of options for forage elsewhere. If good range conditions are widespread, pronghorn are likely to be more resilient to such impacts. Pronghorn entered the southern end of the Valley of the Ajo briefly in 2010 before returning west. They migrated to/from the valley via a southern pathway, but are not known to have used the Bates Well pass (electronic mail from Mark Sturm, OPCNM, August 31, 2011). These data apply to small group of Sonoran pronghorn documented during a visual hilltop survey conducted by NPS.

While specific studies related to the physiological effects of disturbance on Sonoran pronghorn are extremely limited, some information regarding how these effects are manifest in other wildlife may be helpful in assessing the potential effects to pronghorn. Physiological effects of noise on wildlife can include stresses to neural, endocrine, digestive, cardiovascular, and immune systems as well as reproductive function, causing changes such as increased blood pressure, available glucose, and blood levels of corticosteroids (Manci et al. 1988, Kaseloo and Tyson 2004, Keay et al. 2006). However, available research evaluating physiological impacts of human stressors on wild animal populations also indicates that the responses of species are variable (Manci et al. 1988, Larkin 1996, Radle 1998, Krausman et al. 1998, Kaseloo and Tyson 2004, Stankowich 2008). We believe that, given the information in the above studies, it is possible that Sonoran pronghorn could have a physiological stress response to disturbance without showing an overt behavioral response. To have a population effect, behavioral and physiological responses to disturbance must ultimately affect survival and productivity, and to date, no research efforts have supported or refuted population level impacts on pronghorn from physiological stress. At some point, increased energetic costs resulting from a stress-related increase in metabolic rate, reduced foraging efficiency due to interrupted feeding, and alarm and flight responses could jeopardize survival and productivity if the disturbance is stressful enough and chronic (Bright and Hervert 2005, deVos and Miller 2005).

As stated above, and though not specifically related to Sonoran pronghorn, it has been well documented that human presence in wildlands can disturb animals, causing them to unnecessarily expend energy avoiding people, thereby potentially reducing reproductive success (e.g., Manville 1983, van Dyke et al. 1986, Goodrich and Berger 1994, Primm 1996; as cited by Kerley et al. 2002) or increasing the likelihood of fatal encounters with humans (Kasworm and Manley 1990, Saberwal et al. 1994, Khramtsov 1995, Mattson et al. 1996; as cited by Kerley et al. 2002). Range abandonment has been documented in response to human disturbance (Jorgenson 1988), and investigators have shown that heart rate increases in wildlife in response to auditory or visual disturbance in the absence of overt behavioral changes (Thompson et al. 1968, Cherkovich and Tatoyan 1973, Moen et al. 1978). Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human traffic, such as a person walking or running past pronghorn in an enclosed pen, a motorcycle driving past, a truck driving past, a truck blowing its horn while driving past, or a person entering a holding pen, caused an increased heart-rate response in American pronghorn in half-acre holding pens (Workman et al. 1992). The highest heart rates occurred in female pronghorn in response to a person entering a holding pen, or a truck driving past while sounding the horn. The lowest heart rates occurred when a motorcycle or truck was driven past their pen. Pronghorn were more sensitive to helicopters, particularly those flying at low levels or hovering, than fixed wing aircraft. Luz and Smith (1976) observed pronghorn reactions to overhead helicopter flights which suggested mild disturbance (muscle tensing and interruption of grazing) by helicopter noise levels at approximately 60 dBA and strong reaction (running) at approximately 77 dBA.

Disturbances that cause pronghorns to startle and run would energetically have a more significant effect during times of drought. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971). Landon et al. (2003) evaluated whether Sonoran pronghorn used areas, as defined by noise levels produced by military aircraft, in proportion to their availability on the BMGR. Using 15% of the Arizona

pronghorn population, Landon et al. studied pronghorn use of areas with varying sound pressure (ambient sound) levels and found that pronghorns did not use the areas with different ambient sound levels in proportion to their availability (2003). In general, they found that Sonoran pronghorn select areas with the lower noise levels and avoid areas with the higher noise levels; however, they did not consider habitat in their analysis. Whether pronghorn avoid these areas because of the noise or because of some other human-related factor is unknown; however, the various potential factors (i.e. noise levels, human presence, reduced vegetation or cover, disturbance) are interrelated. Hughes and Smith (1990) found that pronghorn immediately ran 1,310- 1,650 feet from a vehicle, and that military low-level flights (less than 500 feet above the ground) over three pronghorn caused them to move about 330 feet from their original location.

Krausman et al. (2001, 2004, 2005a) examined effects of military aircraft and ground-based activities on Sonoran pronghorn at the North and South tactical ranges (TACs) on the BMGR and concluded that military activities, both ground-based and aerial, were associated with some changes in behavior (e.g., from standing to trotting or running, or bedded to standing). In response to 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). 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%) of the 2,128 events with ground-based stimuli resulted in pronghorn changing their behavior to trotting or running; often moving > 10 m (Krausman et al. 2004). Pronghorn tend to exhibit a predator response to human activities, but can habituate to chronic human disturbance in some instances (Krausman et al. 2004). The authors concluded that these changes were not likely to be detrimental to the animals; however, sightings of Sonoran pronghorn were biased towards disturbed habitats on the TACs and other areas of military activities, which also corresponded to areas of favorable ephemeral forage production (Krausman et al. 2005a). No specific conclusions could be drawn about effects of military activities on fawns during the Krausman et al. study, but the data suggests that fawns and their mothers may be more sensitive to anthropogenic stimuli than other pronghorn (Krausman et al. 2004). In general, the study did not detect differences in the behavior of pronghorn with and without anthropogenic stimuli; however, Krausman et al. (2004) recommends that all ground stimuli and activities that alerts or startles females and their fawns should be terminated. However, the long-term behavioral and physiological effects of military activities have not been quantified (Krausman et al. 2004).

The proposed TIMR project would result in additional human presence and activity in within the range of the Sonoran pronghorn. And, while the noise and activity associated with TIMR activities may be somewhat different than that described in the studies above, TIMR activities do include disturbance by heavy equipment, foot traffic, mowers and trimmers, and welding. While baseline levels of human activity are already relatively high in certain portions of the range of the Sonoran pronghorn, additional disturbance as a result of the proposed action, particularly in those areas that do not have access to the general public, will contribute to the potential for disturbance of pronghorn in the project area. Habituation by pronghorn to disturbance is more likely to occur if the disturbance is consistent or predictable. Krausman et al. (2004) report that animals, in general, minimally habituate to intermittent sounds, and that any habituation is gradual. Most of the actions associated with the TIMR project will be as-needed and occur at irregular intervals, reducing the ability of pronghorn to habituate to the activity. However, some degree of habituation may occur

because of the baseline levels of human activity already occurring on the landscape. Regardless, we believe there is the potential for human activities associated with the TIMR project to disturb pronghorn and, given the precarious nature of the pronghorn population, even limited disturbance of a few individuals may have population level impacts to Sonoran pronghorn.

Habitat Disturbance

Livestock grazing has the potential to significantly alter pronghorn habitat and behavior (Leftwich and Simpson 1978, Kindschy et al. 1982, Yoakum et al. 1996). Overgrazing well into the 19th century by Spaniards and their descendants caused widespread habitat changes throughout much of the Sonoran Desert, particularly in more settled areas such as central Sonora, Mexico (Sheridan 2000). The effects of cattle grazing are largely historical; cattle were removed from OPCNM, CPNWR, and the BMGR in 1979, 1983, and 1986, respectively (FWS 1998, Rutman 1997). While grazing activities across the range of the pronghorn have been largely eliminated, it is likely that long term impacts of this past activity are persistent across the species range. In 2004, the U.S. Bureau of Land Management (BLM) closed the Cameron Allotment on the borders of CPNWR and OPCNM, but grazing still occurs in the nearby Childs and Coyote Flat allotments near Ajo. In Sonora, livestock grazing occurs at Pozo Nuevo and at Ejido Puerto Peñasco, but cattle typically stay close to feed and water except in seasons with abundant annual growth when cattle range widely in the Pinacate region.

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

As discussed above, CBV activities and required USBP response have resulted in increased human presence in remote areas and ongoing habitat degradation. For instance, all the valleys at CPNWR are now criss-crossed with a network of illegal north-south roads and trails, even though those areas are designated as Wilderness. Segee and Neely (2006) report about 180 miles of illegal routes were created in wilderness areas of CPNWR from 2002 to 2006; however, this figure may be grossly underestimated. FWS reported 8,000 miles of off-road impacts in CPNWR as of 2008. Similar levels of impacts are expected to exist at OPCNM, and a report summarizing existing impacts is being produced (electronic mail from Mark Sturm, OPCNM, August 31, 2011); however, we have not yet received this report. OPCNM has mapped thousands of miles of unauthorized of off-road impacts to date. Based on this preliminary estimate, hundreds of miles of unauthorized vehicle routes may exist within the vicinity of the proposed TIMR project and thousands may exist within the action area. Many of these routes were likely created both by CBVs and USBP, and are likely currently used by USBP. A cooperative effort is currently underway by CBP, NPS, and BLM to map and mark roads within the range of the Sonoran pronghorn to indicate those roads that are open for use by these agencies, and roads that are closed to vehicle traffic. It is hoped that this effort will reduce the use of unauthorized roads and the associated impacts to Sonoran pronghorn.

Prior to the completion of the vehicle border fences on OPCNM and CPNWR (construction was started on these fences in late 2003 and 2007 and completed 2006 and 2009, respectively), CBVs

frequently crossed the border in vehicles and created countless illegal routes, many of which were continuously used both by CBVs and responding USBP agents. Subsequent to the construction of the vehicle fences on OPCNM and CPNWR, CBV vehicular traffic was significantly reduced (there are occasional breaches in the fence; however, this CBV vehicular activity represents a fraction of that prior to the presence of the fences). NPS notes that CBV vehicle activity has decreased at OPCNM since about 2004 (electronic mail, Tim Tibbitts, OPCNM, 2009 and 2011); however, the number of off-road tracks, and new roads ("unauthorized vehicle routes") in OPCNM continues to increase (electronic mail, Tim Tibbitts, OPCNM, September 1, 2011). There is some evidence that vehicle activity, particularly in remote areas utilized by Sonoran pronghorn, has increased since 2004 by more than 700% (electronic mail from Mark Sturm, OPCNM, August 31, 2011). This is causing unprecedented levels of impacts to Sonoran pronghorn habitat. Decreased CBV vehicle traffic in pronghorn habitat as a result of the fences significantly alleviated the adverse effects of illegal (smuggling and migration) vehicle traffic on pronghorn and their habitat. USBP, however, continues to respond (by vehicle, horseback, foot, and aircraft) to ongoing CBV activity (mostly foot traffic) in these areas. Frequently, this required response necessitates driving off of authorized roads. Off-road driving conducted in pronghorn habitat results in significant degradation of this habitat and disturbance to pronghorn as discussed above. Because of concern over the dramatic increase in disturbance since 2005/2006, NPS has collected data over time to document the trend. The proliferation of unauthorized roads is a major impact on multiple resources, and provides an index of the level of human activity currently taking place in pronghorn habitat.

One potential measure of pronghorn habitat degradation is affects to carrying capacity, the number and distribution of pronghorn that can be supported by habitat conditions and access to available forage. Although the carrying capacity of the pronghorn range has not been quantified, loss or modification of habitat is a potential impact on Sonoran pronghorn. Loss or modification of habitat can reduce the ability of the overall U.S. population of Sonoran pronghorn to cope with limitations of forage by moving from place to place. Ultimately, loss or modification of habitat would reduce the carrying capacity of the U.S. range, resulting in a lower population. Based on population estimates from the past 85 years (Table 3), the pronghorn range has never supported more than about 300 individuals. A population of 300 animals may approach or exceed carrying capacity given current conditions on the occupied range (FWS 2002). Prior to alteration of the range beginning in the early 1900's, the carrying capacity was probably higher due to the ability of herds to migrate to perennial water sources during drought (see "Distribution and Abundance" section under "Status of the Species" for Sonoran pronghorn).

However, the concept of carrying capacity is difficult to describe or apply to the Sonoran desert, particularly as it may apply to pronghorn. For example, it may not just be related to quantity (availability), but also quality of forage. Forage may become limiting for Sonoran pronghorn as the quality decreases, rather than from a lack of forage. Even during a prolonged period of drought, forage still occurs on the landscape; however, it is of insufficient quality to sustain pronghorn. How does this affect carrying capacity? In 2002, the remaining 21 pronghorn were slowly starving to death, but survived after summer rains increased forage quality. The forage plants were present, but were not of sufficient quality for use by pronghorn, until after precipitation events. One could say that the carrying capacity for pronghorn was 21 for the year 2002, but this number of pronghorn was also influenced by other decimating factors (predation, human caused stress). Defining carrying

capacity is complex and is likely related to the cumulative influence of all of these factors on pronghorn survival. Factors affecting pronghorn that are not related to forage are likely exacerbated in periods of poor range conditions, and pronghorn are likely more resilient to such threats during periods of good range conditions. Human activities or infrastructure on the landscape can provide impediments, affecting access by pronghorn to forage and water resources. For example, deVos and Miller (2005) found that pronghorn use areas greater than one kilometer from roads preferentially, and used areas within one kilometer of roads less than predicted, even during a period of good range conditions. Regardless of the forage quality, if pronghorn are not able to access the forage, it cannot contribute to survival and recovery of the population. Overall, carrying capacity is a likely a function of timing of rains and the level of rainfall more than any other factor (Horne 2010, email communications from John Hervert, AGFD, October 3, 2012 and Jim Atkinson, CPNWR, October 5, 2012), but Sonoran pronghorn must be able to access forage of adequate quality.

Due to habitat restrictions previously discussed, any further range reduction through habitat degradation would be significant. Examples of actions that may result in loss or modification of habitat include: permanent human developments; building roads, trails, or other areas cleared of vegetation; invasion by non-native plants; modification of plant communities by fire, etc.; or any activity that further limits use of suitable habitat. In addition to degradation from roads on CPNWR and OPCNM from illegal activity and associated CBP response, USBP operations appear to have precluded use of the 90,000-acre Ajo Valley for fawning as discussed above. This constitutes a large portion of the remaining pronghorn habitat.

Fire

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

Most Sonoran Desert trees, shrubs, and cacti are poorly adapted to fire (Brown and Minnich 1986, Schwalbe et al. 2000, Alford and Brock 2002). If areas burn repeatedly, permanent changes are likely in the flora. Even in the best scenario, it is likely to be many years before trees once again provide thermal cover in wash communities and cholla recover to a point that they are useful forage plants for pronghorn. This said, from 2007 to 2010 pronghorn were attracted to the burned areas, which often supported better growth of annual plants and forbs than adjacent unburned areas. However, in the long term and if these areas continue to burn, removal of thermal cover (trees) and chain fruit cholla, which pronghorn depend on in drought, would likely adversely affect pronghorn and probably limit the use of these areas to wetter and cooler periods and seasons.

Drought and Climate Change

As discussed, drought may be a major factor in the survival of adults and fawns (Bright and Hervert 2005), and the major decline in 2002 was driven by drought. Mean annual temperatures rose 1.8-3.6 °F in the American Southwest from 1970-2004. That trend is accelerating and is predicted to continue through the 21st century and beyond (Intergovernmental Panel on Climate Change 2007). Most of the observed increases in globally averaged temperatures since the mid-20th century are very likely due to the observed increases in anthropogenic greenhouse gas concentrations (Intergovernmental Panel on Climate Change 2007). In the Sonoran Desert, anthropogenic climate change is causing warming trends in winter and spring, decreased frequency of freezing temperatures, lengthening of the freeze-free season, and increased minimum temperatures in winter, which will likely cause changes in vegetation communities (Weiss and Overpeck 2005). These increases in temperature are predicted to be accompanied by a more arid climate in the Southwest (Seager et al. 2007, Intergovernmental Panel on Climate Change 2007). As a result, the Sonoran pronghorn is expected to be confronted with more frequent drought, which increases the importance of recovery actions, such as forage enhancement plots and water developments, which can offset the effects of drought. However, it will be important to consider other factors, such as predation, during management actions. Bright and Hervert (20050) indicated that periods of drought may force Sonoran pronghorn to use areas of available forage where predators may be more effective. Thus, climate change and drought may also exacerbate the effects of predation on the Sonoran pronghorn population and management actions should be focused in areas where predation is likely to be less successful.

Small Population Size and Random Changes in Demographics

At populations of fewer than 100 pronghorn, population viability declines at an increasingly steep rate. To maintain genetic diversity over the long term, a population of at least 500 is desirable (Defenders of Wildlife 1998). At an estimated 21pronghorn in 2002, and 85 in 2010, the U.S. sub-population is critically endangered and has likely experienced a substantial loss of genetic diversity resulting from the 2002 bottleneck; this should gradually improve as more pen-raised animals are released into the wild sub-population. At an estimated 25 pronghorn in 2002 and 52 in 2011, the Pinacate sub-population is also well below desired numbers. At 189 (in 2011), the third sub-population (southeast of Highway 8) is also below the desired size to maintain genetic diversity and has experienced a substantial decline since the 2004/2005 estimate of 625 pronghorn. Loss of the U.S. sub-population would dramatically reduce our ability to manage or recover this subspecies. Populations at low levels may experience random variations in sex ratios, age distributions, and birth and death rates among individuals, which can cause fluctuations in population size and possibly extinction (Richter-Dyn and Goel 1972). In very sparse populations, males may have trouble finding females, reducing productivity (Ehrlich and Roughgarden 1987). Small populations are also sensitive to variations in natural processes, such as drought and predation (Hecht and Nickerson 1999).

Disease

Sonoran pronghorn can potentially be infected by a variety of viral and bacterial diseases, as well as parasites. Epizootic hemorrhagic disease and bluetongue virus are the most common cause of

disease caused die-off in wild pronghorn (Brown and Ockenfels 2007). A number of deaths (five in the captive breeding pen and two in the wild) in 2010 are suspected to be related to epizootic hemorrhagic disease and bluetongue virus. Blood testing has shown pronghorn exposure to these diseases by increases in antibody titers over time. The diseases relevant to pronghorn can be transmitted indirectly through vectors, such as infected midges or ticks, or directly via aerosolized or direct contact of infected fluids or tissues. Diseases that potentially infect pronghorn are all serious diseases of cattle, which can act as vectors. Cattle within the current range of the pronghorn have not been tested for these diseases.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the 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. As described above, the action area for this BO is the action area identified for the project BA (Figures 3a and 3b) and the current range of the pronghorn within the U.S. (Figures 4 and 5). Figure 7 depicts the TIMR proposed action area and infrastructure relative to the Sonoran pronghorn range.

Status of the Sonoran Pronghorn in the Action Area

Within the U.S. portion of the Sonoran pronghorn's range, pronghorn interact to form one sub-population in which interbreeding may occur. The U.S. sub-population is effectively separated from sub-populations in the El Pinacate Region and on the Gulf Coast of Sonora by Mexico Highways 2 and 8. Activities that may affect animals in any portion of the U.S. range of the pronghorn may affect the size or structure of the U.S. sub-population, or habitat use within the U.S. range. Because of this, the entire U.S. range of the Sonoran pronghorn is included in the action area for the TIMR Program.

Distribution, Abundance, and Life History

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

Drought

As discussed in the Status of the Species, climate change in the Southwest and the Sonoran Desert is predicted to result in warming trends and drier conditions, with accompanying changes in vegetation communities (Weiss and Overpeck 2005, Seager et al. 2007). Rowlands (2000) examined trends in precipitation for southwestern Arizona and OPCNM from 1895-1999. For southwestern Arizona, no trend in precipitation was found for the period, but low precipitation occurred around 1895 and

during the 1950s. Periods of high precipitation occurred in 1915-1920 and in the 1980s. For OPCNM, there was a slightly increasing trend in monthly and annual precipitation over the period 1895-1999, a strong drought occurred in the 1950s, and a lesser drought occurred in the 1970s. No discernible trend in precipitation in southwestern Arizona or OPCNM was found in the 1990s, which is when the current decline in the U.S. pronghorn sub-population began.

Since Rowland's analysis, there was one year characterized by above-average rainfall and abundant ephemeral forage (2001) followed by a year with virtually no precipitation or ephemeral forage (2002). Recruitment and survival were high in 2001 and very low in 2002 (Bright and Hervert 2005). Based on the lack of forage and water, and the condition of pronghorn observed, drought is considered the proximate cause of the 79% decline in the U.S. pronghorn sub-population from 2000 to 2002. From 2003 to 2011, rainfall and Sonoran pronghorn range conditions have varied, but have improved overall when compared to 2002. Current range conditions are well below average precipitation for the calendar year and for the water year (October 1, 2011 – September 30, 2012). The January 2012 long-term (48-months) drought status report (http://www.azwater.gov/azdwr/StatewidePlanning/drought/DroughtStatus2.htm) indicates that southwestern Arizona is experiencing conditions of no drought to severe drought conditions.

Historically, pronghorn populations must have weathered severe droughts in the Sonoran Desert, including many that were more severe and longer term than what has occurred recently. Given that pronghorn populations survived the droughts of the 1890s, 1950s, 1970s, and others before those, it is unreasonable to solely attribute recent declines in the U.S. pronghorn population to drought. OPCNM (2001) concluded, "If (individual) recent dry years have had an impact on Sonoran pronghorn, it is most likely because in recent decades Sonoran pronghorn have much more limited options for coping with even brief moderate drought. Because of restrictions on their movements and range, and increasing human presence within their range, pronghorn are less able to employ their nomadic strategy in search of relief. It is not that drought itself is an impact, but possibly that drought has *become* an impact, due to other factors confounding the species' normal ecological strategy."

Recent Recovery Actions

A number of critically important recovery projects have been recently initiated in an attempt to reverse the decline of the U.S. sub-population of the Sonoran pronghorn (Krausman et al. 2005b). These projects are designed to increase availability of green forage and water during dry periods and warm seasons to offset to some extent the effects of drought and barriers that prevent pronghorn from accessing greenbelts and water, such as the Gila River and Río Sonoyta. Many developed water sources and 10 emergency water sources (seven on CPNWR, one on OPCNM, and two on BMGR-West) have been constructed in recent years throughout the range of the U.S. subpopulation. In March 2009, three temporary, experimental feed and water stations were placed on the South TAC on the BMGR-East and in May 2010, two new temporary water stations were placed on OPCNM. These stations are heavily used by pronghorn during times with poor range conditions brought on by drought.

Four forage enhancement plots within pronghorn habitat, each consisting of a well, pump, pipelines and irrigation lines, have been developed to irrigate the desert and produce forage for pronghorn. One plot is currently being constructed and additional plots may be installed over the next five years if warranted. Plots and waters located in areas with little human activity and better range conditions appear to be more effective (i.e., contribute to fawn and adult survival to a greater degree) than those located in areas of high human activity and poor range condition (i.e., experiencing drought) (personal communication with John Hervert, AGFD, September 16, 2009). Therefore, to ensure the success of these measures, it is critical that human activity be avoided or significantly minimized near the plots and waters.

A semi-captive breeding facility at CPNWR was first stocked with pronghorn in 2004; as of December 2011 it contains 48 animals. As described above, this facility will be used to augment the current U.S. sub-population, and to establish additional herds east of SR 85 at Kofa NWR and BMGR-East. The breeding pen at Kofa NWR was stocked with 12 animals in January 2012. These crucial projects, which we hope will pull the U.S. population back from the brink of extinction, have been cooperative efforts among many agencies and organizations, including FWS, AGFD, Marine Corps Air Station (MCAS)-Yuma, Luke Air Force Base, OPCNM, CBP, Arizona Desert Bighorn Sheep Society, Arizona Antelope Foundation, the Yuma Rod and Gun Club, the University of Arizona, the Los Angeles and Phoenix Zoos, and others.

Past and Ongoing Non-Federal Actions in the Action Area

The Status of the Species section describes a variety of human activities that have affected the Sonoran pronghorn since initiation of livestock grazing over 300 years ago (Officer 1993). Many non-Federal activities that have affected the pronghorn are historical in nature, and pronghorn have been all but extirpated from private, state, and Tribal lands. However, increased illegal activities have likely had a significant impact on Sonoran pronghorn in the U.S. in recent times, particularly since the turn of the millennium. See the "*Human-caused Disturbance*" and "*Habitat Disturbance*" portions of the "Threats" section under "Status of the Species" above for further detail.

Past and Ongoing Federal Actions in the Action Area

Due to the extent of Federal lands in the action area, with the exception of CBV activities, most activities that currently, or have recently, affected the U.S. sub-population or their habitat are Federal actions. The primary Federal agencies involved in activities in the action area include the MCAS-Yuma, Luke Air Force Base, FWS, BLM, OPCNM, and Border Patrol. In the following discussion, we have categorized Federal actions affecting the pronghorn as: 1) those actions that have not yet undergone section 7 consultation (although in some cases consultation has been completed on components of the Federal activity), and 2) Federal actions that have undergone consultation.

Federal Actions for Which Consultation Has Not Been Completed

1) U.S. Border Patrol Activities in the Tucson Sector, Arizona

While some USBP field activities to detect, deter, and apprehend CBVs in the Tucson Sector have undergone consultation, others have not. In 2006, the USBP sent us a draft BA for review that

addressed all activities within that sector. We responded with comments on the BA; however, USBP did not submit a final BA. Activities within the Ajo Station of the Tucson Sector have the greatest potential to adversely affect pronghorn and these have been addressed, in part, in the SBI*net* Ajo-1 Tower consultations (BO issued December 10, 2009 [File Number 22410-2009-F-0089] with subsequent reinitiations). As USBP has been able to successfully gain control of more urban areas, CBV activity has shifted to more remote areas, such as CPNWR and OPCNM. Both activities have resulted in increased human presence in and widespread degradation of Sonoran pronghorn habitat. As discussed above (see the "*Human-caused Disturbance*" and "*Habitat Disturbance*" portions of the "Threats" section under "Status of the Species"), hundreds to thousands of illegal routes have been created and are likely currently used by CBVs and USBP on CPNWR and OPCNM. Also as mentioned previously, there is some evidence that pronghorn avoid areas of high CBV traffic and USBP activities on CPNWR and OPCNM. This activity in pronghorn habitat has likely led to varying levels of disturbance to pronghorn, potentially resulting in decreased fitness and death (from reduced availability of important habitat, separation of does and fawns, increased energetic expenditure from fleeing, etc.). However, it is logical to assume the presence of agents in these areas generally reduces the amount of CBV activity; which consequently reduces the potential for disturbance to pronghorn from CBVs.

2) Smuggler/Drug Interdiction

In the past, we were aware of U.S. Customs, Drug Enforcement Authority, and Arizona Army National Guard smuggler or drug interdiction activities in pronghorn habitat, including vehicle and helicopter activities. However, we have never received information regarding the extent or types of activities they conduct, and no consultation occurred on these activities. According to CBP, U.S. Customs now only operates at the Lukeville Port of Entry (adjacent to, but not within the range of the Sonoran pronghorn); we do not know whether activities by the Drug Enforcement Authority or the Arizona Army National Guard continue to occur within the range of the pronghorn.

3) BLM Off-Road Vehicle Use Area

We are aware of an off-road vehicle (ORV) use area located north of Ajo on BLM land, near the CPNWR, and adjacent to suitable pronghorn habitat. The BLM has not authorized the use of this ORV area, but may include it in the updated Sonoran Desert National Monument and Lower Sonoran Resource Management Plan (RMP) they are developing for BLM lands in the vicinity. They will request formal section 7 consultation on the updated RMP. To date, BLM has not provided us with information about the extent and type of use of the ORV area or its possible effects to pronghorn.

4) DHS-CBP Hybrid Fence on BMGR and Vehicle Fence on CPNWR

Consultation was completed for the installation of a vehicle barrier (fence) along the U.S.-Mexico border from Avenue C in Yuma to the western boundary of OPCNM, including the BMGR (see details below). Effects to the Sonoran pronghorn were anticipated and analyzed related to the shift in CBV traffic as a result of the fence. However, subsequent to issuance of the biological opinion, the action was changed to include the installation of a section of hybrid-style fence designed to

prevent the passage of pedestrians. Because all environmental laws were waived (as permitted by the Real ID Act of 2005) by the Secretary of the DHS, CBP never reinitiated consultation with us regarding this change to their proposed action. However, DHS did provide funding to the FWS for the implementation offsetting measures for Sonoran pronghorn, including the development of forage enhancement plots and water sources. These offsetting measures will contribute to recovery actions for the Sonoran pronghorn.

5) DHS-CBP Vehicle Fence on CPNWR

CBP constructed and maintains a 1.6-mile segment of vehicle fence (known as CV-2a) and associated roads on the CPNWR. Although the project was likely to adversely affect pronghorn, as well as benefit pronghorn by reducing CBV vehicle activity within the pronghorn range, because all environmental laws were waived (as permitted by the Real ID Act of 2005) by the Secretary of the DHS, it never underwent formal consultation. We provided CBP with recommendations to avoid, minimize, and offset effects to pronghorn; however, to date, we do not know if they were implemented.

6) Remote Video Surveillance System (RVSS) and Integrated Fixed Towers

CBP is proposing an expansion of both Integrated Fixed Towers (IFT) and RVSS towers within the action area for this project. These projects will involve the construction or placement of new towers to complement the Ajo-1 tower project. Access roads, construction, and operation of these towers have the potential for increased impacts to the Sonoran pronghorn in the action area. Close coordination between DOI agencies and CBP regarding the siting and operation of these towers will be necessary to avoid exacerbating impacts to Sonoran pronghorn already associated with existing and proposed activities in the action area. Coordination with FWS and section 7 consultation has been completed for up to 20 new RVSS towers, as well as for upgrading a number of existing towers. Section 7 consultation will also be completed for the new IFTs.

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 BOs issued to date on actions that may affect the pronghorn. A variety of project types were considered with a range of effects to pronghorn, including capture and collaring of pronghorn for research purposes, consultation numbers 02-21-83-F-0026 and 02-21-88-F-0006; installation of a water source in the Mohawk Valley for pronghorn, consultation number 02-21- 88-F-0081; implementation of the CPNWR Comprehensive Conservation Plan, consultation number 22410-2006-F-0416; change in aircraft type from the F-15A/B to the F-15E on BMGR-East [F-15E Beddown Project], consultation number 02-21-89-F-0008; and the following projects at OPCNM: widening of North Puerto Blanco Road, consultation number 02-21-01-F-0109; improvements to SR 85 roadway and drainages, consultation 02-21-01-F-0546; and construction of a vehicle barrier, consultation number 02-21-02-F-237. Incidental take was anticipated only for the Beddown Project in the form of harassment as a result of aircraft overflights. This project was later incorporated into the BO on Luke Air Force Base's activities on the BMGR, discussed below. All of

these formal consultations can be viewed on our website at http://www.fws.gov/southwest/es/arizona/Biological.htm.

Additional information is included for the following consultations, which were generally of a greater scope than the above consultations:

U.S. Border Patrol Activities in the Yuma Sector, Wellton Station, Yuma, Arizona

This biological opinion (consultation number 02-21-96-F-0334), issued September 5, 2000, addressed all USBP activities along the United States/Mexico border in Yuma County from the Colorado River to about the area of Pinta Sands at the southern end of the Sierra Pinta Mountains. The Yuma Sector requested reinitiation of consultation, and we delivered a draft biological opinion in 2004; however, we have not received comments from the USBP to date.

Currently, USBP activities within the Yuma Sector/Wellton Station include air and ground patrols; drag road preparation and associated road maintenance; remote sensor installation and maintenance; pedestrian and vehicle fence and associated road maintenance; apprehensions and rescues; and assistance to other sectors and agencies. In both BO's, disturbance to pronghorn was anticipated as a result of on-the-ground USBP operations, and direct injury or mortality of pronghorn as a result of collision with USBP vehicles or by low-level helicopter flights abruptly approaching and startling pronghorn, which may result in injury or energetic stress, particularly during drought. Pronghorn may also be adversely affected by noise and visual impacts of helicopter overflights. To reduce adverse effects on pronghorn, the USBP agreed to implement a number of conservation measures including alteration of helicopter flight paths and timing, coordination with AGFD to obtain the locations of telemetered pronghorn, finalization of an MOU with CPNWR, providing monthly reports to CPNWR regarding activities and wildlife observations, and holding an annual meeting with DOI agencies to present the annual report and improve coordination. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. We anticipated take in the form of harassment that is likely to injure up to one pronghorn over a 10 year period. The following reasonable and prudent measures were provided: 1) minimize injury of pronghorn through reduced flights, use of administrative roads, and speed limits; 2) monitor and study reactions of pronghorn on BMGR to USBP activities; and 3) provide a means to determine the level of incidental take that results from USBP activities. Several conservation recommendations were also provided. We are not aware of any incidental take attributable to Yuma Sector activities.

BLM's Lower Gila South Management Area

Three biological opinions address BLM's Lower Gila South Management Area. The Lower Gila South Resource Management Plan-Goldwater Amendment (consultation number 02-21-90-F-0042), proposed specific and general management guidance for non-military activities on the BMGR. The non-jeopardy biological opinion, issued April 25, 1990, was programmatic, requiring BLM to consult when site-specific projects are proposed. No incidental take was anticipated. The Lower Gila South Habitat Management Plan (HMP) (consultation number 02-21-89-F-0213) provided management guidance for both specific and general actions in southwestern Arizona. Four actions were addressed in the HMP, including an exchange of 640 acres near Ajo, rehabilitation work on two catchments,

and assessment of livestock removal from pronghorn habitat. Exchange of land out of public ownership may facilitate development or other uses that would preclude use by pronghorn. The non-jeopardy opinion was issued on May 15, 1990. The biological opinion for the Lower Gila South Resource Management Plan and Amendment (consultation number 02-21-85-F-0069) addressed programmatic management of lands in southwestern Arizona, including livestock grazing, wilderness, cultural resources, fire, minerals and energy, recreation, wildlife management, wood cutting, Areas of Critical Environmental Concern, and other land uses. The non-jeopardy biological opinion was issued on March 27, 1998; no incidental take was anticipated. In regard to management on the BMGR, these three opinions have been replaced by the opinion on the BMGR's Integrated Natural Resources Management Plan (INRMP) (see below). The Air Force and MCAS-Yuma have assumed BLM's management responsibilities on the BMGR.

BLM grazing allotments in the vicinity of Ajo, Arizona

The original biological opinion (consultation number 02-21-94-F-0192), issued December 3, 1997, addressed effects to pronghorn resulting from issuance of grazing permits on five allotments, four of which were located near Ajo and Why (Cameron, Childs, Coyote Flat, and Why allotments); and the fifth near Sentinel (Sentinel allotment). All but portions of allotments east of SR 85 were considered to be within the current distribution of the Sonoran pronghorn. Reinitiations resulted in revised biological opinions dated November 16, 2001, September 30, 2002, June 21, 2004, March 3, 2005, and March 8, 2007. Under the current proposed action, the Cameron Allotment is closed, the Sentinel Allotment has been in non-use for several years, the Coyote Flat and Why allotments were combined into one (Coyote Flat Allotment), and the Childs Allotment remains relatively unchanged in terms of management. Effects of livestock grazing activities included reduced forage availability for pronghorn, human disturbance due to livestock management, barriers to movement caused by pasture and allotment fences, and potential for disease transfer from cattle to pronghorn. The March 8, 2007 opinion concluded that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take was anticipated, and none is known to have occurred.

Organ Pipe Cactus National Monument General Management Plan

The original biological opinion (consultation number 02-21-89-F-0078), issued June 26, 1997, addressed implementation of OPCNM's GMP. This opinion was reinitiated six times, resulting in revised biological opinions dated November 16, 2001, April 7, 2003, March 10 and August 23, 2005, March 8, 2007, and December 10, 2009. GMP plan elements included: 1) continuing travel and commerce on SR 85 while enhancing resource protection, 2) seeking designation of OPCNM as the Sonoran Desert National Park, 3) establishment of partnerships, 4) increased wilderness and an interagency wilderness and backcountry management plan, 5) changes in trails, facilities, and primitive camping, and 6) implementation of a Cultural Resources Management Plan. Included were a number of conservation measures to minimize impacts to pronghorn, including "Limiting future development to the area north of the North Puerto Blanco Drive and east of the Senita Basin Road/Baker Mine Trail/Dripping Springs Trail . . .". Effects of the action included human disturbance to pronghorn and habitat due to recreation and management activities. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. In the latest versions of the opinion, no incidental take of pronghorn was anticipated. No incidental

take is known to have occurred. The original opinion was the subject of a lawsuit (Defenders of Wildlife, et al. v. Bruce Babbitt, et al.) and was remanded by the court due to our failure to adequately address the impact of proposed activities on pronghorn. The sixth reinitiation addressed a one-time deviation from the aforementioned conservation measure to allow DHS to construct SBI*net* towers TCA-AJO-170, 302, and 003 and associated access roads outside the area referenced in the conservation measure. OPCNM issued a Special Use Permit for the construction of these towers on OPCNM lands; but all incidental take was addressed as part of the DHS reinitiation, not the GMP. Therefore, incidental take is addressed in the biological opinions on the SBI*net* Ajo-1 Tower Project, discussed below.

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

The original biological opinion (consultation number 02-21-95-F-0114), was issued on April 17, 1996. That opinion was reinitiated and revised opinions were issued November 16, 2001, August 6, 2003, October 21, 2009, and September 17, 2010 (current consultation number is 22410-1995-F-0114 and its reinitiations). These opinions addressed all proposed and authorized actions on the BMGR by MCAS-Yuma, including ongoing and proposed changes to military flights over CPNWR and the BMGR, operation of various training facilities such as landing strips, a rifle range, targets, a parachute drop zone, a transmitter/telemetry system, ground support areas, and Weapons Tactics Instructor courses, conducted twice a year (March-April and October-November) that involve overflights, ground-based activities, and ordnance delivery at targets in BMGR-East. Ground-based activities, such as those of troops and vehicles at ground-support areas, were determined to adversely affect pronghorn habitat use. In areas where helicopters fly particularly low and create noise and visual stimuli, disturbance of pronghorn was anticipated. Ordnance delivery at North and South TACs could disturb pronghorn, and ordnance, live fire, and shrapnel could potentially strike and kill or injure a pronghorn. MCAS-Yuma proposed measures to reduce the direct and indirect impacts of the proposed action, including measures to reduce or eliminate incidental take of Sonoran pronghorn and to minimize destruction and degradation of habitat. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. In the 2003, 2009, and 2010 versions of the biological opinion, no incidental take of pronghorn was anticipated and none is known to have occurred.

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

The original biological opinion (consultation number 02-21-96-F-0094), issued August 27, 1997, addressed military use of the airspace above and the ground space on BMGR-East and CPNWR by Luke Air Force Base. Military activities within the area of overlap with the CPNWR were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. Military activities occurring within BMGR-East included: airspace use, four manned air-to-ground ranges, three tactical air-to-ground target areas, four auxiliary airfields, Stoval Airfield, and explosive ordnance disposal/burn areas. Primary potential effects of the action included habitat loss due to ground-based activities, harassment and possible mortality of pronghorn at target areas, and disturbance of pronghorn due to military overflights. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. This opinion was reinitiated in 2001, 2003, and 2010, resulting in revised opinions dated November 16, 2001, August 6, 2003, and

May 4, 2010. In the latest (2010) opinion, we anticipated take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury; and one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment. The following reasonable and prudent measure was provided: monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring. We are not aware of any take of pronghorn confirmed attributable to Luke Air Force Base use of the ground-surface and airspace on the BMGR. A pronghorn was recently found dead near a target, but the cause of death was impossible to determine because the animal had been heavily scavenged by the time it was found.

During the development of these opinions, Luke Air Force Base made substantial commitments to minimize the effects of their activities on the Sonoran pronghorn, and additionally committed to implementing a variety of recovery projects recommended by the Sonoran Pronghorn Recovery Team.

Western Army National Guard Aviation Training Site Expansion Project

The non-jeopardy biological opinion for WAATS (consultation number 02-21-92-F-0227) was issued on September 19, 1997; however, Sonoran pronghorn was not addressed in formal consultation until reinitiations and revised opinions dated November 16, 2001 and August 6, 2003. The purpose of WAATS is to provide a highly specialized environment to train Army National Guard (ARNG) personnel in directed individual aviator qualification training in attack helicopters. The WAATS expansion project included: 1) expansion of the existing Tactical Flight Training Area, which includes establishing four Level III touchdown sites, 2) development of the Master Construction Plan at the Silver Bell Army Heliport, and 3) establishment of a helicopter aerial gunnery range for use by the ARNG on East TAC of the BMGR. All activities that are part of the proposed action occur outside the current range of the pronghorn, with the exception of training at North TAC. Training at North TAC only occurs when East TAC is closed for annual maintenance and EOD clearances (4-6 weeks each year). Effects to pronghorn at North TAC are minimized by monitoring protocols established by Luke Air Force Base. Training at East TAC could preclude recovery of historical habitat which might otherwise recover if the many other barriers that prevent pronghorn use of East TAC were removed. The November 16, 2001 and August 6, 2003 opinions found that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take was anticipated and none is known to have occurred as a result of the proposed action. ARNG included the following conservation measures as part of their proposed action: 1) they proposed to study the effects of low-level helicopter flights on a surrogate pronghorn population at Camp Navajo (to date this measure has not been implemented), and 2) they committed to funding up to five percent of the emergency recovery actions on the BMGR which they have been doing on an annual basis. In December 2006, the ARNG requested reinitiation of formal consultation on this project based on changes in their mission, the availability of new information, and the inability to implement the aforementioned conservation measure regarding studying the effects of helicopter flights on pronghorn. In January 2007, we sent a letter to ARNG to request additional information and to inform them that reinitiation of formal consultation would not begin until we received the information. To date, ARNG has not responded to our request.

BMGR Integrated Natural Resources Management Plan

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

CBP and USBP Permanent Vehicle Barrier from Avenue C to OPCNM, Arizona

This biological opinion (consultation number 22410-2006-F-0113), issued September 15, 2006, addressed the CBP - Office of the Border Patrol's installation of a permanent vehicle barrier (as well as access improvements, construction/improvement of border roads, and associated maintenance and patrol activities) along sections of the border from the western end of the OPCNM barrier to Avenue C just east of San Luis, Arizona. Effects to pronghorn included 1) disturbance of a narrow swath of habitat along the border, 2) presence of construction crews and vehicles that may disturb or preclude use of the area by pronghorn, 3) presence of maintenance and patrol vehicles and crews along the barrier access road, and 4) dramatic reduction or elimination of illegal drive-throughs and required law enforcement response, with much reduced route proliferation and habitat damage from off-highway vehicles. Included were a number of conservation measures to minimize and offset impacts to pronghorn, including the contribution of funds to establish pronghorn waters and forage enhancement plots. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take of pronghorn was anticipated; however adverse effects were anticipated as a result of the shifting of CBV traffic because of the fence. As mentioned above, subsequent to issuing the biological opinion, the action was changed to include the installation of a section of hybrid-style fence designed to prevent the passage of pedestrians. Because all environmental laws were waived (as permitted by the Real ID Act of 2005) by Secretary of the DHS, CBP never reinitiated consultation with us regarding this change to their proposed action.

CBP and USBP 5.2-Mile Primary Fence near Lukeville, Arizona

This biological opinion (consultation number 22410-2008-F-0011), issued February 11, 2008, addressed the CBP and USBP action to construct and maintain 5.2 miles of primary fence along the U.S.-Mexico border near Lukeville, Arizona. Effects to pronghorn included 1) disturbance of a

narrow swath of habitat along the border, 2) disturbance to pronghorn from construction and maintenance activities, 3) disturbance to pronghorn and their habitat from potential redirection of CBV traffic and ensuing USBP response to the west of the fence; and 4) reduction in CBV and USBP activities north of the fence, with reduced habitat impacts and disturbance to pronghorn. Included were a number of conservation measures to minimize and offset impacts to pronghorn, including the contribution of funds to close and restore unauthorized routes within pronghorn habitat in OPCNM. These funds were provided to OPCNM in 2011 and unauthorized route restoration planning is currently underway. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. No incidental take of pronghorn was anticipated.

SBI*net* Ajo-1 Tower Project, Ajo Area of Responsibility, USBP Tucson Sector, Arizona

This biological opinion (consultation number 22410-F-2009-0089), issued December 10, 2009, addressed the DHS's implementation of the SBI*net* Ajo-1 Tower Project in the Ajo Station's AOR of USBP Tucson Sector, Arizona. The project included the following components: construction, operation, and maintenance of 10 communication and sensor towers; construction, use, and maintenance of new associated access roads; repair, improvement, use, and maintenance of associated approach roads; USBP operations, including relocating and operating a FOB; and implementation of conservation measures for endangered species. The opinion was reinitiated in 2010 and 2011, resulting in revised opinions dated March 15, 2010, April 29, 2011, and December 16, 2011. Adverse effects to pronghorn included: 1) disturbance of Sonoran pronghorn from noise and lights associated with tower, road, and FOB construction, operation, and maintenance; 2) loss of foraging habitat from tower and road construction; 3) increased risk of collision with project construction and maintenance vehicles; 4) continued degradation of habitat from USBP operations; and 5) disturbance of pronghorn from USBP operations, potential shifts in cross-border violator traffic to important pronghorn areas, better access for the public provided by new or improved roads, and the presence of towers in Sonoran pronghorn habitat. Long-term reduction of impacts to Sonoran pronghorn were anticipated if the project results in greater effective control of the border leading to eventual decreased cross-border violator and USBP activity in the project area. Included were a number of BMPs and offsetting measures to avoid, minimize, and offset effects to Sonoran pronghorn resulting from the project, including the contribution of funds to implement Sonoran pronghorn recovery actions. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. We anticipated incidental take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every five years thereafter; and one due to direct mortality over the life of the project. The following reasonable and prudent measures were stipulated: 1) monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring; and 2) minimize harassment of Sonoran pronghorn resulting from the proposed action. To date, we are not aware of any incidental take attributable to the project.

In the approximately one year since the SBI*net* towers became operational, the number of apprehensions of CBVs have increased by 85% within OPCNM and 183% in CPNWR (see Table 6). Additionally, CBV traffic has appeared to have shifted west of the area of coverage of the SBI*net* towers. However, operational control of the area has not been accomplished as quickly as anticipated under the original SBI*net* Ajo-l Tower Project Environmental Assessment and our

subsequent BO. The CBP 2009 Environmental Assessment states "…when the proposed towers become functional as a result of the enhanced detection capabilities, … interdiction efforts would be more focused and off-road interdiction activities would not be expected to increase overall and would decrease over time." The original SBI*net* Ajo-l Tower Project BO states "both on and off-road vehicle travel in pronghorn habitat is likely to result in significant disturbance to pronghorn. Off-road vehicle travel is especially problematic because it intrudes into areas that should act as refuges from human disturbance, and creates new routes that then facilitate increased CBV and USBP travel into pronghorn habitat." The BO goes on to predict that "interdiction along authorized roads should generally increase, and off-road incursions should decrease as compared to current practices. As a consequence, impacts to Sonoran pronghorn from USBP activities will also decrease over time."

NPS notes that CBV vehicle activity has decreased at OPCNM since about 2004 (electronic mail, Tim Tibbitts, OPCNM, 2009 and 2011); however, the number of off-road tracks, and new roads ("unauthorized vehicle routes") in OPCNM continues to increase (electronic mail, Tim Tibbitts, OPCNM, September 1, 2011). There is evidence to suggest that vehicle activity, particularly in remote areas utilized by Sonoran pronghorn, has increased since 2004 by more than 700% (electronic mail from Mark Sturm, OPCNM, August 31, 2011). This is causing ongoing impacts to Sonoran pronghorn habitat. Decreased CBV vehicle traffic in pronghorn habitat as a result of the fences significantly alleviated the adverse effects of illegal (smuggling and migration) vehicle traffic on pronghorn and their habitat. USBP, however, continues to respond (by vehicle, horseback, foot, and aircraft) to ongoing CBV activity (mostly foot traffic) in these areas. Frequently, this required response necessitates driving off of authorized roads. Off-road driving conducted in pronghorn habitat can result in degradation of this habitat and disturbance to pronghorn as discussed above.

Because off-road impacts from a variety of sources are ongoing, and tracking such incursions has proven to be difficult, we believe that the baseline levels of impacts to Sonoran pronghorn that result from these activities are greater now than were described in the original SBI*net* Ajo-l Tower Project BO. Difficulty in defining baseline conditions and tracking take has been increased by the lack of a consistent definition and documentation of off-road incursions by CBP. Because of the lack of easily identifiable criteria for determining if an off-road incursion has occurred, data may not be collected or reported appropriately and, subsequently, the database information may be incomplete. A cooperative mapping and signage project is being implemented by CBP, DOD, BLM, NPS and FWS which should improve the ability of personnel on the ground to identify designated roads and determine when off-road incursions have occurred. However, it is difficult for FWS or CBP to determine how the baseline conditions have changed, whether incidental take has occurred, or if incidental take limits have been exceeded. In an effort to improve implementation of the conditions in the Ajo 1 Tower BO, CBP met with FWS and NPS staff regarding these issues. CBP subsequently indicated that they do not believe the reinitiation criteria have been triggered for this consultation (letter dated August 2, 2012). We are evaluating the effects of the proposed TIMR Program based on the current baseline of the project area which includes ongoing issues related to off-road incursions, human activities, and existing NPS, FWS, BLM and CBP infrastructure and facilities.

Summary of Activities Affecting Sonoran Pronghorn in the Action Area

Historically, livestock grazing, hunting or poaching, and development along the Gila River and Río Sonoyta were all probably important factors in the well-documented Sonoran pronghorn range reduction and apparent population decline that occurred early in the 20th century. Historical accounts and population estimates suggest pronghorn were never abundant in the 20th century, but recently, the estimated size of the wild population in the action area declined from 179 (1992) to 21 (December 2002). Although the proximate cause of the decline during 2002 was drought, human activities limit habitat use options by pronghorn and increase the effects of drought on the sub-population. For example, deVos and Miller (2005) reported that Sonoran pronghorn used areas greater than one kilometer from a road as expected or greater than expected, while using areas less than one kilometer from a road less than expected. Bright and Hervert (2005) concluded that lack of nutritious forage and water increased Sonoran pronghorn fawn mortality. Therefore, we believe that human activities can contribute to increased fawn mortality if such activities prevent access to nutritious forage and water.

Few studies have addressed human disturbance of pronghorn, but Berger et al. (1983) found that human disturbance reduces the foraging efficiency of pronghorn. Krausman et al. (2001) reported that Sonoran pronghorn reacted to ground disturbances (vehicles or people on foot) with a change in behavior 37 percent of the time, resulting in the animals running or trotting away 2.6 percent of the time. Wright and deVos (1986) noted that Sonoran pronghorn exhibit "a heightened response to human traffic" as compared to other subspecies of pronghorn. They noted that "once aware of an observer, Sonoran pronghorn are quick to leave the area. One herd was observed 1.5 hours later 18 kilometers north of the initial observation in October 1984. Other pronghorn have run until out of the observer's sight when disturbed." Hughes and Smith (1990) noted that on all but one occasion, pronghorn ran from the observer's vehicle and continued to run until they were out of sight. Disturbance and flight of ungulates are known to result in a variety of physiological effects that are adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971, Harlow et al. 1987). Frequent disturbance imposes a burden on the energy and nutrient supply of animals (Geist 1971), which may be exacerbated in harsh environments such as those occupied by Sonoran pronghorn. Krausman et al. (2001) also found that fawns and their mothers were more sensitive to human disturbance than other life stages of Sonoran pronghorn.

The U.S. pronghorn sub-population is isolated from other sub-populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Río Sonoyta, which likely were important sources of water and forage during drought periods, has been severed. Since 2002, due to improved drought status and implementation of emergency recovery actions, the wild sub-population increased to 85 in 2010. At 85, however, the wild sub-population is still in grave danger of extirpation due to, among other factors, human-caused impacts, drought, loss of genetic diversity, and predation (Horne 2010, Defenders of Wildlife 1998).

Within its remaining range, the pronghorn is subjected to a variety of human activities that disturb the pronghorn and its habitat, including military training, increasing recreational activities, grazing, significant presence of CBV and subsequent required law enforcement activities. OPCNM (2001)

identified 165 human activities in the range of the pronghorn, of which 112 were adverse, 27 were beneficial, 26 had both adverse and beneficial effects, and four had unknown effects. OPCNM (2001) concluded that in regard to the pronghorn, "while many projects have negligible impacts on their own, the sheer number of these actions is likely to have major adverse impacts in aggregate." MCAS-Yuma (2001) quantified the extent of the current pronghorn range that is affected by select activities and found the following: recreation covers 69.6% of the range, military training on North and South TACs covers 9.8%, active air-to-air firing range covers 5.8%, proposed EOD five-year clearance areas at North and South TACs and Manned Range 1 cover 1.0%, and MCAS-Yuma proposed ground support areas and zones cover 0.29%.

CBV traffic and responding USBP enforcement activities occur throughout the range of the pronghorn, and evidence suggests pronghorn may be avoiding areas of high CBV and enforcement activities. Historically, pronghorn tended to migrate to the southeastern section of their range (southeastern CPNWR, such as south of El Camino del Diablo, and OPCNM, such as the Valley of the Ajo) during drought and in the summer. Within the last several years, very few pronghorn have been observed south of El Camino del Diablo on CPNWR. This suggests CBV and the interdiction of these illegal activities have resulted in pronghorn avoiding areas south of El Camino del Diablo; these areas are considered important summer habitat for pronghorn and may have long-term management and recovery implications (personal communication with Curtis McCasland, CPNWR, 2007). Sonoran pronghorn have historically used the Valley of the Ajo extensively during the fawning period (they primarily entered the Valley through Bates Pass, an extremely critical and narrow Sonoran pronghorn movement corridor). After the establishment of a FOB at Bates Well, which was located in the middle of Bates Pass on OPCNM, few pronghorn have been documented using the Valley of the Ajo, and no pronghorn have been documented entering the Valley of the Ajo through the Bates Pass area. The valleys at CPNWR and OPCNM, which were once nearly pristine wilderness Sonoran Desert, now have many braided, unauthorized routes through them and significant vehicle use by USBP pursuing CBVs (electronic mail, Tim Tibbitts, OPCNM, September 1, 2011). These areas have also been affected by trash and other waste left by CBVs.

Although major obstacles to recovery remain, since 2002, numerous crucial recovery actions have been implemented in the U.S. range of the species, including 10 emergency waters and four forage enhancement plots, with additional waters and forage plots planned. The projects tend to offset the effects of drought and barriers that prevent movement of pronghorn to greenbelts such as the Gila River and Río Sonoyta. A semi-captive breeding facility on CPNWR currently holds 78 pronghorn. This facility will provide pronghorn to augment the existing sub-population and to establish the additional populations east of SR 85 at Kofa NWR and BMGR-East. A new semi-captive breeding facility on Kofa NWR currently holds 20 pronghorn (electronic mail communication with John Hervert, AGFD, October 3, 2012). Additionally, vehicle barriers on the international border on CPNWR and OPCNM are facilitating recovery of pronghorn by drastically reducing the amount of CBV vehicle traffic in pronghorn habitat.

The current range of the pronghorn in the U.S. is almost entirely comprised of lands under Federal jurisdiction; thus authorized activities that currently affect the pronghorn in the action area are almost all Federal actions. These include ongoing military training activities that could negatively affect pronghorn, disturbance from livestock grazing on public lands, and land use prescriptions on BMGR,

CPNWR, and OPCNM. These same Federal agencies also implement various actions which may benefit the pronghorn. Effects from multiple CBP-related infrastructure projects and activities have been reduced through various conservation measures; however, CBV foot traffic and off-road vehicle activity and required Federal law enforcement response have been, and continue to be, significant threats to the pronghorn and its habitat. Prior to November 2001, in seven of 12 biological opinions issued by FWS that analyzed impacts to the pronghorn, we anticipated that take would occur. In total, we anticipated take of five pronghorn in the form of direct mortality every 10-15 years, and an undetermined amount of take in the form of harassment. Given the small and declining population of pronghorn in the U.S. at the time the opinions were written, take at the levels anticipated in the biological opinions would constitute a substantial impact to the population. In fact, based on population viability analysis, the loss of even a single pronghorn per year could significantly threaten species survival (Hosack et al. 2002).

Changes made in proposed actions and reinitiated biological opinions, plus the findings in other opinions from 2001 to the present, reduced the amount or extent of incidental take anticipated to occur from Federal actions. Significantly, action agencies have worked with us to modify proposed actions and to include significant conservation measures that reduce adverse effects to the pronghorn and its habitat. The current opinions that anticipate incidental take are 1) the Yuma Sector BO, in which we anticipated take in the form of harassment that is likely to injure up to one pronghorn in 10 years; 2) the Ajo 1 Tower BO, in which we anticipated take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every 5 years thereafter; and one due to direct mortality over the life of the project; and 3) the Luke Air Force Base BO, in which we anticipated take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury; and one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment. With the exception of likely capture-related deaths during telemetry studies (which were addressed in 10(a)(1)(A) recovery permits), we are unaware of any confirmed incidental take resulting from the Federal actions described here.

We believe the aggregate effects of limitations or barriers to movement of pronghorn and continuing stressors, including habitat degradation and disturbance within the pronghorn's current range resulting from a myriad of human activities, exacerbated by periodic dry seasons or years, are responsible for the present precarious status of the Sonoran pronghorn in the action area (deVos and Miller 2005). However, collaborative, multi-agency and multi-party efforts to develop forage enhancement plots and emergency waters, reduce human disturbance of pronghorn and their habitat, combined with the success of the semi-captive breeding program, plus planned future recovery actions, including establishment of a second U.S. sub-population, provide a path toward the recovery of the Sonoran pronghorn in the U.S. Key to achieving recovery will be a reduction in human disturbance to pronghorn and their habitat (Sonoran Pronghorn Recovery Criteria, Sonoran Pronghorn Recovery Plan Supplement and Amendment, January 2002).

EFFECTS OF THE ACTION

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

There are no interrelated or interdependent actions that are part of the TIMR Program and that are dependent upon the TIMR Program for justification or have no independent utility apart from the TIMR Program. Ongoing and planned CBP activities in southern Arizona to secure the international border have independent utility from the TIMR Program and would continue, although in many cases less efficiently, regardless of implementation of the TIMR Program. Ongoing maintenance activities that are not considered in this BO, including operation of existing maintenance facilities and equipment used for those activities, also have independent utility from the TIMR Program and are not dependent upon it for justification. Thus, this BO only considers the direct, indirect, and cumulative impacts of TIMR Program activities in the description of the proposed action.

There currently are approximately 100 miles of roads and 15 low water points that are within the range of the Sonoran pronghorn. All of these roads are within OPCNM or CPNWR. The Sonoran pronghorn is expected to be affected both directly and indirectly by the proposed action. Short-term, direct adverse effects include disturbance of Sonoran pronghorn from noise and visual stimuli associated maintenance and repair activities. There is also some potential for increased risk of collision with vehicles. Long-term, indirect adverse effects to Sonoran pronghorn may include the introduction of non-native species through project activities.

Disturbance to Sonoran pronghorn as a result of the proposed action will occur in areas of the Sonoran pronghorn's range in proximity to the infrastructure to be maintained or repaired as discussed in the TIMR Program description, including areas like OPCNM and CPNWR, key areas to the survival and recovery of the U.S. population of pronghorn. CPNWR and OPCNM are essential areas for pronghorn, particularly during the fawning period and annual spring warming-drying trend (i.e., pronghorn use these areas under conditions of greatest thermal and hydration stress). Because the Sonoran pronghorn is endangered and the population has failed to increase to a sustainable number in over 40 years, any effects to individual pronghorn have the potential to affect the species as a whole.

Sonoran pronghorn are sensitive to human disturbance (Luz and Smith 1976; Hughes and Smith 1990; Workman et al. 1992; Landon et al. 2003; Krausman et al. 2004). 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.

Evaluating noise effects on pronghorn from anthropogenic factors is difficult, and human caused noise is difficult to assess separately from its visual appearance. Landon et al. (2003) found that, in areas with noise produced by military aircraft, Sonoran pronghorn used the lowest noise level area more than the higher noise level areas. Disturbance and flight of ungulates are known to result in a variety of physiological effects that are adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971, Harlow et al. 1987), which may be exacerbated in harsh environments, such as those occupied by Sonoran pronghorn. Disturbance may also lead to increased risk of predator attack, susceptibility to heat stress and malnutrition, and abandonment of fawns. Behavioral responses such as interrupted activity, vigilance, alert distance, flight distance, and displacement have been used to assess reactions of bighorn sheep to disturbance (Papouchis et al. 2001, Jansen et al. 2006). When compared to physiological stress responses, such as increased heart rate, increased serum cortisol levels, and fecal and urinary corticosteriod levels (MacArthur et al. 1979, Miller et al. 1991, MacArthur et al. 1982, Stemp 1983, Harlow et al. 1987, Hayes et al. 1994, and Keay et al. 2006), bighorn sheep have been shown to have a pronounced physiological stress response to disturbance without showing an overt behavioral response (MacArthur et al. 1982, Stemp 1983).

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). Vehicle traffic is disturbing to pronghorn and will often cause flight or startle responses with associated adverse physiological changes. Hughes and Smith (1990) found that a Sonoran pronghorn immediately ran 1,310-1,650 feet from a vehicle. Krausman et al. (2001 and 2004) found that Sonoran pronghorn reacted to human ground-based stimuli (vehicles and foot traffic) with a change in behavior, including occasionally running or trotting away. Wright and deVos (1986) noted that Sonoran pronghorn exhibit "a heightened response to human traffic" as compared to other subspecies of pronghorn.

Relatively favorable rainfall and forage conditions for pronghorn population growth occurred from 2005-2010. Additionally, 73 pronghorn have been released from the semi-captive breeding pen into the wild population as of January 2012. Forage and water have been provided via several artificial water sources and forage enhancement plots. Nonetheless, the population stayed fairly static during this period (58 pronghorn in 2004, 68 in 2006, 68 in 2008, and 85 in 2010). At 85 animals, this is still a precariously small population. For this population to increase and ultimately recover, other stressors need to be addressed. If drought and human caused disturbance and habitat degradation within the Sonoran pronghorn range in Arizona continue at their current level, Sonoran pronghorn in Arizona may only continue to survive as a result of captive breeding efforts and providing supplemental feed and water for the wild pronghorn population (Horne 2010, Krausman et al. 2005, deVos and Miller 2005). We believe that, based on the identification in the literature of human disturbance as an impact to pronghorn, a significant reduction in disturbance to pronghorn and their habitat is critical to the continued survival and recovery of this species (deVos and Miller 2005, Gavin 2004, Krausman et al. 2004, FWS 2002). With the pen releases, population genetics among the wild herds and resistance to EHD and BTV are likely improving.

Potential impacts on this species include the risk of direct injury and mortality from collisions with maintenance vehicles accessing tactical infrastructure, loss of habitat, behavioral and physiological impacts resulting from noise and other disturbances associated with human presence during maintenance and repair activities, and changes in behavior associated with avoidance of particular areas. However, because maintenance and repair activities would occur infrequently and most repair and maintenance activities would be completed within an area in less than 1 day, it is anticipated that any adverse effects to migration habitat, behavior, and individuals from the proposed project would be minimal. Some proposed actions will result in a very minor loss of Sonoran pronghorn habitat where new erosion-control features and other structures are added. Most of these repairs and upgrades will be confined to roads and drainage channels, which provide limited forage or cover potential for pronghorn, and no significant effects are anticipated to important habitat areas or overall pronghorn habitat suitability. It is anticipated that any adverse effects to migration habitat, behavior, and individuals from the proposed action would be minimal because TIMR Program activities will occur within the existing footprints of the tactical infrastructure. Additionally, impacts to pronghorn will be minimized because all project activities will occur outside of the fawning season (fawning season is from March 15 to July 31) within suitable habitat within the range of the species (Sonoran Pronghorn BMP #3). Substantial impacts to fecundity or mortality are not anticipated due to the implementation of project avoidance and minimization BMPs. Noise, human presence, and vehicles associated with maintenance and repair activities may cause short-term disturbance to Sonoran pronghorn.

Due to the lack of specific research into the effects of human disturbance on Sonoran pronghorn and the general lack of published information related to this species, we must rely on the best available information, including work conducted on other species and personal communications with biologists currently working in the field with Sonoran pronghorn. It is our opinion that human activities and disturbance can affect Sonoran pronghorn by causing behavioral and physiological responses that potentially affect survival and productivity. It is difficult to predict the extent of such effects that may occur as a result of the TIMR Program, particularly when considering the current baseline conditions which include substantial human activity and infrastructure. However, such effects are reasonably certain to occur based on our conversations with biologists in the field, input from the Sonoran Pronghorn Recovery Team, and the published information and grey literature that is available. We believe this is especially true due to the inconsistent occurrence of good range conditions, and the ongoing history of poor range conditions within the range of the Sonoran pronghorn.

Disturbance to Sonoran pronghorn – Direct Effects

Human activity and noise associated with repair and maintenance activities may result in disturbance to Sonoran pronghorn. This disturbance can cause pronghorn to startle and/or flee, travel further distances to find suitable foraging, watering, and resting areas, and result in stress and short-term denial of access to habitat, all of which can result in adverse physiological effects or injury to pronghorn. Fleeing behavior can cause fawns to be abandoned or separated from their mothers, which can leave them vulnerable to predator attack or cause physiological stress that results in death. Disturbance associated with TIMR will be periodic and short-term, and BMPs and CMs will be

implemented to avoid and minimize adverse effects to Sonoran pronghorn to the extent possible. Per Sonoran Pronghorn BMP #1 the number of vehicle trips required for maintenance will be minimized, and per Sonoran Pronghorn BMP # 2 and General BMP #2, work will be delayed when pronghorn are within one mile of the activity site upon arrival and vehicle travel adjusted, depending on the proximity of pronghorn.

Mobilization for this effort will require some increase in vehicle traffic on established unpaved roads in the action area. The total number of trips necessary constitutes a minor increase in current road use levels. Potential direct effects along the access roads arise from traffic noise and the potential for collisions with pronghorn. Vehicles associated with project activities could collide with pronghorn causing injury and/or death. An adult male pronghorn was struck and killed by a vehicle near kilometer post 29 on Mexico Highway 8 in July of 1996 (FWS 2002). We know of only one suspected instance of a pronghorn dying as a result of a vehicle collision on or off roads in Arizona (AGFD email, June 21, 2012); thus we believe the likelihood of this occurring in any one year is very low. However, given that the TIMR Program has no definite end point, there is some likelihood of a vehicle colliding at some point with pronghorn. This is particularly anticipated if, consistent with recovery goals, the pronghorn population grows. We anticipate the potential for vehicle collisions will increase as the number of Sonoran pronghorn released from the captive pens increases. This is, in part, due to an anticipated increase in the number of free-ranging pronghorn, but also due to the fact that, behaviorally, these pronghorn may be more susceptible to collision because of their extended exposure to human activity and vehicles. In addition, conditions related to dust, the position of the sun, and the winding nature of many of the roads in the project area contribute to the reduced visibility of pronghorn that may be in proximity to roads. Biologists working in areas occupied by Sonoran pronghorn have reported a number of near misses with pronghorn as a result of dust or the sun obscuring visibility or the unpredictable behavior of pronghorn adjacent to roads (electronic mail communication with Jim Atkinson, CPNWR, October 5, 2012). The risk of vehicle related collisions will be minimized through implementation of General BMP #2 (suspend work in the vicinity of pronghorn), Wildlife BMP #4 (speed limits), and Roadways and Traffic BMPs (prohibit off-road vehicle travel); and these BMPs collectively will further reduce the likelihood of disturbing pronghorn in the area. Additionally, Sonoran Pronghorn BMPs #1-3 will significantly reduce the potential for vehicle related disturbance.

Human disturbances can be particularly detrimental during certain critical periods of a pronghorn's life or during the year when animals are in poor condition or more vulnerable to injury. Sonoran pronghorn are particularly susceptible to stress caused by disturbance during the fawning season due to increased energetic demands during this period. Disturbance may result in fawn and adult mortality, particularly during drought years, due to the low availability of forage and water resources and consequent decreased fitness of adults and fawns. Furthermore, as noted above, disturbance during the fawning season may cause fawns to be separated from their mothers which can also result in death. As mentioned above, TIMR Program activities will not occur during the Sonoran pronghorn fawning season within the range and habitat of the species. Therefore, we anticipate these activities will not adversely affect pronghorn during this critical period. In the event that TIMR activities are needed during the fawning period, CBP will obtain guidance and authorization from FWS and other relevant Federal land managers prior to conducting any maintenance and repair activities.

Due to the extremely low population numbers and endangered status of this species, there is only limited research on the physiological impacts of human activities on Sonoran pronghorn (Workman 1992), and baseline levels of stress for this species are not currently known. Most researchers agree, however, that noise can affect an animal's physiology and behavior, and if it becomes a chronic stress, noise can be injurious to an animal's energy budget, reproductive success and long-term survival (Radle 1998, Kaseloo and Tyson 2004). The potential for project activities to cause physiological stress to pronghorn is expected to be short-term and minor. Pronghorn may be exposed to noise arising from maintenance and repair activities; however, the level of noise will be reduced through Noise BMP #1. Sonoran pronghorn may be adversely affected by noise and visual impacts of heavy equipment, vehicles, and personnel. Disturbance to pronghorn is anticipated to result from maintenance equipment, vehicles and activities, which may result in energetic stress or harm related to decreased access to resources, particularly during drought and other periods of poor range conditions. Gavin (2004) indicates that intensity of road use affects pronghorn foraging behavior and habitat use. For example, she indicates that there was a trend for pronghorn to increase vigilance and forage less along roads with higher traffic levels. The direct effects of these activities could include increased behavioral changes or stress in Sonoran pronghorn. Project-related maintenance and repair activities will likely result in short-term visual and auditory disturbance of pronghorn. However, CBP will significantly minimize this disturbance by implementing general and species-specific BMPs. Additionally, as mentioned above, the proposed activities will occur outside of the Sonoran pronghorn fawning season.

Disturbance to Sonoran Pronghorn – Indirect Effects

Potential indirect effects on the Sonoran pronghorn include increased potential for fire, introduction and spread of invasive species, and disturbance impacts from increased use and higher speeds on maintained roads. The introduction of exotic species can reduce the quality of pronghorn habitat, potentially affecting pronghorn occurrence and abundance through habitat degradation and altered fire regimes. Indirect impacts through habitat loss and degradation are addressed below. Per Vegetation BMP #6, a fire prevention and suppression plan will be developed and implemented for all maintenance and repair activities that require welding or otherwise have a risk of starting a wildfire. Implementation of Vegetation BMPs #2, #5, #7, #10 will reduce the potential for indirect effects from invasive plant species.

Habitat Loss and Degradation-Direct Effects

The proposed maintenance and repair activities will not result in any additional habitat loss or degradation beyond the existing tactical infrastructure footprint. Vegetation clearing will not occur in suitable habitat within the range of Sonoran pronghorn without further consultation with FWS (General BMP #3). Implementation of Vegetation BMPs #8 and #11 will ensure that disturbance to pronghorn habitat does not occur outside of the existing footprint.

Habitat Loss and Degradation – Indirect Effects

Non-native plants often thrive in disturbed areas (Tellman 2002); hence, construction activities could encourage the spread and establishment of these plants. Specifically, the perimeter of maintained

roads and infrastructure, and continuously created disturbed ground are susceptible to colonization by invasive non-native plants such as buffelgrass, Sahara mustard (*Brassica tournefortii*), and rocketsalad (*Eruca vesicaria*). Non-native species could spread to other areas and may outcompete native species upon which pronghorn rely, or carry fire which could impact pronghorn habitat. The colonization and spread of non-native plants will be minimized by the implementation of a number of measures (Vegetation BMPs #2, #5, #7, #10). Consequently, we believe effects from the TIMR project related to invasive species and fire to be unlikely to occur.

Limited erosion is expected during and immediately following construction activities. However, erosion and changes to natural hydrology will be minimized through implementing standard construction procedures to minimize potential for erosion and sedimentation (Geology and Soil Resources BMPs), and through environmental design measures implemented through TIMR to decrease erosion and sedimentation. However, given the nature of the braided drainage system and the characteristics of the soils in the project area, there is the potential for roads to capture precipitation runoff in an area and not allow it to follow natural drainages. This affects the occurrence and condition of vegetation downstream of the road (electronic mail communication with John Hervert, AGFD, October 3, 2012). Ongoing maintenance may exacerbate this impact if maintenance blocks or removes the opportunity for water to move across roads.

Effects of Conservation Measures and Best Management Practices

BMPs and CMs incorporated into the proposed action, such as those mentioned above, will significantly help minimize project impacts to Sonoran pronghorn and their habitat. However, the exact location and number of miles of roads and other tactical infrastructure to be maintained under the TIMR Program could change over time to accommodate CBP needs. Any additional TIMR Program activities that may be added in the future will be coordinated with FWS, and consulted on if appropriate, as discussed above. Additionally, the TIMR Program, as presented in the Description of the Proposed Action, has no definite end point. For these reasons, it is difficult to predict the effect of every action under the TIMR Program and whether it will be possible to avoid or minimize some potentially adverse effects.

Since Sonoran pronghorn remain critically endangered, it is imperative that adverse effects be offset by actions to benefit or promote the recovery of the species. Accordingly, as an integral part of the proposed action, CBP has made commitments to provide funding in the total amount of $100,000 over the life of the project, which can be used by FWS to implement priority recovery actions for the Sonoran pronghorn, as decided by the Sonoran Pronghorn Recovery Team (i.e., to construct or maintain wildlife waters or forage enhancement plots within the range of the Sonoran pronghorn). The implementation of recovery projects, such as the construction and maintenance of pronghorn waters and forage enhancement plots, will help improve pronghorn fitness, which should help them better withstand the effects of drought and human disturbance. CBP has pledged to work with FWS to ensure impacts on lands administered by Federal agencies are minimized and will work to facilitate pronghorn recovery actions when feasible. This will help further offset impacts to pronghorn from proposed TIMR activities.

Changes in Pronghorn Status with the Proposed Action

The U.S. Sonoran pronghorn population increased from about 21 in 2002 to about 85 or 90 in 2011, and maybe even as high as 100 in 2012, and pronghorn use of OPCNM has increased. As the population increases, it is more likely that a pronghorn will be adversely affected by TIMR activities, particularly during times when they are stressed by lack of forage and water. Proposed project activities that elicit pronghorn response (such as fleeing behavior) or that lead to reduced use of preferred habitat could contribute to decreased physical condition of individual animals, which could result in increased mortality, particularly during times of drought. Three populations of Sonoran pronghorn exist throughout their range, including two in Mexico and one in Arizona. The two smallest populations occur primarily within federally protected lands (in Sonora and Arizona). The largest population occurs primarily outside of protected lands in Mexico and consequently, is at greatest risk (i.e., authorities have much less of an ability to control activities that may harm pronghorn outside of federally-protected lands). The survival of all three of these populations is critical to the survival of this species. However, because the largest population occurs outside of a protected area, ensuring the survival of the two populations within federally-protected areas, including the one in Arizona, is even more imperative.

Of these two populations, the one in Arizona, which comprises 29% of the total number of estimated wild pronghorn, is the only one over which we have management authority. Additionally, critical recovery projects, including the captive breeding pen, forage enhancement plots, and pronghorn waters, are all located in Arizona and, when the number of Sonoran pronghorn in the captive pens are included, the overall percentage of the total population of Sonoran pronghorn in Arizona is approximately 38%. Therefore, although the majority (62%) of Sonoran pronghorn occur outside of the U.S. and will not be affected by the proposed action, because of the importance of the U.S. population, it is critical that project impacts be minimized and offset to the greatest degree possible. Accordingly, as part of its proposed action, CBP will implement or fund the implementation of BMPs and CMs that will avoid, minimize and offset the impacts of the proposed project and will help to ensure that these impacts do not significantly affect the reproduction, numbers, and distribution of Sonoran pronghorn in the wild in Arizona.

Implementing priority recovery actions for pronghorn, such as constructing and maintaining wildlife waters or forage enhancement plots, will help improve pronghorn fitness, which should help them better withstand the effects of drought and human disturbance.

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 BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Most lands within the action area (within the current range of the pronghorn within Arizona) are managed by Federal agencies; thus, most activities that could potentially affect pronghorn are Federal activities that are subject to section 7 consultation. The effects of these Federal activities are not

considered cumulative effects. Relatively small parcels of private and State lands occur within the currently occupied range of the pronghorn near Ajo and Why, north of the BMGR from Dateland to SR 85, and from the Mohawk Mountains to Tacna. State inholdings in the BMGR were 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 the effects of these activities are expected to continue into the foreseeable future. Historical habitat and potential recovery areas currently outside of the current range are also expected to be affected by these same activities on lands in and near the action area in the vicinity of Ajo, Why, and Yuma. Of most significant concern to pronghorn is the high level of CBV activity in the action area. CBV activity and its effects to pronghorn and pronghorn habitat is described under the "Human-caused Disturbance" and "Habitat Disturbance" portions of the "Threats" section under "Status of the Species" for Sonoran pronghorn. CBV activity has resulted in route proliferation, off-highway vehicle activity, increased human presence in backcountry areas, discarded trash, abandoned vehicles, cutting of firewood, illegal campfires, and increased chance of wildfire. Habitat degradation and disturbance of pronghorn have resulted from these CBV activities. Although CBV activity levels are still high, the trend in overall CBV apprehensions and drive-throughs is a decline in recent years within the action area likely due to increased law enforcement presence, the border fence, and the status of the economy in the U.S. Despite high levels of CBV activity and required law enforcement response throughout the action area, pronghorn in the U.S. have managed to increase since 2002, although their use of areas subject to high levels of CBV use and law enforcement appears to have declined.

We believe the aggregate effects of limitations or barriers to movement of pronghorn and continuing stressors, including habitat degradation and disturbance within the pronghorn's current range resulting from a myriad of human activities, exacerbated by periodic dry seasons or years, are responsible for the present precarious status of the Sonoran pronghorn in the action area. Anticipated incidental take has increased recently, and action agencies have worked with us to modify proposed actions and to include significant conservation measures that reduce adverse effects to the pronghorn and its habitat. Collaborative, multi agency and multi-party efforts to develop forage enhancement plots and emergency waters, reduce human disturbance of pronghorn and their habitat, combined with the success of the semi-captive breeding facility, plus planned future recovery actions, including establishment of a second U.S. sub-population, provide a path toward the recovery of the Sonoran pronghorn in the U.S. At the same time, the rate of recruitment in the wild population in the U.S. is not self sustaining. Population gains are being achieved through augmentation from the semi-captive breeding pen. This indicates that for a number of reasons, including persistent physiological stress of individuals, low recruitment levels persist in the wild U.S. Sonoran pronghorn population.

CONCLUSION

The conclusions of this BO are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including any BMPs and CMs that are incorporated into the project design. After reviewing the current status of the Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed activities, and cumulative

effects, it is FWS's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Sonoran pronghorn. Pursuant to 50 CFR 402.02, to "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. No critical habitat has been designated for this species; therefore, none will be affected. Our conclusion is based on our discussion in this document found in the "Effects of the Action" section above, and the following:

1) The proposed action will not directly affect Sonoran pronghorn habitat, and measures have been included to reduce significant indirect effects; any exceptions are subject to additional consultation with FWS.

2) Although we anticipate that activities associated with the proposed action may result in disturbance to pronghorn, the proposed BMPs and CMs will reduce the potential for adverse effects to the Sonoran pronghorn.

3) CMs included in the proposed action (e.g. providing funding to construct or maintain wildlife waters or forage enhancement plots) will help offset adverse effects to Sonoran pronghorn that could result from implementation of the project. Thus, the project is not expected to significantly affect the distribution, numbers, and reproduction of Sonoran pronghorn in the wild.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). "Harass" is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by CBP so that they become binding conditions of any grant or permit issued to the (applicant), as appropriate, for the exemption in section 7(o)(2) to apply. CBP has a continuing duty to regulate the activity covered by this incidental take statement. If CBP (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant, contractor, or permittee to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the contract, permit, or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the

impact of incidental take, CBP must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement. [50 CFR '402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Incidental take of the Sonoran pronghorn is reasonably certain to occur from the continued implementation of the TIMR Program. We anticipate incidental take of Sonoran pronghorn as a result of this proposed action in the form of harassment due to the effects of human disturbance associated with the project, and direct mortality or injury as a result of a collision with a CBP (or contract personnel) vehicle in the project area.

Specifically, incidental take of one Sonoran pronghorn every 10 years, from the time the TIMR Program is initiated for the duration of the TIMR Program, in the form of harassment is anticipated from the following activity:

- Disturbance of pronghorn due maintenance and repair activities in the form of vehicles, heavy equipment, and personnel which causes increased energetic stress and curtailment of access to crucial habitat components.

Additionally, incidental take of one pronghorn over the duration of the TIMR Program is also anticipated in the form of direct mortality from the following activity:

- CBP or contract personnel vehicle use in the action area that may result in a collision with, and injury or mortality of, a Sonoran pronghorn over the life of the TIMR Program.

We anticipate that incidental take in the form of harassment will be difficult to detect. However, reporting requirements will allow us to assess the effects of TIMR activities. Incidental take will have been exceeded, triggering a requirement for reinitiation (50 CFR 402.16[c]) if:

1) During the life of the proposed action, more than one pronghorn is killed or injured due to a collision with a CBP or contract personnel's vehicle, or

2) Based on the annual reporting and discussions with CBP on status of TIMR:

    a. The proposed action results in the loss or degradation of Sonoran pronghorn habitat within the action area beyond the area immediately adjacent to the existing footprint of tactical infrastructure described and covered in this BO. The Project Description indicates that TIMR activities will occur within or immediately adjacent to tactical infrastructure (BA, pg. 4-20). These effects have been analyzed in this BO. However, such actions occurring outside the area immediately adjacent to the existing footprint of the tactical infrastructure have not been evaluated, would likely result in take in the form of harassment, and would trigger the need to reinitiate this consultation; or

    b. TIMR activities within suitable habitat within the range of the pronghorn 1) exceed 150 miles of roads (100 miles are currently anticipated) and 20 low water points (15

are currently anticipated) within the action area, 2) occur more than four times per year for each road segment or infrastructure facility within the action area, or 3) occur between March 15 and July 31 (Sonoran pronghorn fawning season). The Project Description indicates the level and timing of TIMR Program activities (BA, 4-22, A-10, C-16). The above numbers add a buffer of 50 road miles and five low water points to the proposed extent and number of project activities to allow some flexibility, and this extent of effects has been analyzed in this BO. The effects of actions that exceed the number or timing described above represent potential effects and take of an extent that has not been analyzed and would thus trigger reinitiation of this consultation.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the species. If there is a significant decline in the numbers of free-ranging pronghorn, the effects of this level of take may need to be reconsidered per the Reinitiation Statement below.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

A comprehensive suite of BMPs and CMs have been incorporated into the proposed action for the TIMR Program. These conservation measures generally and specifically require CBP to reduce effects to the Sonoran pronghorn and its habitat. No additional reasonable and prudent measures are necessary to minimize incidental take.

If mortality or injury of Sonoran pronghorn is detected, the instructions provided below under "Disposition of Dead or Injured Listed Species" will be followed. In addition, CBP must report activities implemented under the TIMR Program, including the outcome of any monitoring, as well as any potential take of this species, in its annual report to FWS.

Review requirement: Because FWS has determined that no Reasonable and Prudent Measures or Terms and Condition are required beyond the measures outlined in the Proposed Action above, it is imperative that CBP implement the BMPs and CMs described above, including the required monitoring and reporting. If, during the course of the proposed action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the proposed action, potentially through reinitiation of section 7 consultation as described below in the Reinitiation Notice.

CONSERVATION RECOMMENDATIONS

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

1. We recommend CBP continue to pursue funding for Sonoran pronghorn research and conservation needs identified by the Sonoran Pronghorn Recovery Team.

2. We recommend CBP hire and maintain at least one full-time biologist or environmental specialist for both the Tucson and Yuma Sectors to assist CBP with compliance with ESA, NEPA, and other environmental requirements; to provide environmental training to agents; and to coordinate with agencies regarding environmental issues.

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

CHIRICAHUA LEOPARD FROG

STATUS OF THE SPECIES

Description, Legal Status, and Recovery Planning

The Chiricahua leopard frog is distinguished from other members of the *Lithobates pipiens* complex by a combination of characters, including a distinctive pattern on the rear of the thigh consisting of small, raised, cream-colored spots or tubercles on a dark background; dorsolateral folds that are interrupted and deflected medially; stocky body proportions; relatively rough skin on the back and sides; and often green coloration on the head and back (Platz and Mecham 1979). The species also has a distinctive call consisting of a relatively long snore of 1 to 2 seconds in duration (Platz and Mecham 1979, Davidson 1996). Snout-vent lengths of adults range from approximately 2.1 to 5.4 inches (Platz and Mecham 1979, Stebbins 2003).

The Chiricahua leopard frog (*Lithobates [=Rana] chiricahuensis*) was listed as a threatened species without critical habitat in a Federal Register notice dated June 13, 2002. Included was a special rule to exempt operation and maintenance of livestock tanks on non-Federal lands from the section 9 take prohibitions of the Act. Critical habitat was designated in 2012 (FWS 2012) and includes 39 critical habitat units (CHUs) in Arizona and New Mexico. The Ramsey Canyon leopard frog (*Lithobates* "*subaquavocalis*"), found on the eastern slopes of the Huachuca Mountains, Cochise County, Arizona, has recently been subsumed into *Lithobates chiricahuensis* (Crother 2008) and recognized by the FWS as part of the listed entity (FWS 2009, 2012).

The Chiricahua Leopard Frog Final Recovery Plan (Recovery Plan) was finalized in April 2007 (FWS 2007). The goal of the Recovery Plan is to improve the status of the species to the point that it no longer needs the protection of the ESA. The recovery strategy calls for reducing threats to existing populations; maintaining, restoring, and creating habitat that will be managed in the long term; translocation of frogs to establish, reestablish, or augment populations; building support for the recovery effort through outreach and education; monitoring; conducting research needed to provide effective conservation and recovery; and application of research and monitoring through adaptive management. Recovery actions are recommended in each of eight recovery units (RUs) throughout

the range of the species. Management areas (MAs) are also identified within RUs where the potential for successful recovery actions is greatest.

The Recovery Plan identifies eight RUs in Arizona and New Mexico (Figure 8, Table 7). Focus areas, referred to as MAs, are identified within each RU. Management Areas are areas with the greatest potential for successful recovery actions and threat alleviation. Hydrologic units and mountain ranges are used as MA boundaries. Within MAs, sites where metapopulations and robust, isolated populations occur or will be established are referred to herein as "recovery sites." MAs have been delineated to include all habitats of known extant Chiricahua leopard frog populations as well as other sites with the highest potential for recovery, including sites where habitat restoration or creation, and establishment or re-establishment of Chiricahua leopard frog populations will likely occur or has already occurred. We include all known extant populations within MA boundaries because of the high value of those populations for recovery.

For the Chiricahua leopard frog to be recovered, conservation must occur in each RU (Table 7). Successful conservation is not necessary in every MA and recovery does not depend upon an even distribution of recovery efforts across an RU. Rather, we anticipate that recovery efforts will be focused in those MAs and portions of RUs in which opportunities are best. Recovery criteria to delist the Chiricahua leopard frog includes: 1) at least two metapopulations located in different drainages, plus at least one isolated and robust population in each RU, 2) protection of these populations and metapopulations, 3) connectivity and dispersal habitat protection, and 4) reduction or elimination of threats and long-term protection. As noted in the FWS's 1998 Consultation Handbook, RUs are population units that have been documented as necessary to both the survival and recovery of the species. Avoiding loss of populations or other serious adverse effects in a RU will ensure continued contribution of that RU to the recovery of the species.

Existing populations and suitable habitat in MAs will be protected through management. Management will include maintaining or improving watershed conditions both upstream and downstream of Chiricahua leopard frog habitats to reduce physical threats to aquatic sites and allow for Chiricahua leopard frog dispersal, reducing or eliminating non-native species, preventing and managing disease, and other actions. Suitable or potentially suitable unoccupied habitat with high potential for supporting Chiricahua leopard frog populations or metapopulations (referred to here as recovery sites) will be protected, and restored or created as needed, within MAs. These habitats will include aquatic breeding habitats and uplands or ephemeral aquatic sites needed for movement among local populations in a metapopulation. Activities to achieve this include habitat management, removal of non-native species (e.g. American bullfrogs, non-native fishes, and crayfish), enhancing water quality conditions, and reducing sedimentation. Populations of Chiricahua leopard frogs will be established or reestablished in these MAs.

Life History and Habitat

The life history of the Chiricahua leopard frog can be characterized as a complex life cycle, consisting of eggs and larvae that are entirely aquatic and adults that are primarily aquatic, making the species a habitat specialist (FWS 2007). The species has a distinctive call and males can be temporarily territorial (FWS 2007). Amplexus is axillary and the male fertilizes the eggs as the

female attaches a spherical mass to submerged vegetation. Eggs are laid from February into October, with most masses found in the warmer months (FWS 2007). Numbers of eggs in a mass range from 300 to 1,485 (Jennings and Scott 1991) and may be correlated with female body size. The hatching time of egg masses in the wild ranges between 8-14 days, depending on water temperature (FWS 2007). Upon hatching, tadpoles are mainly herbivorous and remain in the water, where they feed and grow, with growth rates faster in warmer conditions. Tadpoles have a long larval period, from three to nine months, and may overwinter. After metamorphosis, Chiricahua leopard frogs eat an array of invertebrates and small vertebrates and are generally inactive between November and February (FWS 2007). Males reach sexual maturity at 2.1-2.2 in (5.3-5.6 cm), a size they can attain in less than a year (Sredl and Jennings 2005). Under ideal conditions, Chiricahua leopard frogs may live as long as 10 years in the wild (Platz et al. 1997, p. 553).

Chiricahua leopard frogs can be found active both day and night, but adults tend to be active more at night than juveniles (Sredl and Jennings 2005). Chiricahua leopard frogs presumably experience very high mortality (greater than 90 percent) in the egg and early tadpole stages, high mortality when the tadpole turns into a juvenile frog, and then relatively low mortality when the frogs are adults (Zug et al. 2001, FWS 2007). Adult and juvenile Chiricahua leopard frogs avoid predation by hopping to water (Frost and Bagnara 1977). They also possess an unusual ability among members of the *Rana pipiens* complex; they can also darken their ventral skin under conditions of low reflectance and low temperature (Fernandez and Bagnara 1991; Fernandez and Bagnara 1993), a trait believed to enhance camouflage and escape predation (FWS 2007).

The Chiricahua leopard frog is an inhabitant of montane and river valley cienegas, springs, pools, cattle (stock) tanks, lakes, reservoirs, streams, and rivers. The species requires permanent or semi-permanent pools for breeding and water characterized by low levels of contaminants and moderate pH, and may be excluded or exhibit periodic die-offs where *Batrachochytrium dendrobatidis* (*Bd*), a pathogenic chytridiomycete fungus, is present (see further discussion of this in the threats section below and in FWS 2012). The diet of the Chiricahua leopard frog includes primarily invertebrates such as beetles, true bugs, and flies, but fish and snails are also eaten (Christman and Cummer 2006).

Prior to the invasion of perennial waters by predatory, non-native species (American bullfrog, crayfish, fish species), the frog was historically found in a variety of aquatic habitat types. Today, leopard frogs in the Southwest are so strongly impacted by harmful non-native species, which are most prevalent in perennial waters, that their occupied niche is increasingly restricted to the uncommon environments that do not contain these non-native predators, and these now tend to be ephemeral and unpredictable. This increasingly narrow realized niche is a primary reason for the threatened status of the Chiricahua leopard frog.

Distribution and Abundance

The range of the Chiricahua leopard frog includes central and southeastern Arizona; west-central and southwestern New Mexico; and, in Mexico, northeastern Sonora, the Sierra Madre Occidental of northwestern and west-central Chihuahua, and possibly as far south as northern Durango (Platz and Mecham 1984, Degenhardt et al. 1996, Lemos-Espinal and Smith 2007, Rorabaugh 2008) (Figure 8). Reports of the species from the State of Aguascalientes (Diaz and Diaz 1997) are questionable.

The distribution of the species in Mexico is unclear due to limited survey work and the presence of closely related taxa (especially *Lithobates lemosespinali*) in the southern part of the range of the Chiricahua leopard frog (see further discussion below).

Males have larger home range sizes than females, with the largest home range for a male documented at 251,769 square ft (7,674 by 32 ft, or 23,390.2 square meters [2,339 by 9.8 m]) (UFWS 2007). The maximum distance moved by a radio-telemetered Chiricahua leopard frog in New Mexico was 2.2 miles (3.5 km) in one direction (preliminary findings of telemetry study by R. Jennings and C. Painter, Technical Subgroup, 2004). In 1974, Frost and Bagnara (1977) noted passive or active movement of Chiricahua and Plains (*Lithobates blairi*) leopard frogs for five miles or more along West Turkey Creek in the Chiricahua Mountains. In August 1996, Rosen and Schwalbe (1998) found up to 25 young adult and subadult Chiricahua leopard frogs at a roadside puddle in the San Bernardino Valley, Arizona. They believed that the only possible origin of these frogs was stock tank located 3.4 miles away. Although amphibians are known to have limited dispersal and colonization abilities due to physiological constraints, limited movements, and high site fidelity (Blaustein et al. 1994), Chiricahua leopard frogs can disperse to avoid competition, predation, or unfavorable conditions (Stebbins and Cohen 1995). Dispersal most likely occurs within favorable habitat, making the maintenance of corridors that connect disjunct populations possibly critical to preserve populations of frogs. Active or passive dispersal (while carried along stream courses) of juveniles or adults to discrete aquatic habitats facilitates the creation and maintenance of metapopulations (FWS 2007), an important option for a water-dependent frog in an unpredictable environment like the arid Southwest.

Population Status in Arizona and Mexico

Evidence indicates that since the time of listing, the species has probably made at least modest population gains in Arizona, but is apparently declining in New Mexico. Overall in the U.S., the status of the Chiricahua leopard frog is either static or, more likely, improving, with much of the increase attributable to an aggressive recovery program that is showing considerable results on the ground through the reestablishment of populations (mainly in Arizona), captive rearing programs, creation of refugial populations, and enhancement and development of habitat have helped stabilize or improve the status of the species in some areas (FWS 2012). In Arizona, there is currently one main captive breeding facility – the Phoenix Zoo. This captive breeding program was established with the Phoenix Zoo in 2005. This program, in concert with habitat restoration activities occurring across Arizona, is contributing to range-wide recovery of the frog. Population status and trends in Mexico are unknown.

Arizona

In Arizona, the frog still occurs in seven of eight major drainages of historical occurrence (Salt, Verde, Coronado, San Pedro, Santa Cruz, Yaqui/Bavispe, and Magdalena river drainages), but appears to be extirpated from the Little Colorado River drainage on the northern edge of the species' range. Within the drainages where the species occurs, it was not found recently in some major tributaries and/or in river mainstems. For instance, the species has not been reported since 1995 from the following drainages or river mainstems where it historically occurred: White River, West

Clear Creek, Tonto Creek, Verde River mainstem, San Carlos River, upper San Pedro River mainstem, Santa Cruz River mainstem, Aravaipa Creek, Babocomari River mainstem, and Sonoita Creek mainstem. In southeastern Arizona, no recent records (1995 to the present) exist for the following areas: Pinaleno Mountains, Peloncillo Mountains, and Sulphur Springs Valley. Moreover, the species is now absent from all but one of the southeastern Arizona valley bottom cienega complexes. Large valley bottom cienega complexes may have once supported the largest populations in southeastern Arizona, but non-native predators are now so abundant that the cienegas do not presently support the frog in viable numbers (FWS 2002).

A review of the status of the species in Arizona from 2002, when the species was listed, to 2009 was conducted by Rorabaugh (2010). A comparison of survey results during 2005-2009 versus 1999-2002 revealed increasing numbers of sites occupied by Chiricahua leopard frogs from 2002-2008. The total number of occupied sites increased from 49 in 2002 to 80 in 2008 and 90 in 2009, while the number of robust breeding populations increased from 5 in 2002 to 13 in 2008, and then declined slightly to 11 in 2009. The total number of breeding populations increased from 26 in 2002 to 34 in 2008 and then declined by 1 for a total of 33 sites in 2009. These trends were also generally reflected at the RU level of analysis. Exceptions included a reduction in number of breeding populations in RU 3 from three to two and in RU 6 from three to zero. Recovery Unit 5 also exhibited a reduction in the number of robust breeding populations from two to zero. Overall, the data suggest that there has been an increase in the number of occupied sites from 2002-2009. However, the increase in sites may only represent a positive response to temporarily favorable environmental conditions (i.e., such as adequate summer rains in rare years that allow for limited dispersal, rather than an intrinsic improvement that will endure over time due to factors such as long-term drought) and/or it could be a result of our underestimating the number of sites in 2002 due to lack of surveys in areas the frog actually occurred in at that time.

The above data suggest substantial gains in the number of known locations of Chiricahua leopard frogs since the time of listing. However, basing status and trends on differences in numbers of occupied sites from 2002-2009 can be problematic for several reasons. First, if increasing trends are accurate, they may represent population response to temporarily favorable environmental conditions, such as adequate summer rains that allow dispersal, rather than an intrinsic improvement that will endure over time. Second, there are sources of bias that affect the conclusions. For instance, both data sets likely underestimate the number of occupied sites existing at the time, because some sites were unknown or surveys had not been conducted within the last three years to categorize all sites as occupied or unoccupied. But there is further bias in the survey data in that the 2009 data set benefits from recent discoveries of populations that could have existed in 2002, but we did not know of them at the time.

The latter type of bias can be eliminated by adding to the 2002 total all of the occupied sites that were discovered after 2002, except for those for which we are reasonably certain were unoccupied in 2002. If analyzed in this way, the total number of occupied sites, in 2002, increases from 49 to 83. This is roughly the same number of occupied sites as in 2008 (85). Based on this, the total number of occupied sites was fairly stable or increasing slightly in Arizona from 2002 (83) to 2008 (85) and 2009 (92). However, this correction inserts yet another type of bias into the sample – analyzed in this way; the 2002 total is based not only on what was found during 1999 to 2002, but also surveys

during period 2003 to 2009. Yet the 2008 and 2009 totals are only based on surveys during 2005-2008 and 2006-2009 respectively. The number of occupied sites in 2009 would no doubt increase if we could add in new sites during the equivalent future period (through 2016). Although we cannot provide an exact number of expected new sites that may be established by 2016, each RU stakeholder group has identified locations for potential new sites, so we potentially could work toward establishing four to eight new sites per year (though not all of these sites are guaranteed to be successful).

As a result, concluding there were 83 extant sites in 2002, 85 in 2008, and 92 in 2009, is likely the worst case scenario, in that this analysis is most likely to show any declines, if they occurred from 2002-2009. The actual trend is probably somewhere between that (roughly stable) to what was concluded in the previous analysis (substantial increases). In conclusion, there is no evidence of decline in Arizona; rather, the data suggest at least modest increases.

Mexico: Sonora and Chihuahua

Based on published and unpublished reports and perusal of Sonora, Mexico collection data from 23 museums, the Chiricahua leopard frog is known from about 26 localities in Chihuahua, Mexico and 19 localities in Sonora (Lemos-Espinal and Smith 2007). *Lithobates [Rana] chiricahuensis* have been reported as far south as the Mexican state of Aguascalientes, but frogs south of central Chihuahua are of questionable identification (FWS 2007). Based on limited surveys, populations of leopard frogs, gartersnakes, and other native aquatic herpetofauna are generally more intact and non-native predators are much less widely distributed in Sonora and at least parts of Chihuahua (Rosen and Melendez 2010, Lemos-Espinal and Smith 2007, Rorabaugh 2008). However, specifically for the Chiricahua leopard frog, data are insufficient to determine status or trends in Mexico. None of the Chiricahua leopard frog localities in Sonora have been revisited recently, with the exception of one in the Sierra Los Ajos. No frogs were found at that site (L. Portillo, pers. comm. 2009). Chiricahua leopard frogs have been observed recently at several sites in Chihuahua (R. Jennings, pers. comm. 2007), but not enough is known to assess status or trends.

Summary of Population Status

In conclusion, the data suggest the status of the Chiricahua leopard frog is at least stable and probably improving in Arizona, declining in New Mexico, and unknown in Mexico. In pooled data for the U.S., a worst case analysis shows essentially no change in the number of occupied sites from 2002 to 2009 (133 versus 131, respectively); however, as discussed above, this likely underestimates the status of the species in Arizona, overestimates the status of the species in New Mexico, and includes data that are not standardized to be truly comparable. The actual situation is probably that the status of the species is stable in the U.S overall, but the different conditions between Arizona and New Mexico indicate that improvement is occurring only in Arizona at this time, while in New Mexico, frog numbers continue to decline. Continued and new aggressive recovery actions are needed to address threats to the species rangewide, to maintain positive trends in Arizona, to stabilize population losses in New Mexico, and to assist partners in Mexico with their conservation efforts. If on-going recovery actions are interrupted, drought worsens, or other threats intensify, the status of the species across its range could easily deteriorate.

Threats

The primary threats to this species are predation by non-native organisms and die-offs caused by a fungal skin disease – chytridiomycosis. The chytridiomycete skin fungus, (*Bd* is the organism that causes chytridiomycosis) is responsible for global declines of frogs, toads, and salamanders (Berger et al. 1998, Longcore et al. 1999, Speare and Berger 2000, Hale 2001). Additional threats include: drought, floods, degradation and loss of habitat as a result of water diversions and groundwater pumping, poor livestock management, altered fire regimes, mining, development, and other human activities; disruption of metapopulation dynamics, resulting from an increased chance of extirpation or extinction resulting from small numbers of populations and individuals, and environmental contamination (FWS 2007). Loss of Chiricahua leopard frog populations is part of a pattern of global amphibian decline, suggesting other regional or global causes of decline may be important as well (Carey et al. 2001). Witte et al. (2008) analyzed risk factors associated with disappearances of ranid frogs in Arizona and found that population loss was more common at higher elevations and in areas where other ranid population disappearances occurred. Disappearances were also more likely where introduced crayfish occur, but were less likely in areas close to a source population of frogs.

Critical Habitat

The 2012 final rule for the designation of critical habitat includes 39 CHUs across the range of the species in Arizona and New Mexico (FWS 2012). Through the critical habitat designation process, the FWS determined the Primary Constituent Elements (PCEs) for the Chiricahua leopard frog. We consider the PCEs to be the elements of the physical or biological features (PBFs) that provide for a species' life history processes and are essential to the conservation of the species.

Based on the above needs and our current knowledge of the life history, biology, and ecology of the species, and the habitat requirements for sustaining the essential life-history functions of the species, we have determined that the PCEs essential to the conservation of the Chiricahua leopard frog are:

1. Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:

    a. Standing bodies of fresh water (with salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, off-channel pools, and other ephemeral or permanent water bodies that typically hold water or rarely dry for more than a month. During periods of drought, or less than average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they would still be considered essential breeding habitat in non-drought years.

    b. Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, but emergent vegetation does not completely cover the surface of water bodies.

c. Non-native predators (e.g., crayfish (*Orconectes virilis*), American bullfrogs (*Lithobates catesbeiana*), non-native predatory fishes) absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog.

d. Absence of chytridiomycosis, or if present, then environmental, physiological, and genetic conditions are such that allow persistence of Chiricahua leopard frogs.

e. Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.

2. Dispersal and non-breeding habitat, consisting of areas with ephemeral (present for only a short time), intermittent, or perennial water that are generally not suitable for breeding, and associated upland or riparian habitat that provides corridors (overland movement or along wetted drainages) for frogs among breeding sites in a metapopulation with the following characteristics:

a. Are not more than 1.0 mile (1.6 kilometers) overland, 3.0 miles (4.8 kilometers) along ephemeral or intermittent drainages, 5.0 miles (8.0 kilometers) along perennial drainages, or some combination thereof not to exceed 5.0 miles (8.0 kilometers).

b. In overland and non-wetted corridors, provides some vegetation cover or structural features (e.g., boulders, rocks, organic debris such as downed trees or logs, small mammal burrows, or leaf litter) for shelter, forage, and protection from predators; in wetted corridors, provides some ephemeral, intermittent, or perennial aquatic habitat.

c. Are free of barriers that block movement by Chiricahua leopard frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres (20 hectares) or more in size and contain predatory non-native fishes, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.

d. With the exception of impoundments, livestock tanks, and other constructed waters, critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries.

The purpose of the designation of critical habitat is to conserve the PCEs essential to the conservation of the species through the identification of the appropriate quantity and spatial arrangement of the PCEs sufficient to support the life-history functions of the species. Because not all life-history functions require both PCEs, not all areas designated as critical habitat contain both PCEs. Each of the areas designated as critical habitat have been determined to contain sufficient PCEs, or with reasonable effort, PCEs can be restored to provide for one or more of the life-history functions of the Chiricahua leopard frog.

All areas designated as critical habitat will require some level of management to address the current and future threats to the Chiricahua leopard frog and to maintain or restore the PCEs. Special

management in aquatic breeding sites will be needed to ensure that these sites provide water quantity, quality, and permanence or near permanence; cover; and absence of extraordinary predation and disease that can affect population persistence. In dispersal habitat, special management will be needed to ensure frogs can move through those sites with reasonable success.

Approximately 31 percent of all critical habitat for the Chiricahua leopard frog is located on five national forests in Region 3 (the Coronado, Gila, Tonto, Coconino, and Apache-Sitgreaves national forests). In total, approximately 3,265 acres of critical habitat occurs on these five national forests and the majority of these CHUs are represented by populations occupying cattle tanks.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the 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.

Status of the Chiricahua Leopard Frog in the Action Area

The area encompassed by the proposed action occupies a significant portion of the range of the species in the U.S. and, therefore, the species' status in the action area is similar to the rangewide status. The TIMR Program's action area and proposed infrastructure, relative to the range of Chiricahua leopard frog, is included in Appendix C of the BA and is incorporated herein by reference. The proposed project occurs in three RUs identified in the Chiricahua leopard frog recovery plan: RU 1, RU 2, and RU 3.

Recovery Unit 1 (Tumacacori-Atascosa-Pajarito Mountains, Arizona and Mexico) contains several population and breeding sites. Sycamore Canyon is the only significant site with moving water in RU 1 to support breeding frogs; most other sites are livestock tanks or impounded springs. The Sycamore Canyon site which includes the Bear Valley Ranch Tank, Rattlesnake Tank, and Atascosa Canyon downstream of Bear Valley Ranch were all occupied by frogs at the time of listing. Within Sycamore Canyon occupied tanks include the following: Yank Tank, North Mesa Tank, South Mesa Tank, and Bear Valley Ranch Tank. Bonita Tank and Mojonera Tank are considered occupied breeding sites. In wet years, Upper Turner Tank has been known to be occupied. Peña Blanca Lake/Spring and Associated Tanks is the third population area that includes Peña Blanca Lake, Peña Blanca Spring, Summit Reservoir, Tinker Tank, Thumb Butte Tank, and Coyote Tank. These sites were all occupied in 2009. Adult frogs and tadpoles were found in Peña Blanca Lake in 2009 and 2010, after the lake had been drained and then refilled, which eliminated the non-native predators. However, early in 2010, rainbow trout (*Oncorhynchus mykiss*) were restocked back into the lake by AGFD, and they plan to reestablish a variety of warm water fishes as well. Three additional waters including Sierra Tank East, Sierra Tank West, and Sierra Well may have the potential to support breeding with habitat work.

Recovery Unit 2 (Santa Rita-Huachuca- Ajos Bavispe, Arizona and Mexico) also contains several population sites. The Florida Canyon site was augmented with frogs from elsewhere in the Santa Rita Mountains in 2009. The site was enhanced in 2010, with the addition of a steel tank for breeding. The eastern slope of the Santa Rita Mountains is another population site which includes two metal troughs in Louisiana Gulch, Greaterville Tank, Los Posos Gulch Tank, and Granite Mountain Tank complex. The Granite Mountain Tank complex includes two impoundments and a well. All but Los Posos Gulch Tank are currently occupied breeding sites. More than 60 frogs were observed at Los Posos Gulch Tank in 2008 which was once thought to be a robust breeding site; however, it dried, and the frogs disappeared in 2009. Scotia Canyon is another population area where breeding habitat occurs at Peterson Ranch Pond and possibly at other perennial or nearly perennial pools. Frogs were reestablished in this canyon via a translocation in 2009; the last record of a frog in the canyon before that was 1986. A population of the Ramsey Canyon leopard frog was located at Carr Barn Pond. The Coronado National Forest created and now maintains Carr Barn Pond consistent with the Ramsey Canyon (=Chiricahua) leopard frog conservation agreement, to which they are a signatory. This site was occupied in 2009, but the population has since been eliminated, probably by *Bd*. Brown and Ramsey Canyons have been intensively managed for the Ramsey Canyon (=Chiricahua) leopard frog since 1995. Places where frogs have bred and that still retain habitat needed for the leopard frog include Ramsey Canyon, Trout and Meadow Ponds on private lands owned by The Nature Conservancy, and the Ramsey Canyon Box; and in Brown Canyon, the Wild Duck Pond, House Pond, and the Brown Canyon Box.

Recovery Unit 3 (Chiricahua Mountains- Malpai Borderlands-Sierra Madre, Arizona, New Mexico, and Mexico) includes the Peloncillo Mountains. Areas where frog populations occur or have occurred include Geronimo, Javelina, State Line, and Canoncito Ranch Tanks; Maverick Spring; and pools or ponds in the Cloverdale Cienega and along Cloverdale Creek below Canoncito Ranch Tank. Breeding occurs in State Line and Canoncito Ranch Tanks, and possibly other aquatic sites. In the Chiricahua Mountains, John Hands Pond (the type locality for the Chiricahua leopard frog) and a spring-fed pond at the Southwest Research Station are managed for frog recovery however, no frogs have been observed at the site since 1977.

Status of Critical Habitat Within the Action Area

Critical habitat for the Chiricahua leopard frog has been designated for 39 units, 12 of which are within the action area, composing 2,991 acres. These CHUs are as follows: Twin Tanks and Ox Frame Tank; Garcia Tank; Buenos Aires NWR Central Tanks; Bonita, Upper Turner, and Mojonera Tanks; Sycamore Canyon; Peña Blanca Lake and Spring and Associated Tanks; Florida Canyon; Eastern Slope of the Santa Rita Mountains; Scotia Canyon; Carr Barn Pond; Ramsey and Brown Canyons; and Cave Creek. Each unit includes one to several tanks, springs, ponds, or other aquatic habitat and many also include dispersal habitat such as perennial, ephemeral, or intermittent drainages. Critical habitat extends for 6.1 meters (20 feet) beyond the high water line or boundary of the riparian and upland vegetation of each pond, tank, or spring, and also extends 100 meters (328 feet) upstream of that aquatic habitat. Critical habitat also extends 100 meters (328 feet) on either side of most drainages included as dispersal or other habitat. The information provided below describes the status of critical habitat in the action area within RUs and CHUs.

Recovery Unit 1 (Tumacacori-Atascosa-Pajarito Mountains, Arizona and Mexico)

Twin Tanks and Ox Frame Tank CHU

This unit include 1.3 acres (0.5 ha) of lands owned by the Arizona State Land Department and 0.4 acres (0.2 ha) of private lands in the Sierrita Mountains, Pima County, Arizona. Twin Tanks is on lands owned and managed by the Arizona State Land Department and consists of two tanks in proximity to each other as well as a drainage running between them. Ox Frame Tank is on private lands. Occupancy of these livestock tanks at the time of listing is unknown, as they were not surveyed for frogs until 2007; however, these sites are important breeding sites for recovery.

Twin Tanks held more than 1,000 frogs in 2008, and is a robust breeding population. Ox Frame and Twin tanks are too far apart (4.3 miles [7.0 km] overland) across rugged terrain to expect frogs to move between these sites. Hence, these tanks serve as isolated populations. PCE 1 is present at both sites. The Twin Tanks area is less than 0.5 miles (0.8 km) upslope of active mining at Freeport McMoRan's Sierrita Copper Mine and could be affected by those mining activities. Both sites are also at risk of introduction of nonnative predators, such as bullfrogs and crayfish. Presence of *Bd* at these tanks has not been investigated.

Garcia Tank CHU

This unit, consisting of 0.7 acres (0.3 ha), is a former cattle tank located on the Buenos Aires NWR, Pima County, Arizona. It is a double tank; the southwest or downstream impoundment is what dependably holds water, but both parts of the tank are proposed as critical habitat. This was occupied at the time of listing and currently contains sufficient PCEs (PCE 1) to support life-history functions essential for the conservation of the species. This unit is a breeding site, and was known to have been occupied in 2002 and 2006. Leopard frogs were noted in 2010, but they were not identified to species (the lowland leopard frog, *Lithobates yavapaiensis*, is known to occur in the area). It is about 3.6 miles (5.8 km) over land across dissected and hilly terrain to the next nearest population at Lower Carpenter Tank. The nearest known populations to the east are on the Coronado National Forest more than 9.0 miles (14 km) away. Hence, this site is isolated and is managed as an isolated, robust population. The greatest threats needing management are introductions of or colonization by nonnative species, such as bullfrogs and crayfish; and drought that could greatly reduce or eliminate the aquatic habitat.

Buenos Aires National Wildlife Refuge Central Tanks CHU

This unit, consisting of 1,720 acres (696 ha) within the Buenos Aires NWR, Pima County, Arizona, includes former cattle tanks and other waters used as breeding and dispersal sites plus intervening and connecting drainages and uplands. This unit was occupied at the time of listing and currently contains sufficient PCEs (PCEs 1 and 2) to support life-history functions essential for the conservation of the species.

Core breeding sites at permanent or nearly permanent tanks (Carpenter, Rock, State, Triangle, and New Round Hill) support the strongest metapopulation known within the range of the species. Chongo Tank, where a population was established in 2009, may become a sixth breeding site. Seven other tanks support frogs periodically to regularly, and breeding and recruitment likely takes place at these tanks in wet cycles. Frogs occupied Carpenter, Rock, and Triangle Tanks in 2002 at or about the time of listing. Tanks include Carpenter, Rock, State, Triangle, New Round Hill, Banado, Choffo, Barrel Cactus, Sufrido, Hito, Morley, McKay (a cluster of three tanks), and Chongo Tanks. Also included in this unit are the intervening drainages, including: (1) Puertocito Wash from Triangle Tank north through and including Aguire Lake to New Round Hill Tank, then upstream to the confluence with Las Moras Wash, and upstream in Las Moras Wash to Chongo Tank; (2) an unnamed drainage from Puertocito Wash upstream to McKay Tank; (3) an unnamed drainage from Puertocito Wash upstream to Rock Tank, including Morley Tank, then upstream in an unnamed drainage to the top of that drainage, directly overland to an unnamed drainage, and then upstream to Hito Tank and downstream to McKay Tank; (4) from Sufrido Tank downstream in an unnamed drainage to its confluence with an unnamed drainage running between Rock and Morley tanks; (5) Lopez Wash from Carpenter Tank downstream to Aguire Lake; (6) an unnamed drainage from its confluence with Lopez Wash upstream to Choffo Tank; (7) an unnamed drainage from its confluence with Lopez Wash upstream to State Tank; (8) an unnamed drainage from Banado Tank downstream to its confluence with an unnamed drainage, then upstream in that drainage to Barrel Cactus Tank; and (9) an unnamed drainage from Banado Tank upstream to a saddle, then directly downslope to Lopez Wash.

In this unit, bullfrogs remain a threat, but efforts are underway to eliminate the last known populations of bullfrogs in the Altar Valley (on the Santa Margarita Ranch to the south of Buenos Aires NWR). Frogs in this area have tested positive for *Bd*, but the disease appears to have little effect on population viability.

Bonita, Upper Turner, and Mojonera Tanks CHU

This unit includes 201 acres (81 ha) of Coronado National Forest lands in the Pajarito and Atascosa Mountains, Santa Cruz County, Arizona. Two breeding sites (Bonita Tank and Mojonera Tank), combined with a dispersal site or site where breeding and recruitment may occur in wet years (Upper Turner Tank), form the center of a future metapopulation. Three additional waters—Sierra Tank East, Sierra Tank West, and Sierra Well—may have the potential to support breeding with habitat work. Frogs currently occupy Bonita and Mojonera Tanks. Frogs were last found at Upper Turner Tank in 2004.

In this unit, bullfrogs are a continuing threat, and illegal border activity and associated law enforcement have resulted in watershed damage. A road on the berm of Upper Turner Tank is scheduled for improvement to access a surveillance tower operated by CBP. Frogs in this region have tested positive for *Bd*, but the disease appears to have little effect on population persistence.

Sycamore Canyon CHU

This unit includes 262 acres (106 ha) of Coronado National Forest land and 7 acres (3 ha) of private lands along Atascosa Canyon through Bear Valley Ranch in the Pajarito and Atascosa Mountains, Santa Cruz County, Arizona Sycamore Canyon, Yank Tank, North Mesa tank, South Mesa Tank, and Bear Valley Ranch Tank are currently occupied. The current occupancy status of Rattlesnake Tank and Atascosa Canyon downstream of Bear Valley Ranch Tank is unknown. Sycamore Canyon from Ruby Road to the international border supports frogs and breeding, but in the driest months (May and June) the stream dries to pools.

Bullfrogs have been a continuing problem in this unit, although recent control efforts seem to have eliminated them from Sycamore Canyon. Non-native green sunfish (*Lepomis cyanellus*) have occasionally been found in Sycamore Canyon, as well. Pools critical to survival of frogs and tadpoles through the dry season, are sensitive to sedimentation and erosion upstream in the watershed of Sycamore Canyon. The earliest records of *Bd* in Arizona are from Sycamore Canyon (1972). A robust population of Chiricahua leopard frogs persists at this site despite the disease and periodic die-offs. Illegal border activity and associated law enforcement have resulted in many trails and new vehicle routes in the area, as well as trampling in the canyon.

Peña Blanca Lake and Spring and Associated Tanks CHU

This unit includes 202 acres (82 ha) on Coronado National Forest lands in Santa Cruz County, Arizona. This unit is a metapopulation that includes Peña Blanca Lake, Peña Blanca Spring, Summit Reservoir, Tinker Tank, Thumb Butte Tank, and Coyote Tank. These sites were all occupied in 2009.

Chiricahua leopard frogs and tadpoles were found in Peña Blanca Lake in 2009 and 2010, after the lake had been drained and then refilled, which eliminated the non-native predators. However, early in 2010, rainbow trout were stocked back into the lake, and plans were underway to reestablish a variety of warm water fishes in the spring of 2012. Despite the stocking of rainbow trout, Peña Blanca Lake now boasts a robust population of Chiricahua leopard frogs; the largest single population throughout its range. Surveys of the lake in April 2011, confirmed that Chiricahua leopard frogs remained extant. Surveys of the lake in September 2011, estimated the Chiricahua leopard frog population to number between 300-500 individuals which is likely a low estimate because only a single night survey was performed and the shoreline habitat was complex, making observations difficult. During that survey, Chiricahua leopard frogs were calling, indicating that fall breeding may have been occurring (AGFD unpublished data).

Non-native introduced predators, particularly bullfrogs and sportfish, remain a serious threat in this region. A concerted effort began in 2008 to clear the area of bullfrogs. The effort appears to be successful, and Chiricahua leopard frogs have clearly benefited. However, there is a continuing threat of recolonization or purposeful introduction of bullfrogs, and management of this area will continue to concentrate on preventing bullfrogs from decolonizing the area and eliminating those that do. As discussed, warmwater sportfish at Peña Blanca Lake were stocked in the spring of 2012,

which will affect the suitability of the lake as Chiricahua leopard frog habitat. However, given the management against bullfrogs and ensuring the persistence of dense shoreline vegetation, the proposed stocking of warmwater fish would not result in adverse modification of this CHU. Frogs in this region have tested positive for *Bd*; however, the disease appears to have little effect on population persistence.

Recovery Unit 2 (Santa Rita-Huachuca-Ajos Bavispe, Arizona and Mexico)

The requisite number of metapopulations (two) and isolated, robust populations (one) have not been met (Criterion 1) for this recovery unit, although we are working toward metapopulations meeting the definition in the recovery plan on the eastern slope of the Santa Rita Mountains and on the southeastern slopes of the Huachuca Mountains. An isolated, robust population occurs at Beatty's Guest Ranch in the Huachuca Mountains and is the most stable, robust population in this RU. Several other isolated populations also occur scattered across the RU, and we are currently working with partners to build a metapopulation in the Las Cienegas area.

The appropriate protection and management of habitats for persistence of two metapopulations and connectivity have not been met (Criteria 2 and 3). However, dispersal sites and corridors for connectivity have been established in the Huachuca Mountains (e.g. Ramsey Canyon), and various conservation plans and Safe Harbor Agreements have been developed or are in development in this RU. Threats have not been eliminated (Criterion 4). American bullfrogs, crayfish, *Bd*, non-native fishes, illegal border activities and law enforcement response, and wildfire continue to threaten Chiricahua leopard frogs in this RU.

American bullfrogs, crayfish, *Bd*, non-native fishes, illegal border activities and law enforcement response, and wildfire continue to threaten Chiricahua leopard frogs in this RU. The status of the Chiricahua leopard frog is relatively stable and threats are increasing.

Florida Canyon CHU

Florida Canyon includes 4 acres (2 ha) and is all on the Coronado National Forest in the Santa Rita Mountains, Pima County, Arizona. Included in the proposal is approximately 1,521 feet (463 m) of Florida Canyon from a silted-in dam to the downstream end of the Florida Workstation property. PCE 1 is present and was enhanced in 2010, with the addition of a steel tank for breeding. Chiricahua leopard frogs currently occupy this site. This is considered an isolated population.

Water is a limiting factor in this system, particularly during drought. Fire in the watershed could result in scouring and sedimentation in the pools important as habitat for the frog. The addition of a steel tank will provide dependable water for breeding that is safe from erosion or sedimentation events. Introduced predators and *Bd* are potential threats, but neither has been recorded at this site.

Eastern Slope of the Santa Rita Mountains CHU

This unit includes 172 acres (70 ha) of Coronado National Forest lands and 14 ac (6 ha) of private lands in the Greaterville area in Pima County, Arizona. PCEs 1 and 2 are present. Included in the

CH designation are two metal troughs in Louisiana Gulch, Greaterville Tank, Los Posos Gulch Tank, and Granite Mountain Tank complex. The Granite Mountain Tank complex includes two impoundments and a well. All but Los Posos Gulch Tank are currently occupied breeding sites. More than 60 frogs were observed at Los Posos Gulch Tank in 2008. It was once thought to be a robust breeding site; however, it dried, and the frogs disappeared in 2009. These four sites collectively form a metapopulation.

Surface water is a primary limiting factor in this unit. The breeding habitat at Louisiana Gulch, although limited to two 6.0-ft (1.8-m) diameter steel tanks, is dependable because it is fed by a well. The other tanks are filled by runoff and susceptible to drying during drought. Nonnative predators and *Bd* are not known to be imminent threats in this area.

Scotia Canyon CHU

This unit includes 70 acres (29 ha) in Scotia Canyon, Huachuca Mountain, Cochise County, Arizona, and is entirely on Coronado National Forest lands. Breeding habitat occurs at Peterson Ranch Pond and possibly at other perennial or nearly perennial pools. Chiricahua leopard frogs were reestablished in this canyon via a translocation in 2009; the last record of a Chiricahua leopard frog in the canyon before that was 1986. PCEs 1 and 2 are present. This site is managed as an isolated population, but there is some potential for creating connectivity to the metapopulation in Ramsey and Brown Canyons via population reestablishment in Garden Canyon at Fort Huachuca. Scotia Canyon, with its pond and stream habitats, has the potential to be a robust population.

Intensive bullfrog eradication and habitat enhancement work has been done in preparation for reestablishing the Chiricahua leopard frog. However, bullfrog reinvasion is a significant, continuing threat, and other nonnative predators could potentially reach Scotia Canyon via natural or human assisted releases. In addition, barred tiger salamanders from the Peterson Ranch Pond tested positive for *Bd*, but the frogs appeared to be persisting in that same pond. Further, heavy fuel loads could result in a catastrophic wildfire, which would have significant detrimental effects on the frog and its aquatic habitats. Finally, a road through the canyon is eroded in places and contributes sediment to the stream; it receives much use by recreationists and CBP.

Carr Barn Pond CHU

This unit includes 0.6 acres (0.3 ha) of Coronado National Forest lands in the Huachuca Mountains, Cochise County, Arizona. This population is considered isolated. We believe PCE 1 is present. Carr Barn Pond is an impoundment with a small, lined pond with water provided from a well. During runoff events, the size of the pond expands considerably and then gradually shrinks back to the lined section. The population has since been eliminated, probably by *Bd*. The unit has a history of nonnative predator problems and disease. The population has been eliminated after *Bd* dieoffs three times; twice the population has subsequently been reestablished through translocations. Largemouth bass (*Micropterus salmoides*) have been introduced illegally into the pond and then removed, and bullfrogs periodically invade the site but are promptly removed before they breed.

Ramsey and Brown Canyons CHU

This unit includes 49 acres (20 ha) of private lands in Ramsey Canyon and 58 acres (24 ha) of Coronado National Forest in Brown and Ramsey Canyons, Huachuca Mountains, Cochise County, Arizona. PCEs 1 and 2 are present within this unit. This unit is managed as a metapopulation. Places where Chiricahua leopard frogs have bred and that still retain PCE 1 include Ramsey Canyon, Trout and Meadow Ponds on private lands owned by The Nature Conservancy, and the Ramsey Canyon Box; and in Brown Canyon, the Wild Duck Pond, House Pond, and the Brown Canyon Box (on Coronado National Forest lands).

Ramsey Canyon and Brown Canyon are considered currently occupied, but although frogs have bred at the Box in Brown Canyon, the site is too small to support more than just a few frogs. In addition, recent die-offs associated with *Bd* have significantly reduced populations in both canyons. The House and Wild Duck ponds as well as Ramsey Canyon have a history of *Bd* outbreaks. The Ramsey Canyon population has been eliminated twice and then reestablished; the Wild Duck and House Ponds have also undergone repeated disease-related declines and extirpations followed by reestablishments. The populations tend to persist for months or years after reestablishment only to experience epizootic (an outbreak of disease affecting many animals of one kind at the same time) *Bd* outbreaks followed by declines or extirpation.

Additional threats in this unit include nonnative species, drying, sedimentation, and fire. Non-native predators threaten populations at the House and Wild Duck Ponds, where bullfrogs have been found periodically and goldfish (*Carassius auratus auratus*) were once introduced. Those two ponds are buffered against drought and drying by a pipeline from a spring and a windmill. However, the Box in Brown Canyon is subject to low water and drying during drought. That latter population depends upon immigration or active reestablishment for long-term persistence. The Trout and Meadow Ponds in Ramsey Canyon are fed by pipelines; thus the water supply is dependable. The Trout Pond could however be filled in with sediment during a flood. Further, a fire in the watershed could threaten aquatic breeding sites in both canyons.

Recovery Unit 3 (Chiricahua Mountains-Malpai Borderlands-Sierra Madre, Arizona, New Mexico, and Mexico)

Cave Creek CHU

This unit includes 234 acres (95 ha) of Coronado National Forest lands in the Chiricahua Mountains, Cochise County, Arizona. Chiricahua leopard frogs and tadpoles were released during the fall of 2011 into a pond on the Southwestern Research Station where they were initially reared in an on-site ranarium. Included in this unit is Cave Creek and associated ponds in or near the channel, from Herb Martyr Pond downstream to the eastern USFS boundary. PCEs 1 and 2 are present. This site will be managed as a metapopulation.

Herb Martyr Pond is the type locality for the Chiricahua leopard frog; however, no frogs have been observed at the site since 1977. The pool behind the dam is entirely silted in, and pools at the base of the dam are probably not adequate for Chiricahua leopard frog survival or reproduction. However,

with restoration this site could once again support Chiricahua leopard frogs. The pond below the dam at John Hands appears suitable for occupancy, but Chiricahua leopard frogs have not been recorded there since 1966. Chiricahua leopard frogs were occasionally seen in Cave Creek through 2002.

Scarcity of water can occur in drought years and bullfrogs occur to the east but have never been recorded in the unit. The current status and past history of *Bd* in this unit are unknown. Rainbow trout were present and occurred concurrently with Chiricahua leopard frogs at Herb Martyr Pond, but no trout are currently known in the unit.

Wildland Fires

Recent wildfires may have affected the PCEs of designated critical habitat for the frog. Areas containing designated critical habitat units may have experienced a range of burn severities and fire could have removed all or a portion of the surrounding vegetation component (including trees, shrubs, grasses, and forbs). Post-fire storm water runoff may have carried ash or sediment into the streams, resulting in poor water quality and sedimentation events that reduced or eliminated particular habitat features. The extent of damage to the PCEs of designated critical habitat units is not well known at this time. Three major wildfires that occurred in the action area last year are described below.

Horseshoe 2 Wildfire

The Horseshoe 2 wildfire started in the Chiricahua Mountains on May 8, 2011 and was declared contained on June 25, 2011. The fire burned a total of 222,954 acres of which included 192,647 acres of National Forest Service lands, 12,163 acres of National Park Service lands, 1,336 acres of BLM land, 2,874 acres of State of Arizona lands and 13,934 acres of private land. No wild populations of Chiricahua leopard frog are extant in the Chiricahua Mountains, but one captive population is found in man-made ponds at the Southwest Research Station in Cave Creek. These ponds were not significantly affected by suppression activities, the wildfire, or floods. Critical habitat has been designated in Cave Creek. The creek itself underwent significant flooding following the fire, but the stream channel is expected to recover as the watershed stabilizes. No suppression effects have been identified, but critical habitat may be affected by ash flow and sedimentation, at least for the next year or two. The effects of fire and suppression actions would not be expected to change the baseline for this species in the Chiricahua Mountains.

Murphy Wildfire

The Murphy Wildfire started on May 30, 2011 on the Nogales RD and was contained on June 14, 2011. Less than three percent of the fire area burned at high severity. Several tanks serve as habitat for Chiricahua and lowland leopard frogs: Summit, Thumb Butte, Ronquillo Pond (Peña Blanca Spring) and Peña Blanca Lake are designated CH for the Chiricahua leopard frog. Yank, Summit, Lookout, Bear Valley Ranch, Tinker, Bellota, and Mesa Tanks; as well as Waterfall Spring, Ronquillo Pond, Sycamore Canyon and Peña Blanca Lake are occupied by Chiricahua and/or lowland leopard frogs. All of these may be affected to some degree by ash flow or sedimentation.

Sycamore Canyon may be affected by ash and sediment, but only a portion of this watershed burned. Two designated CHUs (Sycamore Canyon and Peña Blanca Lake and Spring and Associated Unit Tanks) fall within the perimeter of the fire.

Monument Fire

The Monument Fire began on June 12, 2011 and was contained on July 5, 2011. A total of 32,074 acres burned during the fire. One breeding site (also known as Beatty's Guest Ranch) in Miller Canyon on private land was lost to post-fire flooding. Frogs were salvaged from this site by the AGFD prior to the floods and are being housed off site. Although individuals were lost as a result of post-fire flooding, a remnant population persists in a small pond and in the stream in Miller Canyon. The Carr Barn Pond CHU also burned, but was not occupied by frogs at the time of the fire.

Summary of Activities Affecting Chiricahua Leopard Frog and Designated Critical Habitat in the Action Area

Our information indicates that 29 formal consultations have evaluated actions potentially resulting in adverse effects to the Chiricahua leopard frog within the TIMR action area. These consultations and the incidental take anticipated for the frog from 2001 (i.e., the year the species was proposed for listing) to the present are summarized in Table 8. The threats identified for the rangewide status of the species are affecting the Chiricahua leopard frog and their habitats in the action area (e.g. *Bd*, illegal border activity and law enforcement response, non-native predators, fire, and drought). Activities and threats affecting the Chiricahua leopard frog and its designated critical habitat within each CHU in the action area are included in the previous sections. Federal agencies manage much of the land in the action area, particularly the Coronado National Forest and Buenos Aires NWR. Additional activities and recovery actions in these areas are detailed below.

Activities in the action area include degradation of habitats due to mining (mostly historical) and associated contamination, recreation, illegal smuggling and associated law enforcement activities (particularly those activities that create new vehicle or foot routes of travel near or through frogs habitats), and livestock grazing activities. The latter has been the subject of previous consultation with the Coronado National Forest (2-21-98-F-399 and reinitiations). Recent drought and apparent climate change are contributing to habitat degradation within the range of this species in the action area. For instance, the montane woodlands at the higher elevations have all experienced drought and associated large-scale catastrophic wildfires in recent years that have severely altered habitat.

The environmental baseline for Chiricahua leopard frog within the the Coronado National Forest appears to be stable. Factoring in the three large wildfires in 2011, data do not show a declining population. The greatest threats to Chiricahua leopard frogs on the Coronado National Forest are nonnative species, drought, and disease. The Coronado National Forest is actively participating in recovery actions that are benefiting the frog. A multi-year effort lead by herpetologists at the University of Arizona has nearly eliminated bullfrogs from Sycamore Canyon. Chytridiomycosis has been present in Sycamore Canyon since 1972, which is the earliest date for the disease in the

U.S. (FWS 2007). Although lowland leopard frogs and Tarahumara frogs have disappeared from Sycamore Canyon since the disease was first recorded, the Chiricahua leopard frog has persisted, despite periodic dieoffs. *Bd* and ranavirus are also known from the Altar Valley.

The Chiricahua leopard frog metapopulation at Buenos Aires NWR is under constant threat from bullfrogs, which again, through a multi-year effort by the same herpetologists at the University of Arizona, have been held at bay and prevented from overrunning the Chiricahua leopard frog populations. The refuge is currently working with the University of Arizona to remove bullfrogs from several tanks in order to prepare them for leopard frog releases in the future. On the Buenos Aires NWR, a well has been dug and a solar pump installed at Garcia Tank in order to provide reliable permanent water for the leopard frog in order to conserve this metapopulation. Carpenter, State, Rock Tanks, and the headquarters holding pond (artificially filled) are permanent water sources. In addition, the restoration of earthen water tanks, once used for livestock, is being planned for wildlife use, including Chiricahua leopard frogs. Additionally, the placement of these tanks is being discussed to avoid providing a potential pathway for bullfrog dispersal.

The effects of increased immigration and CBP activities at Buenos Aires NWR have little impact on Chiricahua leopard frogs. The construction of the border fencing that precludes movements by Chiricahua leopard frogs along the international border may reduce cross border dispersal and gene flow. Such movements may be precluded by the fence itself, depending on design and materials, or through the alteration of hydrologic systems through blockages, headcutting, downcutting, etc. The occupied tanks are relatively large and the potential for impacts from immigrants (undocumented aliens) drinking or walking in the water are insignificant. The use of these tanks for bathing and personal hygiene may result in some decrease in water quality, but effects of this type have not been studied or documented.

EFFECTS OF THE ACTION

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

There are no interrelated or interdependent actions that are part of the TIMR Program and that are dependent upon the TIMR Program for justification or have no independent utility apart from the Program. Ongoing and planned CBP activities in southern Arizona to secure the international border have independent utility from the TIMR Program and would continue, although in many cases less efficiently, regardless of implementation of the TIMR Program. Ongoing maintenance activities that are not considered in this BO, including operation of existing maintenance facilities and equipment used for those activities, also has independent utility from the TIMR Program and are not dependent upon it for justification. Thus, this BO only considers the direct, indirect, and cumulative impacts of TIMR Program activities in the description of the proposed action.

Effects of the Action on the Chiricahua Leopard Frog

The Chiricahua leopard frog is expected to be affected by the proposed action. There are currently up to 350 miles of roads, 15 culverts, 10 low water points, and 50 towers included in the proposed action that are within the range of the species. Maintenance and repair activities would be conducted within and immediately adjacent to the footprint of existing tactical infrastructure and would result in direct effects and indirect effects on Chiricahua leopard frogs and their habitat. BMPs and CMs will be implemented to minimize the potential for direct and indirect impacts, and monitoring will be conducted to reduce the possibility of this species being harmed during TIMR Program activities.

Disturbance to Chiricahua Leopard Frog – Direct Effects

Potential direct impacts are primarily related to habitat degradation (see below) and the risk of direct injury or mortality from maintenance activities. Direct injury, mortality, or behavioral changes could occur if adult Chiricahua leopard frogs disperse into areas being maintained or repaired. There is some potential for Chiricahua leopard frogs to be killed on roadways used by maintenance or repair vehicles where such vehicles are traveling through or near occupied aquatic habitats. During the summer rainy season frogs frequently disperse overland or along drainages. Although no Chiricahua leopard frogs have been found dead on roads, Lowland and Rio Grande leopard frogs have both been found run over by vehicles on roads in the desert Southwest (J. Rorabaugh, pers. obs.). Road kills can be a significant source of mortality (Carr and Fahrig 2001) and serve as a barrier to movement (deMaynadier 2000) for other species of leopard frogs.

To minimize the possibility that Chiricahua leopard frogs are harmed, in-water work within Chiricahua leopard frog critical habitat will be conducted during the active season (May through September) so that frogs can escape to the best of their ability (Chiricahua Leopard Frog BMP #2). Prior to any in-water work within critical habitat of this species, CBP will contact FWS personnel at the Arizona Ecological Services Office to determine if frogs will be salvaged and placed in holding facilities until work is complete (Chiricahua Leopard Frog BMP #8). Capture, movement, and holding of frogs would be accomplished by permitted biologist at the expense of CBP under all appropriate State and Federal permits, including permit conditions to ensure minimal harm or mortality. A qualified biologist will monitor ground-disturbing maintenance activities and use of heavy equipment to be conducted in vegetated or undisturbed areas (Chiricahua Leopard Frog BMP #1). Monitoring will occur prior to and during activities located within one mile overland of critical habitat, 3 miles along ephemeral drainages in that habitat, and 5 miles along perennial streams in that habitat. If a frog is found in the project area and is in danger of being harmed, work will cease in the area of the frog until either the qualified biological monitor can safely move the individual to a nearby location or the frog moves away on its own. Additional monitoring will occur after the first major precipitation event following the completion of the activity in order to ensure that the BMPs were effective. As mentioned above, direct effects will be minimized by conducting in-water maintenance and repair activities during specified periods. Conducting work during those periods and monitoring for the presence of this species during maintenance activities would reduce, but not eliminate, the possibility that Chiricahua leopard frogs would be harmed during maintenance and repair activities.

Disturbance to Chiricahua Leopard Frog – Indirect Effects

Potential indirect effects to this species include increased spread of diseases, and impacts from habitat loss and degradation (discussed below). Spread of disease (*Bd* or ranavirus) may occur via maintenance and repair equipment or vehicles traveling from one aquatic site to the next. A vehicle traveling along a road and through a stream could potentially carry *Bd* in water or mud to the next wet drainage (Daszak 2000). To prevent the spread of amphibian diseases among drainages via water or mud on maintenance vehicles and equipment, all maintenance work within Chiricahua leopard frog critical habitat shall conform to amphibian disease prevention protocols as described in the recovery plan for this species (see Appendix B). Equipment would either be disinfected between uses at different sites or rinsed and air dried. By implementing BMPs to avoid the spread of diseases (Chiricahua Leopard Frog BMP #4, General BMPs #8 and 9) the potential for adverse indirect effects on Chiricahua leopard frog should be minimized.

Habitat Loss and Degradation-Direct Effects

Maintenance of roads, culverts, and low water points will occur within or immediately adjacent to existing tactical infrastructure. To avoid affecting habitat, maintenance will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered (Chiricahua Leopard Frog BMP #4). Nevertheless, minor and temporary alteration of habitat would occur during some maintenance and repair activities, and there remains a possibility that individuals of this species might be harmed during those activities. General BMP #3 will minimize direct effects to habitat because vegetation clearing will not occur in suitable habitat within the range or designated critical habitat of Chiricahua leopard frog. If a PCE, or other indicator of suitable habitat occurs within the project area, then further consultation with FWS will be required.

Habitat Loss and Degradation – Indirect Effects

Potential indirect effects to this species include increased sedimentation in aquatic habitat and introduction of non-native invasive species. Maintenance and repair of access roads, low water crossings, and culverts near currently or future occupied frog habitats may result in erosion and sedimentation into those habitats, or improve access for the public or others who may introduce non-native predators or disease, collect frogs, start fires, or otherwise degrade habitats (NPS 2012, Watson 2005).

Non-native plants often thrive in disturbed areas (Tellman 2002); hence, TIMR activities could encourage the spread and establishment of these plants. Many non-native plants, such as Lehmann's lovegrass, carry fire better and often burn hotter than the native plants (Bock and Bock 2002, Esque and Schwalbe 2002). As a result, the proposed action has the potential to increase fire frequency and intensity via spread of non-native plants. Fire can result in temporary watershed degradation and increased sedimentation and ash flow into Chiricahua leopard frog habitats. Sediments can fill in frog habitats (Wallace 2003) and ash flow can create toxic conditions (Spencer and Hauer 1991). We believe that impacts to Chiricahua leopard frogs from invasive species and fire as a result of the TIMR Program are unlikely, due to the implementation of BMPs and conservation measures discussed below.

The potential for indirect effects to habitat is much reduced or eliminated by implementing BMPs to reduce sedimentation and runoff from roads and other infrastructure. Other BMPs that minimize potential effects to amphibian habitat include avoiding the spread of non-native invasive species (Vegetation BMPs #2 and 10, General BMP #8), and conducting periodic inspection and maintenance to minimize erosion and other adverse conditions (Vegetation BMP #12). Clearing of riparian vegetation will not occur within 100 feet of aquatic habitats to provide a buffer area to protect the habitat from sedimentation (Wildlife BMP #3). To minimize impacts from habitat degradation due to sedimentation and effects on water quality and quantity, a site-specific SWPPP and a spill protection plan will be prepared and regulatory approval will be sought as required by regulations, for maintenance and repair activities that could result in sedimentation and that occur within 0.3 miles of suitable habitat (Chiricahua Leopard Frog BMP #3). This will include, but is not limited to, placing straw bale-type sediment traps at the inlet of ponds or stock tanks and upstream of drainages known to be occupied by the species or within critical habitat of the species. General BMPs to protect water resources, as listed in the description of the proposed action, will also be implemented (General BMPs #7-9, Water Resources BMPs #1-25, Geology and Soil Resources BMPs #1-4, Chiricahua Leopard Frog BMPs #5 and 7). By implementing BMPs to avoid sedimentation, and by conducting follow-up monitoring in the vicinity of critical habitat (Conservation Measure #1), the potential for adverse indirect effects to Chiricahua leopard frog habitat should be minimized. In addition, CBP or their contractors will conduct monitoring of suitable Chiricahua leopard frog habitat at and downstream of work sites following the first major precipitation event after the activity has been completed. This monitoring will ensure that the BMPs have functioned properly.

Effects of the Action on Chiricahua Leopard Frog Critical Habitat

In our analysis of the effects of the action on critical habitat, we consider whether or not a proposed action will result in the destruction or adverse modification of critical habitat. In doing so, we must determine if the proposed action will result in effects that appreciably diminish the value of critical habitat for the recovery of a listed species. To determine this, we analyze whether the proposed action will destroy or adversely modify any of the PCEs that are the basis for proposing critical habitat. To determine if an action results in adverse modification of critical habitat, we must also evaluate the current condition of all critical habitat units, and the PCEs of those CHUs, to determine the overall ability of all critical habitat to support recovery. Further, the functional role of each of the CHUs in recovery must also be considered because, collectively, they represent the best available scientific information as to the recovery needs of the species.

Based upon the project description for the TIMR Program and previous consultations on other similar Federal agency actions, implementation of the proposed action may result in adverse effects to critical habitat. Below, we describe the PCEs related to Chiricahua leopard frog aquatic breeding habitat (including immediately adjacent uplands) and dispersal habitat and the potential effects from implementation of the proposed action.

1. Aquatic breeding habitat and immediately adjacent uplands exhibiting the following characteristics:

PCE 1a: Standing bodies of fresh water (with salinities less than 5 parts per thousand, pH greater than or equal to 5.6, and pollutants absent or minimally present), including natural and manmade (e.g., stock) ponds, slow-moving streams or pools within streams, off-channel pools, and other ephemeral or permanent water bodies that typically hold water or rarely dry for more than a month. During periods of drought, or less than average rainfall, these breeding sites may not hold water long enough for individuals to complete metamorphosis, but they would still be considered essential breeding habitat in non-drought years.

Effect: With the exception of some potential effects to water quality, activities implemented under the proposed action are expected to retain and recover this PCE for frogs. There are measures in place to ensure that areas supporting listed species are not dewatered or impaired to the point that they cannot support frogs. For example, work will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered. Sediment control structures will also be used and BMPs implemented to reduce the potential for contaminants to enter the system.

PCE 1b: Emergent and or submerged vegetation, root masses, undercut banks, fractured rock substrates, or some combination thereof, but emergent vegetation does not completely cover the surface of water bodies.

Effect: No adverse effects to this PCE are expected as a result of the proposed action. Riparian vegetation within 100 feet of critical habitat will not be cleared, and clearing of vegetation would not occur in critical habitat without further consultation with FWS.

PCE 1c: Non-native predators absent or occurring at levels that do not preclude presence of the Chiricahua leopard frog.

Effect: There is very little potential for the proposed action to introduce or transfer non-native predators into critical habitat, and CBP will notify FWS Arizona Ecological Service Office prior to any in-water work within designated Chiricahua leopard frog critical habitat. CBP will not use surface water from aquatic or marsh habitats for maintenance and repair projects, if that site supports aquatic federally-listed species or if it contains non-native invasive species or disease vectors based on the best available information provided by FWS. Additionally, conservation measures CBP is implementing to ensure that the proposed action does not spread amphibian diseases among drainages via water or mud on maintenance vehicles and equipment will also prevent the spread of non-native predators.

PCE 1d: Absence of chytridiomycosis (*Bd*), or, if present, then environmental, physiological, and genetic conditions are such that allow persistence of Chiricahua leopard frogs.

Effect: There is the potential that actions carried out under the proposed action, such as the cleaning and moving vehicles and equipment between aquatic sites could result in the movement of *Bd*, or other diseases, to critical habitat. However, CBP will not use surface water from aquatic or marsh habitats for maintenance and repair projects, if that site supports aquatic federally-listed species or if it contains non-native invasive species or disease vectors

based on the best available information provided by FWS. Additionally, to prevent the spread of amphibian diseases among drainages via water or mud on maintenance vehicles and equipment, all maintenance work within Chiricahua leopard frog critical habitat shall conform to amphibian disease prevention protocols as described in the Recovery Plan for the Chiricahua leopard frog. Equipment would either be disinfected between uses at different sites or rinsed and air dried. Pathogens, such as *Bd*, can easily be transferred between habitats on equipment and footwear. Disinfecting equipment between sites should significantly reduce the potential for *Bd* to be transmitted to critical habitat.

PCE 1e: Upland areas that provide opportunities for foraging and basking that are immediately adjacent to or surrounding breeding aquatic and riparian habitat.

Effect: Vegetation control actions may result in reduced vegetative habitat immediately around and surrounding critical habitat. However, clearing of vegetation would not occur in critical habitat without further consultation with FWS. Vegetation clearing will not occur in suitable habitat within the range or designated critical habitat of threatened and endangered species. If a threatened or endangered species, primary constituent element (PCE), or other indicators of suitable habitat occur within the project area, then further consultation with FWS will be required. Additionally, riparian vegetation within 100 feet of critical habitat will not be cleared.

2. Dispersal and non-breeding habitat, consisting of areas with ephemeral (present for only a short time), intermittent, or perennial water that are generally not suitable for breeding, and associated upland or riparian habitat that provide corridors (overland movement or along wetted drainages) for frogs to move among breeding sites in a metapopulation. The dispersal and nonbreeding habitat need to have the following characteristics:

PCE 2a: Are not more than 1.0 mile overland, 3.0 miles along ephemeral or intermittent drainages, 5.0 miles along perennial drainages, or some combination thereof not to exceed 5.0 miles.

Effect: Actions implemented under the proposed action should not result in the loss of aquatic habitats within critical habitat that would change the movement distance between breeding habitat. Therefore, dispersal and non-breeding habitat should remain intact.

PCE 2b: In overland and non-wetted corridors, provides some vegetation cover or structural features (e.g., boulders, rocks, organic debris such as downed trees or logs, small mammal burrows, or leaf litter) for shelter, forage, and protection from predators; in wetted corridors, provides some ephemeral, intermittent, or perennial aquatic habitat.

Effect: Actions implemented under the proposed action should not significantly reduce or modify this PCE within critical habitat. Although actions may result in small reductions in organic debris as a result of road maintenance, these impacts are not likely to significantly modify this PCE.

> *PCE 2c*: Are free of barriers that block movement by Chiricahua leopard frogs, including, but not limited to, urban, industrial, or agricultural development; reservoirs that are 50 acres or more in size and contain predatory nonnative fishes, bullfrogs, or crayfish; highways that do not include frog fencing and culverts; and walls, major dams, or other structures that physically block movement.
>
> *Effect*: Actions implemented under the proposed action would not result in the creation of barriers to movement within critical habitat.

Maintenance activities conducted within and near Chiricahua leopard frog critical habitat could alter the quality of surface water within and downstream of the maintenance area. Impacts on water quality should be localized and temporary, and BMPs will be implemented to reduce sedimentation and runoff from roads and other infrastructure and minimize other potential indirect effects on this species. In areas where maintenance and repair activities took place within 0.3 miles of the critical habitat for Chiricahua leopard frogs, CBP will conduct one additional monitoring visit (by a permitted biologist) following the first significant rainfall event following the completion of TIMR Program activities to determine the effectiveness of BMPs implemented (Conservation Measure #1).

Most TIMR Program activities within critical habitat will occur within and immediately adjacent to the footprint of existing tactical infrastructure, and BMPs designed to avoid impacts to critical habitat of this species will be implemented. For example, work will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered (Chiricahua Leopard Frog BMP #2). Riparian vegetation within 100 feet of critical habitat will not be cleared (Wildlife BMP #3 and Vegetation BMP #13), use of herbicides will not occur within 0.3 miles of Chiricahua leopard frog critical habitat or other suitable habitat within the range of this species, unless approved by the FWS (Chiricahua Leopard Frog BMP #7), and clearing of vegetation will not occur in critical habitat without further consultation with FWS (General BMP #3).

While monitoring will occur to ensure BMPs function properly, vandalism or degradation may prevent the erosion control structures and other measures from being effective. This is particularly the case if significant time passes between project implementation and the first major precipitation event. Therefore, because maintenance activities could cause temporary and localized changes in water quality, and because measures implemented to reduce effects may become ineffective over time, the proposed action may affect, and is likely to adversely affect designated Chiricahua leopard frog habitat.

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 BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. Federal agencies manage much of the land in the action area, particularly the Coronado National Forest and Buenos Aires NWR. Thus, most of the actions that are reasonably expected to occur in the project area that may adversely affect the

Chiricahua leopard frog would be subject to future section 7 consultations. However, some occupied breeding localities are on private lands or state lands.

Unregulated activities on non-Federal lands, such as trespass livestock, inappropriate use of off-highway vehicles, and illegal introduction of non-indigenous aquatic species are cumulative effects and can adversely affect the species through a variety of avenues. Illegal introductions of non-indigenous fishes and other aquatic invasive species are routinely made by the public (e.g., topminnow, red shiner, and guppies).

Cumulative effects to native aquatic animals include ongoing activities in the watersheds in which the species occurs such as livestock grazing and associated activities outside of Federal allotments, irrigated agriculture, groundwater pumping, stream diversion, bank stabilization, channelization, and recreation without a Federal nexus. Some of these activities, such as irrigated agriculture, are declining and are not expected to contribute substantially to cumulative long-term adverse effects to native aquatic animals. Other activities, such as recreation, are increasing. Increasing recreational, residential, or commercial use of the non-Federal lands near the Arivaca riparian area and ciénega managed by Buenos Aires NWR would likely result in increased cumulative adverse effects to occupied, as well as potentially occupied native aquatic animal habitat through increased water use, increased pollution, and increased alteration of the stream banks through riparian vegetation suppression, bank trampling, changing flow regimes, and erosion.

CONCLUSION

The conclusions of this BO are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including all BMPs and CMs that are incorporated into the project design. This BO does not rely on the regulatory definition of "destruction or adverse modification" of critical habitat in 50 CFR 402.02 because of various court cases surrounding the FWS's jeopardy and adverse modification analyses. Instead, we have relied upon the statutory provisions of the Act to complete the analysis with respect to critical habitat. Critical habitat is defined in section 3 of the Act "as the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical and biological features essential to the conservation of the species and that may require special management considerations or protection; and specific areas outside the geographical area occupied by a species at the time it is listed, upon a determination that such areas are essential for the conservation of the species." We have also relied upon the Consultation Handbook which provides guidance on determining adverse modification of critical habitat and jeopardy pursuant to the following: "Adverse effects on individuals of a species or constituent elements or segments of critical habitat generally do not result in jeopardy or adverse modification determinations unless that loss, when added to the environmental baseline, is likely to result in significant adverse effects throughout the species' range, or appreciably diminish the capability of the critical habitat to satisfy essential requirements of the species" (FWS and National Marine Fisheries Service 1998:4-34).

After reviewing the current status of the Chiricahua leopard frog and its critical habitat, the environmental baseline for the action area, the effects of the proposed activities, and cumulative effects, it is the FWS's biological opinion that the proposed action is not likely to jeopardize the

continued existence of the Chiricahua leopard frog nor adversely modify critical habitat. Pursuant to 50 CFR 402.02, to "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. Our conclusion is based on our discussion in this document found in the "Effects of the Action" section above, and the following:

1. During the consultation for the proposed action, FWS and CBP jointly developed a set of BMPs and CMs for the Chiricahua leopard frog which became part of the proposed action and which will avoid, minimize, or offset anticipated adverse effects to the Chiricahua leopard frog and its designated critical habitat.
2. TIMR Program activities will primarily occur within the existing footprint of the tactical infrastructure and, as a result, minimal areas of additional habitat disturbance will occur.
3. CBP's process for implementing proposed maintenance and repair activities will promote the avoidance and minimization of effect to the Chiricahua leopard frog and its critical habitat.
4. Monitoring will allow the CBP and FWS to determine the effectiveness of the BMPs and CMs in reducing the reducing adverse effects to the Chiricahua leopard frog and its critical habitat.
5. CBP will provide project implementation information in an annual report to the FWS indicating that the activities completed under the proposed action were implemented as proposed.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). "Harass" is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by CBP so that they become binding conditions of any grant or permit issued to the (applicant), as appropriate, for the exemption in section 7(o)(2) to apply. CBP has a continuing duty to regulate the activity covered by this incidental take statement. If CBP (1) fails to assume and implement the terms and conditions or (2) fails to require any applicant, contractor, or permittee to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the contract, permit, or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the

impact of incidental take, CBP must report the progress of the action and its impact on the species to the FWS as specified in the incidental take statement. [50 CFR '402.14(i)(3)].

AMOUNT OR EXTENT OF TAKE

Incidental take of the Chiricahua leopard frog is reasonably certain to occur from the proposed implementation of the TIMR Program. There is some potential for take of individual frogs of various life stages (frogs, tadpoles, and eggs) in the form of harm resulting from the increased flow of sediment into occupied habitat due to proposed activities conducted within or upstream of aquatic habitat. For example, individuals may be harmed through changes in the water chemistry, or as a result of heavy sediment deposits covering eggs, tadpoles, and clogging gills. Take of Chiricahua leopard frogs could also occur through direct mortality or harm from trampling (human or machine), and harm and/or harassment through habitat modification (e.g., as a result of maintenance and repair along roads and/or the transmittal of disease). While we believe that the proposed BMPs and CMs will effectively reduce this potential for take, there is some potential for take to occur if measures to reduce sedimentation are not effective.

We believe that we cannot measure the number of frogs taken as a result of this action because these frogs are difficult to find, particularly if they are dead or impaired, and the frog is difficult to see due to its size, cryptic coloring, and complex habitat. In addition, egg masses and tadpoles are frequently hidden in submerged vegetation and cannot be counted precisely. Based on the form of take anticipated for TIMR activities, we will use loss or degradation of habitat as the determinant for take. Take of this species can be anticipated if visual inspection determines that the BMPs designed to control erosion have not been effective and if visual confirmation determines that more than approximately half of an occupied tank, pond or pool is covered by fresh silt, resulting from TIMR Program activities, following a precipitation event. Visual inspections are included as a conservation measure above and will be scheduled and conducted by CBP or their contractors within 7 days of the first significant precipitation event following TIMR activities, and any such sedimentation will be reported to FWS within 5 days. Such deposits are directly related to habitat modifications and indicative of a sedimentation event significant enough that, if exceeded, will constitute an unacceptable impact to occupied habitat and individual Chiricahua leopard frogs. We anticipate take of this type to occur once every five years for the duration of the TIMR Program.

During the visual inspections described above, CBP or their contractors will also conduct visual inspections for any dead or dying Chiricahua leopard frogs within the water bodies inspected. Any such loss of Chiricahua leopard frogs will be reported to the FWS within 5 days.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the species or adverse modification of the designated critical habitat.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

A comprehensive suite of BMPs and CMs have been incorporated into the proposed action for the TIMR Program. These conservation measures generally and specifically require CBP to reduce effects to the Chiricahua leopard frog and its designated critical habitat. No additional reasonable and prudent measures are necessary to minimize incidental take.

If mortality or injury of any Chiricahua leopard frog is detected, the instructions provided below under "Disposition of Dead or Injured Listed Species" will be followed. In addition, CBP must report activities implemented under the TIMR Program, including the outcome of any monitoring, as well as any potential take of this species, in its annual report to FWS.

Review requirement: Because FWS has determined that no Reasonable and Prudent Measures or Terms and Condition are required beyond the measures outlined in the Proposed Action above, it is imperative that CBP implement the BMPs and CMs described above, including the required monitoring and reporting. If, during the course of the proposed action, the level of incidental take exceeded, such incidental take would represent new information requiring review of the proposed action, potentially through reinitiation of section 7 consultation as described below in the Reinitiation Notice.

CONSERVATION RECOMMENDATIONS

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

1. We recommend that your agency participate in the implementation of the Chiricahua leopard frog recovery plan.

2. We recommend that your agency investigate the distribution of *Bd* and other amphibian diseases in the action area. Protocols for this investigation should be coordinated with our office and AGFD.

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

Please note that surveys for Chiricahua leopard frog that involve capture or take require appropriate permits from the FWS and AGFD.

SONORAN TIGER SALAMANDER

STATUS OF THE SPECIES

Description, Legal Status, and Recovery Planning

Sonoran tiger salamanders (*Ambystoma tigrinum stebbinsi*) are large salamanders with a dark venter and light-colored blotches, bars, or reticulation on a dark background. Metamorphosed terrestrial Sonoran tiger salamanders have a color pattern ranging from a reticulate pattern with an irregular network of light coloration, often coupled with light spots, on a dark background color to a pattern of large, well-defined light or yellow spots or transverse bars, some of which encroach on the dark venter (Jones et al. 1988). Metamorphosed Sonoran tiger salamanders measure from about 6.6 to 12.4 cm (2.6 to 4.9 inches) snout to vent length (SVL) (Lowe 1954, Jones et al. 1988). Male and female adult Sonoran tiger salamanders can be distinguished by the presence of two black folds of tissue (cloacal folds) on the caudal side of the vent.

Branchiate adults are gray to olive on the dorsum, head, and tail, and off-white to yellow on the ventral surface. They have three external gills on each side of their head, and measure between 6.5 and 16.5 cm (2.6 to 6.5 inches) SVL. Larvae are aquatic with external plume-like gills and well-developed tail fins (Behler and King 1980). At this stage, they are gray on the dorsum, head, and tail, with little pigment on the ventral surface. They hatch without legs, but grow hind and forelimbs early in development.

Sonoran tiger salamanders are one of three subspecies of tiger salamanders found in Arizona; the other two subspecies are Arizona tiger salamanders (*A. t. nebulosum*) and barred tiger salamanders (*A. t. mavortium*). The barred salamander is an introduced species in the San Rafael Valley and elsewhere in southern Arizona. The Sonoran tiger salamander was discovered in 1949 at the J.F. Jones Ranch stock tank in Parker Canyon, San Rafael Valley, Arizona (Reed 1951).

The eggs, larvae, and branchiate adults of the three subspecies appear similar, except that larval and branchiate adult Arizona and barred tiger salamanders sometimes develop into a cannibalistic morph that has a wider head, enlarged vomerine teeth, and feeds preferentially on smaller conspecifics. Metamorphosed Arizona tiger salamanders have 11-50 irregularly shaped, yellow to olive spots and blotches, often with indistinct edges (Stebbins 2003), on a dark dorsal ground, with a similar pattern on the head and tail. Metamorphosed barred tiger salamanders have large, distinct, yellowish bars, spots, or transverse bars on a darkly grounded dorsum. Some of the spots or bars encroach on the dark venter. The reticulate pattern that can be seen in Sonoran tiger salamanders is not seen in Arizona or barred tiger salamanders, however, many metamorphosed Sonoran tiger salamanders do not have the reticulate pattern and are visually indistinguishable from barred tiger salamanders.

Genetic analysis was conducted between the gene loci of Sonoran tiger salamanders and the gene loci of rosy salamanders (*Ambystoma rosaceum*), barred tiger salamander, and Arizona tiger salamanders (Jones et al. 1988). Based on this analysis, distinctive reticulate color patterns, low heterozygosity, and apparent geographic isolation, subspecific designation of Sonoran tiger

salamander was considered warranted by Collins and Jones (1987) and Jones et al. (1988). Further analysis of mitochondrial DNA reaffirmed subspecific designation (Collins et al. 1988).

The rosy salamander occurs from Durango, Chihuahua, to Sonora, Mexico, including the southern portion of the San Rafael Valley in Mexico (Shannon 1951, Jones et al. 1995). Rosy salamander larvae are pinkish in color with dark patterning on the sides and back (Taylor 1941) and fewer gill rakers (9-15) than tiger salamanders found in Arizona and Mexico (15-24) (Collins 1979). Metamorphed rosy salamanders are uniformly dark brown on the sides and back and lighter ventrally (Anderson 1961). Allozyme data suggest that interbreeding between tiger salamanders and rosy salamanders is rare or non-existent, even when their distributions overlap (Shaffer 1983).

In 1997, the FWS listed the Sonoran tiger salamander as an endangered species (FWS 1997a). A final Recovery Plan for the species was signed on September 24, 2002. The Sonoran tiger salamander has a recovery priority number of 3. Recovery priority numbers range from 1 to 18, with 1 having the highest priority. No critical habitat has been designated for the Sonoran tiger salamander.

Collecting *Ambystoma* in the San Rafael Valley is prohibited under Arizona Game and Fish Commission Orders 40 and 41, except under special permit. Furthermore, transport and stocking of live bullfrogs and fishing with live bait fish or *Ambystoma* within the range of the Sonoran tiger salamander in Arizona are prohibited (R1-316). Sale of live waterdogs at Parker Canyon Lake is prohibited under the same regulation. In the San Rafael Valley, live crayfish can be used as bait, but only at the place of capture. Transported crayfish must be dead. The Sonoran tiger salamander is included in AGFD's Draft Species of Special Concern (Arizona Game and Fish Department 1996); however, this designation affords the species and its habitat no legal protection. State of Arizona Executive Order Number 8-16 (Streams and Riparian Resources), signed on June 10, 1989, directs state agencies to evaluate their actions and implement changes, as appropriate, to allow for restoration of riparian resources.

Recovery Actions

Federal listing under the Act provided considerable protection to the Sonoran tiger salamander and its habitat. Section 9 of the ESA prohibits take of any listed wildlife species, including the Sonoran tiger salamander. Because most of the land, cattle ponds, and salamander populations in the San Rafael Valley are on Federal lands, most activities that might affect the salamander or its habitat are also subject to Section 7 consultation.

Biological Opinions and incidental take statements were issued in 1997 and 1999 by the FWS during section 7 consultations with the Coronado National Forest. This consultation process resulted in the development of a "Stock Pond Management and Maintenance Plan" addressing cattle pond maintenance guidelines in order to minimize incidental take of salamanders associated with cleaning out ponds (FWS 1997b, 1999). The 1997 consultation also provided measures to reduce the possibility that salamanders might be unintentionally killed or moved among cattle ponds by fire suppression activities.

The Sonora Tiger Salamander Recovery Plan was completed in 2002; it outlines goals and objectives for downlisting to threatened status by 2007 (FWS 2002). However, the recommendation in the 5-year review (FWS 2007) was to leave the species status unchanged. A final version of the five-year report is still pending. The Sonoran tiger salamander monitoring protocol is set up to detect a 5% change in population trends with a minimum of ten years of data, so it will likely require more time before a more telling trend analysis can be conducted. The "Stock Pond Management and Maintenance Plan" is included as an appendix to the Recovery Plan.

Life History and Habitat

Sonoran tiger salamanders begin their life as jelly-coated eggs laid in water. They hatch and grow as aquatic larvae with gills, and then either mature as gilled aquatic adults called branchiate adults; or metamorphose into terrestrial Sonoran tiger salamanders without gills. Branchiate adults are reproductively mature, but have not undergone metamorphosis and spend their entire lives in water. Terrestrial adults are those that have undergone metamorphosis and spend most of their lives out of the water, but return to ponds to breed. Populations and habitats are dynamic, thus the number and location of extant aquatic populations changes over time, as exhibited by the differences between survey results in 1985 and 1993 to 1997 (Collins and Jones 1987, Collins 1996, Abbate 1998, Ziemba et al, 1998).

Sonoran tiger salamanders begin breeding as early as January, and eggs can be found in ponds as late as early May (FWS 2002). Breeding after monsoon rains in July and August is rare (FWS 2002). Sonoran tiger salamanders that are ready to breed have swollen, reddish vents. Terrestrial adults return to ponds to breed, and branchiate adults in the pond also breed. Although there is little data on breeding site fidelity for Sonoran tiger salamanders, other *Ambystoma* species usually return to breed in the ponds where they were born (Shoop 1965, 1968; Shoop and Doty 1972; Douglas and Monroe 1981; Semlitsch 1981; Madison 1997; Madison and Farrand 1998). Courtship takes place under water, and is difficult to observe in the field.

After fertilization, female tiger salamanders lay 200 to 2000 eggs (FWS 2002), attaching them to aquatic vegetation, sticks, rocks, or substrate either individually or in clumps of up to 50. Eggs take from 2-4 weeks to hatch; the colder the water, the longer the eggs take to develop. Sources of mortality for tiger salamander eggs include freezing, drying, trampling by livestock, and predation by adult salamanders (Holomuzki 1986) and introduced fish (Snyder 1998). Crayfish may prey upon salamander eggs as well.

Following hatching, Sonoran tiger salamander larvae can develop to the minimum size necessary to metamorphose into terrestrial salamanders in as little as two months, from late July to early September. However, because many San Rafael Valley sites with salamanders hold water all year, larvae often remain in the water longer before metamorphosing or develop into branchiate adults instead of metamorphosing. In addition, larvae may not undergo metamorphoses and may overwinter in ponds (Collins and Jones 1987). Only an estimated 17 to 40 percent of Sonoran tiger salamanders metamorphose annually (Collins and Jones 1987). All larvae that hatch in ephemeral waters metamorphose into the terrestrial form. Larvae must be at least 4.5 cm (1.8 in) SVL in order to make the transformation (FWS 1997a).

Small tiger salamander larvae feed primarily on zooplankton (daphnids, copepods, bosminids, ostracods, etc.), but incorporate larger aquatic macroinvertebrates (chironomids, trichopterans, molluscs, zygopterans, etc.) into their diet as they grow (Collins and Holomuzki 1984). Sources of mortality for tiger salamander larvae include pond drying, disease (Jancovich et al. 1997), and predation by wading birds, introduced fish and bullfrogs (Snyder 1998), aquatic insects (Holomuzki 1986), and adult salamanders (Holomuzki 1986). Crayfish may also prey upon larval salamanders.

Salamander larvae in permanent water often develop into branchiate adults. San Rafael Valley ponds that do not dry may support up to several hundred branchiates (FWS 2002). Branchiate adults can sometimes metamorphose into the terrestrial form in response to stressful events such as pond drying, but are often unable to complete metamorphosis and may even die during the process (FWS 2002). The lifespan of branchiate adults in the field is not known, but Arizona tiger salamanders have survived as branchiates for up to 8 years in captivity (FWS 2002). The reason that branchiates have not been kept longer is that they eventually metamorphose, even after years as branchiates.

Branchiate adult tiger salamanders prey on zooplankton and a variety of macroinvertebrates, and eat salamander eggs and larvae during the breeding season (Holomuzki 1986). Although branchiate adult Sonoran tiger salamanders probably eat salamander eggs and larvae, they seldom develop into a cannibalistic morph. Sources of mortality for branchiate adults include pond drying, disease (Jancovich et al. 1997), and predation by wading birds and larger introduced bullfrogs and fish species (Snyder 1998).

When larvae are large enough (>4.5 cm (1.77 inches) SVL), they can metamorphose into terrestrial salamanders. The proportion of larvae that metamorphose depends heavily on pond permanence. In ponds that dry, all larvae that are large enough metamorphose. In ponds that do not dry, approximately 17 percent of larvae that are large enough to metamorphose actually do so (Collins et al. 1988). Metamorphs often re-populate ponds following drying or disease outbreaks that kill most branchiate adults and larvae. Metamorphs are also the only life stage that can disperse from pond to pond and establish new populations.

Outside the pond, metamorphosed tiger salamanders consume terrestrial insects and other macroinvertebrates. In the pond, metamorphosed individuals eat aquatic macroinvertebrates and terrestrial insects that fall in the water (Whiteman et al. 1994). Sources of mortality for metamorphosed adults include extreme conditions in the terrestrial environment, disease (Jancovich et al. 1997), and predation by terrestrial predators and introduced fish and bullfrogs (Snyder 1998). The lifespan of metamorphosed Sonoran tiger salamanders in the wild is not known, but metamorphosed Arizona tiger salamanders have survived 17 years in captivity (FWS 2002). Analysis of growth rings in toe bones (skeletochronology) of 150 Arizona tiger salamanders captured in the field revealed no salamanders over 6 years old (FWS 2002), but it remains to be seen whether the same is true for Sonoran tiger salamanders.

Historically, the Sonoran tiger salamander probably inhabited springs, cienegas, and possibly backwater pools of the Santa Cruz River and streams in the San Rafael Valley where permanent or nearly permanent water allowed survival of mature branchiates. Erosion and arroyo cutting in the late 19th and early 20th centuries caused the San Rafael Valley to dry and natural standing water

habitats to disappear (Hendrickson and Minckley 1984, Hadley and Sheridan 1995). The Sonoran tiger salamanders are no longer found in these rare habitats. The state of Arizona (1990) estimated that up to 90 percent of the riparian habitat along Arizona's major desert watercourses has been lost, degraded, or altered. The Sonoran tiger salamander apparently has opportunistically taken advantage of available stock tank habitats as natural habitats disappeared (Hendrickson and Minckley 1984) or were invaded by non-native predators with which the salamander cannot coexist (FWS 2002).

The San Rafael Valley is a broad, open valley that forms the headwaters of the Santa Cruz River. The dominant terrestrial plant community in the San Rafael Valley is plains grassland (Brown 1994). Typical grasses include, among others, plains lovegrass (*Eragrostis intermedia*), side-oats grama (*Bouteloua curtipendula*), and curly mesquite (*Hilaria belangeri*). Within the grasslands, stringers or groves of cottonwoods and other wetland plants grow along some drainages and at ponds and springs. Upslope, at the edges of the San Rafael Valley, juniper and several species of oak form patchy woodlands or savannas that gradually give way to pine-oak woodlands at higher elevation (Brown 1994).

The most important habitat requirement for Sonoran tiger salamanders is the availability of standing water for breeding from January through June. This gives the salamanders enough time to breed, grow as larvae, and metamorphose before the pond dries. Permanent bodies of water can be good breeding sites, except they often contain introduced fish and bullfrogs (Snyder 1998). As a result, ponds created by ranchers for watering their cattle are now almost the only suitable breeding sites remaining. However, there are still some springs on the San Rafael Cattle Ranch (FWS 2002), and possibly elsewhere, such as in Scotia Canyon, that may be suitable breeding sites.

Sonoran tiger salamanders are tolerant of a wide range of temperatures, with temperatures in ponds varying from less than 5ºC (41ºF) at the beginning of the year up to 30ºC (86ºF) during summer. Temperatures in the terrestrial environment range from below freezing to over 35ºC (95ºF). Mammal burrows or loosened soils outside the pond likely provide refugia for metamorphosed salamanders in the terrestrial environment, enabling them to burrow underground to avoid extreme environmental conditions.

Distribution and Abundance

Because so few sites were sampled prior to the 1980's, it is impossible to determine the historical distribution of Sonoran tiger salamanders. However, based on collections and observations of salamanders and the distribution of plains grassland and adjacent Madrean evergreen woodlands (Brown 1994) in which the salamander has been found, the range of the subspecies and its occupied and potentially occupied habitat is thought to extend from the crest of the Huachuca Mountains west to the crest of the Patagonia Mountains, including the San Rafael Valley and adjacent foothills from its origins in Sonora north to the Canelo Hills.

It is speculated that historically the Sonoran tiger salamander probably inhabited springs, cienegas, and possibly backwater pools of the Santa Cruz River and streams in the San Rafael Valley that were extant long enough to support breeding and metamorphosis (at least two months), but ideally were

permanent or nearly permanent, allowing survival of mature branchiates. The grassland community of the San Rafael Valley and adjacent montane slopes, where all extant populations of Sonoran tiger salamander occur, may represent a relictual grassland and a refugium for grassland species.

All confirmed historic and extant aquatic populations are found in tanks, ponds, or impounded cienegas within 31 km (19 mi) of Lochiel, Arizona. This region lies between the Patagonia and Huachuca Mountains, is bordered on the north end by the Canelo Hills, and stretches from Santa Cruz County in Arizona south into Sonora, Mexico. Cattle ponds or tanks are the primary habitat for Sonoran tiger salamanders, but there are several observations of unidentified salamanders away from cattle ponds.

Surveys for the Sonoran tiger salamander have been conducted on public lands throughout the Arizona portion of the San Rafael Valley. Dr. James P. Collins began surveying ponds with tiger salamanders in the San Rafael Valley in 1979. The Sonoran tiger salamander has been found at approximately 58 breeding localities, although not all are currently occupied (Collins and Jones 1987, Collins 1996, Abbate 1998, FWS 2002 and files). During intensive surveys in 1997, from one to 150 Sonoran tiger salamanders were found at 25 stock tanks (Abbate 1998). Populations and habitats are dynamic, thus the number and location of extant aquatic populations change over time, as exhibited by the differences between survey results in 1985 and 1993-1996 (Collins and Jones 1987, Collins 1996, FWS 1997a). In 1999, the lab of Dr. James Collins, Arizona State University, found Sonoran tiger salamanders at 17 localities (Collins 1999). Recent genetic analysis confirmed that barred salamanders (A. *m. mavortium*) or hybrids between barred salamanders and Sonoran tiger salamanders are present at seven stock tanks along Highway 83 and near Parker Canyon Lake in the San Rafael Valley.

A single terrestrial Sonoran tiger salamander was found near Oak Spring in Copper Canyon of the Huachuca Mountains (FWS 1997a). Tiger salamanders have also been reported from a cave, a vertical mining shaft at the northwestern edge of the San Rafael Valley, and one spring-fed well, which have yet to be confirmed (Ziemba et al. 1998). In the past, salamanders were collected from a ciénega at Rancho Los Fresnos in the San Rafael Valley, Sonora, and they were likely *A. m. stebbinsi*. However, surveys during 2006 and 2007 failed to locate additional salamanders, and most waters on the ranch were occupied by non-native bullfrogs, crayfish, green sunfish, and/or black bullhead (FWS 2009).

More data are needed to make definitive statements about the long-term viability of Sonoran tiger salamanders in the San Rafael Valley. About half of the 58 Sonoran tiger salamander populations have been discovered within the last five years, and only within the last five years were ponds with salamanders sampled consistently, making it difficult to determine long-term trends in the proportion of ponds occupied by salamanders and suitability of those ponds for salamander breeding habitat. Also, more data on the ecology of Sonoran tiger salamanders (e.g., life-span, proportion of adults breeding each year, frequency and distance of dispersal events) are required to develop a suitable population viability analysis.

Tiger salamanders have also been found in areas just outside the San Rafael Valley, such as Fort Huachuca, Harshaw Canyon, Copper Canyon, and the Coronado Memorial. Of these localities,

genetic testing has only been performed on salamanders from Fort Huachuca, and with the exception of one pond within a kilometer of the San Rafael Valley, salamanders on the Fort Huachuca appear to be barred tiger salamanders (FWS 2002). A salamander population in Garden Canyon, Fort Huachuca, near the crest of the Huachuca Mountains, also contained hybrids, but this population has apparently disappeared. Barred salamanders are likely present due to their use as fish bait in and around Parker Canyon Lake.

Genetic testing has been performed on salamanders from a number of San Rafael Valley ponds to determine their identity. This testing has showed that some San Rafael Valley ponds contain salamanders with genetic characteristics similar to barred tiger salamanders. Salamanders with these "mavortium-like" sequences are more common on the outskirts of the San Rafael Valley and ponds close to Parker Canyon Lake, which, because of prior use of imported waterdogs as fish bait, is where we expect to find introduced barred tiger salamanders (Ziemba et al. 1998).

Population Dynamics

The dispersal patterns of Sonoran tiger salamanders are also unknown. The number of metamorphs in each population is difficult to estimate because most metamorphosed salamanders leave the pond after breeding, and it is unknown what fraction of salamanders in the terrestrial environment returns each year to breed. In some years, salamanders will be completely absent from a pond, only to return the following year to breed and produce many offspring. Radio tracking of other *Ambystoma* species has shown that they frequently move up to 250 m (273 feet) from their breeding ponds (Shoop 1965, 1968; Shoop and Doty 1972; Douglas and Monroe 1981; Semlitsch 1981; Madison 1997; Madison and Farrand 1998).

Although most records for Sonoran tiger salamanders occur at stock tanks where breeding occurs, terrestrial metamorphs potentially wander considerable distances from these aquatic habitats, and are occasionally encountered in upland habitats. AGFD personnel captured a Sonoran tiger salamander in a pit fall trap at Oak Spring in Copper Canyon, Huachuca Mountains. The nearest known breeding site is approximately 0.6 mile to the south, suggesting the salamander may have moved at least that far. Capture in a pit fall trap also confirms that the individual was surface active. In other subspecies of *Ambystoma tigrinum*, metamorphs may disperse hundreds of meters from the breeding pond, or may remain nearby (Gehlbach et al. 1969, Petranka 1998). Of hundreds of marked *Ambystoma tigrinum nebulosum* in northern Arizona, two were found to move from 0.9 to 1.2 miles to new ponds (FWS 1999a). On Fort Huachuca, Sheridan Stone reported finding terrestrial tiger salamanders (probably *A. t. mavortium*) 1.9 to 2.5 miles from the nearest known breeding pond (FWS 1999a). Referring to conservation of the California tiger salamander (*A. californiense*), Petranka (1998) finds that based on studies of movements of other *Ambystoma* species, conservation of a 650-1,650 foot radius of natural vegetation around a breeding pond would protect the habitat of most of the adult terrestrial population. Adults of western subspecies of *A. tigrinum* typically live in or about mammal burrows (Petranka 1998), although metamorphs may construct their own burrows, as well (Gruberg and Stirling 1972, Semlitsch 1983). Some species of salamanders exhibit seasonal migrations of up to several miles each way from breeding sites to upland habitats (Stebbins and Cohen 1995). If such migrations occur in the Sonoran tiger

salamander, we have no information about migration corridors or non-breeding habitat. Because of the arid nature of the environments in the region where the subspecies occurs, if salamanders move very far from breeding ponds, they may use wet canyon bottoms as movement corridors.

Threats

The FWS's final listing rule (FWS 1997a) and Recovery Plan (FWS 2002) for the Sonoran tiger salamander described multiple threats or limiting factors which, when taken together, justified listing. These threats or limiting factors include the following: restricted distribution; limited number of breeding habitats; disappearance of natural standing water habitat; predation by non-native fish, bullfrogs, and crayfish; genetic swamping by introduced, non-native barred salamanders (*A. t. mavortium*); disease; low genetic diversity; collection for bait or translocation by anglers; use of man-made water holding structures (e.g., impoundments, stock tanks, ponds); maintenance of impoundments; use of occupied sites as water sources for fire suppression; loss of cover around occupied sites; illegal collecting; catastrophic floods and drought; and stochastic extirpations or extinction characteristic of small populations.

Salamanders have disappeared from a few ponds since surveys began in the late 1970s, but there is little indication that there is a general decline in the number of populations in the San Rafael Valley. Furthermore, the density of ponds supporting salamander populations in the San Rafael Valley is comparable to that in other regions supporting tiger salamanders. However, the restricted distribution of Sonoran tiger salamanders makes them vulnerable to relatively small-scale environmental disturbances and land-use changes. The primary threats to the Sonoran tiger salamander include predation by non-native fish and bullfrogs, diseases, catastrophic floods and drought, illegal collecting, introduction of other subspecies of salamanders that could genetically swamp *A. m. stebbinsi* populations, and stochastic extirpations or extinction characteristic of small populations (FWS 2009).

Prior to the 20th century, the San Rafael Valley contained many more cienegas and vernal pools than it does today. Erosion and arroyo cutting in the late 19th and early 20th centuries caused the San Rafael Valley water table to drop and natural standing water habitats to disappear (Hendrickson and Minckley 1984, Hadley and Sheridan 1995). However, at the same time natural standing water habitats were disappearing, cattle ponds were built. Many of the remaining springs and cienegas were converted into impoundments at this time, so most of the small standing water habitats remaining in the San Rafael Valley are cattle ponds. Currently, Sonoran tiger salamanders breed almost exclusively in these cattle ponds. The fact that Sonoran tiger salamanders breed in human-constructed cattle ponds instead of natural habitats does not necessarily threaten persistence of the taxon. Sonoran tiger salamanders have successfully bred in cattle ponds for decades, but salamanders are now dependent on humans to maintain the habitat. In particular, cattle ponds require occasional re-excavation because they fill in with silt, and pond dams also require occasional maintenance. Unfortunately, the maintenance required to maintain these ponds also adversely

affects the Sonoran tiger salamander. Cattle pond habitats are also vulnerable to extreme weather conditions. Long-term drought could dry many of the ponds, and if ponds remained dry for several years, lack of breeding could lead to local extirpation of the salamander population.

Illegal collection of salamanders for bait has been reported from the San Rafael Valley although there are no data on the number of Sonoran tiger salamanders that are collected for bait (Collins and Jones 1987, FWS 2002). If large numbers of salamanders are collected for bait, it could threaten the persistence of Sonoran tiger salamander populations. Given the popularity of other salamanders as bait, it is reasonable to assume that illegal collection of salamanders will continue to occur.

There are reports of introduced non-native fish occurring in the San Rafael Valley as early as the 1950s, and various introduced fish species now occur in San Rafael Valley ponds, including mosquito fish, green sunfish, bluegill sunfish, black bullheads, and largemouth bass. Bullfrogs have also been in the valley since at least the early 1970s. Laboratory and field experiments have shown that metamorphosed bullfrogs and all of the fish species listed above quickly eat salamander larvae, and even adult Sonoran tiger salamanders have been found in the stomachs of adult bullfrogs (Snyder 1998). In addition, whenever non-native fish are introduced to a pond, the salamanders almost always disappear within the next few years, and do not reappear unless the fish are killed by pond drying (Snyder 1998). For some reason, adult bullfrogs have not maintained consistently high population densities in many San Rafael Valley ponds, so the potential effect of bullfrogs on Sonoran tiger salamanders remains unclear (Snyder 1998). However, given the observation that bullfrogs eat salamanders and the effect of bullfrogs on other native western herpetofauna populations (Rosen and Schwalbe 1996, Kupferberg 1997, Kiesecker and Blaustein 1997), bullfrogs should be considered a threat to Sonoran tiger salamanders. Occasional drying of cattle ponds due to drought or siltation has limited the number of ponds occupied by non-native fish and/or bullfrogs, because both taxa are vulnerable to drying. Crayfish are potential predators on salamanders as well, but have only been found in a few San Rafael Valley ponds, and those did not contain salamanders (FWS 2002). Crayfish are in many San Rafael Valley streams, however, and if they are introduced to ponds with salamanders, it is likely they will harm Sonoran tiger salamanders, much as they have harmed other western herpetofauna populations (Gamradt and Kats 1996, Fernandez and Rosen 1996).

Tiger salamander populations in the western U.S. and Canada, including populations of the Sonoran tiger salamander, exhibit frequent epizootics (Collins et al. 2001). Sonoran tiger salamander populations experience frequent disease-related die-offs (approximately eight percent of populations are affected each year) in which almost all salamanders and larvae in the pond die. *Ambystoma tigrinum* virus (ATV) is the pathogen believed to be primarily responsible for these die-offs (Jancovich et al. 1997). This, and possibly other iridoviruses, is also apparently the proximate cause of die-offs observed in other *Ambystoma* salamander populations in the U.S. and Canada (Collins et al. 2000, Docherty et al. 2003). It is also possible that some die-offs might occur as a result of low pH (FWS 2002). A copper smelter at Cananea, Sonora, less than 25 miles south of the border, may have released sulfur plumes resulting in acid precipitation (Blanchard and Stromberg 1987, Platz 1989), but currently there is no evidence to connect salamander die-offs with the copper smelter, and the smelter has not been operated since 1999. ATV may be spread by bullfrogs, birds, cattle, or other animals that move among tanks (Jancovich et al. 1997); however, the viral life cycle appears to be restricted to tiger salamanders as no other syntopic hosts have been identified (Jancovich et al. 2001). In the laboratory, Sonoran tiger salamanders exhibited lower survival and growth rates when exposed to the disease as compared to *Ambystoma tigrinum nebulosum* from the White Mountains of Arizona (Collins et al. 2003). Animals that survive ATV exposure may harbor transmissible infection for more than six months. Dispersing metamorphosed salamanders have been found

carrying ATV, and may reinfect the aquatic population when they return to a pond to breed (Collins et al. 2003). The disease could be spread by researchers or anglers if equipment such as waders, nets, or fishing tackle used at a salamander tank are not allowed to dry or are not disinfected before use at another tank. ATV has been identified from waterdogs obtained from a Phoenix bait shop, suggesting another mechanism of transmission (Collins et al. 2003). Storfer (2003) considers ATV an emerging pathogen, with recent spread likely attributable to human activities.

Sonoran tiger salamanders also contract chytridiomycosis, a fungal disease associated with global declines of frogs and toads (Berger et al. 1998, Longcore et al. 1999, Speare and Berger 2000, Davidson et al. 2003). However, compared to anurans, infected salamanders exhibit only minimal symptoms (Davidson et al. 2000). In the laboratory, infected Sonoran tiger salamanders did not die from the disease and are capable of ridding themselves or much reducing chytrid infections by frequent sloughing of the skin (Davidson et al. 2003). The effect of this disease on salamander populations needs further study.

Sonoran tiger salamanders also face the threat of genetic swamping by introduced barred tiger salamanders which are often sold as large larvae or branchiate adults for fishing bait or to anglers trying to establish a population that could be harvested at a later date. Genetic analysis has suggested that barred tiger salamanders have been introduced to some San Rafael Valley ponds, perhaps by anglers using salamanders as bait. Ponds in which introduced barred salamanders are most likely to occur are those that are most accessible, i.e. adjacent to roads on public lands, those that have a history of angling, and those near existing populations of barred salamanders. Salamanders with genetic characteristics similar to barred tiger salamanders have been found in 7 San Rafael Valley ponds in the southeastern portion of the valley (Ziemba et al. 1998). Very low sample sizes (maximum of three individuals tested from these sites) have made it impossible to determine what percentage of salamanders in these ponds had *mavortium*-like sequences and what percentage had *stebbinsi*-like sequences. Although the analysis of allozymes that was used could not determine whether there was any hybridization between the two subspecies, such hybridization is likely when the two subspecies co-occur.

Research on the ecology and viability of Sonoran tiger salamander populations should assist in developing a management strategy to protect salamanders and their habitat that will ensure persistence of salamanders in the San Rafael Valley. The genetic status of Sonoran tiger salamanders is still being studied, but it appears that some (approximately 25 percent) San Rafael Valley ponds with tiger salamanders contain at least some salamanders with sequences resembling barred tiger salamanders (Ziemba et al. 1998). The threat of genetic swamping by introduced barred tiger salamanders is one of the most difficult threats to assess because genetic testing is often required to distinguish between Sonoran tiger salamanders, barred tiger salamanders, and potential hybrids of the two subspecies.

Allozyme analysis has shown very little genetic variability in Sonoran tiger salamanders (Jones et al. 1988, 1995; Ziemba et al. 1998). Low genetic variability is a concern because in populations with low heterozygosity, deleterious alleles are expressed more frequently, disease resistance may be compromised, and there is little capacity for evolutionary change in response to environmental change.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the 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.

Figure 9 depicts the TIMR Program's action area and infrastructure to be maintained relative to the range of Sonoran tiger salamander.

Status of the Sonoran Tiger Salamander in the Action Area

The action area for the proposed TIMR Program occupies the entire range of the species in the U.S. and, therefore, the species' status in the action area is similar to the rangewide status. The historic, extant, and current records indicate 71 ponds rangewide have been known to contain Sonoran tiger salamanders. Of these, 53 (approximately 90%) occur on the Coronado National Forest. Forty ponds are currently known to be occupied (within the last five years) by Sonoran tiger salamanders, 38 (95%) of which are located on Coronado National Forest (USFS 2004). During surveys by the AGFD from 2001-2006, Sonoran tiger salamander were found at 38 of 139 stock tanks, which were sampled from 1-7 times each. At 23 of 29 tanks where salamanders were found, and which were sampled more than once, salamanders were not found on at least one visit. All sites where Sonoran tiger salamanders have been found in Arizona are located in the Santa Cruz and San Pedro river drainages, including sites in the San Rafael Valley and adjacent portions of the Patagonia and Huachuca mountains in Santa Cruz and Cochise counties. All confirmed historical and extant aquatic populations are found in cattle tanks or impounded ciénegas within 19 mi of Lochiel, Arizona. In the past, salamanders were collected from a ciénega at Rancho Los Fresnos in the San Rafael Valley, Sonora, and they were likely A. m. stebbinsi. However, surveys during 2006 and 2007 failed to locate additional salamanders, and most waters on the ranch were occupied by non-native bullfrogs, crayfish, green sunfish, and/or black bullhead (FWS 2009).

Summary of Activities Affecting Sonoran Tiger Salamander in the Action Area

The threats identified for the rangewide status of the species are affecting the Sonoran tiger salamander and their habitats in the action area. Managed livestock grazing, road use and maintenance, and other land management actions occur within the action area on Federal and private lands. The majority of lands occupied by the Sonoran tiger salamander are in the Coronado National Forest. Section 7 consultations on the Coronado National Forest lands consider the presence of the salamander and the effects of actions on its status. Because nearly all occupied and potential salamander breeding habitats are used as livestock watering holes, the fate of the salamander is meshed with that of livestock grazing in the San Rafael Valley and adjacent areas. Management actions to maintain or enhance stock tanks that provide salamander habitats in the action area may provide benefits to the species. Grazing allotments that have ponds occupied (currently or

historically) by Sonoran tiger salamander incorporate the "Stock Pond Management and Maintenance Plan" as part of their plan of operations. All of the allotments are largely in Federal ownership (remaining lands are privately owned). Thus, management of grazing on many or most of the private inholdings within the allotments is likely affected by how the public lands are grazed, and as a result, grazing on the private lands within the allotments is likely interrelated and interdependent to grazing on the public lands.

The presence of non-native invertebrates (crayfish), amphibians (barred tiger salamanders, bullfrogs), fish (largemouth bass, green sunfish, bluegill, and mosquitofish) in the action area poses a continuing threat to the salamander through predation or competition for limited resources in the small tanks that support the species. The sources of these non-native species include both past illegal or inadvertent transport events and past legal stockings of the species into tanks or fishing waters. Illegal use of barred tiger salamanders for bait, and, the subsequent release of live individuals into the lake or tanks in the vicinity allows for hybridization and the spread of ATV.

Drought affects the sustainability of breeding tanks which must retain water long enough to allow young salamanders to reach the size needed to metamorphose. The status of the salamander, particularly regarding the continuing threat of hybridization, is of significant concern.

Possibly the greatest threat to terrestrial salamander populations is fire. Degradation of watershed condition immediately after fires can result in dramatically increased runoff, sedimentation, and debris flow that can scour aquatic habitats in canyon bottoms or bury them in debris (DeBano and Neary 1996). In degraded watersheds, less precipitation is captured and stored, thus perennial aquatic systems downstream may become ephemeral during dry seasons or drought (Rinne and Neary 1996). Fire could result in degradation of the immediate watershed around a pond, and result in erosion, sedimentation, and ash flow into the pond. Erosion and increased runoff could bury or flood burrows, burrow entrances, rock shelters, or other cover sites. Fire may also reduce surface cover such as logs and debris, resulting in reduced invertebrate populations and reduced prey densities for salamanders (FWS 1999b). Reduced cover may also result in heating and dessication of moist cover sites that salamanders require. Grazing immediately after a fire can retard recovery of grasses and other plants, and facilitate erosion of slopes through hoof action and reduced vegetation cover. Erosion in the watersheds of occupied breeding sites could contribute to sedimentation or erosion of tanks and loss of habitat.

If aquatic populations of salamanders are eliminated due to disease, ash flow, increased turbidity, or collection, but the habitat remains suitable (i.e. the tank is not silted in or erodes away, and fish are not introduced), the tank is likely to be recolonized by terrestrial salamanders. As a result, effects of the action that result in destruction of breeding sites or introduction of non-native predators are much more serious to the viability of the species than death or injury of individuals.

EFFECTS OF THE ACTION

Effects of the action refer to the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action that will be added to the environmental baseline. Interrelated actions are those that are part of

a larger action and depend on the proposed action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. Indirect effects are those that are caused by the proposed action and, are later in time, but are still reasonably certain to occur.

There are no interrelated or interdependent actions that are part of the TIMR Program and that are dependent upon the TIMR Program for justification or have no independent utility apart from the TIMR Program. Ongoing and planned CBP activities in southern Arizona to secure the international border have independent utility from the Program and would continue, although in many cases less efficiently, regardless of implementation of the TIMRProgram. Ongoing maintenance activities that are not considered in this BO, including operation of existing maintenance facilities and equipment used for those activities, also have independent utility from the TIMR Program and are not dependent upon it for justification. Thus, this BO only considers the direct, indirect, and cumulative impacts of TIMR Program activities in the description of the proposed action.

The proposed action would result in potential direct effects, as well as indirect effects on Sonoran tiger salamanders. There are currently up to 10 miles of road included in the proposed action that are within the range of the species. Maintenance and repair activities would be conducted within and immediately adjacent to the footprint of existing tactical infrastructure and BMPs would be implemented to minimize the potential for direct and indirect impacts. However, TIMR Program activities conducted within the upstream drainages of suitable stock tank habitat may affect the Sonoran tiger salamander and its habitat if BMPs are not effective in eliminating or reducing sediment that could enter these stock tanks. Monitoring would be conducted to reduce the possibility of this species being harmed during TIMR Program activities, and to determine the effectiveness of BMPs.

Disturbance to Sonoran Tiger Salamander – Direct Effects

Potential direct impacts on this species include habitat degradation (discussed below) and the risk of direct injury or mortality from repair and maintenance activities. Direct injury, mortality, or behavioral changes could occur if adult Sonoran tiger salamanders disperse into areas being maintained or repaired. To minimize the possibility that Sonoran tiger salamanders are harmed, in-water work within the range of this species will occur during periods of low or no flow (Sonoran Tiger Salamander BMP #2 - This BMP may conflict with Chiricahua leopard frog BMP #2. In areas where there is overlap between Sonoran tiger salamander and Chiricahua leopard frog ranges, CBP will base TIMR Program activity implementation on the species most likely to occur in the area and on the potential for effects to either species). A qualified biologist will monitor all ground-disturbing maintenance activities and use of heavy equipment that occurs within 0.1 mile of Sonoran tiger salamander suitable habitat (i.e., cattle ponds and tanks with standing water) (Sonoran Tiger Salamander BMP #1). This monitoring will occur for all maintenance and repair activities to be conducted in vegetated or undisturbed areas, or in proximity to stock tanks. If a salamander is found in the project area and is in danger of being harmed, work will cease in the area of the species until either the qualified biological monitor can safely move the individual to a nearby location or the salamander moves away on its own. Additionally, to avoid direct mortality from vehicles, maintenance vehicles and equipment will be operated during daylight hours and at speeds of 25 mph

or less within 0.3 miles of Sonoran tiger salamander habitat during the breeding season (January through June) (Sonoran Tiger Salamander BMP #5 and 6).

As mentioned above, direct affects will be minimized by conducting maintenance and repair activities under specific conditions. Conducting in-water work during those periods of low or no flow and monitoring for the presence of these species during maintenance activities would reduce, but not eliminate the possibility that Sonoran tiger salamanders or their stock tank habitats would be harmed during maintenance and repair activities.

Disturbance to Sonoran Tiger Salamander – Indirect Effects

Potential indirect impacts on this species include increased sedimentation in aquatic habitat, introduction of non-native invasive species, and the spread of diseases (especially ATV). The indirect effects to Sonoran tiger salamander will be minimized by the implementation of a number of measures to prevent habitat loss and degradation, including preventing sedimentation (see discussion below). To prevent the spread of amphibian diseases among drainages via water or mud on maintenance vehicles and equipment, all maintenance work within known, occupied Sonoran tiger salamander habitat shall conform to amphibian disease prevention protocols as described in the recovery plan for this species (FWS 2002). Equipment would either be disinfected between uses at different sites or rinsed and air dried. By implementing BMPs to avoid the spread of diseases (Sonoran Tiger Salamander BMP #7, General BMPs #8 and 9) the potential for adverse indirect effects on Sonoran tiger salamander would be minimized.

Habitat Loss and Degradation-Direct Effects

Maintenance activities could alter the quality of surface water within the maintenance area and downstream. However, impacts on water quality would be localized and temporary and BMPs would be implemented to reduce sedimentation and runoff from roads and other infrastructure and minimize other potential indirect effects on this species. To avoid affecting habitat, maintenance will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered (Sonoran Tiger Salamander BMP #2). Direct effects to habitat will be minimized because vegetation clearing will not occur in suitable habitat within the range of Sonoran tiger salamander (per General BMP #3). If vegetation clearing in suitable habitat needs to occur within the project area, then further consultation with FWS will be required. Additionally, clearing of riparian vegetation will not occur within 100 feet of aquatic habitats to provide a buffer area to protect the habitat from sedimentation (Vegetation BMP #13 and Wildlife BMP #3). To minimize impacts from habitat degradation due to sedimentation and effects on water quality and quantity, a site-specific SWPPP and a spill protection plan will be prepared and regulatory approval will be sought as required by regulations, for maintenance and repair activities that could result in sedimentation and that occur within 0.3 miles of suitable habitat (Sonoran Tiger Salamander BMP #3). This will include, but is not limited to, placing straw bale type sediment traps at the inlet of ponds or stock tanks and upstream of drainages known to be occupied by the species or within critical habitat of the species. General BMPs to protect water resources will also be implemented. In addition, CBP or their contractors will conduct monitoring of suitable Sonoran tiger salamander habitat at and

downstream of work sites following the first major precipitation event after the activity has been completed. This monitoring will ensure that the BMPs have functioned properly.

By conducting in-water maintenance and repair activities during specified periods and ensuring that the hydrology of their habitat is not altered, adverse direct effects on the habitat of Sonoran tiger salamanders should be avoided or reduced. Nevertheless, minor and temporary alteration of habitat would occur during some maintenance and repair activities, which may affect the species.

Habitat Loss and Degradation – Indirect Effects

Maintenance of roads would occur within or immediately adjacent to existing tactical infrastructure. To avoid affecting habitat, maintenance will be designed and implemented so that the hydrology of streams, ponds, and other habitat is not altered. Indirect effects to habitat from sedimentation at aquatic sites and introduction of non-native invasive species could result in habitat loss or degradation which may affect Sonoran tiger salamander. Maintenance and repair of access roads near currently or future occupied salamander habitats may result in erosion and sedimentation into those habitats, or improve access for the public or others who may introduce non-native predators or disease, collect salamanders, start fires, or otherwise degrade habitats (NPS 2012, Watson 2005). CBP or their contractors will conduct monitoring of suitable Sonoran tiger salamander habitat at and downstream of work sites following the first major precipitation event after the activity has been completed. This monitoring will ensure that the BMPs have functioned properly.

Non-native plants often thrive in disturbed areas (Tellman 2002); hence, TIMR activities could encourage the spread and establishment of these plants. Many non-native plants, such as Lehmann lovegrass, carry fire better and often burn hotter than the native plants (Bock and Bock 2002, Esque and Schwalbe 2002). As a result, the proposed action has the potential to increase fire frequency and intensity via spread of non-native plants. Fire can result in temporary watershed degradation and increased sedimentation and ash flow into Sonoran tiger salamander habitats. Sediments can fill in aquatic habitats (Wallace 2003) and ash flow can create toxic conditions (Spencer and Hauer 1991). We believe that effects to Sonoran tiger salamanders from fire and invasive species as a result of the TIMR Program are unlikely, due to implementation of the BMPs as described below.

The potential for indirect effects to habitat is much reduced or eliminated by implementing BMPs to reduce sedimentation and runoff from roads and other infrastructure. Other BMPs that minimize potential effects on amphibian habitat include avoiding the spread of non-native invasive species (Vegetation BMPs #2 and 10, General BMP #8), and conducting periodic inspection and maintenance to minimize erosion and other adverse conditions (Vegetation BMP #12). Clearing of riparian vegetation will not occur within 100 feet of aquatic habitats to provide a buffer area to protect the habitat from sedimentation (Wildlife BMP #3). To minimize impacts from habitat degradation due to sedimentation and effects on water quality and quantity, a site-specific SWPPP will be prepared and regulatory approval sought, as required by regulations, for maintenance and repair activities that could result in sedimentation and that occur within 0.3 miles of suitable habitat within the range of this species (Sonoran Tiger Salamander BMP #3). This will include, but is not limited to, placing straw bale-type sediment traps at the inlet of ponds or stock tanks known to be occupied by the species. General BMPs listed in the description of the proposed action to protect

water resources will also be implemented (General BMPs #7-9, Water Resources BMPs #1-25, Geology and Soil Resources BMPs #1-4, Sonoran Tiger Salamander BMP #2 and 4). To monitor for delayed indirect effects to habitat, CBP will conduct an additional monitoring visit (by a permitted biologist) in areas where maintenance and repair activities take place the within 0.3 miles of the known occupied habitat following the first significant precipitation event after completion of the TIMR Program activity to determine the effectiveness of BMPs implemented (Conservation Measure #3). By implementing BMPs to avoid sedimentation, and by conducting follow up monitoring in the vicinity of occupied habitat, the potential for adverse indirect effects on Sonoran tiger salamander habitat would be minimized.

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 BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Federal agencies manage much of the land in the project area, particularly the Coronado National Forest, Fort Huachuca, and the Coronado National Memorial. Thus, most of the actions that are reasonably expected to occur in the project area that may adversely affect the Sonoran tiger salamander would be subject to future section 7 consultations. However, some occupied breeding localities are on private lands or state lands in the center of the San Rafael Valley. Compliance with the ESA for activities on private lands that may result in incidental take of the Sonoran tiger salamander, but are not addressed by section 7 consultation, could occur through section 10(a)(1)(B) of the ESA. Some activities on private lands may require permits or funding from federal agencies; consequently section 7 consultations would be required. These private lands are used primarily for grazing, but potentially could be used for other purposes. Effects from the current use of lands for grazing could result in improper livestock grazing on private range land leading to degraded cover habitat for terrestrial Sonoran tiger salamanders, degraded water quality for aquatic larvae and branchiate adults, and trampling of various life stages by cattle. Other land uses that could be implemented on private land include: housing subdivisions, oil and gas pipelines, mining, agriculture, and division into ranchettes. The largest private parcel in the center of the valley (San Rafael Ranch) is covered by a conservation easement that prohibits most of these activities. In addition, there is the potential for anglers on private land to collect salamanders as bait or contribute to the spread of non-native predators, although these activities are prohibited by state law. Furthermore, anglers may contribute to the spread of disease on private lands by moving contaminated bait or equipment between aquatic sites.

Additional cumulative impacts to the Sonoran tiger salamander may result from cross-border activities along the U.S./Mexico border. Cross-border activities include, but may not be limited to the following: human traffic, deposition of trash, new trails from human traffic, soil compaction and erosion, increased fire risk from human traffic, water depletion and contamination, introduction and spread of disease, and interference with survey, monitoring, and research efforts.

CONCLUSION

The conclusions of this BO are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including the BMPs and CMs that are incorporated into the project design. After reviewing the current status of the Sonoran tiger salamander, the environmental baseline for the action area, the effects of the proposed activities, and cumulative effects, it is the FWS's biological opinion that the proposed action is not likely to jeopardize the continued existence of the Sonoran tiger salamander. Pursuant to 50 CFR 402.02, to "jeopardize the continued existence of" means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. No critical habitat has been designated for the species; therefore, none will be affected. Our conclusion is based on our discussion in this document found in the "Effects of the Action" section above, and the following:

1. During the consultation for the proposed action, FWS and CBP jointly developed a set of BMPs and CMs for the Sonoran tiger salamander which became part of the proposed action and which will avoid, minimize, or offset anticipated adverse effects to the Sonoran tiger salamander and its habitat.
2. TIMR Program activities will primarily occur within the existing footprint of the tactical infrastructure and, as a result, minimal areas of additional habitat disturbance will occur.
3. CBP's process for implementing proposed maintenance and repair activities will promote the avoidance and minimization of effects to the Sonoran tiger salamander and its habitat.
4. Monitoring will allow the CBP and FWS to determine the effectiveness of the BMPs and CMs in reducing the reducing adverse effects to the Sonoran tiger salamander and its habitat.
5. CBP will provide project implementation information in an annual report to the FWS indicating that the activities completed under the proposed action were implemented as proposed.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibits the take of endangered and threatened species, respectively, without special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). "Harass" is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). "Incidental take" is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

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

AMOUNT OR EXTENT OF TAKE

Incidental take of the Sonoran tiger salamander is reasonably certain to occur from the continued implementation of the TIMR Program. We anticipate incidental take as a result of this proposed action in the form of harm resulting from the increased flow of sediment into occupied habitats due to proposed activities conducted within or upstream of stock tanks and other suitable aquatic habitat. For example, individuals may be harmed through changes in the water chemistry, or as a result of heavy sediment deposits covering eggs and clogging gills. Take of Sonoran tiger salamanders could also occur through direct mortality or harm from trampling (human or machine), and harm and/or harassment through habitat modification (e.g., as a result of maintenance and repair along roads and/or the transmittal of disease). While we believe that the proposed BMPs and CMs will effectively reduce this potential for take, there is some potential for take to occur if measures implemented to reduce sedimentation are not effective.

As stated previously, the Sonoran tiger salamander is known from 71 localities, although not all are currently occupied and some probably do not represent breeding sites. The FWS expects that numbers and locations of occupied ponds will vary from year to year depending upon disease outbreaks, drought, and other factors. However, in the long-term, we anticipate no decline in habitat. We believe that we cannot measure the number of salamanders taken as a result of this TIMR Program because they are difficult to find. Therefore, the FWS defines incidental take in terms of the condition and number of Sonoran tiger salamander ponds, and is using this surrogate measure to identify when take has been exceeded. Take of this species can be anticipated if visual inspection determines that BMPs designed to control erosion have not been effective and, as a result, visual confirmation determines that more than approximately half of the bottom of an occupied tank, pond or pool is covered by fresh silt, as a result of TIMR activity, following the first major precipitation event after project implementation has been completed. Visual inspections are included as a conservation measure above and will be scheduled and conducted by CBP or their contractors within 7 days of the first significant precipitation event following TIMR activities, and any such sedimentation will be reported to FWS within 5 days. Such deposits are directly related to habitat modifications and indicative of a sedimentation event significant enough that, if exceeded, will constitute an unacceptable impact to occupied habitat and individual Sonoran tiger salamanders. We anticipate take of this type to occur once every five years for the duration of the TIMR Program.

During the visual inspections described above, CBP or their contractors will also conduct visual inspections for any dead or dying Sonoran tiger salamanders within the water bodies inspected. Any such loss of salamanders will be reported to the FWS within 5 days.

EFFECT OF THE TAKE

In this biological opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the species.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

A comprehensive suite of BMPs and CMs have been incorporated into the proposed action for the TIMR Program. These conservation measures generally and specifically require CBP to reduce effects to the Sonoran tiger salamander and habitat. No additional reasonable and prudent measures are necessary to minimize incidental take.

If mortality or injury of any Sonoran tiger salamander is detected, the instructions provided below under "Disposition of Dead or Injured Listed Species" will be followed. In addition, CBP must report activities implemented under the TIMR Program, including the outcome of any monitoring, as well as any potential take of this species, in its annual report to FWS.

Review requirement: Because FWS has determined that no Reasonable and Prudent Measures or Terms and Condition are required beyond the measures outlined in the Proposed Action above, it is imperative that CBP implement the BMPs and CMs described above, including the required monitoring and reporting. If, during the course of the proposed action, the level of incidental take is exceeded, such incidental take would represent new information requiring review of the proposed action, potentially through reinitiation of section 7 consultation as described below in the Reinitiation Notice.

CONSERVATION RECOMMENDATIONS

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

1. CBP is encouraged to participate in the implementation of the Sonoran tiger salamander Recovery Plan.

2. CBP is encouraged to support the implementation of, and/or help fund studies of vectors of disease transmission, salamander metapopulation dynamics, distribution of the *mavortium* genome in the San Rafael Valley, the movements and habitat use of terrestrial salamanders, and other topics that may improve our understanding of the conservation and recovery needs of the Sonoran tiger salamander.

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

Please note that surveys for Sonoran tiger salamander that involve capture or take require appropriate permits from the FWS and AGFD.

PIMA PINEAPPLE CACTUS

STATUS OF THE SPECIES

Description, Legal Status, and Recovery Planning

The Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*; PPC) is a low-growing, hemispherical plant known from the semi-desert grassland and Sonoran desert scrub of southern Arizona and northern Mexico. Pima pineapple cacti can be single-stemmed, multi-headed, or appear in clusters (FWS 1993). Adults of the species measure 4-18 inches (10-46 centimeters) tall and 3-7 inches (7.5-18 centimeters) in diameter. Spines of the pineapple cactus are very stout, and form clusters consisting of one strong, hooked central spine, and 6-15 straight radial spines (FWS 1993). The spines are initially straw colored, but become black with age. Pineapple cactus flowers are silky yellow in color, and the fruit is green ellipsoid, succulent, and sweet. The PPC occurs on lands of the Tohono O'odham Nation, Arizona State lands, and private lands. The cactus also occurs on Federal lands under management of the BLM, USFS, FWS, and Bureau of Reclamation (Arizona Rare Plant Committee 2001).

Coryphantha scheeri var. *robustispina* was first collected in 1856 by Mr. A. Schott, from grasslands on the south side of the Baboquivari Mountains in Sonora, Mexico. These plants were originally named *Mammillaria robustispina*, and subsequently underwent several name changes (FWS 1993). Lyman Benson (1969) published the most recent revision, which split *Coryphantha scheeri* into three varieties, including the variety *robustispina*. The PPC is also known as Scheer's strong-spined cory cactus.

The PPC was listed as endangered on September 23, 1993 (58 FR 49875). The rule became effective on October 25, 1993, and critical habitat was not designated at that time. Factors that contributed to the listing include habitat loss and degradation, habitat modification and fragmentation, limited geographic distribution and species rareness, illegal collection, and difficulties in protecting areas large enough to maintain functioning populations. Biological information was summarized in the proposed and final listing rules. A 5-year review was completed in 2007 and recommended no change to the cactus's classification as an endangered species (FWS 2007).

The PPC is protected as a "Highly Safeguarded Species" under the Arizona Native Plant Law. The Arizona Native Plant Law may delay vegetation clearing on private property for the salvage of specific plant species within a 30-day period. Although the law prohibits the illegal taking of PPC on State and private lands without a permit for educational or research purposes, it does not provide for protection of plants in situ through restrictions on development activities.

There are two established conservation banks for PPC, one on a private ranch in the Altar Valley and another owned by Pima County which includes areas in both the Altar Valley and south of Green Valley. Nine projects have used the bank to mitigate the loss of Pima pineapple cactus and habitat from residential and commercial development. Pima County and the City of Tucson's large-scale conservation efforts for this species (Habitat Conservation Plans) are not yet complete, but strategies for PPC conservation will likely include additional conservation banks, acquisition of occupied and suitable Pima pineapple cactus habitat, a revision of both the City and County ordinances dealing with native plant protection, and provisions for the protection of PPC and habitat within subdivisions (FWS 2007).

Life History and Habitat

Pima pineapple cacti grow in alluvial basins and hillsides of semi-desert grasslands and desert scrub. The plant occurs most commonly in open areas on flat ridge tops or areas with less than 10-15 percent slope (FWS 1993). Soils range from shallow to deep, and silty to rocky. In Arizona, the plant is found at elevations between 2,360 ft and 4,700 ft (Phillips et al. 1981, Benson 1982, Ecosphere 1992), in transition zone vegetation characterized as a combination of upland Sonoran Desert scrub and semi-desert grasslands (Brown 1982). Vegetation within this transition zone is dominated by mid-sized mesquite trees, half shrubs (snakeweed, burroweed, and desert zinnia) with patches of native grass and scattered succulents. In Sonora, the cactus reportedly occurs in semi-desert grasslands upslope into oak woodlands, at elevations of 2,300-4,920 ft (Paredes-Aguilar et al. 2000). Several attempts have been made to delineate suitable habitat within the range of PPC (McPherson 2002; RECON Environmental Inc. 2006; FWS, unpublished analysis) with very limited success. As such, we are still unable to determine exact ecological characters to help us predict locations of the cactus or precisely delineate suitable habitat (FWS 2007).

The major pollinator of PPC is *Diadasia rinconis*, a ground-nesting, solitary, native bee. McDonald (2005) found that PPC plants need to be within approximately 900 m (2,970 ft) of each other in order to facilitate effective pollination. PPC plants that are located at distances greater than 900 m from one another become isolated. The species is an obligate outcrosser (not self-pollinating), so it is important for plants to be within a certain distance to exchange pollen with each other. Also, the study found that pollination was more effective when other species of native cacti are near areas that support PPC. The native bees pollinate a variety of cacti species and the sole presence of PPC may not be enough to attract pollinators.

Distribution and Abundance

PPC occurs south of Tucson, in Pima and Santa Cruz Counties, Arizona and adjacent northern Sonora, Mexico. The range of the species extends east from the Baboquivari Mountains, 45 miles to the western foothills of the Santa Rita Mountains; and extends south from Tucson, Arizona, 50 miles to Sonora, Mexico. In Arizona, the PPC is distributed at very low densities throughout both the Altar and Santa Cruz Valleys, and in low-lying areas connecting the two valleys. Because populations are healthier in desert scrub/semi-desert grassland transition zones, conservation within these areas is very important (Roller and Halvorson 1997). However, this important habitat type is

not uniformly distributed throughout the plant's range. Populations of PPC are patchy, widely dispersed and highly variable in density. The few higher population densities that have been documented range from 6.3-7.5 plants per hectare (ha) [1-3 plants per acre]. Other densities across the majority of the plant's range vary between one plant per 1.9 ha (4.6 acres) and one plant per 8.5 ha (21 acres) (Mills 1991, Ecosphere 1992, Roller 1996).

As a consequence of its general habitat requirements, considerable suitable habitat for this species appears to exist in Pima and Santa Cruz counties, much of which is unoccupied. PPC occurs at low densities, widely scattered, and sometimes in clumps, across valley bottoms and bajadas. The species can be difficult to detect, especially in dense grass cover. For this reason, systematic surveys are expensive and have not been conducted in much of its range. As a result, location information has been gathered opportunistically, either through small systematic surveys, usually associated with specific development projects, or larger surveys that are typically only conducted in areas that seem highly suited for the species. Furthermore, our knowledge of this species is gathered primarily through the section 7 process; therefore, we only see projects that require a Federal permit or have Federal funding. There are many projects that occur within the range of pineapple cactus that do not undergo section 7 consultation, and we have no information regarding the status or loss of plants or habitat associated with those projects. For these reasons, it is difficult to characterize abundance and population trends for this species. Even with complete data on historical change related to pineapple cactus distribution and abundance, we cannot reliably predict population status due to compounding factors such as climate change, urbanization, and legal and political complexities (McPherson 1995). We do not know if the majority of populations of pineapple cacti can be sustainable under current reduced and fragmented conditions. Thus, there is a need to gather information on limits to the plant's distribution under current habitat conditions.

Section 7 consultations on development projects have provided us information on 2,705 plants found on approximately 15,217 acres within the range of the PPC (FWS 2011). Of the total number of plants, 1,992 (74 percent) were destroyed, removed, or transplanted as a result of development, mining, and infrastructure projects (FWS 2011). In terms of habitat, some of the measured acres likely did not provide PPC habitat, but that amount is difficult to quantify because it was not consistently delineated in every consultation. Of the 15,217 acres, however, we are aware of 14,552 acres (96 percent) have been either permanently or temporarily impacted. Similarly, through section 7 consultations on non-development-related projects (e.g., fire management plans, grazing, buffelgrass control), we are aware of an additional 781 plants within an unknown number of acres; the number of acres is unknown because these types of projects are often surveyed inconsistently, if at all (FWS 2012).

Across the entire PPC range, it is difficult to quantify the total number of cacti lost and the rate and amount of habitat loss for the following three reasons: 1) we review only a small portion of projects within the range of the cactus (only those that have Federal involvement and are subject to section 7 consultation), 2) development that takes place without any jurisdictional oversight is not tracked within Pima and Santa Cruz counties, and 3) many areas within the range of the cactus have not been surveyed; therefore, we do not know how many plants exist, nor how much habitat is presently

available. It is important to note that the above survey results have never been used as an estimate of the entire PPC population, nor was a population estimate ever extrapolated from these data (FWS 2007).

The AGFD maintains the Heritage Data Management System (HDMS), a database identifying elements of concern in Arizona and consolidating information about their distribution and status throughout the state. This database has 7,155 PPC records, 7,015 PPC of which have coordinates. Some of the records are quite old, and we have not confirmed whether the plants are still alive. We also cannot determine which plants may be the result of multiple surveys in a given area. Of the known individuals (7,155), approximately 1,739 PPC plants are documented in the database as extirpated as of 2008. There have been additional losses since 2008, but that information is still being compiled in the database. However, in general, recent reports indicate a continued loss of known PPC individuals. The database is dynamic, based on periodic entry of new information, as time and staffing allows. As such, the numbers used from one biological opinion to the next may vary and should be viewed as a snapshot in time at any given moment. We have not tracked loss of habitat because very few biological assessments quantify habitat for PPC.

Based on surveys and habitat analysis, areas south of Tucson through the Santa Cruz Valley to the town of Amado and surrounding developed parts of Green Valley and Sahuarita, and parts of the San Xavier District of the Tohono O'odham Nation, appear to support abundant populations and some recruitment, and units of extensive habitat still remain. However, the primary threat to the status of this species throughout its range is the accelerated rate (since 1993) at which much of the prime habitat is being developed, fragmented, or modified. The Altar Valley has not seen the development pressures that have been seen in the rest of this species' range, and the majority of the habitat in this valley remains intact. Surveys related to prescribed fire projects and research activities have continued to provide information on the status of this species in this part of its range.

The protection of habitat and individuals is complicated by the varying land ownership within the range of this species. An estimated 10 percent of the potential habitat for pineapple cacti is held in Federal ownership. The remaining 90 percent is on Tribal, State, and private lands. Most of the federally-owned land is either at the edge of the plant's range or in scattered parcels. The largest contiguous piece of federally-owned land is the Buenos Aires National Wildlife Refuge, located at the southwestern edge of the plant's range at higher elevations and lower plant densities.

Threats

Threats to PPC continue to include habitat loss and fragmentation, competition with non-native species, and inadequate regulatory mechanisms to protect this species. We believe residential and commercial development, and its infrastructure, is by far the greatest threat to PPC and its habitat. The cactus has continued to experience declines throughout most of its range because of the loss of habitat and individuals due to residential and commercial development in the Santa Cruz River Valley, the lands south of Tucson and along the corridor north and south of State Route 86. Most of the documented habitat loss has occurred south of Tucson through the Santa Cruz Valley to the town of Amado. This area is critical for the future recovery of the species. The expansion of urban

centers, human population, and mining activities will continue to eliminate habitat and individuals, and result in habitat fragmentation.

Other specific threats that have been previously documented (58 FR 49875), such as overgrazing, illegal plant collection, prescribed fire, and mining, have not yet been analyzed to determine the extent of effects to this species. However, partial information exists. Mining has resulted in the loss of hundreds, if not thousands, of acres of potential habitat throughout the range of the plant. Much of the mining activity has been occurring in the Green Valley area, which is the center of the plant's distribution and the area known to support the highest densities of pineapple cactus. Overgrazing by livestock, illegal plant collection, and fire-related interactions involving exotic Lehmann's lovegrass (*Eragrostis lehmanniana*) may also negatively affect pineapple cactus populations (58 FR 49875). Based on current knowledge, urbanization, farm and crop development, and exotic species invasion alter the landscape in a manner that would be nearly irreversible in terms of supporting PPC populations.

ENVIRONMENTAL BASELINE

Regulations implementing the Act (50 CFR § 402.02) define the environmental baseline as the 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.

Status of the Pima Pineapple Cactus in the Action Area

Sites suitable for PPC (elevations between 2,360 and 4,700 ft in areas at less than 10 to 15% slope) occur throughout the action area. While wide-ranging survey data are lacking, the species is known from several localities in which TIMR Program activities will occur, including the Altar and Santa Cruz River Valleys, and the plains and bajadas surrounding the mountains bordering those valleys. The action area encompasses a 14- to 50-mile-wide corridor extending north of the U.S./Mexico international border, plus the location of the road north of Three Points, and is a subset of the broader range of the PPC (see Figure 10). The action area encompasses over half of the known range of the PPC, and no systematic inventory of PPC individuals has taken place in the TIMR action area. According to the BA, NatureServe data indicate that within the action area, PPC are known to occur within the boundaries of Amado, Cerro Colorado, Fresno wash, Kino Springs, Las Guijas, Mildred Peak, Palo Alto Ranch, Presumido Peak, and Wilbur Canyon USGS topographic quadrangle maps (2011). Figure 10 depicts the TIMR proposed action area and infrastructure relative to the range of PPC. Approximately 275 - 300 miles of roads will be repaired or maintained in PCC habitat, along with 5 - 20 towers, 1 - 10 culverts, and 1 - 10 low water points. Due to the relatively wide distribution of this species in the action area, the condition of the habitat where project activities will occur is likely varied. The area encompassed by the proposed action occupies an appreciable proportion of the range of the species in the U.S. and, therefore, the species' status in the action area is similar to the rangewide status.

Summary of Activities Affecting Pima Pineapple Cactus in the Action Area

Our information indicates that, rangewide, more than 45 consultations have been completed or are underway for actions affecting the Pima pineapple cactus. The majority of these biological opinions concerned the effects of development (approximately 38 percent), utility infrastructure (approximately 15 percent), prescribed fire plans (approximately 12 percent), and roads and bridges (approximately 8 percent). The remaining 42 percent of consultations dealt with grazing, mining, and agency planning issues.

The area of habitat reviewed under section 7 of the ESA in approximately 26 consultations between 1987 and 2000 (i.e., habitat developed or significantly modified beyond the point where restoration would be a likely alternative) is approximately 24,429 acres, which represents 43 percent of the total area surveyed to date. While some of these sites occur outside of the TIMR action area, the information is useful in understanding the importance of the remaining PPC populations within the action area for TIMR. For example, in 1998, more than 1,100 acres of pineapple cactus habitat were lost, including 752 acres from the ASARCO, Inc. Mission Complex mining project. In 2000, 586 acres of habitat were lost with the expansion of a state prison in Tucson. In 2001, 177 acres of habitat were lost through development, but 888 acres of occupied and suitable habitat were conserved through conservation easements. In 2002-2003, 76.5 acres of occupied habitat were destroyed, but 36 acre-credits were purchased in the pineapple cactus conservation bank, thus protecting 36 acres of pineapple cactus habitat, and an additional 58.5 acres of pineapple cactus habitat were conserved in a conservation easement. We are aware of housing developments along Valencia Road, Pima County, Arizona, in the vicinity of T15S, R12E, Section 15 and surrounding areas, which support pineapple cacti. In addition, residential development has continued, although at a slower rate than historically, in the Corona de Tucson area in the southeastern portion of the Tucson Basin. These developments affect several hundred acres of habitat and have not been evaluated through the section 7 process. The number of acres lost through private actions, not subject to Federal jurisdiction, is not known but, given the rate of urban development in Pima County, we believe it is significant. Livestock grazing and unauthorized off-road vehicle activity may also be affecting PPC within the action area.

Much of the potential PPC habitat in the action area is subject to intense use by CBVs and law enforcement response by the USBP. The FWS has observed many new roads, vehicle tracks, footpaths, and illegal dumping of trash in areas on Arizona State lands and at Buenos Aires National Wildlife Refuge (BANWR), where larger areas of suitable habitat for PPC exist (personal communication with Dan Cohan, Biologist with BANWR). Areas of TIMR infrastructure that are adjacent to these lands are probably being used in a similar manner. These activities are contributing to overall habitat degradation and may be facilitating the movement of non-native species (e.g., buffelgrass, Lehmann's lovegrass) into desert scrub and semi-desert grassland communities that support PPC.

In summary, monitoring has shown that the range-wide status of the pineapple cactus appears to have been recently affected by threats that have completely altered or considerably modified more than a third of the species' surveyed habitat, and have caused the elimination of nearly 60 percent of

documented locations. Dispersed, patchy clusters of individuals are becoming increasingly isolated as urban development, mining, and other commercial activities continue to detrimentally impact the habitat. The remaining habitat also is subject to degradation or modification from current land-management practices, increased recreational use on lands when adjacent to urban expansion (i.e., off-road vehicle use and illegal collection), and the continuing aggressive spread of non-native grasses into pineapple cactus habitat. Although there has been a recent slowdown in the development of residential and commercial properties, habitat fragmentation and degradation will likely continue into the foreseeable future based on historical data and growth projections produced by the Pima County Association of Governments (1996). There is very little Federal oversight on conservation measures that would protect or recover the majority of the potential habitat. Even some areas where section 7 consultations have been completed have been modified and may not be able to support viable populations of the pineapple cactus over the long-term. There is some hope that County-level habitat conservation plans will contribute to the conservation of the PPC, but these planning efforts have not yet been completed or implemented.

EFFECTS OF THE ACTION

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

There are no interrelated or interdependent actions that are part of the TIMR Program and that are dependent upon the Program for justification or have no independent utility apart from the TIMR Program. Ongoing and planned CBP activities in southern Arizona to secure the international border have independent utility from the TIMR Program and would continue, although in many cases less efficiently, regardless of implementation of the TIMR Program. Ongoing maintenance activities that are not considered in this BO, including operation of existing maintenance facilities and equipment used for those activities, also have independent utility from the TIMR Program and are not dependent upon it for justification. Thus, this BO only considers the direct, indirect, and cumulative impacts of TIMR Program activities in the description of the proposed action.

We do not know specifically if and where the following effects to cacti will occur because we do not have specific information on their location within the action area, but cacti will likely be affected to some degree. Maintenance and repair activities could affect PPC through trampling or crushing of individuals and altering the habitat around individuals. Trampling or crushing that results in injury or death to an individual PPC could occur, but we anticipate that this would not be a common occurrence because individuals and small clumps are scattered and rare and TIMR Program activities will occur primarily within the existing footprint of the tactical infrastructure. Habitat conditions may be altered through proposed activities by decreasing cover, increasing soil compaction, destruction of cryptobiotic crusts, increasing erosion, and increasing non-native grasses and other

plants (with changes in fire frequency and intensity). These effects may decrease the suitability of a site to maintain cacti in the long-term.

Disturbance to Pima Pineapple Cactus – Direct Effects

Potential direct impacts on PPC individuals from maintenance and repair activities include direct injury and mortality from trampling or crushing by equipment, alteration of the plant seed bank, and habitat degradation from disturbance of soils. Although most maintenance and repair activities will be conducted within previously disturbed areas, some activities will need to be conducted in areas immediately adjacent to the existing infrastructure footprint. For example, equipment might need to be operated off of existing roads to remove debris from culverts and fences and to otherwise access and maintain infrastructure. There may be an occasion where CBP might need to conduct maintenance and repair activities outside the footprint of tactical infrastructure in an area where PPC occur. However, activities outside of the existing footprint of tactical infrastructure would occur very infrequently; thus, the proposed action would result in limited direct effects on PPC. Because some individual cacti might be destroyed during that work, the proposed project may affect and is likely to adversely affect PPC. The proposed CM for the PPC indicates that CBP will compensate for any lost PPC habitat or individuals by purchasing credits in an approved PPC conservation bank.

In general, CBP will avoid direct and indirect impacts on PPC by allowing no ground disturbance outside the existing infrastructure footprint in known habitat for this species without offsetting such impacts by purchasing credits in an existing PPC conservation bank. By generally avoiding suitable habitat where these protected plants occur, the proposed project has a reduced likelihood that it would harm individual plants, cause habitat degradation, or otherwise directly adversely affect PPC.

Disturbance to Pima Pineapple Cactus – Indirect Effects

Potential indirect impacts include increased erosion and sedimentation from alterations in hydrology, and increased potential for invasive species and fire. Based on the implementation of BMPs designed to avoid or reduce impacts on this species, these impacts would be extremely unlikely to occur.

Habitat Loss and Degradation-Direct Effects

Potential direct impacts on PPC include habitat degradation from disturbance of soils. To avoid these effects, as well as habitat degradation from removal of canopy cover, vegetation clearing (i.e., removal of vegetation to maintain line of sight for CBP operations or remove CBV hiding locations from areas where vegetation has not been previously cleared) will not be conducted within suitable PPC habitat unless absolutely necessary, in which case habitat impacts will be offset through acquisition of credits in a PPC mitigation bank as described below.

PPC are habitat generalists that are found over a relatively large portion of southern Arizona and, as a consequence, they can be found throughout a substantial portion of the action area. It is therefore possible that some maintenance and repair activities would need to be conducted outside of the footprint of existing tactical infrastructure in an area where this species occurs. To mitigate for the loss of PPC, CBP will purchase, from a conservation bank approved by the FWS Arizona Ecological

Services Office, one credit for each acre of suitable habitat lost. Because almost all maintenance and repair activities would be conducted from existing roads and other disturbed areas, and disturbances outside of existing footprints would be required very infrequently, we anticipate that CBP would need to acquire credits in the conservation bank on a very limited basis.

Habitat Loss and Degradation – Indirect Effects

Maintenance activities that compact soils and change water infiltration could alter local hydrology by increasing sedimentation and runoff in suitable PPC habitat. BMPs will be implemented to reduce sedimentation and runoff from roads and other infrastructure and minimize other potential indirect effects to this species. A SWPPP will be prepared and implemented prior to applicable maintenance activities (i.e., disturbances greater than 1 acre of exposed dirt or as required by the property owner or land manager). BMPs described in the SWPPP to reduce erosion will be implemented. CBP will consider areas with highly erodible soils when planning the maintenance activities and will require the use of measures such as waddles, aggregate materials, and wetting compounds where appropriate. Tactical infrastructure will be periodically inspected for the presence of erosion, and repair and maintenance will be implemented as necessary.

Recently disturbed soils can have an increased potential for invasive species such as Lehman's lovegrass and Boer lovegrass (*Eragrostis curvula*) to become established. These and other invasive species tend to form dense stands that promote higher intensity fires that occur more often (FWS 2007). However, coordination with the CBP environmental SME would be conducted in order to determine if the maintenance activities occur in a highly sensitive area or an area that poses an unacceptable risk of transmitting invasive species. If it is determined that maintenance activities occur in such an area, the CBP cleaning protocol for all equipment will be followed. In addition, a fire prevention and suppression plan will be developed and implemented for all maintenance and repair activities that require welding or otherwise have a risk of starting a wildfire.

By implementing BMPs to reduce sedimentation and runoff, and by reducing the potential for invasive species and fire, the proposed action should avoid or reduce potential effects on threatened and endangered perennial plant species, including the PPC.

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 BO. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

The majority of PPC habitat occurs on Arizona State lands, some of it adjacent to Federal lands within and outside of the action area. State lands are managed primarily for income to the State Trust and ultimately may be sold for development or other purposes. Urban development is the primary threat to the species and causes loss of individuals and fragmentation of populations, especially populations that exist on different land ownerships. Off-road vehicle use also occurs on State land and illegally on BLM lands. This activity, often unsupervised, contributes to habitat

degradation and loss of plants. Erosion, leading to the formation of gullies and headcuts, can form on adjacent State lands and spread onto Federal lands. Livestock grazing on State and private lands, if not properly managed, can contribute to PPC habitat degradation. Trail creation and use, off-road driving, and trash dumping associated with undocumented CBV traffic and associated law enforcement response has been observed in PPC habitat. These actions increase the likelihood of directly affecting individual cacti, compacting soil, and increasing the likelihood of wildfire. Trails may act as vector points for the movement of invasive species into PPC habitat. Illegal collection of this cactus is an additional threat with cumulative effects.

CONCLUSION

The conclusions of this BO are based on full implementation of the project as described in the Description of the Proposed Action section of this document, including the BMPs and CMs that are incorporated into the project design. After reviewing the current status of PPC, the environmental baseline for the action area, the effects of the TIMR Program, and the cumulative effects, it is the FWS's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the PPC. No critical habitat has been designated for this species; therefore, none will be affected. We base this conclusion on the following reasons:

1. Maintenance and repair work will be generally confined to the existing, disturbed footprint of the tactical infrastructure described above. These areas would not typically be occupied by PPC. The only anticipated TIMR Program activities outside of the existing footprint would be for the clearing of culverts and debris removal within ephemeral drainages that do not provide suitable habitat for PPC. These types of activities outside of the existing infrastructure footprint would be rare.

2. Vegetation clearing will not be conducted within suitable habitat of PPC unless absolutely necessary. If CBP determines that vegetation clearing must be conducted within suitable habitat of threatened or endangered species, they will offset such impacts by purchasing credits in an approved conservation bank as outlined elsewhere in this document.

3. The effects of maintenance and repair activities will be reduced by the implementation of invasive species control measures, fire prevention and suppression, and sediment control measures, and limited repair activities outside of existing infrastructure. These measures will minimize the scale of effects to PPC, but may not completely offset them.

4. Effects to PPC habitat not avoided or minimized through BMPs will be offset by the purchase of credits at a 1:1 ratio from a Pima pineapple cactus conservation bank approved by FWS.

5. Use of herbicides will not occur within areas of suitable habitat within the range of threatened or endangered plant species unless approved by the FWS.

INCIDENTAL TAKE STATEMENT

Sections 7(b)(4) and 7(o)(2) of the Act generally do not apply to listed plant species. However, limited protection of listed plants from take is provided by the Act through prohibiting the removal and reduction to possession of federally-listed endangered plants from areas under Federal jurisdiction, or for any act that would remove, cut, dig up, or damage or destroy any such species in any other non-Federal area in knowing violation of any regulation of any State or in the course of any violation of a State criminal trespass law. The Pima pineapple cactus is protected as a highly safeguarded, protected native plant under Arizona State Law (Arizona Revised Statutes §§3-900-916 and Arizona Administrative Code Article 11, §§ R3-3-1101-1111). In effect, listed plants may be removed or transplanted within a non-Federal property, but may not be removed or relocated from that non-Federal property.

CONSERVATION RECOMMENDATIONS

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

1. We recommend that CBP participate in efforts to identify and conserve PPC throughout its range, including participation in forums that address the control of invasive, exotic plants (e.g. buffelgrass and Lehmann's lovegrass).

2. We recommend CBP map the occurrence and abundance of Lehmann's lovegrass and buffelgrass along its infrastructure within the PPC range.

3. We recommend that CBP fund research of PPC pollination biology, which would contribute to our understanding of how habitat fragmentation affects this plant.

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

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species, initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Road, Suite 113, Mesa, Arizona, 85202, telephone: (480) 967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care and in handling dead specimens to preserve the biological material in the best possible state.

REINITIATION NOTICE

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

For further information, please contact Scott Richardson at (520) 670-6150 (x 242) or Jean Calhoun (x 223) of our Tucson Suboffice.

Please refer to the consultation number, 02EAAZOO-2012-F-0170 in future correspondence concerning this project.

Sincerely,

/s/ Jean Calhoun for
Steven L. Spangle
Field Supervisor

cc (hard copy):
Field Supervisor, Fish and Wildlife Service, Phoenix, AZ (2)
Jean Calhoun, Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ
Sid Slone, Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
Sally Gall, Refuge Manager, Buenos Aires National Wildlife Refuge, Sasabe, AZ
Bill Radke, Refuge Manager, San Bernardino/ Leslie Canyon National Wildlife Refuges, Douglas, AZ
Lee Baiza, Superintendant, Organ Pipe Cactus National Monument, Ajo, AZ
Emily Garber, Field Office Manager, Phoenix Field Office, Bureau of Land Management, Phoenix, AZ
Brian Bellew, Field Office Manager, Tucson Field Office, Bureau of Land Management, Tucson, AZ
Jim Upchurch, Forest Supervisor, Coronado National Forest, Tucson, AZ

cc (electronic copy):
Charles Buchanan, Director, 56th Range Management Office, Luke Air Force Base, Gila Bend, AZ
Ronald Pearce, Director, Range Management Department, Marine Corp Air Station, Yuma, AZ
Dr. Ned Norris Jr., Chairperson, Tohono O'Odham Nation, Sells, AZ
Lane Baker, Superintendant, Coronado National Memorial, Hereford, AZ
Acting Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Raul Vega, Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ
Pat Barber, Regional Supervisor, Arizona Game and Fish Department, Yuma, AZ

LITERATURE CITED

Sonoran Pronghorn

Alford, E.J., and J.H. Brock. 2002. Effects of fire on Sonoran Desert plant communities. Page 20 in W.L. Halvorson and B.S. Gebow (eds.), Creative Cooperation in Resource Management: Fourth Conference on Research and Management in the Southwestern Deserts, extended abstracts. USGS Sonoran Desert Field Station, University of Arizona, Tucson, AZ.

Bright, J.L., and J.J. Hervert. 2005. Adult and fawn mortality of Sonoran pronghorn. Wildlife Society Bulletin 33(1):43-50.

_____, _____. 2003. Sonoran pronghorn 2002 aerial survey summary. Arizona Game and Fish Department Nongame and Endangered Wildlife Program Technical Report 236. Arizona Game and Fish Department, Phoenix, AZ.

_____, _____, 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.

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

Brown, D. E. 1982. Biotic communities of the American Southwest – United States and Mexico. Desert Plants 4:123,181.

_____, and R.A. Minnich. 1986. Fire and changes in creosote bush scrub of the western Sonoran Desert, California. American Midland Naturalist 116(2):411-422.

_____ and R. A. Ockenfels. 2007. Arizona's Pronghorn Antelope, A Conservation Legacy. Arizona Antelope Foundation. 190 pp.

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

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

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

deVos, J.C., and W.H. Miller. 2005. Habitat use and survival of Sonoran pronghorn in years with above-average rainfall. Wildlife Society Bulletin 33(1):35-42.

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

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

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

Gavin, S.D. 2004. Road effects on pronghorn in southern Alberta, Canada. *In* Proceedings of the 21st Biennial Pronghorn Workshop, May 1 – 4, 2004, Bismark, North Dakota. Pp. 104 – 111.

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

Gerstenzang, J. 2006. Bush visits border, urges Senate action. Los Angeles Times, May 19, 2006.

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.

Harlow, H.J., E.T. Thorne, E.S. Williams, E.L. Belden, and W.A. Gern. 1987. Cardiac frequency: a potential predictor of blood cortisol levels during acute and chronic stress exposure in Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*). Canadian Journal of Zoology 65:2028-2034.

Hayes, C.L., P.R. Krausman, and M.C. Wallace. 1994. Habitat, visibility, heart rate and vigilance of bighorn sheep. Desert Bighorn Council Transactions 38:6-11.

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

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

Hervert, J.J. J.L. Bright, R.S. Henry, L.A. Piest, and M.T. Brown. 2005. Home-range and habitat-use patterns of Sonoran pronghorn in Arizona. Wildlife Society Bulletin 33(1):8-15.

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

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

Horne, J.S. 2010. An approach for quantifying prediction uncertainty in population viability analysis: evaluating the benefit of the captive breeding program and reestablishment of a new population to Sonoran pronghorn viability. Draft 12/28/10. 25 pp.

Hosack, D.A., P.S. Miller, J.J. Hervert, and R.C. Lacy. 2002. A population viability analysis for the endangered Sonoran pronghorn, *Antilocapra americana sonoriensis*. Mammalia 66(2):207-229.

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

Intergovernmental Panel on Climate Change. 2007. Summary for policymakers of the synthesis report of the IPCC fourth assessment report. Draft copy, 16 November 2007.

Jansen, B. D., P. R. Krausman, J. R. Heffelfinger, and J. C. deVos Jr. 2006. Bighorn sheep selection of landscape features in an active copper mine. Wildlife Society Bulletin 34:1121-1126.

Jorgenson, J.T. Environmental impact of the 1988 winter Olympics on bighorn sheep of Mt. Allan. Biennial Symposium of the Northern Wild Sheep and Goat Council 6:121-134.

Kaseloo, P. A., and K.O. Tyson. 2004. Synthesis of Noise Effects on Wildlife Populations. (FHWA-HEP-06-016) Washington, DC: U.S. Department of Transportation, Federal Highway Administration.

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.

Keay, J.M., J. Singh, M.C. Gaunt, and T. Kaur. 2006. Fecal glucocorticoids and their metabolites as indicators of stress in various mammalian species: a literature review. Journal of Zoo and Wildlife Medicine 37:234-244.

Kerley, L. L., J. M. Goodrich, E. N. Smirnov, D. G. Miquelle, H.B. Quigley, and M.G. Hornocker. 2002. Effects of roads and human disturbance on Amur tigers. Conservation Biology 16(1):97-108.

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

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

Krausman, P.R., L.K. Harris, 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.

_____, _____, C.L. Blasch, K.K.G. Koenen, and J. Francine. 2004. Effects of military operations on behavior and hearing of endangered Sonoran pronghorn. Wildlife Monographs 157:1-41.

_____, _____, S.H. Haas, K.K.G. Koenen, P. Devers, D. Bunting, and M. Barb. 2005a. Sonoran pronghorn habitat us on landscapes disturbed by military activities. Wildlife Society Bulletin 33(1):16-33.

_____, J.R. Morgart, L.K. Harris, C.S. O'Brian, J.W. Cain III, and S.S. Rosenstock. 2005b. Introduction: management for the survival of Sonoran pronghorn in the United States. Wildlife Society Bulletin 33(1):5-7.

Landon, D.M., P.R. Krausman, K.K.G. Koenen, and L.K. Harris. 2003. Pronghorn use of areas with varying sound pressure levels. The Southwestern Naturalist 48(4):725-728.

Larkin, R.P. 1996. Effects of Military Noise on Wildlife: A Literature Review, Technical Report 96/21, U.S. Army Construction Engineering Research Laboratory, Champaign, Illinois.

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

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

MacArthur, R. A., V. Geist, and R. H. Johnston. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journal of Wildlife Management 46:351-368.

_____, 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.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G. Cavendish. 1988. Effects of aircraft noise and sonic booms on domestic animals and wildlife: a literature synthesis. U.S. Fish and Wildlife Service, National Ecology Research Center, Ft. Collins, Colorado. NERC-88/29. 88 pp.

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.

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

Miller, M.W., N.T. Hobbs, and M.C. Sousa. 1991. Detecting stress response in Rocky Mountain bighorn sheep (*Ovis canadensis canadensis*): reliability of cortisol concentrations in the urine and feces. Canadian Journal of Zoology 69:15-24.

Milstead, B., and B. Barns. 2002. Life on the border: monitoring the effects of border-crossing and law enforcement on natural resources. W.L. Halvorson and B.S. Gebow, eds., Meeting resource management information needs: fourth conference on research and resource management in the southwestern deserts, extended abstracts. USGS Sonoran Desert Field Station, University of Arizona, Tucson: 87-88.

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

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

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

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

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

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

Papouchis, C.M., S. F. Singer, and W. B. Sloan. 2001. Responses of desert bighorn sheep to increased human recreation. Journal of Wildlife Management 65:573-582.

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

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

Radle, A. L. 1998. The effect of noise on wildlife: A literature review. *In* World Forum for Acoustic Ecology Online Reader, March 2007. MS Thesis, University of Oregon, Eugene.

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

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

Rutman, S. 1997. Dirt is not cheap: livestock grazing and a legacy of accelerated soil erosion on Organ Pipe Cactus National Monument, Arizona. *In* J. M. Feller and D. S. Strouse, 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, Arizona.

Schwalbe, C.R., T.C. Esque, P.J. Anning, and W.L. Halvorson. 2000. Exotic grasses, long-lived species, and managing desert landscapes: a case history at Saguaro National Park. Page 87 in W.L. Halvorson and B.S. Gebow (eds), Creative Cooperation in Resource Management: Third Conference on Research and Management in the Southwestern Deserts, extended abstracts. USGS Sonoran Desert Field Station, University of Arizona, Tucson, Arizona.

Seager, R., M. Ting, T. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harrnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. Science 316:1181-1184.

Segee, B.P., and J.L. Neeley. 2006. On the line, the impacts of immigration policy on wildlife and habitat in the Arizona borderlands. Defenders of Wildlife, Washington, D.C. 40 p.

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

Stankowich, T. 2008. Ungulate flight responses to human disturbance: A review and meta-analysis. Biological Conservation 141:2159-2173.

Stemp, R. E. 1983. Heart rate responses of bighorn sheep to environmental factors and harassment. MS Thesis, University of Calgary, Alberta, Canada 314 pp.

Tellman, B. 2002. Introduction. Pages xvii-xxvi in B. Tellman (ed.), Invasive Exotic Species in the Sonoran Region. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson, Arizona.

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

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

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

_____. 2002. Recovery criteria and estimates of time for recovery actions for the Sonoran pronghorn: a supplement and amendment to the 1998 final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.

Weiss, J.L., and J.T. Overpeck. 2005. Is the Sonoran Desert losing its cool? Global Change Biology 11:2065-2077.

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

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

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.

Chiricahua Leopard Frog

Blaustein, A.R., D.B. Wake, and W.P. Sousa. 1994. Amphibian declines: judging stability, persistence, and susceptibility of populations to local and global extinction. Conservation Biology 8(1):60-71.

Bock, J.H., and C.E. Bock. 2002. Exotic species in grasslands. Pages 147-164 *in* B. Tellman (ed.), Invasive Exotic Species in the Sonoran Region. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson, Arizona.

Carr, L.W., and L. Fahrig. 2001. Effect of road traffic on two amphibian species of differing vagility. Conservation Biology 15(4):1071-1078.

Christman, B.L. and M.R. Cummer. 2006. Stomach content analysis of Chiricahua leopard frog (*Rana chirircahuensis*) and plains leopard frog (*Rana blairi*) in New Mexico. Report to the New Mexico Department of Game and Fish, Santa Fe, NM.

Crother, B.I. (ed.). 2008. Scientific and Common Names for Amphibians and Reptiles of North America North of México. Society for the Study of Amphibians and Reptiles, Herpetological Circular No. 37:1-84

Daszak, P. 2000. Frog decline and epidemic disease. International Society for Infectious Diseases. http://www.promedmail.org.

Davidson, C. 1996. Frog and toad calls of the Rocky Mountains. Library of Natural Sounds, Cornell Laboratory of Ornithology, Ithaca, NY.

Degenhardt, W.G., C.W. Painter, and A.H. Price. 1996. Amphibians and reptiles of New Mexico. University of New Mexico Press, Albuquerque.

deMaynadier, P. 2000. The effects of logging roads on amphibian movements. Herpetological Review 31(4):212.

Diaz, J.V., and G.E.Q. Diaz. 1997. Anfibios y reptiles de Aguascalientes. Grupo Impressor Mexico, Aguascalientes, Aguascalientes, Mexico.

Esque, T.C., and C.R. Schwalbe. 2002. Alien annual grasses and their relationships to fire and biotic change in Sonoran desertscrub. Pages 165-194 *in* B. Tellman (ed.), Invasive Exotic Species in the Sonoran Region. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson, Arizona.

Fernandez, P.J. and J.T. Bagnara. 1991. Effect of background color and low temperature on skin color and circulating ά-MSH in two species of leopard frog. General and Comparative Endocrinology 83:132-141.

Fernandez, P.J. and J.T. Bagnara. 1993. Observations on the development of unusual melanization of leopard frog ventral skin. Journal of Morphology 216:9-15.

Frost, J.S. and J.T. Bagnara. 1977. Sympatry between *Rana blairi* and the southern form of leopard frog in southeastern Arizona (Anura: Ranidae). Southwestern Naturalist 22:443-453.

Jennings, R.D. and N.J. Scott. 1991. Global amphibian population declines: insights from leopard frogs in New Mexico. Report to the New Mexico Department of Game and Fish, Albuquerque, New Mexico. 43 pp. + appendices, figures, and tables.

Lemos-Espinal, J.A., and H.M. Smith. 2007. Anfibios y Reptiles del Estado de Chihuahua, México/Amphibians and Reptiles of the State of Chihuahua, México. Universidad Nacional Autonoma de México y CONABIO, México D.F.

National Park Service (NPS). 2012. Help stop the spread of non-native species. Accessed at: www.nps.gov/pore/planyourvist/stop_invasive_species.htm

Painter, C.W. 2000. Status of listed and category herpetofauna. Report to US Fish and Wildlife Service, Albuquerque, NM. Completion report for E-31/1-5.

Platz, J.E., A. Lathrop, L. Hofbauer, and M. Vradenburg. 1997. Age distribution and longevity in the Ramsey Canyon leopard frog, *Rana subaquavocalis*. Journal of Herpetology 31(4):552-557.

Platz, J.E., and J.S. Mecham. 1984. *Rana chiricahuensis*. Catalogue of American Amphibians and Reptiles 347.1.

Platz, J.E., and J.S. Mecham. 1979. *Rana chiricahuensis*, a new species of leopard frog (*Rana pipiens* Complex) from Arizona. Copeia 1979(3):383-390.

Rorabaugh, J.C. 2008. An introduction to the herpetofauna of mainland Sonora, México, with comments on conservation and management. Journal of the Arizona-Nevada Academy of Science 40(1):20-65.

Rorabaugh, J. 2010. A comparison of the status of the Chiricahua leopard frog (*Lithobates chiricahuensis*) in Arizona from 2002 to 2009. U.S. Fish and Wildlife Service. Ecological Services. Tucson, Arizona. January 2010. 30 pp.

Rosen, P.C. and C. Melendez. 2010. Observations on the status of aquatic turtles and the occurrence of ranid frogs and other aquatic invertebrates in northwestern Mexico. Pages 205-224 *in* W. Halvorson, C. Schwalbe, and C. van Riper III (eds), Southwestern Desert Resources. University of Arizona Press, Tucson.

Rosen, P.C., and C.R. Schwalbe. 1998. Using managed waters for conservation of threatened frogs. Pages 180-202 *in* Proceedings of Symposium on Environmental, Economic, and Legal Issues Related to Rangeland Water Developments. November 13-15, 1997, Tempe, AZ

Spencer, C.N., and F.R. Hauer. 1991. Phosphorus and nitrogen dynamics in streams during a wildfire. Journal of the North American Benthological Society 10(1):24-30.

Sredl, M.J., and R.D. Jennings. 2005. *Rana chiricahuensis*: Chiricahua leopard frogs. Pages 546-549 in M.J. Lannoo (ed), Amphibian Declines: The Conservation Status of United States Species. University of California Press, Berkeley.

Stebbins, R.C. and N.W. Cohen. 1995. A Natural History of Amphibians. Princeton University Press, Princeton, New Jersey. 316 pp.

Stebbins, R.C. 2003. A Field Guide to Western Reptiles and Amphibians. Houghton Mifflin Company, Boston, MA.

Tellman, B. 2002. Introduction. Pages xvii-xxvi in B. Tellman (ed.), Invasive Exotic Species in the Sonoran Region. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson, Arizona.

U.S. Fish and Wildlife Service (FWS). 2002. Endangered and threatened wildlife and plants; listing of the Chiricahua leopard frog (*Rana chiricahuensis*); final rule. Federal Register 67(114):40790-40811.

_____. 2007. Chiricahua leopard frog (*Rana chiricahuensis*) recovery plan. Region 2, U.S. Fish and Wildlife Service, Albuquerque, NM.

_____. 2009. Endangered and threatened wildlife and plants; partial 90-day finding on a petition to list 475 species in the Southwestern United States as threatened or endangered with critical habitat; proposed rule. Federal Register 74(240):66866-66905.

_____. 2011a. Endangered and threatened wildlife and plants; listing and designation of critical habitat for the Chiricahua leopard frog: final rule. Federal Register 77(54):16324-16424.

Wallace, J.E. 2003. Status assessment of lowland leopard frogs in mountain canyons of Coronado National Forest – Santa Catalina Ranger District. Purchase Order #43-8197-3-0058. Report to the Coronado National Forest.

Watson, M.L. 2005. Habitat fragmentation and the effects of roads on wildlife and habitats: Background and literature Review. New Mexico Department of Game and Fish. 18 pp.

Zug, G. R., L. J. Vittand J. P. Caldwell. 2001. Herpetology: An Introductory Biology of Amphibians and Reptiles, 2nd edition. Academic Press, San Diego, California.

Sonoran Tiger Salamander

Abbate, D. 1998. Arizona Game and Fish Department 1997 Sonora tiger salamander surveys. Presentation to the Fourth Annual Meeting of the Southwestern Working Group of the Declining Amphibian Populations Task Force, Phoenix, Arizona.

Arizona Game and Fish Department. 1996. Species of Special Concern. Arizona Game and Fish Department, Phoenix, Arizona.

Anderson, J. D. 1961. The life history and systematics of *Ambystoma rosaceum*. Copeia 1961:371-377.

Behler, J. L., and F. W. King. 1980. The Audubon Society field guide to North American reptiles and amphibians. Alfred A. Knopf, New York.

Berger L., R. Speare, P. Daszak, D. E. Green, A. A. Cunningham, C. L. Goggins, R. Slocombe, M. A. Ragan, A. D. Hyatt, K. R. McDonald, H. B. Hines, K. R. Lips, G. Marantelli, and H. Parkes. 1998. Chytridiomycosis causes amphibian mortality associated with population declines in the rain forests of Australia and Central America. Proceedings of the National Academy of Science 95:9031-9036.

Blanchard, C. L., and M. Stromberg. 1987. Acidic precipitation in southeastern Arizona: sulfate, nitrate, and trace metal deposition. Atmospheric Environment 21:2375-2381.

Brown, D. E. 1994. Biotic Communities: Southwestern United States and northwestern Mexico. University of Utah Press, Salt Lake City, Utah.

Collins, J. P. 1979. Sexually mature larvae of the salamanders *Ambystoma rosaceum* and *A. tigrinum velasci* from Chihuahua, Mexico: Taxonomic and ecological notes. Journal of Herpetology 13:351-354.

_____. 1996. Final report: A status survey of three species of endangered/sensitive amphibians in Arizona. Report to Arizona Game and Fish Department, Phoenix, Arizona. Heritage Fund - IIPAM #I92014.

_____. 1999. J. P. Collins Lab, 1999 Sonoran tiger salamander report. Report to the U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____, J. L. Brunner, V. Miera, M. J. Parris, D. Schock, and A. Storfer. 2003. Ecology and evolution of infectious disease. Pages 137-151 *in* R. D. Semlitsch. Amphibian Conservation. Smithsonian Books, Washington D.C.

_____, E. W. Davidson, J. E. Longcore, A. P. Pessier, M. J. Perris, and A. T. Storfer. 2001. Pages 20-21 *in* Abstracts of the Annual Conference of The Western Section of The Wildlife Society, Sacramento, California, 22-24 February 2001.

_____, and J. R. Holomuzki. 1984. Intraspecific variation in diet within and between trophic morphs in larval tiger salamanders (*Ambystoma tigrinum nebulosum*). Canadian Journal of Zoology 62:168-174.

_____, J. K. Jancovich, E. W. Davidson, V. G. Chinchar, and collaborators. 2000. The current status of salamander ranaviruses in Western North America. Abstract for Scientific Conference - Getting the Jump! On Amphibian Diseases, Cairns, Australia, 26-30 August 2000.

_____, and T. R. Jones. 1987. Report on the status of the Sonora tiger salamander, *Ambystoma tigrinum stebbinsi* Lowe. Department of Zoology, Arizona State University, Tempe, Arizona.

_____, _____, and H. J. Berna. 1988. Conserving genetically distinctive populations: The case of the Huachuca tiger salamander (*Ambystoma tigrinum stebbinsi* Lowe). Pages 45-53 *in* R. C. Szaro, K. C. Severson, and D. R. Patton, editors. Management of amphibians, reptiles, and small mammals in North America. U.S. Forest Service GTR-RM-166, Fort Collins, Colorado.

Davidson, E. W., M. Parris, J. P. Collins, J. E. Longcore, A. P. Pessier, and J. Brunner. 2003. Pathogenicity and transmission of chytridiomycosis in tiger salamanders (*Ambystoma tigrinum*). Copeia 2003(3):601-607.

_____, A. P. Pessier, J. E. Longcore, M. Perris, J. Jancovich, D. Schock, and J. P. Collins. 2000. Chytridiomycosis in Arizona (USA) tiger salamanders. Abstract for Scientific Conference - Getting the Jump! On Amphibian Diseases, Cairns, Australia, 26-30 August 2000.

DeBano, L. F., and D. G. Neary. 1996. Effects of fire on riparian systems. Pages 69-76 *in* P. F. Ffolliott, L. F. DeBano, M. B. Baker, G. J. Gottfried, G. Solis-Garza, C. B. Edminster, D.G. Neary, L. S. Allen, and R. H. Hamre, technical coordinators. Effects of fire on Madrean province ecosystems, a symposium proceedings. U.S. Forest Service, General Technical Report RM-GTR-289.

G. Neary, L. S. Allen, and R. H. Hamre, technical coordinators. Effects of fire on Madrean province ecosystems, a symposium proceedings. U.S. Forest Service, General Technical Report RM-GTR-289.

Docherty, D .E., C. U. Meteyer, J. Wang, J. Mao, S. T. Case, and V. G. Chinchar. 2003. Diagnostic and molecular evaluation of three iridovirus-associated salamander mortality events. Journal of Wildlife Diseases 39(3):556-566.

Douglas, M. E., and B. L. Monroe. 1981. A comparative study of topographical orientation in *Ambystoma* (Amphibia:Caudata). Copeia 1981:460-463.

Fernandez, P. J., and P. C. Rosen. 1996. Effects of the introduced crayfish *Orconectes virilis* on native aquatic herpetofauna in Arizona. Heritage Program, IIPAM Project No. 194054, Arizona Game and Fish Department, Phoenix, Arizona.

Gamradt, S. C., and L. B. Kats. 1996. Effect of introduced crayfish and mosquitofish on California newts. Conservation Biology 10:1155-1162.

Gehlbach, F. R., Kimmel, J. R., and W. A. Weems. 1969. Aggregations and body water relationships in tiger salamanders (*Ambystoma tigrinum*) from the Grand Canyon rims, Arizona. Physiological Zoology 42:173-182.

Gruberg, E. R., and R. V. Stirling. 1972. Observations on the burrowing habits of the tiger salamander (*Ambystoma tigrinum*). Herpetological Review 4:85-89.

Hadley, D., and T. E. Sheridan. 1995. Land use history of the San Rafael Valley, Arizona (1540-1960). General Technical Report GM-GTR-269. USDA Forest Service, Fort Collins, Colorado.

Hendrickson, D. A., and W. L. Minckley. 1984. Cienegas - vanishing climax communities of the American Southwest. Desert Plants 6(3):131-175.

Holomuzki, J. R. 1986. Variation in microhabitat use and trophic patterns of larval tiger salamanders (*Ambystoma tigrinum nebulosum*) in Arizona. Dissertation, Arizona State University, Tempe, Arizona.

Jancovich, J. K., E. W. Davidson, J. F. Morado, B. L. Jacobs, and J. P. Collins. 1997. Isolation of a lethal virus from the endangered tiger salamander *Ambystoma tigrinum stebbinsi*. Diseases of Aquatic Organisms 31:161-167.

_____, _____, A. Seiler, B. L. Jacobs, and J. P. Collins. 2001. Transmission of the *Ambystoma tigrinum* virus to alternative hosts. Diseases of Aquatic Organisms 46:159-163.

Jones, T. R., J. P. Collins, T. D. Kocher, and J. B. Mitton. 1988. Systematic status and distribution of *Ambystoma tigrinum stebbinsi* Lowe (Amphibia:Caudata). Copeia 1988:6216-6235.

_____, E. J. Routman, D. J. Begun, and J. P. Collins. 1995. Ancestry of an isolated subspecies of salamander, *Ambystoma tigrinum stebbinsi* Lowe: The evolutionary significance of hybridization. Molecular Phylogenetics and Evolution 4:194-202.

Kiesecker, J. M., and A. R. Blaustein. 1997. Population differences in responses of red-legged frogs (*Rana aurora*) to introduced bullfrogs. Ecology 78:1752-1760.

Kupferberg, S. J. 1997. Bullfrog (*Rana catesbeiana*) invasion of a California river: The role of larval competition. Ecology 78:1736-1751.

Longcore, J. E., A. P. Pessier, and D. K. Nichols. 1999. *Batracytrium dendrobatidis* gen. Et sp. Nov., a chytrid pathogenic to amphibians. Mycologia 91(2):219-227.

Lowe, C. H. 1954. A new salamander (genus *Ambystoma*) from Arizona. Proceedings of the Biological Society of Washington 67:243-245.

Madison, D. M. 1997. The emigration of radio-implanted spotted salamanders, *Ambystoma maculatum*. Journal of Herpetology 31:542-551.

_____, and L. Farrand III. 1998. Habitat use during breeding and emigration in radio-implanted tiger salamanders, *Ambystoma tigrinum*. Copeia 1998:402-410.

National Park Service (NPS). 2012. Help stop the spread of non-native species. Accessed at: www.nps.gov/pore/planyourvist/stop_invasive_species.htm

Petranka, J. W. 1998. Salamanders of the United States and Canada. Smithsonian Institution Press, Washington D.C.

Platz, J. E. 1989. *Rana subaquavocalis*: Conservation Assessment/Conservation Strategy. Article prepared in satisfaction of U.S. Forest Service Agreement CCS - 95 - 0006.

Reed, C. A. 1951. Larval ambystomatid salamanders from southern Arizona and Sonora. Chicago Academy of Sciences, Natural History Miscellanea 79:1-3.

Rinne, J. N. and D. G. Neary. 1996. Fire effects on aquatic habitats and biota in Madrean-type ecosystems: Southwestern United States. Pages 135-145 *in* P. F. Ffolliott, L. F. DeBano, M. B. Maker, Jr., G. J. Gottfried, G. Solis-Garza, C. B. Edminster, D. G. Neary, L. S. Allen, and R. H. Hamre, technical coordinators. Effects of fire on Madrean Province ecosystems, a symposium proceedings. U.S. Forest Service, General Technical Report RM-GTR-289.

Rosen, P. C., and C. R. Schwalbe. 1996. Status of native and introduced species of aquatic herpetofauna at San Bernardino National Wildlife Refuge. Report to Arizona Game and Fish Department Heritage Program, IIPAM 195045, Phoenix, Arizona.

Semlitsch, R. D. 1981. Terrestrial activity and summer home range of the mole salamander (*Ambystoma talpoideum*). Canadian Journal of Zoology 59:315-322.

_____. 1983. Burrowing ability and behavior of salamanders in the genus Ambystoma. Canadian Journal of Zoology 61:616-620.

Shaffer, H. B. 1983. Biosystematics of *Ambystoma rosaceum* and *A. tigrinum* on Northwestern New Mexico. Copeia 1983: 67-78.

Shannon, F. A. 1951. Notes on a herpetological collection from Oaxaca and other localities in Mexico. Proceedings of the United States National Museum 101:465-484.

Shoop, C. R. 1965. Orientation of *Ambystoma maculatum*: Movements to and from breeding ponds. Science 149:558-559.

_____. 1968. Migratory orientation of *Ambystoma maculatum*: Movements near breeding ponds and displacements of migrating individuals. Biological Bulletin 135:230-238.

_____, and T. L. Doty. 1972. Migratory orientation by marbled salamanders (*Ambystoma opacum*) near a breeding area. Behavioral Biology 7:131-136.

Snyder, J. D. 1998. Ecology, management, and intellectual history of native and introduced species. Thesis, Arizona State University, Tempe, Arizona.

Speare, R., and L. Berger. 2000. Global distribution of chytridiomycosis in amphibians. Http://www.jcu.edu.au/school/phtm/PHTM/frogs/chyglob.htm.

State of Arizona. 1990. Final report and recommendations of the Governor's riparian habitat taskforce. Executive Order 89-16, Streams and Riparian Resources, Phoenix, Arizona.

Stebbins, R. C. 2003. A field guide to western reptiles and amphibians, Third Edition. Houghton Mifflin, Boston, Massachusetts.

_____, and N. W. Cohen. 1995. A natural history of amphibians. Princeton University Press, Princeton, New Jersey.

Storfer, A. 2003. Emerging disease and amphibian declines. Pages 42-43 *in* Program Book for the 2003 Joint Meeting of Icthyologists and Herpetologists, Manaus, Amazonas, Brazil (abstract).

_____, J. P. Collins, and J. Snyder. 1999. Molecular genetic status of tiger salamanders on the Fort Huachuca Military Reservation. Report to Fort Huachuca, Arizona, contract #DABT63-99-P-0087.

Taylor, E. H. 1941. Two new ambystomatid salamanders from Chihuahua. Copeia 1941:143-146.

U.S. Fish and Wildlife Service (FWS). 1997a. Determination of endangered status for three wetland species found in southern Arizona and northern Sonora, Mexico. Federal Register 62(3):665-689.

_____. 1997b. Biological opinion and conference opinion, land and resource management plans, as amended, for eleven National Forests and National Grasslands in the Southwestern Region. U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1999a. Biological opinion, ongoing and long-term grazing on the Coronado National Forest. U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 1999b. Biological opinion and conference opinion, Coronado National Forest Lone Mountain Prescribed Fire, Cochise County, Arizona. U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 2002. Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*) recovery plan. U.S. Fish and Wildlife Service, Phoenix, Arizona.

U.S. Forest Service. 2004. Biological Assessment on eleven land and resource management plans, USDA Forest Service, Southwestern Region.

Watson, M.L. 2005. Habitat fragmentation and the effects of roads on wildlife and habitats: Background and literature Review. New Mexico Department of Game and Fish. 18 pp.

Whiteman, H. H., S. A. Wissinger, and A. J. Bohonak. 1994. Seasonal movement patterns in a subalpine population of the tiger salamander, *Ambystoma tigrinum nebulosum*. Canadian Journal of Zoology 72:1780-1787.

Ziemba, R. E., A. T. Storfer, J. Warren, and J. P. Collins. 1998. A survey of genetic variation among populations of the Sonora tiger salamander (*Ambystoma tigrinum stebbinsi*). Report to Arizona Game and Fish Department Heritage Program, Phoenix, Arizona.

Pima Pineapple Cactus

Arizona Rare Plant Committee. 2001. Arizona rare plant field guide: A collaboration of agencies and organizations. U.S. Fish and Wildlife Service, Phoenix, Arizona.

Benson, L. 1982. The Cacti of the United States and Canada. Stanford University Press, Stanford, CA. Page 820.

Brown, D. E. 1982. Biotic communities of the American Southwest – United States and Mexico. Desert Plants 4:123,181.

Ecosphere Environmental Services Inc. 1992. Final Report: A survey for threatened and endangered plant species at three proposed reservoir sites and associated pipelines. Bureau of Reclamation contract 0-CS-32-1950. Farmington, NM. 69 pp.

McDonald, C. J. 2005. Conservation of the rare Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*): recruitment after fires and pollination in the Altar Valley of southern Arizona. Master of Science Thesis, School of Natural Resource, The University of Arizona. 82 pp.

McPherson, G. R. 2002. Relationship of ecological variables in the field with the presence of Pima pineapple cactus. Report to USFWS under agreement 1448-20181-01-J818. 4 pp.

Mills, G.S. 1991. Miscellaneous notes on (*Coryphantha scheeri* var. *robustispina*). Unpublished report. U.S. Fish and Wildlife Service, Arizona Ecological Services Office, Phoenix, Arizona.

NatureServe. 2011. EO [elemental occurrence] Data Standard. NatureServe, Arlington, Virginia. Available online <www.natureserve.org/prodServices/eodraft/2.pdf >. Accessed 15 January 2011.

Paredes-Aguilar, R., T.R. Van Devender, and R.S. Felger. 2000. Cactáceas de Sonora, México: su diversidad, uso, y conservacíon. IMADES y Arizona-Sonora Desert Museum, Tucson, Arizona.

Phillips, A. M. III, B. G. Phillips, and N. Brian. 1981. Status report for *Coryphantha scheeri* var. *robustispina*. Unpublished Report. U.S. Fish and Wildlife Service, Office of Endangered Species, Albuquerque, NM.

Pima County Association Of Governments, 1996. Population handbook 1995.

RECON Environmental, Inc. 2006. Draft Pima County Multi-Species Conservation Plan, Pima County, Arizona and Attachments.

Roller, P.S. 1996. Distribution, growth and reproduction of Pima pineapple cactus (*Coryphantha scheeri* Kuntz var. *robustispina* Schott). M. S. Thesis, University of Arizona.

_____. and W.L. Halvorson. 1997. Fire and Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*) in southern Arizona *in* Proceedings of the Effects of Fire on Threatened and Endangered Species Symposium. Coeur d' Alene, Idaho. November 1995.

U.S. Fish and Wildlife Service (FWS). 1993. Determination of endangered status for the plant PPC (*Coryphantha scheeri* var. *robustispina*). Federal Register 58(158):49875-49880.

_____. 2007. 5-year review for Pima pineapple cactus (*Coryphantha scheeri* var. *robustispina*). Arizona Ecological Services Office, Phoenix, Arizona. 17 pp. http://www.fws.gov/southwest/es/arizona /Documents/SpeciesDocs/PimaPineappleCactus/PPC_5yrReview.pdf

_____. 2011. Biological opinion on the Proposed Reconfiguring of the Existing Traffic Interchange Ramp Connections between I-19 and Sahuarita Road, 22410-2011-F-0343. U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office, Phoenix, Arizona.

_____. 2012. Biological opinion on The Continued Implementation of the Land and Resource Management Plan for The Coronado National Forest of the Southwestern Region U.S.D.A. Forest Service, 2012-F-0005. U.S. Fish and Wildlife Service, Arizona Ecological Services Field Office, Phoenix, Arizona.

List of Tables

Table 1. Threatened and Endangered Plant Species Suitable Habitat and Blooming Season

Table 2. Threatened and Endangered Bird Species Suitable Habitat and Nesting Season

Table 3. Summary of Population Estimates for Sonoran Pronghorn in the U.S.

Table 4. Comparison of U.S. Sonoran Pronghorn Population Surveys

Table 5. Comparison of Mexico Sonoran Pronghorn Population Surveys, 2000-20011

Table 6. CBV Apprehensions by Location

Table 7. The eight Chiricahua leopard frog RUs as identified in the Recovery Plan and the current status of the delisting criteria for each RU.

Table 8. Formal consultations and incidental take anticipated for the Chiricahua leopard frog in the Action Area.

List of Figures

Figure 1. General Location Map

Figures 2a and 2b. Work Plan Flow Chart

Figures 3a and 3b. Action Area for Proposed Tactical Infrastructure Maintenance and Repair Areas in Arizona

Figure 4. Current occupied range of the Sonoran pronghorn in Arizona and Sonora, Mexico

Figure 5. Current Sonoran pronghorn distribution in the United State: Records from 1994-2001

Figure 6. Historical range of Sonoran pronghorn in the United States and Mexico

Figure 7. TIMR within Sonoran Pronghorn Range

Figure 8. Known range of the Chiricahua leopard frog as of 2007. The map covers areas in Arizona, New Mexico, and Mexico. All eight recovery units are delineated by number.

Figure 9. TIMR within Sonoran Tiger Salamander Range

Figure 10. TIMR within Pima Pineapple Cactus Range

Table 1. Threatened and Endangered Plant Species Suitable Habitat and Blooming Season

Common Name	Habitat	Blooming Season
Canelo Hills ladies' tresses	Fine-grained, highly organic, saturated soils of cienegas (i.e., spring-fed marshes) and among sedges and tall grasses up to an elevation of 1,524 meters (5,000 feet).	July–August
Cochise pincushion cactus	High-calcium Permian limestone, at elevations from 1,280 to 1,433 meters (4,200 to 4,700 feet) where Chihuahuan desert scrub transitions to semi-desert grassland.	March–April
Huachuca water umbel	Perennial springs, rivers, and stream headwaters that are permanently or seasonally saturated within Sonoran desertscrub, grassland or oak woodlands between 1,219 to 1981 meters (4,000 to 6,500 feet).	June–August
Kearney's slimpod	Southwest-draining dry, rocky washes of the Baboquivari Mountains at about 1,220 to 1,830 meters (4,000 to 6,000 feet).	April–May
Pima pineapple cactus	Transition zone between the semi-desert grasslands and Sonora desert scrub on alluvial bajadas (lower slopes of mountains characterized by loose alluvial sediments and poor soil development) and slopes of less than 10 percent grade at elevations between 701 to 1,402 meters (2,300 to 4,600 feet).	July–August

Table 2. Threatened and Endangered Bird Species Suitable Habitat and Nesting Season

Common Name	Suitable Habitat	Nesting Season
Masked bobwhite quail	Savannah grassland within Buenos Aires NWR	Jul 1–Nov 30
Mexican spotted owl	Closed-canopy forests [riparian, mixed conifer, pine-oak, and pinyon juniper woodland] and steep, narrow, entrenched, rocky canyons and cliffs within designated critical habitat	Mar 1–Jun 30
Southwestern willow flycatcher	Dense riparian habitat along streams, rivers, lakesides, and other wetland	Mar 15–Sep 15
Yuma clapper rail	Freshwater marshes generally dominated by cattail [*Typha* spp.] and bulrush [*Scirpus* ssp.] with a mix of riparian trees and shrubs	Mar 15–Jul 15

Table 3. Summary of Population Estimates for Sonoran Pronghorn in the U.S.

Date	Population estimate	Source
1925	105[a]	Nelson 1925
1941[b]	60[a]	Nicol 1941
1957	<100[a]	Halloran 1957
1968	50[a]	Monson 1968
1968-1974	20-150[a]	Carr 1974
1981	100-150[a]	Arizona Game and Fish Department 1981
1984	85-100[a]	Arizona Game and Fish Department 1986
1992	179 (145-234)[a]	Bright *et al*. 1999
1994	282 (205-489)[a]	Bright *et al*. 1999
1996	130 (114-154)[a]	Bright *et al*. 1999
1998	142 (125-167)[a]	Bright *et al*. 1999
2000	99 (69-392)[a]	Bright *et al*. 1999
2002	21 (18-33)[a]	Bright and Hervert 2003
2004	58 (40-175)[a]	Bright and Hervert 2005
2006	68 (52-116)[a]	Unpublished data
2008	68	Unpublished data
2010	85[c]	Unpublished data

[a]95% Confidence interval. There is a 5% chance that the population total falls outside this range.
[b]Population estimate for southwestern Arizona, excluding Organ Pipe National Monument.
[c]Does not include 17 pronghorn released from breeding pen in December 2010.

Table 4. Comparison of U.S. Sonoran Pronghorn Population Surveys

	Pronghorn Observed		Population Estimates			
Date	On transect	Total observed	Density estimate using DISTANCE[a]	Lincoln-Peterson[a]	Sightability model[a]	Other estimate
Dec 1992	99	121	246 (103-584)	---	179 (145-234)	---
Mar 1994	100	109	184 (100-334)	---	282 (205-489)	---
Dec 1996	71	82 (95[b])	216 (82-579)	162 (4-324)	130 (114-154)	---
Dec 1998	74	86 (98[b])	---	172 (23-321)	142 (125-167)	---
Dec 2000	67	69[b]	N/A	N/A	99 (69-392)	---
Dec 2002	18	18	N/A	N/A	21 (18-33)[c]	---
Dec 2004	39	51	N/A	N/A	58	---
Dec 2006	51	59	N/A	N/A	68 (52-116)	---
Dec 2008	N/A	N/A	N/A	N/A	N/A	68[d]
Dec 2010	N/A	N/A	N/A	N/A	85	---

[a] 95% Confidence interval. There is a 5% chance that the population total falls outside this range.
[b] Includes animals missed on survey, but located using radio telemetry.
[c] Jill Bright, Arizona Game and Fish Department, pers. comm. 2003.
[d] Due to poor visibility and low pronghorn sighting rate (some radio-collared pronghorn were detected from their transmitter signals but not seen during the surveys) caused by inclement weather during the surveys and having do resurvey some areas during better weather, the usual survey estimator was not used because it would have lacked accuracy. The estimate of 68 was based on individual seen and missed on the survey and on several recent telemetry flights.

Table 5. Comparison of Mexico Sonoran Pronghorn Surveys, 2000-2011.

	Pronghorn Observed			Population Estimate		
Date	West of Hwy 8	Southeast of Hwy 8	Total	West of Hwy 8	Southeast of Hwy 8	Total
Dec 2000	--	--	--	--	--	346
Dec 2002	--	--	214	25	255	280
Dec 2004/Feb 2005	30	439	469	59	625	684
Jan 2006	--	--	486	--	--	634
Dec 2007	35	325	360	50	354	404
Dec 2009	53	258	311	101	381	482
Dec 2011	30	167	197	52	189	241

Table 6. CBV Apprehensions by Location

Location	1999	2006	FY2009	FY2010	FY2011	FY2012*
Ajo Station AOR	21,300	22,504	15,456	20,448	17,385	--
Wellton Station AOR	--	--	1,889	1,758	1,678	--
OPCNM and CPNWR	--	--	N/A	3,265	7,282	5,187

*Data as of August 30, 2012

Table 7. The eight Chiricahua leopard frog RUs as identified in the Recovery Plan and the current status of the delisting criteria in each RU.

Recovery Unit	RU#	Recovery Criteria 1	Recovery Criteria 2	Recovery Criteria 3	Recovery Criteria 4
Tumacacori-Atascosa-Pajarito Mountains, Arizona and Mexico	1	Met	Not Met	Not Met	Not Met
Santa Rita-Huachuca-Ajos Bavispe, Arizona and Mexico	2	Not Met	Not Met	Not Met	Not Met
Chiricahua Mountains-Malpai Borderlands-Sierra Madre, Arizona, New Mexico, and Mexico	3	Not Met	Not Met	Not Met	Not Met
Pinaleno-Galiuro-Dragoon Mountains, Arizona	4	Not Met	Not Met	Not Met	Not Met
Mogollon Rim-Verde River, Arizona	5	Not Met	Not Met	Not Met	Not Met
White Mountains-Upper Gila, Arizona and New Mexico	6	Not Met	Not Met	Not Met	Not Met
Upper Gila-Blue River, Arizona and New Mexico	7	Not Met	Not Met	Not Met	Not Met
Black-Mimbres-Rio Grande, New Mexico	8	Not Met	Not Met	Not Met	Not Met

Table 8. Formal consultations and incidental take anticipated for the Chiricahua leopard frog in the Action Area.

Consultation #	Date of Final BO	Project	Anticipated Take	Locations	Form of Take
2-21-00-F-344	6/6/2001	Livestock grazing management on the Montana allotment	Mortality of all frogs at one livestock tank; mortality of recently metamorphosed frogs at one locality; and an unquantified number from trampling, destruction, lost productivity	California Gulch, Warsaw Spring, Japanese Tank, and Holden Canyon	Mortality, harm, and harass
2-21-98-F-399-R1	10/24/2002	Livestock Grazing on the Coronado National Forest	All frogs at all livestock tanks; frogs at one locality (livestock tank, stream, or spring); and an unquantified number at three frog sites, three tanks, and three livestock tanks	Coronado National Forest	Direct mortality and harm
02-21-02-F-0148	1/13/2003	Reintroduction of Tarahumara frog into South Central Arizona	4 frogs	Sycamore Canyon and Penasco Canyon; possibly Big Casa Blanca, Walker, Adobe, and Gardner canyons	Mortality or harm
02-21-98-F-0399-R2	1/2/2004	Livestock grazing on the Kunde and Papago allotments	Unquantified number of eggs, tadpoles, and frogs	O'Donnell Creek in the Papago allotment	Direct mortality, harm
02-21-02-F-0157	1/16/2004	Ryan Fire in the Coronado National Forest	2 frogs	Flower Tank, possibly Meadow Valley and other tanks and ponds	Direct mortality and injury
02-21-03-F-0210	9/3/2004	BLM Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management	Undetermined number at one site without extirpation, and during emergency salvage at one site.	Cienega Creek/Empire Cienega, Guadalupe Canyon-Peloncillo Mountains, and Leslie Canyon	Harassment, harm, or mortality
22410-2005-F-0243	5/20/2005	Buenos Aires NWR Fire Management Plan 2005-2008	Not quantified	Carpenter, State, and Triangle tanks	Harm, harass, or indirect mortality
02-21-05-F-0847	5/11/2006	10-year allotment management plans for	No take anticipated	n/a	n/a

Consultation #	Date of Final BO	Project	Anticipated Take	Locations	Form of Take
		the HQ, Campini and Blacktail grazing allotments			
02-21-03-F-0083	9/27/2006	Incidental Take Permit (TE-123062-0) and Safe Harbor Agreement to AGFD for Chiricahua leopard frog	Up to all individuals in all population sites established under the Agreement (above baseline conditions)	non-Federal lands in Arizona	Not specified (assume harass, harm, and mortality)
22410-2007-F-0360	8/30/2007	Wildland fire use management areas within the BLM Safford Field Office management area	No take anticipated	Guadalupe Canyon Fire Use Management Area	n/a
22410-2003-F-0022	2/11/2008	Enhancement of Survival Permit (TE-083686-0) to AGFD	50 frogs and their eggs	Habitats occurring on non-Federal land within the historical ranges of topminnow and pupfish in Arizona	Harass, harm, and mortality
22410-2008-F-0029	6/13/2008	Redrock Canyon fish barrier	20 frogs	Redrock Canyon drainage and Oak Tank	Harm
22410-2006-F-0408	8/12/2008	Malpai Borderlands Habitat Conservation Plan	Not quantifed, but no extirpation of the known breeding sites. Livestock related take of one population site every 5 years	Silver Creek; Black Draw; Astin Spring; Guadalupe Canyon; Clanton Draw; Playas Creek; Cloverdale Canyon; Animas Creek; and San Simon Creek.	Harm, harass, and mortality
22410-2008-F-0373	9/4/2008	(SBI*net* Tucson West Tower Project, Ajo, Tucson, Casa Grande, Nogales, and Sonoita Stations Area of Operation, USBP, Tucson Sector	2 frogs/yr (direct), and ½ of metamorphosed frogs (indirect)	Upper Turner Tank	Direct and indirect mortality
22410-2005-F-0002	12/15/2008	Altar Valley Fire Management Plan	Not quantified	Buenos Aires NWR, two permanent population sites on the west side of Altar Valley, various new and proposed aquatic	Harm and mortality

Consultation #	Date of Final BO	Project	Anticipated Take	Locations	Form of Take
				sites	
22410-2008-F-0103	12/31/2008	Aquatic species conservation at the San Pedro Riparian and Las Cienegas National Conservation Areas	Up to 100%	San Pedro Riparian and Las Cienegas National Conservation Areas	Harm, harass, direct mortality, and pursuit
22410-2005-F-0243-R001	3/23/2009	Buenos Aires NWR Fire Management Plan 2005-2008 (reinitiation for the 2009 fire season)	Not quantified	Carpenter, State, and Triangle tanks	Harm, harass, or indirect mortality
22410-2010-F-0279	3/16/2010	Stocking of trout at Peña Blanca Lake, Santa Cruz County	100% of tadpoles in the lake during the during the residence time of the stocked rainbow trout	Peña Blanca Lake	Direct mortality
22410-2005-F-0243-R002	4/13/2010	Buenos Aires NWR Fire Management Plan 2005-2008 (reinitiation for the 2010 fire season)	Not quantified	Carpenter, State, and Triangle tanks	Harm, harass, or indirect mortality
22410-2010-F-0279R1	10/27/2010	Stocking of trout at Peña Blanca Lake, Santa Cruz County	100% of tadpoles in the lake during the during the residence time of the stocked rainbow trout	Peña Blanca Lake	Direct mortality
22410-F-2010-0495	12/23/2010	Cloverdale Ciénega restoration project	100% loss of frogs*	Middle and lower reaches of Cloverdale Creek	Harm and harass
22410-2005-F-0243-R003	2/1/2011	Buenos Aires NWR Fire Management Plan 2005-2008 (reinitiation for the 2011 fire season)	Not quantified	State Tank	Harm, harass, or indirect mortality
22410-2010-F-0330	5/10/2011	Stocking of Warmwater Fish at Peña Blanca Lake, Santa Cruz County	Unquantified, up to 100% of all life stages (from egg to adult)	In and below Peña Blanca Lake	Direct mortality, harm, and, harass
22410-2008-F 0486	8/26/2011	AGFD's WSFR-funded sportfish stocking program	Unknown number tadpoles each year, up to 100%	Peña Blanca Lake	Harm
22410-2008-F-0149-R001	12/6/2011	Effects to Listed Species from U.S. USFS Aerial Application of Fire Retardants on NFS Lands	Six drops in occupied frog habitat on the Coronado National Forest affecting 32.7 miles or 3 acres of nonfluvial, standing water.	Coronado NF	Direct mortality, harm, and harass
22410-2011-F-	12/20/2011	Aquatic Inventory,	3 frogs/yr from	All aquatic	Direct

Consultation #	Date of Final BO	Project	Anticipated Take	Locations	Form of Take
0290		Survey, and Monitoring Activities, and Conservation Activities for Aquatic Species by AGFD, 2011-2020	sportfish survey and monitoring; 3 frogs/yr from other species surveys and monitoring; unspecified/unlimited "safe" numbers for recovery purposes	habitats in Arizona where AGFD activities will take place	mortality, harass
22410-2002-F-0162-R001	2/1/2012	Las Cienegas National Conservation Area Resource Management Plan	Up to 100% loss at each site	Las Cienegas National Conservation Area	Direct mortality, pursuit, harm and harass
2012-F-0005	4/30/2012	The continued implementation of the Land and Resource Management Plan for the Coronado National Forest	Not quantified	Coronado NF	Direct mortality, harm, and harass
02AAZ00-2012-F-0165	4/30/2012	Multi-Unit Burn Plan for the 2012-2017 Burn Seasons	Not quantified	Buenos Aires National Wildlife Refuge	Harm, harass, or indirect mortality

* Cloverdale Cienega is an ephemeral site that can be utilized as a dispersal corridor for Chiricahua leopard frogs in the Peloncillo Mountains.

APPENDIX A.

Concurrence for Riparian/Aquatic Species including Canelo Hills ladies'-tresses (*Spiranthes delitescens*), Huachuca water umbel (*Lilaeopsis schaffneriana* var. *recurva*) and critical habitat, Southwestern willow flycatcher (*Empidonax traillii extimus*) and proposed critical habitat, and Yuma clapper rail (*Rallus longirostris yumanensis*)

Environmental Baseline

Four listed species occur within the TIMR action area that are dependent on riparian and/or aquatic resources for their conservation and recovery. These four species include two plant species (Canelo Hills ladies'-tresses and the Huachuca water umbel) and two bird species (southwestern willow flycatcher and Yuma clapper rail). The riparian and aquatic resources, upon which these species depend, include perennial streams and ponds, marshes and cienegas, as well as intermittent or ephemeral drainages. A number of these resources are found within the action area for the TIMR Program, and could potentially be impacted by the proposed action.

A slender, erect, terrestrial member of the orchid family, Canelo Hills ladies' tresses typically has five to ten grass-like leaves arising from the base of the stem. Flower stalks extend above the leaves, with up to 40 white flowers in a spiral arrangement. This species blooms July through August, but is otherwise difficult to observe as its leaves blend with other grasses and sedges. Canelo Hills ladies' tresses are short-lived perennials, surviving for only 4 to 5 years (Rice 2010a). Canelo Hills ladies' tresses was listed as a Federal endangered species without critical habitat on January 6, 1997 (62 *Federal Register* [FR] 665). Canelo Hills ladies' tresses are rare and in decline. The limited number of locations and small populations at these locations makes this species particularly vulnerable to extinction. Direct threats include livestock grazing, improper fire management, competition with invasive plant species, water diversion and impoundments, stream channelization, sand and gravel mining, and groundwater pumping (FWS 2010a, 62 FR 665–689).

Huachuca water umbel is a semi-aquatic to aquatic, herbaceous, perennial plant with slender erect leaves. The leaves are segmented, hollow cylinders. The flat-topped, rounded flower cluster is composed of 3 to 10 flowers that arise from the root nodes (FWS 1999). Huachuca water umbel was listed as a Federal endangered species on January 6, 1997 (62 FR 665), with critical habitat subsequently designated in 1999 (64 FR 37441, July 12, 1999). Threats to Huachuca water umbel include watershed degradation due to livestock grazing and development, trampling by livestock, diversion of water and dewatering of habitats, and flash flooding (FWS 2001a).

The southwestern willow flycatcher is a small bird, typically less than 15 cm (6 inches) in length with conspicuous light-colored wing bars (FWS 2002). Southwestern willow flycatcher was listed as federally endangered on February 27, 1995 (60 FR 10694,) with critical habitat designation on October 19, 2005 (50 CFR 60886). The USFWS announced a proposed revision to southwestern willow flycatcher designated critical habitat on August 15, 2011. The habitat requirements of the southwestern willow flycatcher include areas of dense riparian foliage and nesting habitat with trees and shrubs that include willows (*Salix* spp.) and box elder (FWS 2002). The breeding period for this species is April through September (FWS 2002). This species is threatened by the loss and

degradation of cottonwood-willow riparian habitat and structurally similar riparian habitats. Increased irrigated agriculture and livestock grazing have aided brown-headed cowbird populations that, in turn, impact the southwestern willow flycatcher by parasitizing their nests. The current population exists in small, fragmented subpopulations, which increases the risk of local extirpation (NatureServe 2010).

The Yuma clapper rail is a small marsh bird with an average height of 20 cm (8 inches). This species begins breeding in February and will nest from March through June, with a peak in mid-May. Nests are made on stable substrates and are typically near shore in shallow water or in the interior of marshes over deeper water (FWS 1983). Yuma clapper rail was listed as federally endangered without critical habitat on March 11, 1967 (32 FR 4001). Populations of the Yuma clapper rail are threatened by destruction, modification, and curtailment of its habitat and range. Increased development along the Lower Colorado River and interior Arizona rivers could have direct and indirect effects on clapper rail habitat through water management regimes (FWS 1983). In addition, the presence and increase of selenium in clapper rail habitat has been identified as a potential threat to the survival and recovery of the clapper rail (FWS 2006).

Effects of the Proposed Action

There are a number of potential effects to these riparian/aquatic species from the proposed action. However, CBP has also included a number of BMPs to reduce the potential for these effects.

Potential direct impacts to the two riparian/aquatic plant species from maintenance and repair activities include direct injury and fatality from trampling or crushing by equipment, alteration of the plant seed bank, and habitat degradation from disturbance of soils. To avoid these effects and habitat degradation from removal of canopy cover, vegetation clearing (i.e., removal of vegetation to maintain line of sight or remove hiding locations from areas where vegetation has not been previously cleared) will not be conducted within suitable or critical habitat of any threatened or endangered plant species. Additionally, clearing of riparian vegetation will not occur within 100 feet of aquatic habitats.

Potential indirect impacts on these species include increased erosion and sedimentation from alterations in hydrology, and increased potential for invasive species and fire. Erosion and sedimentation BMPs include silt fencing and floating silt curtains to prevent movement of soil and sediment and to minimize turbidity increases in water. Clearing of riparian vegetation will not occur within 100 feet of aquatic habitats, which will provide a buffer area to protect the habitat from sedimentation. Based on the implementation of BMPs designed to avoid or reduce impacts on these species, these indirect impacts would be unlikely to occur.

Maintenance activities that compact soils and change water infiltration could alter local hydrology by increasing sedimentation and runoff in suitable perennial plant species habitat. BMPs would be implemented to reduce sedimentation and runoff from roads and other infrastructure and minimize other potential indirect effects to these species. For example, cleaning or modification of culverts and other work within drainages that could cause sedimentation or otherwise affect water quality or quantity will not occur within critical habitat, or within 0.5 miles upstream of critical habitat or other

suitable habitat of aquatic plant species (i.e., Huachuca water umbel and Canelo Hills ladies' tresses) without further consultation with the FWS. Also, no ground disturbance will occur outside the existing footprint in suitable habitat or designated critical habitat of these species, and areas within 0.25 miles upstream of suitable habitat or critical habitat, without further consultation with the FWS. Multiple water resources BMPs will be implemented to avoid contamination and reduce erosion and sedimentation. In addition, a Storm Water Pollution Prevention Plan (SWPPP) will be prepared and implemented prior to applicable maintenance activities (i.e., disturbances greater than 1 acre of exposed dirt or as required by the property owners or land manager). BMPs described in the SWPPP to reduce erosion will be implemented. The CBP environmental SME will consider areas with highly erodible soils when planning the maintenance activities and will require the use of measures such as waddles, aggregate materials, and wetting compounds where appropriate. Tactical infrastructure will be periodically inspected for the presence of erosion, and repair and maintenance will be implemented as necessary.

Potential direct impacts on threatened and endangered avian species (i.e., Yuma clapper rail and southwestern willow flycatcher) include noise disturbances from increased human presence, injury or fatality from collisions with maintenance vehicles and during maintenance activities, and habitat degradation from vegetation removal. As described, maintenance and repair activities would occur infrequently. For example, inspections and routine maintenance of access roads would occur up to four times per year, and routine maintenance of other tactical infrastructure would occur less often. These maintenance activities would include trips by vehicles ranging in size from pickup trucks to heavy equipment such as dump trucks and road graders. Measures discussed above to avoid or reduce impacts in riparian habitat would reduce these impacts on southwestern willow flycatcher and Yuma clapper rail. If vegetation clearing is to be conducted adjacent to suitable riparian habitat of these bird species, qualified personnel with experience identifying suitable habitat of that species will delineate and clearly mark the suitable habitat to be avoided. For all other maintenance activities to be conducted within suitable habitat of a threatened or endangered bird species during the nesting season, a qualified biologist will conduct a survey for threatened and endangered birds prior to initiating maintenance activities. If a threatened or endangered bird is present, a qualified biologist will survey for nests approximately once per week within 500 feet of the maintenance area for the duration of the activity. If an active nest is found, no maintenance will be conducted within 300 feet of the nest until the young have fledged.

Noise effects associated with maintenance activities are expected to occur at any given location for one to a few days in duration. Noise and visual disturbance associated with maintenance and repair activities could disrupt breeding and foraging behaviors of threatened and endangered avian species. Birds may be exposed to noise arising from maintenance and repair activities; however, the level of noise will be reduced through Noise BMP #1. Additional protection for avian species is provided through specific migratory bird BMPs.

Indirect impacts on avian species are not expected because BMPs designed to minimize sedimentation, prevent fires, reduce the spread of nonnative invasive plant species, and otherwise avoid indirect impacts would be implemented.

Conclusion

The Service concurs with the CBP determination that the proposed action may affect, but is not likely to adversely affect the riparian/aquatic species named above, based upon the following:

- Maintenance and repair activities would occur infrequently.
- Clearing of riparian vegetation will not occur within 100 feet of aquatic habitats.
- CBP will implement BMPs to protect water resources as outlined in Appendix A of the BA.
- BMPs will be implemented to reduce sedimentation and runoff, and to reduce the potential for invasive species and fire.
- BMPs will be implemented that will avoid impacts during the nesting season for threatened and endangered avian species.
- No in-water work will occur within streams or other waterbodies with known occurrences or designated critical habitat without further consultation with the FWS.
- Use of herbicides will not occur in streams or other waterbodies with known occurrences within the range or designated critical habitat unless approved by the FWS.
- CBP would conduct additional consultation with the FWS if maintenance and repair activities that would cause sedimentation or otherwise affect water quality or quantity are required less than 0.5 miles upstream of threatened and endangered riparian/aquatic plant species.
- Maintenance and repair activities will be not conducted outside of the existing footprint in known habitat or designated critical habitat, or within 0.25 miles upstream of known habitat or critical habitat of threatened and endangered riparian/aquatic plant species.
- Vegetation clearing will not occur in suitable habitat within the range of threatened and endangered species. If a threatened or endangered species or other indicators of suitable habitat occur within the action area and vegetation clearing is necessary, then further consultation with FWS will be required.
- If vegetation clearing is to be conducted adjacent to suitable riparian habitat of a threatened or endangered bird species, qualified personnel with experience identifying suitable habitat of that species will delineate and clearly mark the suitable habitat to be avoided.
- A qualified biologist will conduct a survey during nesting season for threatened and endangered birds prior to initiating maintenance activities. If a threatened or endangered bird is present, a qualified biologist will survey for nests approximately once per week within 152 meters (500 feet) of the maintenance area for the duration of the activity. If an active nest is found, no maintenance will be conducted within 91 meters (300 feet) of the nest until the young have fledged.

Critical Habitat

Critical habitat for the Huachuca water umbel and the southwestern willow flycatcher has been designated or proposed. We have also evaluated potential effects to the critical habitat for these two species that may result from the proposed action.

Critical habitat was designated for the Huachuca water umbel on July 12, 1999, in the Arizona counties of Cochise and Santa Cruz. As presented in 64 FR 37441–37453, the primary consistent

elements (PCEs) of critical habitat for this species include the habitat components that provide the following:

1. "Sufficient perennial base flows to provide a permanently or nearly permanently wetted substrate for growth and reproduction of Huachuca water umbel;"

2. "A stream channel that is relatively stable, but subject to periodic flooding that provides for rejuvenation of the riparian plant community and produces open microsites for Huachuca water umbel expansion;"

3. "A riparian plant community that is relatively stable over time and in which nonnative species do not exist or are at a density that has little or no adverse effect on resources available for Huachuca water umbel growth and reproduction; and"

4. "In streams and rivers, refugial sites in each watershed and in each reach, including but not limited to springs or backwaters of mainstream rivers that allow each population to survive catastrophic floods and recolonize larger areas."

Critical habitat areas were selected to provide for the conservation of Huachuca water umbel throughout the remaining portion of its geographic range in the United States. At least one segment of critical habitat is designated in each watershed containing the species, with the exception of the Rio Yaqui watershed where the plants are found on the San Bernardino NWR. Critical habitat for Huachuca water umbel occurs in the action area. There currently is no tactical infrastructure to be maintained within Huachuca water umbel critical habitat. The proposed action would not result in direct, indirect, or cumulative effects that would appreciably diminish the value of PCEs within Huachuca water umbel critical habitat or result in destruction or adverse modification of that critical habitat. All activities would be restricted to within and immediately adjacent to the footprint of existing tactical infrastructure within designated critical habitat, and vegetation clearing would not occur in designated critical habitat of Huachuca water umbel. Thus, TIMR Program activities are not likely to adversely affect critical habitat of the Huachuca water umbel.

Critical habitat was designated for southwestern willow flycatcher on October 19, 2005, and included approximately 120,824 acres (48,896 hectares) of habitat in Apache, Cochise, Gila, Graham, Greenlee, Maricopa, Mohave, Pinal, Pima, and Yavapai counties, Arizona; and Kern, Santa Barbara, San Bernardino, and San Diego counties, California (70 FR 60885). As presented in 70 FR 60885, the PCEs for southwestern willow flycatcher critical habitat include the following:

1. "Riparian habitat in a dynamic successional riverine environment (for nesting, foraging, migration, dispersal, and shelter) that comprises:

a. Trees and shrubs that include Goodding's willow (*Salix gooddingii*), coyote willow (*Salix exigua*), Geyer's willow (*Salix geyerana*), arroyo willow (*Salix lasiolepis*), red willow (*Salix laevigata*), yewleaf willow (*Salix taxifolia*), pacific willow (*Salix lasiandra*), boxelder (*Acer negundo*), tamarisk (*Tamarix ramosissima*), Russian olive (*Eleagnus angustifolia*), buttonbush (*Cephalanthus occidentalis*), cottonwood (*Populus fremontii*), stinging nettle (*Urtica dioica*), alder

(*Alnus rhombifolia, Alnus oblongifolia, Alnus tenuifolia*), velvet ash (*Fraxinus velutina*), poison hemlock (*Conium maculatum*), blackberry (*Rubus ursinus*), seep willow (*Baccharis salicifolia, Baccharis glutinosa*), oak (*Quercus agrifolia, Quercus chrysolepis*), rose (*Rosa californica, Rosa arizonica, Rosa multiflora*), sycamore (*Platinus wrightii*), false indigo (*Amorpha californica*), Pacific poison ivy (*Toxicodendron diversilobum*), grape (*Vitus arizonica*), Virginia creeper (*Parthenocissus quinquefolia*), Siberian elm (*Ulmus pumila*), and walnut (*Juglans hindsii*).

b. Dense riparian vegetation with thickets of trees and shrubs ranging in height from 2 m to 30 m (6 to 98 ft). Lower-stature thickets (2 to 4 m or 6 to 13 ft tall) are found at higher elevation riparian forests and tall-stature thickets are found at middle- and lower elevation riparian forests;

c. Areas of dense riparian foliage at least from the ground level up to approximately 4 m (13 ft) above ground or dense foliage only at the shrub level, or as a low, dense tree canopy;

d. Sites for nesting that contain a dense tree and/or shrub canopy (the amount of cover provided by tree and shrub branches measured from the ground) (i.e., a tree or shrub canopy with densities ranging from 50 percent to 100 percent);

e. Dense patches of riparian forests that are interspersed with small openings of open water or marsh, or shorter/sparser vegetation that creates a mosaic that is not uniformly dense. Patch size may be as small as 0.1 ha (0.25 ac) or as large as 70 ha (175 ac);" and

2. "A variety of insect prey populations found within or adjacent to riparian floodplains or moist environments, including: flying ants, wasps, and bees (Hymenoptera); dragonflies (Odonata); flies (Diptera); true bugs (Hemiptera); beetles (Coleoptera); butterflies/moths and caterpillars (Lepidoptera); and spittlebugs (Homoptera)."

As described in 70 FR 60885–1009, the 120,824 acres of critical habitat are located in Arizona, Nevada, New Mexico, Utah, and California. No portion of the designated critical habitat occurs in the Arizona Action Area.

The FWS announced a proposed revision to southwestern willow flycatcher designated critical habitat on August 15, 2011. This revision would increase the total designated critical habitat by approximately 3,364 stream kilometers (2,090 stream miles) in several counties in Arizona, California, Utah, Colorado, and New Mexico. Within the action area, the proposed critical habitat areas are located in Yuma County along and near the Colorado River and Santa Cruz County along the Santa Cruz River (76 FR 50542). The PCEs described in the proposed revision are very similar to those listed in the current designation and described above.

The Service also concurs with the CBP determination that the proposed action may affect, but is not likely to adversely affect, destroy, or adversely modify critical habitat for the Huachuca water umbel, nor existing or proposed critical habitat for the southwestern willow flycatcher, based upon the following:

- Vegetation clearing will not occur in designated critical habitat of threatened and endangered species. If primary constituent elements (PCE) of threatened or endangered species critical habitat occur within the action area, then further consultation with FWS will be required.
- All activities would be restricted to within and immediately adjacent to the footprint of existing tactical infrastructure within designated critical habitat.
- There currently is no tactical infrastructure to be maintained within Huachuca water umbel critical habitat.
- There is no critical habitat designated for the southwestern willow flycatcher within or near the action area; therefore, the TIMR Program (proposed action) would have no effect on critical habitat of this species. However, FWS announced a proposed revision to southwestern willow flycatcher designated critical habitat on August 15, 2011. This revision would increase the total designated critical habitat by approximately 3,364 stream kilometers (2,090 stream miles) in several counties in Arizona, California, Utah, Colorado, and New Mexico. Within the action area, proposed critical habitat is located in Yuma and Santa Cruz Counties, Arizona (76 FR 50542–50629). There currently is no tactical infrastructure to be maintained within southwestern willow flycatcher proposed critical habitat.

Concurrence for Fish Species including Desert pupfish (*Cyprinodon macularius*) and critical habitat, Quitobaquito pupfish (*C.m. macularius* = *Cyprinodon eremus*) and critical habitat, Gila chub (*Gila intermedia*) and critical habitat, Gila topminnow (*Poeciliopsis occidentalis occidentalis*), and Sonora chub (*Gila ditaenia*) and critical habitat

Environmental Baseline

Five fish species, including critical habitat designations for four of those species, occur within the proposed TIMR action area. These fish species and their critical habitats are dependent on reliable aquatic habitats for their survival and recovery. The proposed action may result in some impacts to these fish species and their habitats.

The desert pupfish is a small fish, approximately 8 cm (3 inches) in length with narrow dark vertical bars on a silvery background. Its diet is varied and consists of plants, algae, detritus, and invertebrates. Males are larger than females and take on a bright blue body color with orange-tipped fins during the breeding season. The spawning season lasts from spring through autumn, although local conditions might allow for reproduction at any time of the year (FWS 2010b). Desert pupfish was listed as federally endangered with critical habitat on March 31, 1986 (51 FR 10842). Critical habitat for desert pupfish occurs in California. An area of critical habitat at Quitobaquito Springs, Arizona, that was designated as critical habitat for this species is occupied by the Quitobaquito pupfish, which is now considered a separate species (see below). Desert pupfish are declining due to dewatering of habitats such as springs, some headwaters, and lower reaches of streams and marshes; alteration of its habitat, including stream diversion, channelization, impoundment, and discharge regulation; other watershed impacts including domestic livestock grazing, timber harvest, mining, road construction, and water pollution; and competition or predation with nonnative species. Numerous historic habitats have dried up as a result of groundwater pumping, channel erosion, and water impoundment (FWS 1993a).

The Gila chub is a chunky, small-finned minnow with a dark olive-green to silvery coloration, fading to lighter on the belly. Males tend to be smaller with adults reaching 15 cm (6 inches), while females can reach 20 cm (8 inches) (FWS 2008a). Gila chub was listed as federally- endangered with critical habitat on November 2, 2005 (70 FR 66664). Critical habitat for Gila chub occurs in the action area. The majority of Gila chub habitat has been destroyed or degraded to a point that it is not recoverable. What remains of native habitat is under heavy grazing pressure and is threatened by active mining operations. Increased recreational use has contributed to degradation of habitat, as has the introduction of nonnative species (FWS 2008a).

The Sonora chub is a moderately chubby, dark-colored fish less than 12.5 cm (5 inches) long; it has two prominent black lateral bands on the sides and a dark oval spot at the base of the tail. Breeding males have red lower fins and a somewhat orange belly. The Sonora chub can be described as a tenacious, desert-adapted species, adept at exploiting small marginal habitats that can survive under severe environmental conditions. It is thought to be an opportunistic feeder that takes advantage of seasonally available food resources (FWS 1992). Sonora chub was listed as federally-threatened with critical habitat on April 30, 1986 (51 FR 16042). Critical habitat for Sonora chub occurs in the action area. The major threat to the Sonora chub is the modification of suitable habitat by human activities including grazing, mining, recreation, and the introduction of exotic species (FWS 1992).
Absent a standardized, repeatable population or habitat, it is difficult to determine if there have been appreciable changes in the species' distribution; present-day distribution data are primarily anecdotal. The Arizona Game and Fish Department (AGFD) (1995) discovered that Sonora chub also occurs in California Gulch, a stream located approximately 3 miles west of Sycamore Canyon; this is most likely a metapopulation. California Gulch has been surveyed infrequently since the initial discovery, and Sonora chub are reliably present in suitable habitat from the International Boundary upstream to the tinaja. In 2002, Sonora chub were detected in three new locations within the Sycamore Canyon watershed: one site was within an unnamed side canyon, one in Sycamore Canyon proper, and the third was in Atascosa Canyon (FWS 2002). Hendrickson and Romero (1990) surveyed Sonora chub in the Río de La Concepción basin in Sonóra, México and posited that threatened status was appropriate for the peripheral and geographically isolated population of Sonora chub in Arizona while rangewide, the species' status was secure. The current status of Sonora chub in Mexico is unknown, but it is presumed that predatory and competitive nonnative fishes noted by these authors are still present within the species' range there and that drought has affected Sonóra to an extent similar to Arizona. In May 2006, USFWS staff confirmed the continued presence of Sonora chub in the headwaters of the Río Cocóspera at Rancho el Aribabi in Sonora (Duncan 2006).

The Gila topminnow is a small, guppy-like, live-bearing fish that is 2.5 to 5 cm (1 to 2 inches) long (FWS 2008b). Males and females are both characterized by a tan- to olive-colored body and usually display a white belly (FWS 1998). Gila topminnow was listed as federally- endangered without critical habitat on March 11, 1967 (32 FR 4001). The primary threats to Gila topminnow are habitat destruction, competition, and predation from invasive nonnative species (FWS 1998, FWS 2008b). Land use practices such as livestock grazing, mining, timber cutting, road maintenance, and recreation can result in increased erosion, intensified flood events, and decreased groundwater storage, potentially affecting existing populations and suitable habitats for future reintroductions. Urban and suburban population growth and development and associated increased groundwater

pumping, alteration of streams and rivers, and increased water pollution also threaten the recovery efforts of the species (FWS 1998).

Originally described as a subspecies of the desert pupfish, recent taxonomic studies indicate that the Quitobaquito pupfish is a distinct species. As a result, the FWS is in the process of updating the listed species in the Code of Federal Regulations (CFR) (50 CFR 17.11) to reflect this taxonomic relationship (FWS 2010c). The Quitobaquito pupfish differs from the desert pupfish by having a slightly deeper and broader body and head. The dorsal fin originates further toward the tail than on the desert pupfish in both male and female Quitobaquito pupfish. The pelvic fins are also reduced in comparison with desert pupfish. The Quitobaquito pupfish is known to occur in only two U.S. locations, in Quitobaquito Spring just north of the U.S./Mexico international border in Organ Pipe Cactus National Monument in Arizona, and in a recently established population as part of an introduction program at the Visitors Center at Cabeza Prieta National Wildlife Refuge (ISDA 2005). The Quitobaquito pupfish was threatened by the introduction of nonnative golden shiner in 1968 or 1969; however, this species was eradicated and the Quitobaquito pupfish population was reestablished (FWS 1993a). Additional threats to this species include destruction or curtailment of habitat from groundwater pumping and water diversion, soil erosion and impacts on watershed health, and livestock grazing (FWS 2010c).

Effects of the Proposed Action

There are a number of potential effects to these riparian/aquatic species from the proposed action. However, CBP has also included a number of BMPs and incorporated measures into the proposed action to reduce the potential for these effects. No in-water work will occur within streams or other waterbodies with known occurrences or designated critical habitat of these species without further consultation with the FWS, and, therefore, no protected fish will be harmed or otherwise directly affected by the proposed action.

Potential indirect impacts on these native fish species include increased potential for erosion and sedimentation, changes in hydrology from groundwater pumping and water diversion, and the introduction of nonnative invasive species.

Maintenance activities could alter the quality of surface water within and downstream of maintenance areas. However, impacts on water quality would be localized and temporary, and BMPs would be implemented to reduce sedimentation and runoff from roads and other infrastructure and minimize other potential indirect effects on these species. Clearing of riparian vegetation will not occur within 30 meters (100 feet) of aquatic habitats to provide a buffer area to protect the habitat from sedimentation. In addition, cleaning or modification of culverts and other work within drainages that could cause sedimentation or otherwise affect water quality or quantity will not occur within, or within 0.25 miles upstream of, critical habitat or other suitable habitat without further consultation with the FWS. Equipment staging areas shall be located at previously used staging areas or at least 0.3 miles away from known, occupied sites of listed aquatic species. CBP will implement BMPs to avoid erosion, sedimentation, and runoff. Other general BMPs listed in this BO to protect water resources also will be implemented as part of the proposed action.

The introduction of nonnative invasive species can impact threatened and endangered fish species. However, the proposed action does not include any activities that would result in the introduction of nonnative invasive aquatic species. Contamination of ground and surface waters should be avoided by ensuring that water tankers that convey untreated surface water do not discard unused water where it has the potential to enter any aquatic or wetland habitat. In addition, CBP will not use surface water from aquatic or marsh habitats for maintenance and repair projects if that site supports aquatic federally-listed species, or if it contains non-native invasive species or disease vectors based on the best available information provided by FWS. CBP also will not use surface water from untreated sources, including water used for irrigation purposes, for maintenance and repair projects located within one mile of aquatic habitat for federally-listed aquatic species. Groundwater or surface water from a treated municipal source will be used when within one mile of such habitats.

Conclusion

The Service concurs with the CBP determination that the proposed action may affect, but is not likely to adversely affect the fish species named above, based upon the following:

- No in-water work will occur within streams or other waterbodies with known occurrences of the listed fish species described above or within designated critical habitat without further consultation with the FWS.

- Cleaning or modification of culverts and other work within drainages that could cause sedimentation or otherwise affect water quality or quantity will not occur within, or within 0.25 miles upstream of, critical habitat or other suitable habitat without further consultation with the FWS.
- Use of herbicides will not occur in streams or other waterbodies with known occurrences within the range or designated critical habitat of listed fish unless approved by the FWS.

Critical Habitat

Critical habitat for the Gila chub, desert pupfish (including the Quitobaquito pupfish), and the Sonoran chub has been designated. We have also evaluated potential effects to the critical habitat for these four species that may result from the proposed action.

Critical habitat was designated for the Gila chub (*Gila intermedia*), on November 2, 2005. As presented in 70 FR 66664–66721, the PCEs of critical habitat for Gila chub include the habitat components that provide the following:

1. "Perennial pools, areas of higher velocity between pool areas, and areas of shallow water among plants or eddies all found in small segments of headwaters, springs, or cienegas of smaller tributaries."

2. "Water temperatures for spawning ranging from 17 to 24 degrees Celsius (62.6 to 75.2 degrees Fahrenheit) and seasonally appropriate temperatures for all life states, from 10-30 degrees Celsius."

3. “Water quality with reduced levels of contaminants or any other water quality characteristics, including excessive levels of sediments, adverse to Gila chub health, and adequate levels of pH (6.5-9.5), dissolved oxygen (3.0.10.0), and conductivity (100-1000 millimhos).”

4. “Food base consisting of invertebrates, filamentous (threadlike) algae, aquatic plants, and insects.”

5. “Sufficient cover consisting of downed logs in the water channel, submerged aquatic vegetation, submerged large tree root wads, undercut banks with sufficient overhanging vegetation, large rocks and boulders with overhangs, and a high degree of streambank stability and healthy, intact, riparian vegetation community.”

6. “Habitat devoid of nonnative aquatic species detrimental to Gila chub or habitat in which detrimental nonnatives are kept at a level that allows Gila chub to continue to survive and reproduce.”

7. “Streams that maintain a natural unregulated flow pattern including periodic natural flooding.”

Critical habitat areas were designated to provide for the conservation of the Gila chub throughout the remaining portion of its geographic range in the United States. Several areas of critical habitat have been proposed in Arizona and New Mexico; however, only one of these areas is located in the action area. That area of critical habitat includes two tributaries of the Babocomori River, O’Donnel Canyon and Turkey Creek, and a buffer zone adjacent to those reaches. The tributaries are located about 13 and 17 miles north of the international border, respectively. There currently is no tactical infrastructure to be maintained within these critical habitat units. These units are located primarily on Coronado National Forest, but also on private land and land managed by the Bureau of Land Management. The proposed action would not result in direct, indirect, or cumulative effects that would appreciably diminish the value of constituent elements within this critical habitat. All activities would occur within and immediately adjacent to the footprint of existing tactical infrastructure, and BMPs designed to avoid impacts on critical habitat of this species will be implemented. For example, no in-water work will occur within designated critical habitat without further consultation with the FWS, riparian vegetation within 30 meters (100 feet) of aquatic habitat will not be cleared, and use of herbicides within critical habitat will not occur without approval from the FWS. In addition, clearing of vegetation will not occur in designated critical habitat without further consultation with the FWS. Thus, TIMR Program activities are not likely to adversely affect, adversely modify or destroy critical habitat of the Gila chub.

Critical habitat was designated for the desert pupfish, including the Quitobaquito pupfish, on March 21, 1986. As presented in 51 FR 10842–10851, the PCEs of critical habitat for desert pupfish include the habitat components that provide the following:

1. “Clean unpolluted water that is relatively free of exotic organisms, especially exotic fishes.”

2. “Small slow-moving desert streams spring pools with marshy backwater areas.”

Critical habitat areas were selected to provide for the conservation of the desert pupfish, including

the Quitobaquito pupfish, throughout its geographic range in the United States. Four areas of critical habitat were designated for the desert pupfish, including Quitobaquito Spring (and the immediately adjacent riparian zone), located on Federal lands in Organ Pipe Cactus National Monument in Pima County, Arizona. There currently is no tactical infrastructure to be maintained within this critical habitat unit, although CBP does need to maintain the access road to Quitobaquito Springs. The proposed action would not result in direct, indirect, or cumulative effects that would cause that critical habitat to be destroyed or adversely modified. CBP would coordinate maintenance and repair of the access road to Quitobaquito Spring and other all TIMR Program activities conducted in the vicinity of that spring with the U.S. Park Service, and BMPs would be implemented for all maintenance and repair conducted in the area to prevent direct or indirect impacts on that habitat. Thus, critical habitat of the desert pupfish, including the Quitobaquito pupfish, would not be destroyed or adversely modified.

Critical habitat was designated for the Sonora chub on April 30, 1986. As presented in 51 FR 16042–16047, the PCEs of critical habitat for Sonora chub include the habitat components that provide the following:

1. "Clean permanent water with pools and intermediate riffle areas."

2. "Intermittent pools maintained by bedrock or by subsurface flow in areas shaded by canyon walls."

Critical habitat areas were selected to provide for the conservation of the Sonora chub throughout the remaining portion of its geographic range in the United States. The designated critical habitat for this species consists of several stream reaches and associated riparian areas in Santa Cruz County, Arizona. These streams include portions of Sycamore Creek (and an unnamed tributary), Penasco Creek, and Yank's Spring (51 FR 16042–16047). All of the critical habitat areas, except for Yank's Spring, are within designated wilderness areas. All critical habitat for the Sonora chub occurs within the action area. This habitat is entirely within Coronado National Forest. There currently is no tactical infrastructure to be maintained within these critical habitat units. The proposed action should not result in direct, indirect, or cumulative effects that would appreciably diminish the value of constituent elements within this critical habitat. All activities will occur within and immediately adjacent to the footprint of existing tactical infrastructure, and BMPs designed to avoid impacts on critical habitat of this species will be implemented.

The Service also concurs with the CBP determination that the proposed action may affect, but is not likely to adversely affect, destroy, or adversely modify critical habitat for the Gila chub, Quitobaquito pupfish (desert pupfish), and the Sonora chub, based upon the following:

- There currently is no tactical infrastructure to be maintained within these critical habitat units.
- The TIMR Program should not result in direct, indirect, or cumulative effects that would appreciably diminish the value of constituent elements within this critical habitat. All activities will occur within and immediately adjacent to the footprint of existing tactical infrastructure, and BMPs designed to avoid impacts on critical habitat of these species will be implemented. For example, no in-water work will occur within designated critical habitat without further

consultation with the FWS, riparian vegetation within 30 meters (100 feet) of aquatic habitat will not be cleared, and use of herbicides within critical habitat will not occur without approval from the USFWS. In addition, clearing of vegetation will not occur in designated critical habitat without further consultation with the FWS.

- CBP will coordinate maintenance and repair of the access road to Quitobaquito Spring and other all TIMR Program activities conducted in the vicinity of that spring with the U.S. Park Service and BMPs will be implemented for all maintenance and repair conducted in the area to prevent direct or indirect impacts on that habitat.

Concurrence for Upland Species including Jaguar (*Panthera onca*), Lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Mexican spotted owl (*Strix occidentalis lucida*) and critical habitat, New Mexico ridge-nosed rattlesnake (*Crotalus willardi obscurus*), Ocelot (*Leopardus pardalis*), Masked bobwhite (*Colinus virginianus ridgwayi*), and Cochise pincushion cactus (*Coryphantha robbinsorum*)

Environmental Baseline

A number of listed species occur in the upland ecosystems of the action area. These species include two terrestrial mammals, two birds, a bat species, a snake, and a cactus. Effects to these upland species from the proposed action occur in somewhat different areas than those described for other species groups as described above.

The jaguar is the largest species of cat native to the western hemisphere. It has a cinnamon-buff color with many black spots and has a muscular, deep-chested body with relatively short, massive limbs. Its weight ranges widely from 40 to 135 kilograms (90 to 300 pounds) and its length is typically 2.4 meters (7.8 feet) from head to tail tip (FWS 2000). The U.S. population of jaguar was listed as federally-endangered without critical habitat on July 22, 1997 (62 FR 39147). The non-U.S. population of jaguar was listed as federally-endangered on March 30, 1972 (37 FR 6476). Critical habitat has recently been proposed (77 FR 50214) for the portion of the jaguar's range within the U.S. in Arizona and New Mexico. In Arizona, the species was historically found in mountainous parts of eastern Arizona to the Grand Canyon. The current range includes central Mexico and into central South America as far south as northern Argentina. While a number of documented occurrences have occurred in Arizona and New Mexico since the mid-1990s, there are no currently known breeding populations in the United States (USFWS 2000b). In Arizona, potential habitat includes areas of forest, woodland, and grassland vegetation in the Baboquivari Mountains, the southern portion of the Altar Valley, a portion of the southern Santa Cruz River basin, and the San Pedro River basin south of Arivapa Creek. The recent jaguar observations in south-central Arizona near the Mexican border have primarily occurred in Madrean oak woodland communities; however, jaguars were also documented in open mesquite grasslands and desert scrub/grasslands on the desert valley floor (USFWS 2007c).

The lesser long-nosed bat is a yellow-brown or cinnamon gray bat, with a total head and body measurement of approximately 8 cm (3 inches). The tongue measures approximately the same length as the body. This species also has a small nose leaf (FWS 2001b). Lesser long-nosed bat was listed as federally endangered without critical habitat on September 30, 1988 (53 FR 38456). The species

historically ranged from southern Arizona in the Picacho Mountains, the Agua Dulce Mountains, and the Chiricahua Mountains to southwestern New Mexico in the Animas and Peloncillo Mountains through much of Baja California, Mexico (FWS 1994). These bats are seasonal (April to September) residents of southeastern Arizona, and possibly extreme western Arizona (i.e., Cochise, Pima, Santa Cruz, Graham, Pinal and Maricopa Counties, Arizona) (FWS 2001b, 2005). Within the action area for the TIMR Program, there are at least two maternity roost sites: Bluebird Mine and Copper Mountain Mine; and five post-maternity roost sites: Patagonia Bat Cave, Manila Mine, Coal Mine Springs, Cabeza Prieta NWR, and the State of Texas Mine (FWS 1994, FWS 1997). A sixth post-maternity roost site, the Cave of the Bells, occurs immediately adjacent to the action area (FWS 1994). Habitat for the species includes mainly desert scrub habitat in the U.S. portion of its range. In Mexico, the species occurs up into high elevation pine-oak and ponderosa pine forests. Within the United States, this species forages at night on nectar, pollen from columnar cacti (such as saguaros), and agaves with branched flower clusters (FWS 2001b). Considerable evidence exists for the interdependence of *Leptonycteris* bat species and certain agaves and cacti (FWS 2001b). During daylight, lesser long-nosed bats roost in caves or abandoned mines. Impacts to foraging resources have been identified as a threat to this species. Impacts to forage resources, including the conversion of habitat for agricultural uses, livestock grazing, woodcutting, urbanization, and other development might contribute to the decline of long-nosed bat populations. In addition, occupancy of communal roost sites by illegal border crossers and recreational users is a potential threat. These bats are particularly vulnerable due to many individuals using only a small number of communal roosts (FWS 2001b). In general, the trend in overall number of lesser long-nosed bats has been stable or increasing in both the United States and Mexico. In part, for this reason, the FWS recommended reclassifying the status of this species as threatened (FWS 2007a).

The Mexican spotted owl has large, dark eyes, an overall dark to chestnut brown coloring, whitish spots on the head and neck, and white mottling on the abdomen and breast (FWS 1995a). Mexican spotted owl was listed as federally-threatened on March 16, 1993 (58 FR 14248), with critical habitat designated on August 31, 2004 (69 FR 53182). Critical habitat for Mexican spotted owl occurs in the action area for the proposed project. The Mexican spotted owl inhabits canyon and forest habitats across its range and is frequently associated with mature mixed-conifer, pine-oak, and riparian forests. Owls are usually found in areas with some type of water source such as perennial streams, creeks, and springs. Mexican spotted owls use a variety of habitats for foraging, including multi-layered forests with many potential patches. In areas within Arizona and New Mexico, forests used for roosting and nesting often contain mature or old-growth stands with complex structure. The breeding period for Mexican spotted owls is March through June (FWS 1995a). The primary threats to the Mexican spotted owl are even-aged timber harvest and the threat of catastrophic wildfire. Additional threats include development from oil, gas, and mining; and recreation (FWS 1995a).

The New Mexico ridge-nosed rattlesnake is a small (30- to 60-cm- [12 to 24-inch] long), montane, grayish-brown rattlesnake with a distinct ridge on the tip of its snout. The diet of the New Mexico ridge-nosed rattlesnake consists of a broad range of prey including small mammals, birds, lizards, arthropods, and other snakes. Reproduction and birthing periods generally occur between early August and mid-October, with the majority of births occurring in mid-September. This species is active during periods of moderate temperatures, both daily and seasonally. New Mexico ridge-nosed rattlesnakes are active from April to October. The greatest periods of activity coincide with the rainy

season in the Animas Mountains (July to September) (FWS 1985). New Mexico ridge-nosed rattlesnake was listed as federally-threatened with critical habitat on August 4, 1978 (43 FR 34479). Critical habitat for New Mexico ridge-nosed rattlesnake does not occur in the action area. Natural threats to the New Mexico ridge-nosed rattlesnake include predation, starvation, and pathogenic-related diseases that remain poorly understood (FWS 1985). Other threats, more important to the decline in population numbers include over-collecting by the pet trade, and the alteration of habitat by fire suppression, climate change, grazing, mining, and development (FWS 1985).

The ocelot is a medium-sized nocturnal cat, measuring up to 3 feet in body length and weighing twice as much as a large domestic cat. It is slender and covered with attractive, irregular-shaped rosettes and spots that run the length of its body. The ocelot's background coloration can range from light yellow to reddish gray, to gold, and to a grayish gold color. The ocelot is divided into as many as 11 subspecies; 2 subspecies occur in the United States: the Texas/Tamaulipas ocelot (*L.p. albescens*) and the Arizona/Sonora ocelot (*L.p. sonoriensis*) (FWS 2010c). The U.S. population of ocelot was listed as federally-endangered without critical habitat on August 20, 1982 (47 FR 31670). The Arizona/Sonora ocelot subspecies is known to occur in southern Arizona and northwestern Mexico. The first live Arizona/Sonora ocelot seen in Arizona since the 1960s was documented in Cochise County, Arizona, in November 2009. In April 2010, an ocelot was found dead on a road near Globe, Arizona. In February 2011, the Arizona Game and Fish Department reported that an ocelot was observed in the Huachuca Mountains of southern Arizona. This individual has been subsequently detected by trail cameras a number of times in the Huachuca Mountains, including as recently as spring 2012. A possible fourth ocelot was also detected in the Huachuca Mountains in spring 2012. In addition, a number of sightings of ocelot have been documented directly south of the U.S. border in Sonora, Mexico, including more than four ocelots in the Sierra Azul, 30 to 35 miles southeast of Nogales since 2007; and one ocelot in 2009 in the Sierra de Los Ajos, 30 miles south of Naco, Mexico (FWS 2010c). A female with a kitten was reportedly photographed at Rancho El Aribabi, in the Sierra Azul, in February 2011. In Arizona, little is known about habitat use. Some studies suggest that Arizona/Sonora ocelots are most often associated with tropical or subtropical habitat, including subtropical thornscrub, tropical deciduous forest, and tropical thornscrub (FWS 2010c). Threats to the ocelot include destruction, modification, and curtailment of its habitat and range; collection for commercial, recreational, scientific, and educational purposes; and disease and predation (FWS 2010c).

The adult male masked bobwhite has a deep cinnamon-colored breast, black head and throat, and crown feathers that darken with age. The female masked bobwhite has plumage that is mottled brown, black, and white, with a pale cinnamon-colored throat (FWS 1995b). The masked bobwhite was listed as federally-endangered without critical habitat on June 2, 1970 (35 FR 8495). The distribution of the masked bobwhite includes south-central Arizona and Sonora, Mexico. The northern limit of historic range is defined by the Altar and Santa Cruz valleys in Arizona. It was extirpated from the United States by about 1900 and reintroduced at the Buenos Aires NWR in southern Arizona (NatureServe 2010). The masked bobwhite was listed as endangered as a result of habitat loss due to overgrazing and possibly due to competition with other native species of quail (NatureServe 2010). Current threats include factors related to their extremely small population size, vulnerability of the captive flock, ongoing drought, and climate change.

The Cochise pincushion cactus is a small unbranched cactus, 1.4 to 6 centimeters (cm) (0.5 to 2.4 inches) in diameter and covered by white, cottony areoles (i.e., spine-bearing structures), overlapped by radial spines within the areoles. This species has a whitish appearance with pale yellow to light beige flowers that bloom in March. Flowers are followed by orange-red to scarlet fruits that dry to a brown color rather quickly and can contain up to 20 seeds (FWS 1993b). Cochise pincushion cactus was listed as a Federal threatened species without critical habitat on January 9, 1986 (51 FR 952). Threats to the Cochise pincushion cactus include habitat degradation from cattle, wildlife, feral animals, illegal border activities, minerals exploration, development (FWS 1993b), and competition from invasive plant species, especially grasses (FWS 2007b). Survival and reproduction of the Cochise pincushion cactus could be affected by prolonged periods of severe drought (FWS 1993b).

Effects of the Proposed Action

There are a number of potential effects to these upland species from the proposed action. However, maintenance and repair activities would occur infrequently, and CBP has included a number of BMPs and other measures to reduce the potential for these effects.

Potential direct impacts to the upland plant species from maintenance and repair activities include direct injury and fatality from trampling or crushing by equipment, alteration of the plant seed bank, and habitat degradation from disturbance of soils. To avoid these effects and habitat degradation from removal of canopy cover, vegetation clearing will not occur in suitable habitat within the range or designated critical habitat of these threatened and endangered species. If a threatened or endangered species, PCE, or other indicators of suitable habitat occur within the project area, then further consultation with FWS will be required.

Potential direct impacts to jaguar and ocelot include the risk of direct injury and fatality from maintenance vehicles accessing tactical infrastructure and changes in behavior resulting from noise and other disturbances associated with human presence during maintenance and repair activities. Occurrences of jaguar and ocelot in Arizona are extremely rare, and as previously mentioned, maintenance and repair activities would occur infrequently. Maintenance and repair activities would occur within or immediately adjacent to existing tactical infrastructure, and would, therefore, result in no measureable degradation, modification, or habitat fragmentation of undisturbed areas where jaguars and ocelots potentially occur. The presence of maintenance crews and equipment, and their associated noise, could cause jaguars and ocelots to move away from an area or otherwise modify their behavior. Because most repair and maintenance activities would be completed within an area in less than 1 day, and almost all would be completed within a few days, any displacement or other associated adverse effects would be temporary and minor. Additionally, because jaguars and ocelots are so rare in the action area, the potential for an individual jaguars or ocelots to encounter maintenance activities is extremely unlikely to occur, and such effects therefore are discountable.

The potential direct impacts on lesser long-nosed bat include disruption of normal roosting and foraging behavior due to noise and lighting associated with maintenance and repair activities, and degradation of foraging habitat from vegetation removal. Maintenance activities that occur at night have the potential to interfere with a bat's ability to locate and find food (Schaub et al. 2008), and bats might avoid areas where maintenance noise is present. Maintenance and security lighting have

the potential to impact bat behavior, altering commuting routes to foraging habitat (Stone et al. 2009). However, work at night within 5 miles of any known roost sites of the lesser long-nosed bat will be minimized from mid-April through mid-September. If night lighting is unavoidable, light will shine directly onto the work area to ensure worker safety and efficiency, and light will not exceed 1.5 foot-candles in lesser long-nosed bat habitat. Considerable evidence exists for the interdependence of *Leptonycteris* bat species and certain agaves and cacti (FWS 2001b). To avoid affecting the availability of these important forage species, removal of columnar cacti (i.e., saguaro and organ pipe) and agave within the range of the lesser long-nosed bat will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure. Prior to conducting any maintenance or repair activity outside of the existing disturbed footprint of tactical infrastructure within the range of this species, a qualified biologist will conduct a survey to identify and flag all columnar cactus and agave to be avoided. In addition, CBP will comply with all requirements of land management agencies for the protection and replacement of cacti and yucca. By implementing these BMPs, the proposed action would cause very little or no habitat degradation and would not harm or otherwise directly adversely affect lesser long-nosed bats; therefore, the potential for adverse direct effects would be discountable and any effects that might occur would be insignificant.

Potential direct impacts to masked bobwhite and Mexican spotted owl include the risk of direct injury and fatality from maintenance activities, and habitat degradation from vegetation removal. Avian species are particularly susceptible to adverse affects during the breeding and nesting season. Masked bobwhites nest on the ground, increasing the potential for nest destruction, fatality of incubating hens, or loss of very young, less mobile chicks during the nesting season (FWS 1995b, FWS 2009). Removal of vegetation could affect threatened and endangered avian species by reducing suitability of habitat if enough vegetation is removed that it fragments the habitat and alters its structure. Vegetation removal will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure and will be confined to the existing disturbed footprint. This limited vegetation control will be conducted outside of the nesting season. If vegetation clearing is to be conducted adjacent to suitable habitat of a threatened or endangered bird species (i.e., savannah grassland within Buenos Aires NWR for masked bobwhite, and closed-canopy forests [riparian, mixed conifer, pine-oak, and pinyon juniper woodland] and steep, narrow, entrenched, rocky canyons and cliffs within designated critical habitat for Mexican spotted owl), qualified personnel with experience identifying suitable habitat of that species will delineate and clearly mark the suitable habitat to be avoided. In addition to the vegetation clearing restrictions previously mentioned, no maintenance and repair activities will be conducted within areas classified as protected activity centers of Mexican spotted owls during the nesting season. For all other maintenance activities to be conducted within suitable habitat of a threatened or endangered bird species during the nesting season, the following avoidance measures will apply: A qualified biologist will conduct a survey for threatened and endangered birds prior to initiating maintenance activities. If a threatened or endangered bird is present, a qualified biologist will survey for nests approximately once per week within 396 meters (1,300 feet, Mexican spotted owl) or 152 meters (500 feet, all other species) of the maintenance area for the duration of the activity. If an active nest is found, no maintenance will be conducted within 396 meters (1,300 feet, Mexican spotted owl) or 91 meters (300 feet, all other species) of the nest until the young have fledged. By implementing these BMPs, the potential for direct and indirect effects from the proposed action will be minimal and discountable

and any effects that might occur would be negligible. In addition, all maintenance vehicles will be limited to a maximum speed of 35 mph on major unpaved roads (i.e., graded with ditches on both sides) and 25 mph on all other unpaved roads. Based on these considerations, injury to threatened and endangered avian species from striking a CBP maintenance vehicle is extremely unlikely to occur.

Potential direct impacts to New Mexico ridge-nosed rattlesnake include the risk of direct injury and fatality from maintenance activities. This species is limited to a very small area within the action area, and maintenance and repair within that area would be limited to within and immediately adjacent to existing tactical infrastructure. Maintenance activities would be avoided within defined New Mexico ridge-nosed rattlesnake habitat when the rattlesnakes are active from April to October. New Mexico ridge-nosed rattlesnake habitat is defined as occupied habitat, critical habitat, and suitable habitat (i.e., pine-oak woodlands at high elevations of 1,700 to 2,750 meters [5,500 to 9,000 feet]) in the Peloncillo Mountains. If maintenance and repair activities cannot be avoided within the activity period, maintenance and repair vehicles would not exceed a speed of 15 to 20 miles per hour (mph) during periods of elevated roaming and foraging activities from July through August within defined New Mexico ridge-nosed rattlesnake habitat. Wildlife BMPs will prevent entrapment of this species in excavated, steep-walled holes or trenches. Visible space underneath all vehicles and heavy equipment will be checked for listed species and other wildlife prior to moving vehicles and equipment at the beginning of each workday and after vehicles have idled for more than 15 minutes. Indirect effects to New Mexico ridge-nosed rattlesnakes could occur from increased raptor predation, facilitated by project infrastructure. This will be avoided because temporary light poles and other pole-like structures used for maintenance activities will have anti-perch devices to discourage roosting by birds. BMPs and measures within the proposed action designed to minimize or avoid impacts on New Mexico ridge-nosed rattlesnakes will be implemented and the potential for effects is discountable, and any effects that might occur would be insignificant.

Potential direct impacts to Cochise pincushion cactus include the risk of direct injury and habitat loss from maintenance activities. To avoid direct impacts on Cochise pincushion cactus, no ground disturbance will occur outside the existing TIMR footprint within known habitat for this species (i.e., high-calcium Permian limestone, at elevations from 1,280 to 1,433 meters (4,200 to 4,700 feet) where Chihuahuan desert scrub transitions to semi-desert grassland). By avoiding suitable habitat where these protected plants occur, the proposed action would not harm individual plants, cause habitat degradation, or otherwise directly adversely affect Cochise pincushion cactus. Potential indirect impacts on this species include increased erosion and increased potential for invasive species and fire. Recently disturbed soils can have an increased potential for invasive species such as Lehman's lovegrass (*Eragrostis lehmannian*) and Boer lovegrass (*Eragrostis chloromelas*) to become established. These and other invasive species tend to form dense stands that promote higher intensity fires that occur more often. However, coordination with the CBP environmental SME will be conducted in order to determine if the maintenance activities occur in a highly sensitive area or an area that poses an unacceptable risk of transmitting invasive species. If it is determined that maintenance activities occur in such an area, the CBP cleaning protocol will be followed. In addition, a fire prevention and suppression plan will be developed and implemented for all maintenance and repair activities that require welding or otherwise have a risk of starting a wildfire. Based on the implementation of BMPs designed to avoid or reduce these types of impacts, these impacts would be unlikely to occur.

Potential direct impacts to the upland wildlife species discussed above also include noise disturbances from increased human presence, injury or fatality from collisions with maintenance vehicles and during maintenance activities, and habitat degradation from vegetation removal. As described within the proposed action, maintenance and repair activities would occur infrequently. For example, inspections and routine maintenance of access roads would occur up to four times per year, and routine maintenance of other tactical infrastructure would occur less often. These maintenance activities will include trips by vehicles ranging in size from pickup trucks to heavy equipment such as dump trucks and road graders. Noise levels from pickup trucks are anticipated to be similar to noise levels of most vehicles currently using the roadways. Noise levels from multiple pieces of heavy equipment, such as backhoes, construction trucks, and front-end loaders are anticipated to temporarily increase ambient sound levels. Noise effects associated with maintenance activities are expected to occur at any given location for one to a few days in duration. The distance and levels at which noise is likely to disturb these upland species is dependent on the sensitivity of individual species. Threatened and endangered wildlife may be exposed to noise arising from maintenance and repair activities; however, the level of noise will be reduced through noise BMPs.

Noise and visual disturbance associated with maintenance and repair activities could disrupt breeding and foraging behaviors of these upland wildlife species. For example, such disturbances could cause adult Mexican spotted owls and masked bobwhite quail to flush from roosts or nests. However, no TIMR Program activities will occur within the nesting season of these species or surveys will be conducted to locate nesting areas so that they can be avoided. As described above, BMPs will be implemented that will avoid impacts during the nesting season and measures will be taken to ensure that no maintenance activities will occur within the vicinity of nesting spotted owls or bobwhite quail. Noise and disturbance associated with the proposed action could also result in the disturbance of roosting bats, if such disturbance occurs in proximity to roosts while bats are present. However, CBP will not conduct maintenance activities within or at the entrance to caves or mineshafts, and no maintenance and repair activities will be conducted within 0.5 miles of any known lesser long-nosed bat roost between mid-April through mid-September. Effects from noise and disturbance to jaguar, ocelot, and masked bobwhite quail are discountable because these species are rare in the action area, and the potential for an individual to encounter maintenance activities is extremely unlikely to occur.

Conclusion

The Service concurs with the CBP determination that the proposed action may affect, but is not likely to adversely affect the upland species named above, based upon the following:

- Maintenance and repair activities will occur infrequently.
- Most maintenance and repair will occur within the existing, disturbed footprint of the tactical infrastructure. As a result, impacts to the habitat of these upland species will be insignificant in most instances.
- For cases where CBP may need to conduct maintenance and repair activities outside of the existing infrastructure footprint, no ground disturbance will occur in species habitat or critical habitat without further consultation with the FWS.

- The presence of maintenance crews and equipment, and their associated noise, could cause these upland species to move away from or avoid an area or otherwise modify their behavior. Because most repair and maintenance activities will be completed within an area in less than one day, and almost all will be completed within a few days, any displacement or other associated adverse effects would be temporary and minor.
- CBP will conduct additional consultation with the FWS if herbicides must be used in habitat where the species' presence is documented.
- Maintenance vehicles will not exceed a speed of 15 to 20 mph during periods of elevated roaming and foraging activities from July through August within New Mexico ridge-nosed rattlesnake habitat (i.e., pine-oak woodlands at high elevations of 1,475 and 2,800 meters [5,600 to 9,000 feet]).
- Wildlife BMPs will prevent entrapment of New Mexico ridge-nosed rattlesnake in excavated, steep-walled holes or trenches.
- Visible space underneath all vehicles and heavy equipment will be checked for listed species and other wildlife prior to moving vehicles and equipment at the beginning of each workday and after vehicles have idled for more than 15 minutes.
- Temporary light poles and other pole-like structures used for maintenance activities will have anti-perch devices to discourage roosting by birds.
- No maintenance and repair activities will be conducted within areas classified as protected activity centers of Mexican spotted owls during the nesting season (see **Table 2**).
- Vegetation clearing will not occur in suitable habitat within the range or designated critical habitat of threatened and endangered species. If a threatened or endangered species, primary constituent element (PCE), or other indicators of suitable habitat occur within the project area, then further consultation with FWS will be required.
- Vegetation control in suitable habitat of threatened or endangered bird species (see **Table 2**) will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure. This limited vegetation control will be conducted outside of the nesting season. This restriction does not apply to areas where protocol surveys have been conducted and it has been determined that the area is not occupied and does not contain PCEs.
- If vegetation clearing is to be conducted adjacent to suitable habitat of a threatened or endangered bird species, qualified personnel with experience identifying suitable habitat of that species will delineate and clearly mark the suitable habitat to be avoided.
- For all other maintenance activities to be conducted within suitable habitat of a threatened or endangered bird species during the nesting season, the following avoidance measures will apply. A qualified biologist will conduct a survey for threatened and endangered birds prior to initiating maintenance activities. If a threatened or endangered bird is present, a qualified biologist will survey for nests approximately once per week within 1,300 feet (Mexican spotted owl) or 500 feet (all other species) of the maintenance area for the duration of the activity. If an active nest is found, no maintenance will be conducted within 1,300 feet (Mexican spotted owl) or 300 feet (all other species) of the nest until the young have fledged.
- Removal of columnar cacti (i.e., saguaro and organ pipe) and agave will be limited to the minimum necessary to maintain drivable access roads and to maintain the functionality of other tactical infrastructure. Prior to conducting any maintenance or repair activity outside of the

existing disturbed footprint of tactical infrastructure within the range of this species, a qualified biologist will conduct a survey to identify and flag all columnar cactus (i.e., saguaro and organ pipe) and agave to be avoided.

- No maintenance and repair activities will be conducted within 0.5 miles of any known lesser long-nosed bat roost between mid-April through mid-September.
- For maintenance and repair activities that will take place greater than 0.5 miles and less than 5 miles of any known lesser long-nosed bat roost, limit activities to daylight hours only from mid-April through mid-September to avoid effects on bats in bat roosts. If night lighting is unavoidable: (1) minimize the number of lights used; (2) place lights on poles pointed down toward the ground, with shields on lights to prevent light from going up into sky, or out laterally into landscape; and (3) selectively place lights so they are directed away from native vegetation.
- Jaguars, ocelots, and masked bobwhite quail are so rare in the action area that the potential for individuals of these species to encounter maintenance activities is extremely unlikely to occur, and such effects therefore are discountable.

Critical Habitat

Critical habitat for the Mexican spotted owl and the New Mexico ridge-nosed rattlesnake has been designated. Critical habitat has recently been proposed (77 FR 50214) for the portion of the jaguar's range within the U.S. in Arizona and New Mexico, but CBP has determined that the activities associated with the TIMR Program will have no effect on proposed jaguar critical habitat. We have evaluated potential effects to the critical habitat for the Mexican spotted owl and the New Mexico ridge-nosed rattlesnake that may result from the proposed action.

Critical habitat was designated for the Mexican spotted owl on August 31, 2004, in 69 FR 53182–53230. The primary constituent elements of critical habitat for this species include the habitat components that provide the following:

PCEs related to forest structure are as follows:

• "A range of tree species, including mixed conifer, pine-oak, and riparian forest types, composed of different tree sizes reflecting different ages of trees, 30 percent to 45 percent of which are large trees with a trunk diameter of 12 inches (0.3 meters) or more when measured at 1.4 meters (1.4 meters 4.5 feet) from the ground"

• "A shade canopy created by the tree branches covering 40 percent or more of the ground"

• "Large dead trees (snags) with a trunk diameter of at least 12 inches (0.3 meters) when measured at 1.4 meters (1.4 meters 4.5 feet) from the ground."

PCEs related to maintenance of adequate prey species are as follows:

1. "High volumes of fallen trees and other woody debris"

2. “A wide range of tree and plant species, including hardwoods”

3. “Adequate levels of residual plant cover to maintain fruits, seeds, and allow plant regeneration.”

PCEs related to canyon habitat include one or more of the following:

1. “Presence of water (often providing cooler and often higher humidity than the surrounding areas)”

2. “Clumps or stringers of mixed conifer, pine-oak, pinyon-juniper, and/or riparian vegetation”

3. “Canyon wall containing crevices, ledges, or caves;”

4. “High percent of ground litter and woody debris.”

Critical habitat areas were selected to provide for the conservation of the Mexican spotted owl throughout the remaining portion of its geographic range in the United States. The designated critical habitat for this species consists of 8.6 million acres in Arizona, Colorado, New Mexico, and Utah, all of which are located on Federal lands. There are five designated critical habitat units for the Mexican spotted owl within the action area in Arizona. These units are located within and near the Santa Rita Mountains, Atascosa and Pajarito Mountains, Patagonia Mountains, Huachuca Mountains, and Chiricahua Mountains, and are all primarily within Coronado National Forest.

The TIMR Program within these critical habitat units includes continued maintenance of 35 miles of existing road, 5 culverts, 5 low water crossings, and 5 towers. Limited management of vegetation adjacent to existing tactical infrastructure will continue (e.g., trimming of branches and other vegetation removal where vegetation encroaches on road shoulders, and removal of understory vegetation within 3 meters [10 feet] of culverts to permit clearing of pipes). However, other vegetation clearing and control will not occur in Mexican spotted owl critical habitat. If a Mexican spotted owl or PCEs are observed within the project area, then CBP will conduct further consultation with FWS to avoid impacts. The maintenance and repair of tactical infrastructure, including continued management of vegetation adjacent to roads and other infrastructure, is not anticipated to measurably diminish the value of PCEs that are essential to conservation of the Mexican spotted owl within the aforementioned critical habitat units.

Critical habitat was designated for the New Mexico ridge-nosed rattlesnake on August 4, 1978. As presented in 43 FR 34476–34480, the PCEs of critical habitat for this species include, but are not limited to, the following: “Dens to provide winter and summer retreats, vegetation to provide cover, and an abundance of lizards and rodents to provide an adequate source of food items.”
The designated critical habitat for this species is in Hidalgo County New Mexico, and consists of an area between 1,890 and 2,600 meters (6,200 and 8,532 feet) in elevation in Bear, Mountain, and Spring canyons in the Animas Mountains (43 FR 34476–34480). Critical habitat for the New Mexico ridge-nosed rattlesnake does not occur in the Arizona action area.

The Service also concurs with the CBP determination that the proposed action may affect, but is not likely to adversely affect, destroy, or adversely modify critical habitat for the Mexican spotted owl or

the New Mexico ridge-nosed rattlesnake based upon the following:

- All TIMR Program activities within critical habitat will occur within and immediately adjacent to the footprint of existing tactical infrastructure.
- BMPs designed to avoid impacts on critical habitat of this species will be implemented.
- Vegetation clearing and control beyond that described above will not occur in Mexican spotted owl critical habitat (i.e., closed-canopy forests [riparian, mixed conifer, pine-oak, and pinyon juniper woodland] and steep, narrow entrenched rocky-canyons and cliffs). If vegetation clearing is to be conducted adjacent to suitable habitat of a threatened or endangered bird species, qualified personnel with experience identifying suitable habitat of that species will delineate and clearly mark the suitable habitat to be avoided. That vegetation clearing or control will be conducted from July through February, outside of the nesting season.
- If a Mexican spotted owl or PCEs are observed within the action area, then CBP will conduct further consultation with FWS to avoid impacts. The maintenance and repair of tactical infrastructure, including continued management of vegetation adjacent to roads and other infrastructure, is not anticipated to measurably diminish the value of PCEs that are essential to conservation of the Mexican spotted owl within the aforementioned critical habitat units.

LITERATURE CITED

Arizona Game and Fish Department. 1995. Report on Sonora chub collection in California Gulch. Arizona Game and Fish Department, Phoenix.

Delaney, K.D., T.G. Grubb, P. Beier, L.L. Pater, and M.H. Reiser. 1999. *Effects of Helicopter Noise on Mexican Spotted Owls.* Journal of Wildlife Management 63(1):60-76. 1999.

Duncan, D. 2006. Unpublished Trip Report of May 10-12, 2006, Biological Survey of Rancho El Aribabi, Rio Cocospera, Sonora, Mexico. Tucson, Arizona. 5 pp.

Hendrickson, D.A. and L.R. Juarez-Romero. 1990. Fishes of the Rio de la Concepcion basin, Sonora, Mexico, with emphasis on determinations of status of the Sonora chub, Gila ditaenia, a threatened species. Southwestern Naturalist 35 (2): 177-187.

International Sonoran Desert Alliance (ISDA). 2005. Pupfish refuges. Available on-line <*http://www.isdanet.org/ISDA%20pupfish.htm*>. Accessed 21 December 2011.

NatureServe. 2010. NatureServe Explorer: An Online 2008 encyclopedia of life [web application]. Version 7.0. NatureServe, Arlington, Virginia. Available online <*http://www.natureserve.org/explorer/*>. Accessed 27 December 2010.

Rice, K.C. 2010. "Plant Profile: *Spiranthes delitescens*." Center for Plant Conservation. Available online <*http://www.centerforplantconservation.org/collection/cpc_viewprofile.asp?CPCNum=13510*>. Accessed 27 December 2010.

Schaub, A., J. Ostwald, and B. Siemers. 2008. Foraging Bats Avoid Noise. *The Journal of Experimental Biology* 211, 3174-3180. Available online <http://jeb.biologists.org/cgi/content/full/211/19/3174>. Accessed December 30, 2009.

Stone, E., G. Jones, and S. Harris. 2009. Street Lighting Disturbs Commuting Bats. *Current Biology* 19:1123–1127.

U.S. Fish and Wildlife Service (FWS). 1983. *Yuma Clapper Rail Recovery Plan (*Rallus longirostris yumanensis*).* Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1985. *Recovery Plan for the New Mexico Ridge Nose Rattlesnake*. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 1992. *Recovery Plan for Sonora Chub* (Gila ditaenia). Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1993a. *Desert Pupfish Recovery Plan*. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 1993b. *Cochise Pincushion Cactus* (Coryphantha robbinsorum) Recovery Plan. Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1994. Lesser Long-nosed Bat Recovery Plan. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona. May 1994.

_____. 1995a. *Recovery Plan for the Mexican Spotted Owl* (Strix occidentalis lucida*).* Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1995b. *Recovery Plan for the Masked Bobwhite*. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 1997. *5-Year Review: Summary and Evaluation for Lesser Long-nosed Bat/Leptonycteris curasoae yerbabuenae*. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 1998. *Gila Topminnow* (Poeciliopsis occidentalis occidentalis) *Revised Recovery Plan*. Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 1999. *Designation of Critical Habitat for the Huachuca Water Umbel, a Plant*. Prepared by U.S. Fish and Wildlife Service. *Federal Register* Vol. 64, No. 132.

_____. 2000. "General Species Information: Jaguar." Available online <*http://www.fws.gov/southwest/es/arizona/Documents/Redbook/Jaguar%20RB.pdf*>. Accessed 23 July 23, 2008.

_____. 2001a. "General Species Information: Huachuca Water Umbel." Available online <*http://www.fws.gov/southwest/es/arizona/Documents/Redbook/Huachuca%20Water%20Umbel%20RB.pdf*>. Accessed 10 December 2010.

_____. 2001b. "General Species Information: Lesser long-nosed bat." Available online<*http://www.fws.gov/southwest/es/arizona/Documents/Redbook/Lesser%20Long-nosed%20bat%20RB.pdf*>. Accessed 23 July 2008.

_____. 2002. Reinitiation of Biological Opinion 2-21-98-F-399; Continuation of Livestock Grazing on the Coronado National Forest. October 24, 2002. Arizona Ecological Services Office, Phoenix. 227 pp w/appendices.

_____. 2002. *Final Recovery Plan, Southwestern Willow Flycatcher (*Empidonax traillii extimus*)*. Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

_____. 2005. *5-Year Review: Summary and Evaluation, Lesser Long-nosed Bat* (Leptonycteris curasoa yerbabuenae). Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 2006. *Yuma Clapper Rail (*Rallus longirostris yumanensis*) 5-Year Review: Summary Evaluation*. Prepared by U.S. Fish and Wildlife Service, Carlsbad, California.

_____. 2007a. *Lesser Long-nosed Bat (*Leptonycteris curasoae yerbabuenae*), 5-Year Review: Summary and Evaluation*. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 2007b. *Cochise Pincushion Cactus (*Coryphantha robbinsorum*), 5-Year Review: Summary and Evaluation*. Prepared by U.S. Fish and Wildlife Service, Phoenix, Arizona.

_____. 2008a. "General Species Information: Gila Chub." Available online <*http://www.fws.gov/southwest/es/arizona/GilaChub.htm*>. Accessed 29 December 2010.

_____. 2008b. "General Species Information: Gila topminnow." Available online <*http://www.fws.gov/southwest/es/arizona/Documents/Redbook/Gila%20Topminnow%20RB.pdf*>. Accessed 10 December 2010.

_____. 2009. Biological Opinion for Section 7 Consultation for the Buenos Aires National Wildlife Refuge Habitat Management Plan. December 4, 2009.

_____. 2010a. "General Species Information; Canelo Hills Ladies' tresses." Available online <*http://www.fws.gov/southwest/es/arizona/Canelo.htm*>. Accessed 27 December 2010.

_____. 2010b. "Desert Pupfish (*Cyprinodon macularius*), 5-Year Review: Summary and Evaluation." Available online <*www.fws.gov/southwest/es/Documents/R2ES/5-Year_Review_Desert_Pupfish_Sept2010.pdf*>. Accessed 28 December 2010.

_____. 2010c. "Desert Pupfish (*Cyprinodon macularius*), 5-Year Review: Summary and Evaluation." Available online <*www.fws.gov/southwest/es/Documents/R2ES/5-Year_Review_Desert_Pupfish_Sept2010.pdf*>. Accessed 28 December 2010.

_____. 2010c. *Draft Ocelot (Leopardus pardalis) Recovery Plan, First Revision*. Prepared by U.S. Fish and Wildlife Service, Albuquerque, New Mexico.

APPENDIX B. FIELD WORK AMPHIBIAN DISEASE PREVENTION PROTOCOL

All resource and land management agencies, researchers, and others conducting aquatic monitoring or research are encouraged to follow this protocol to prevent or reduce the spread of amphibian and other aquatic borne diseases. This protocol for working in wetland habitats is adapted from the Declining Amphibian Populations Task Force Fieldwork Code of Practice, which provides guidelines for use by anyone conducting fieldwork in amphibian or other aquatic habitats. Chytrid fungus, iridoviruses, and other highly contagious and deadly diseases are being reported worldwide, and may be a significant cause of amphibian population declines. Pathogens such as chytrid fungus can easily be transferred between habitats on equipment and footwear of fieldworkers, spreading to new locations containing species that have little or no resistance to the organisms. It is vitally important for anyone involved in amphibian research and other types of wetland studies, including those on fish, bats, invertebrates and plants, to take steps to prevent the introduction of disease agents and parasites. For further Declining Amphibian Populations Task Force information, see http://www.open.ac.uk/daptf/index.htm (website current as of March 2004).

Requirements for Working in Wetland and Aquatic Systems

- Dedicated equipment will be used by staff, crews, and permitees frequently working in springs occupied by Chiricahua leopard frogs. This includes footwear. Dedicated equipment will be cleaned and stored separately.
- Equipment which cannot be duplicated or can be easily cleaned must be disinfected between visits to springs. Equipment will be rinsed and all debris removed. Surfaces, which should appear clean, will be scrubbed with one of the following solutions:
    - 1) rinsing with 1 percent sodium hypochlorite (household bleach);
    - 2) 20-second exposure to 70 percent ethanol or 1 mg/ml benzalkonium chloride;
    - 3) desiccation and exposure to 50-60°C heat for 30 minutes;
    - 4) 0.012 percent Path-X™ or 0.008 percent quaternary ammonium compound 128 (both containing DDAC, didecyl dimethyl ammonium chloride as active ingredient)
    - Solution concentrations from Johnson, ML, L Berger, L Philips and R, Speare. 2003. Fungicidal effects of chemical disinfectants, UV light, desiccation and heat on the amphibian chytrid *Batrachochytrium dendrobatidis*. *Diseases of Aquatic Organisms* 57:255-260.
- Following disinfection, equipment should be rinsed copiously with tap water.
- Footwear belonging to occasional users must be completely cleaned before and between visiting spring sites, with special attention paid to grips, cleats, and laces. Felt-bottomed wader boots are very difficult to clean completely and should be avoided whenever possible.

To further reduce the risk of disease transfer, all equipment will be completely dried before re-use. Bat and bird netting which has remained out of the water does not have to be wetted. Poles and stakes need to be completely cleaned as above. Trowels used to collect plants need to be dedicated or completely disinfected between springs.

• In remote locations, clean all equipment as described above upon return to the lab or base camp. If disinfecting in the field is necessary, sanitize all items before arriving at the next location. Do not use solutions in the immediate vicinity of the springs or in other habitats. Used cleaning materials (including liquids) must be disposed of safely and if necessary taken back to the lab for proper disposal.
• When animals are collected, separation of specimens from different sites will be ensured and great care taken to avoid indirect contact between them (e.g. via handling, reuse of containers) or with other captive animals. Isolation from unsterilized plants or soils that have been taken from other sites is also essential.
• Amphibians that are headstarted for release into refugia will be grown using clean lab methods (i.e., quarantine) and disinfected prior to release.

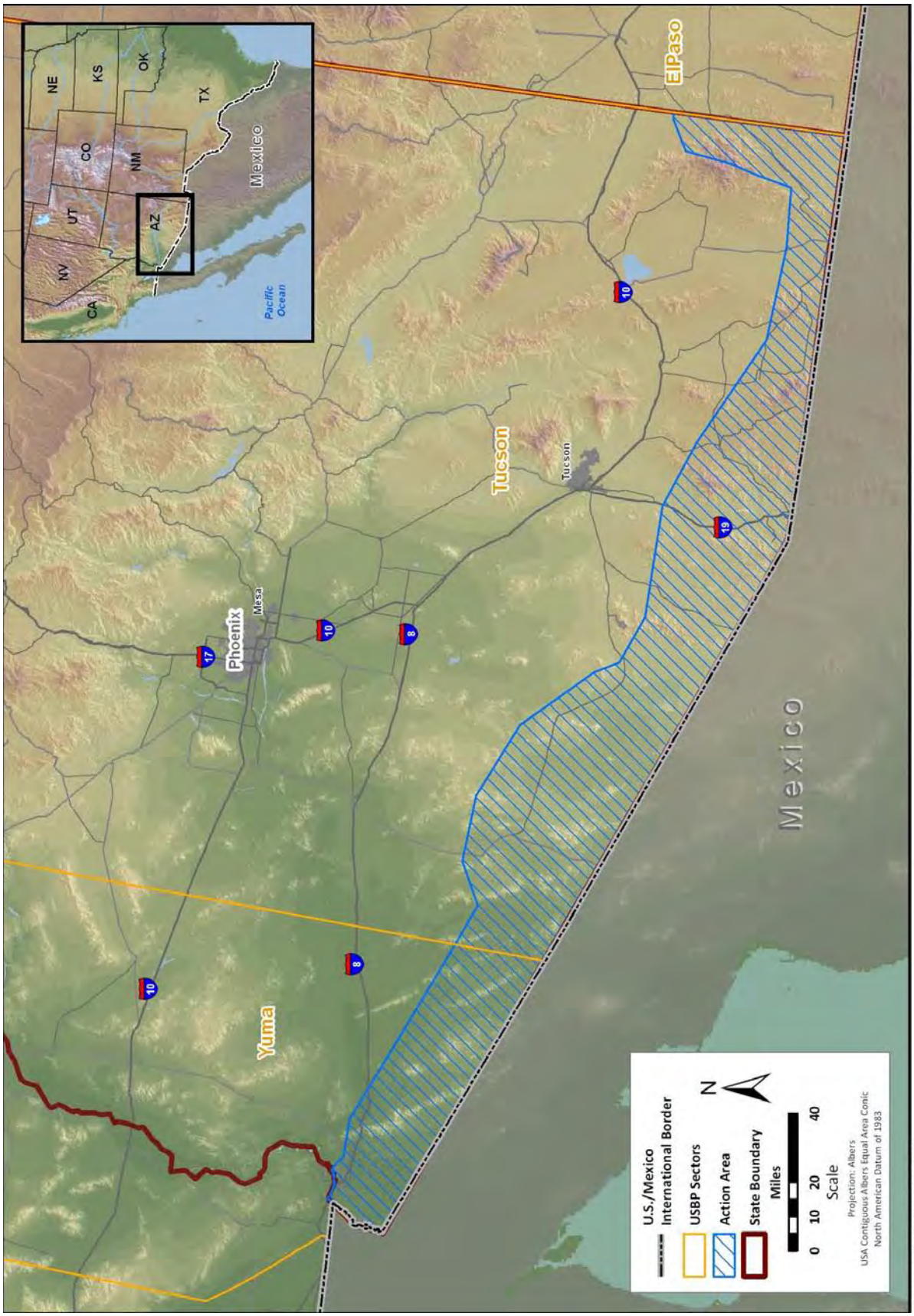
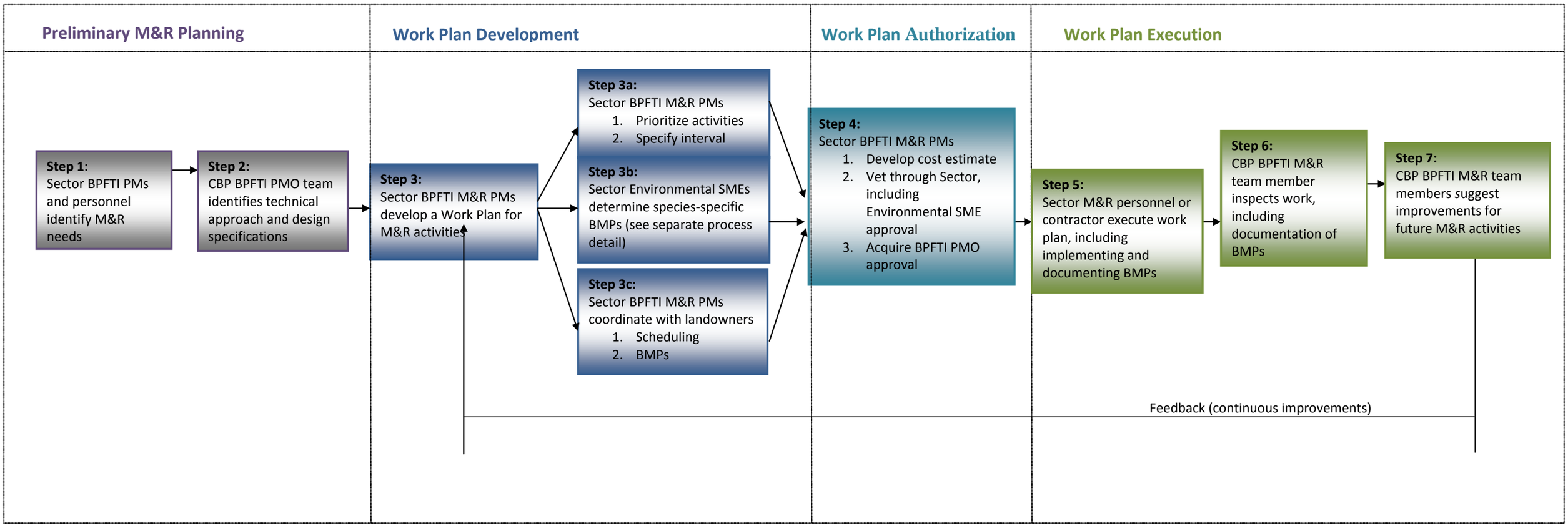


Figure 1. General Location Map



Acronyms
BMP = Best Management Practice
BPFTI = Border Patrol Facilities Tactical Infrastructure
CBP = U.S. Customs and Border Protection
M&R = Maintenance and Repair
PM = Program Manager
PMO = Program Management Office
SME = Subject Matter Expert

Figure 2a. Project Implementation

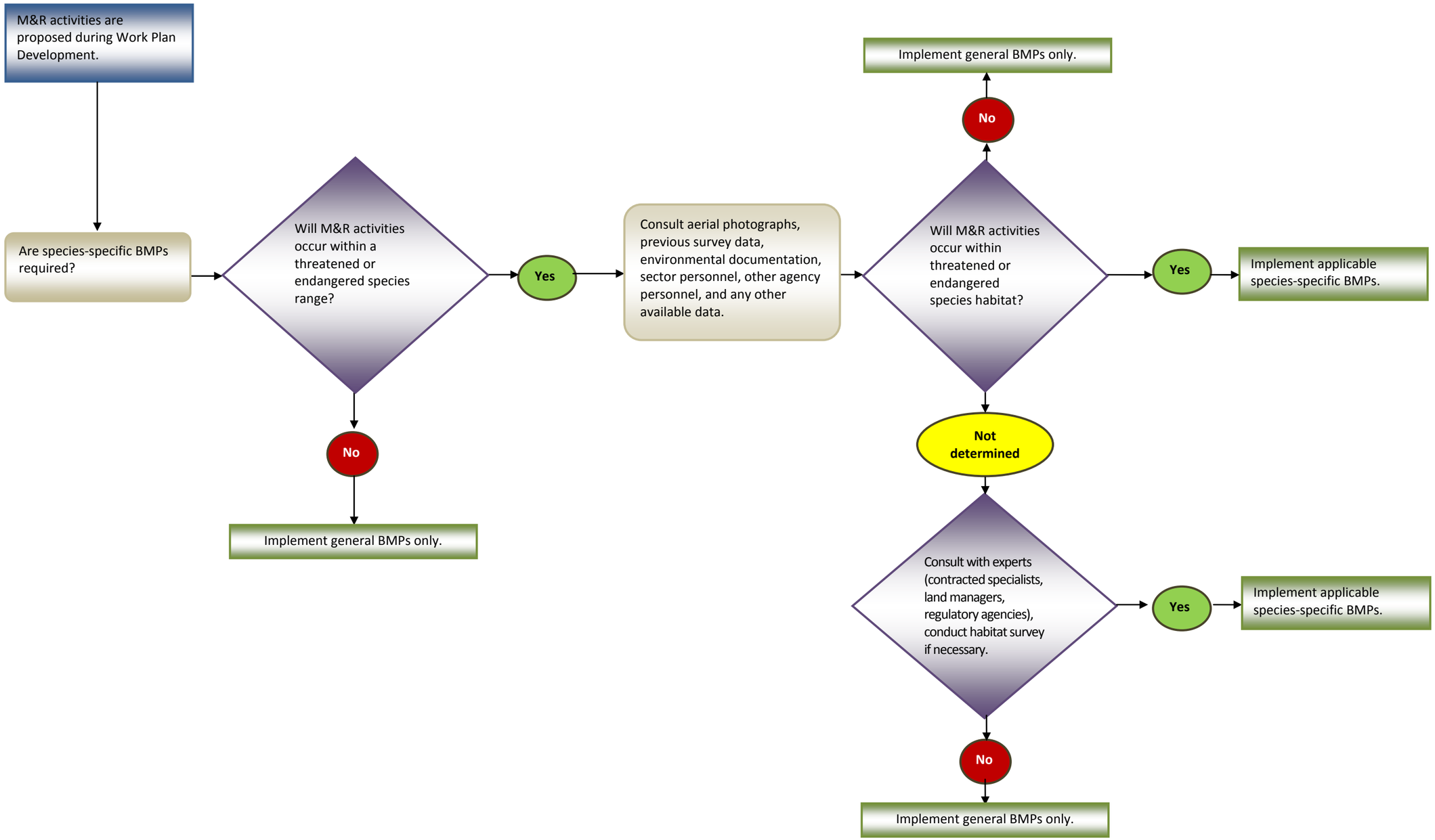


Figure 2b. Step 3b Process Detail for the Sector Environmental SMEs

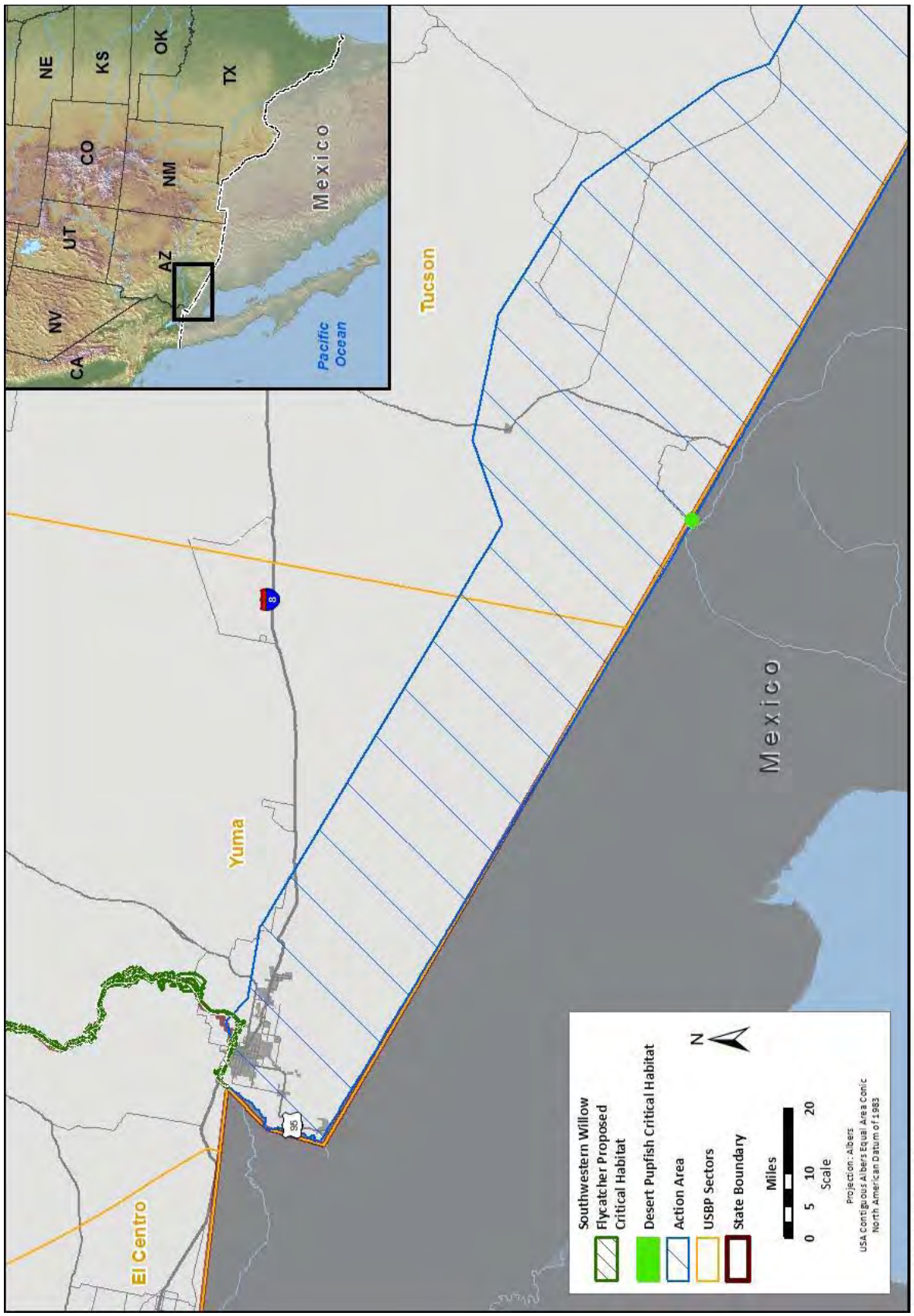


Figure 3a. Action Area for Proposed Tactical Infrastructure Maintenance and Repair Areas in Arizona

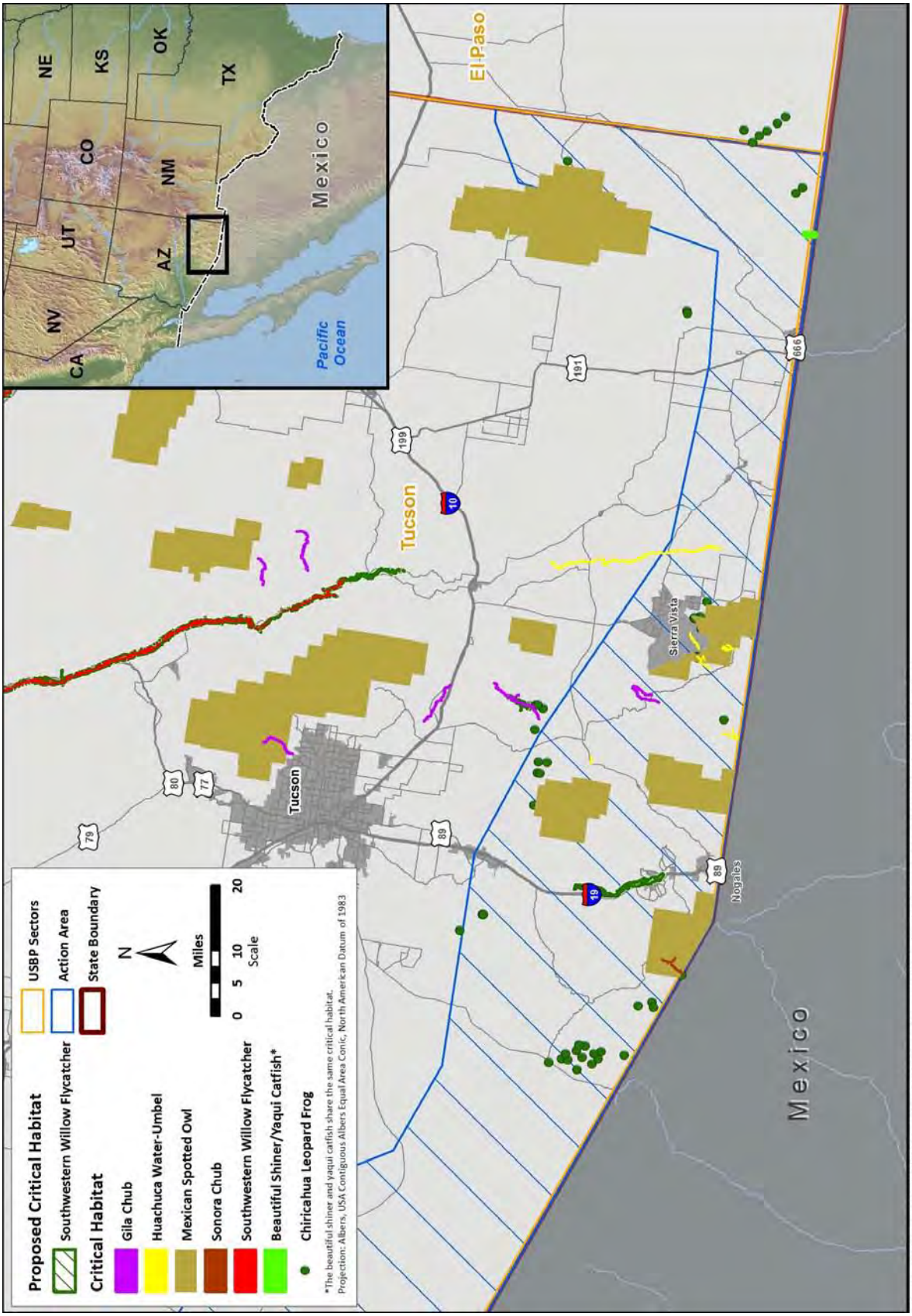


Figure 3b. Action Area for Proposed Tactical Infrastructure Maintenance and Repair Areas in Arizona

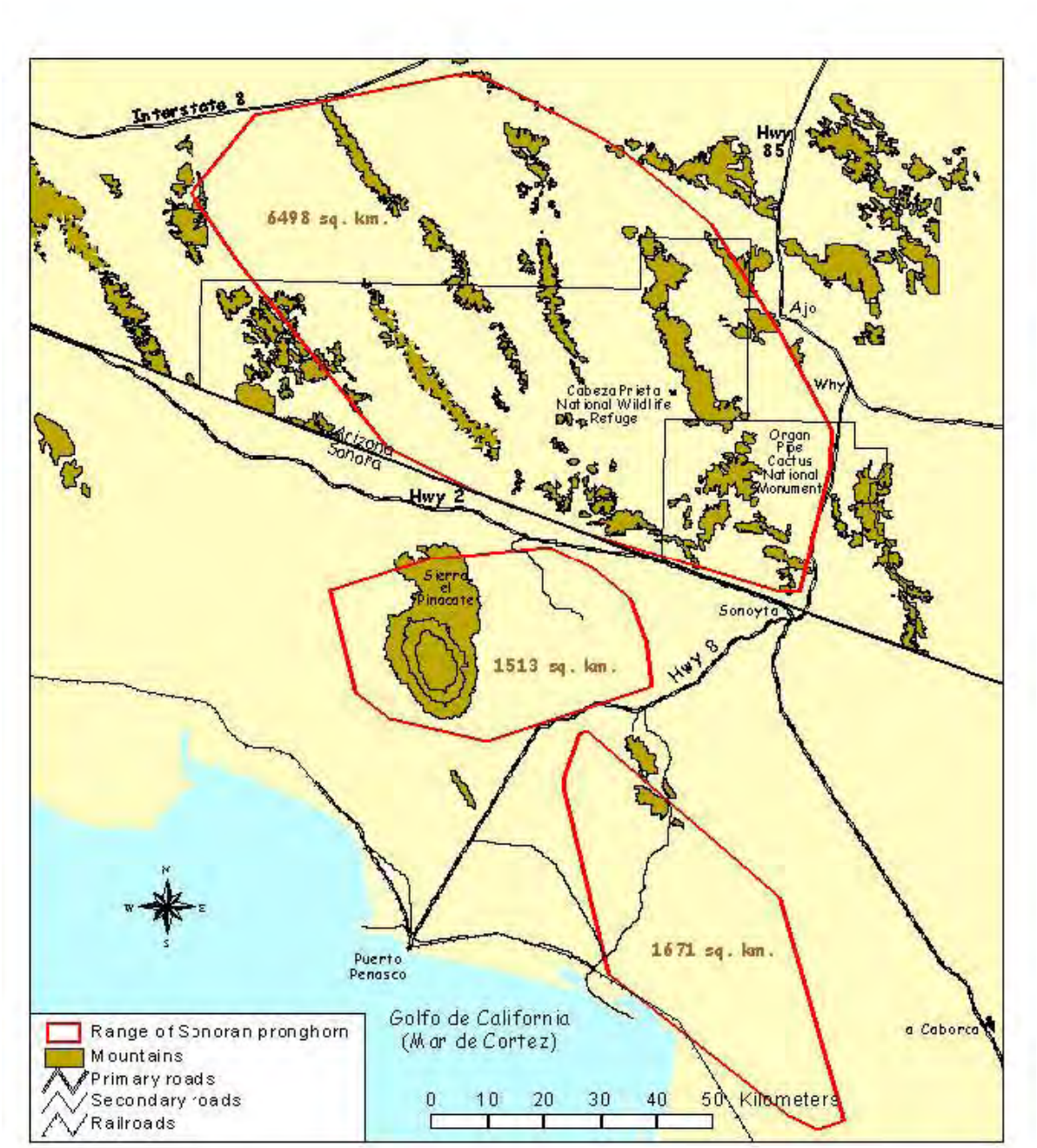


Figure 4. Current occupied range of the Sonoran pronghorn in Arizona and Sonora, Mexico.

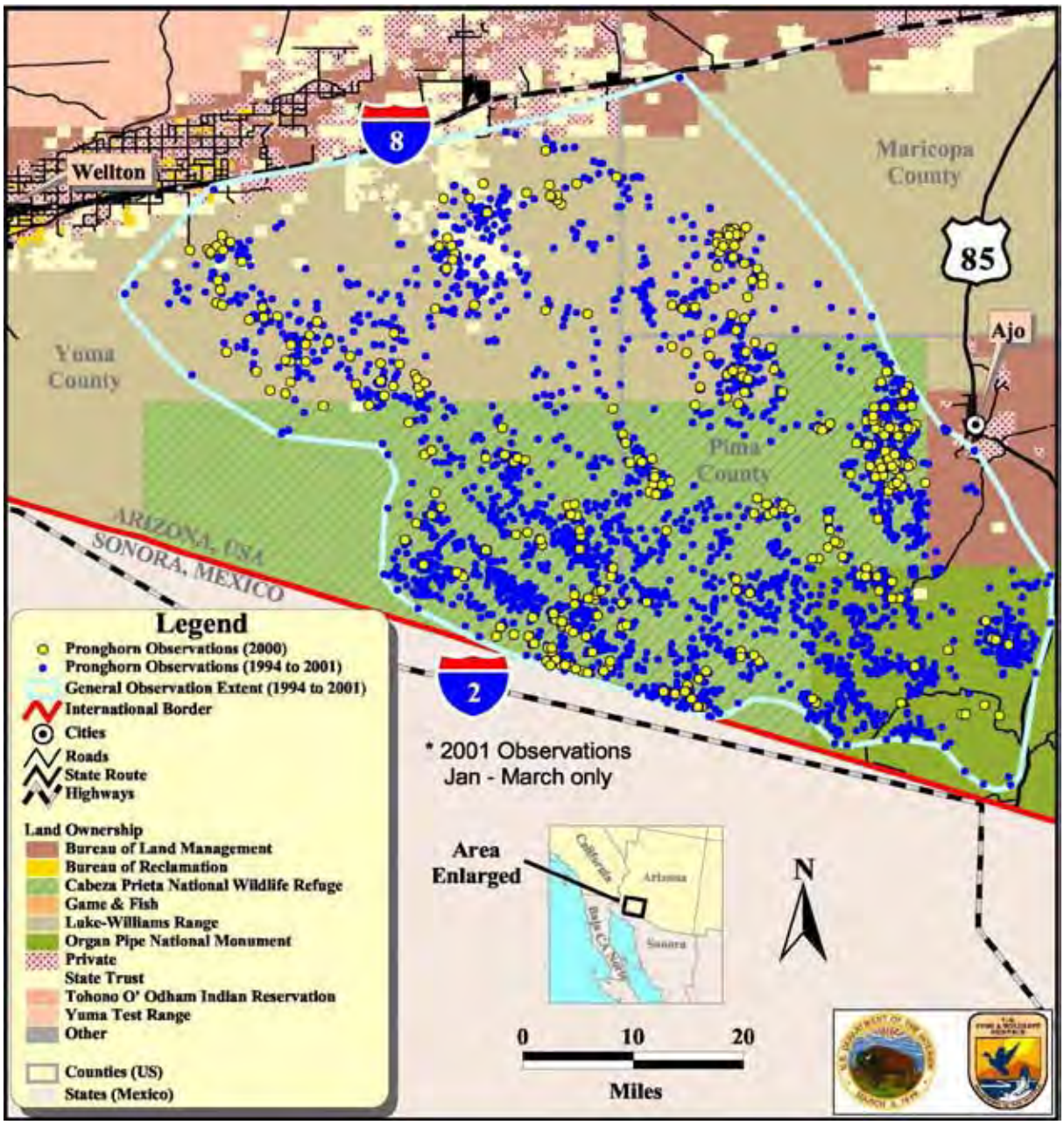


Figure 5. Current Sonoran pronghorn distribution in the United State: Records from 1994-2001.

Figure 6. Historical range of Sonoran pronghorn in the United States and Mexico

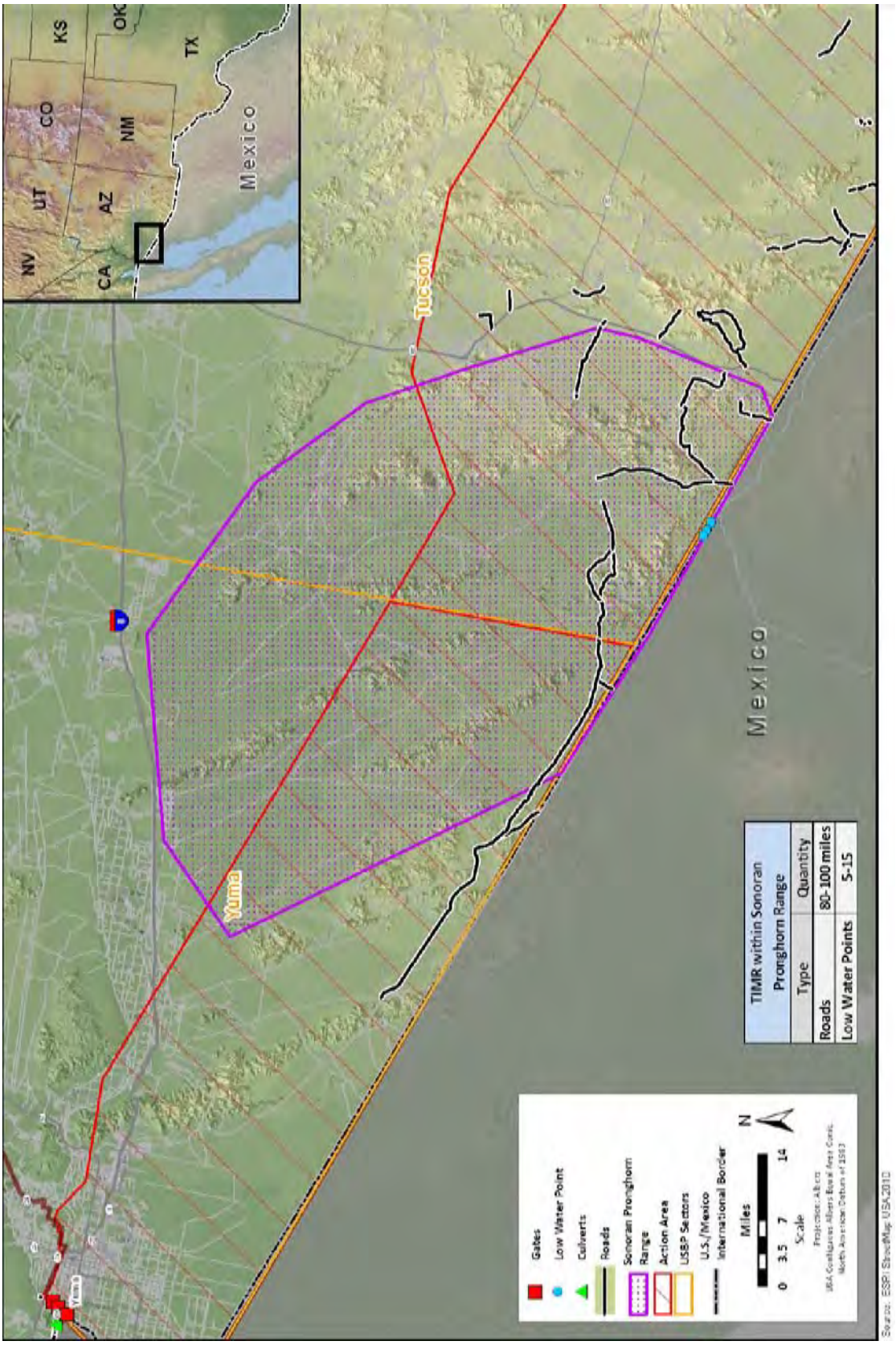


Figure 7. TIMR within Sonoran Pronghorn Range

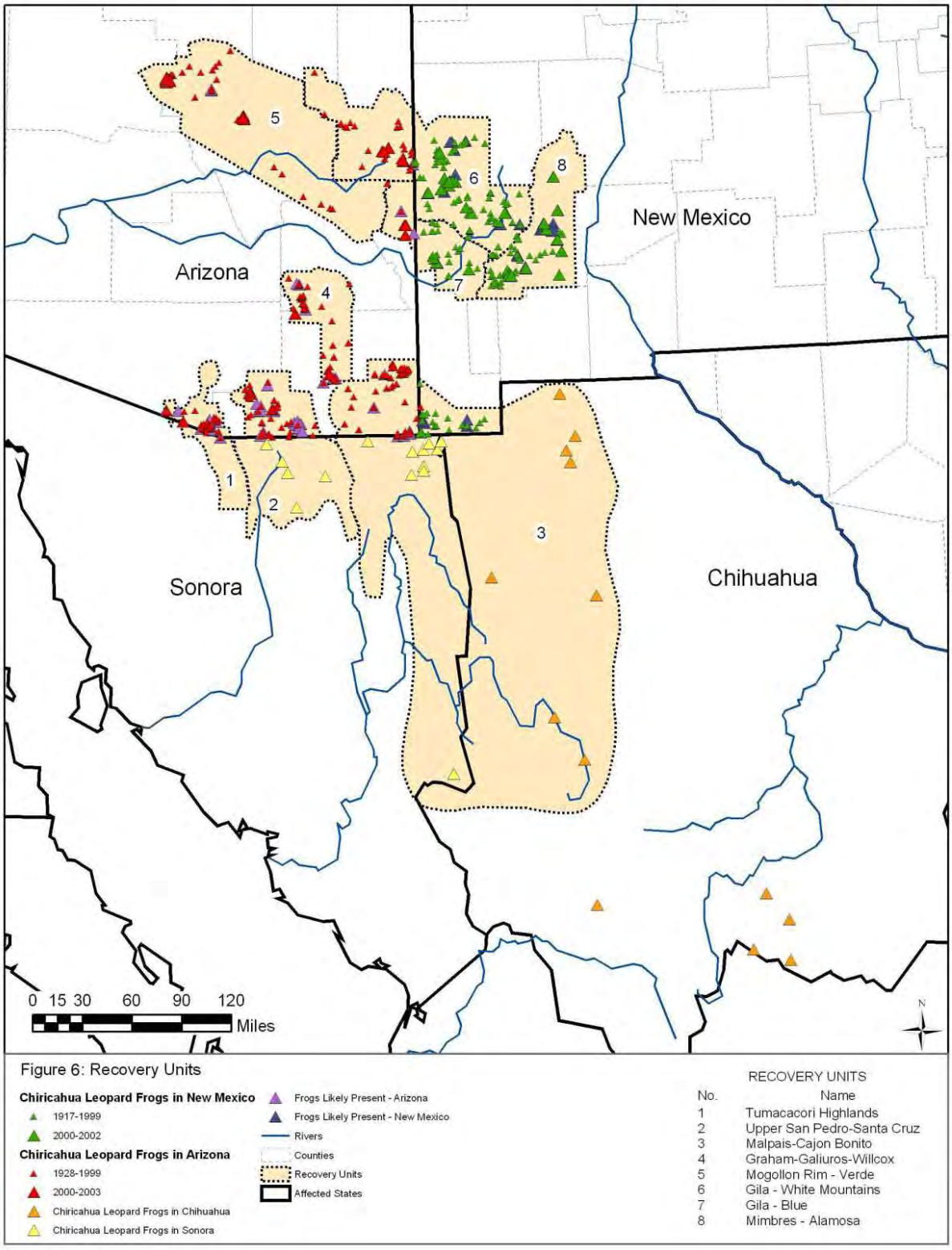


Figure 8. Known range of the Chiricahua leopard frog as of 2007. The map covers areas in Arizona, New Mexico, and Mexico. All eight recovery units are delineated by number.

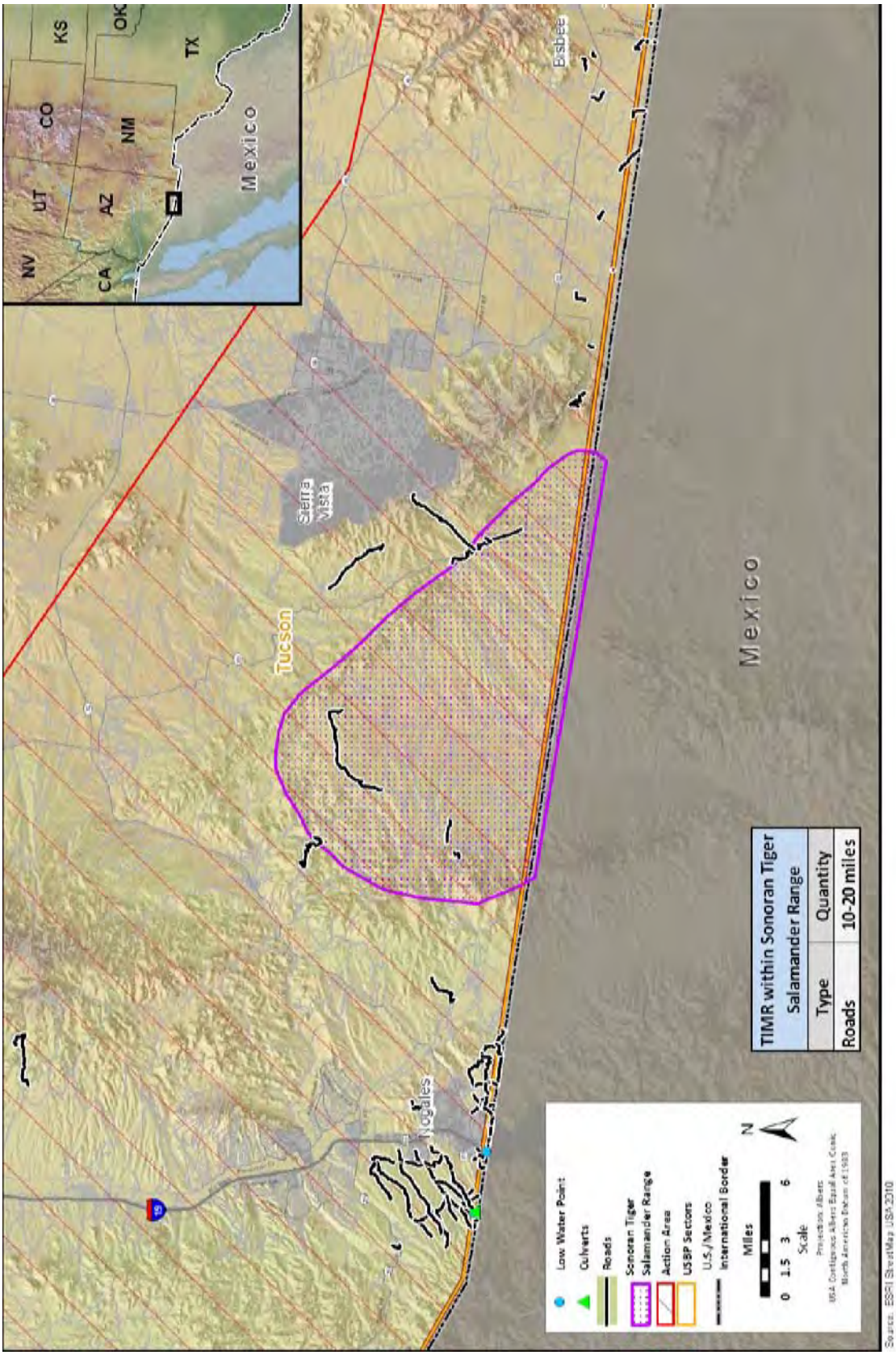


Figure 9. TIMR within Sonoran Tiger Salamander Range

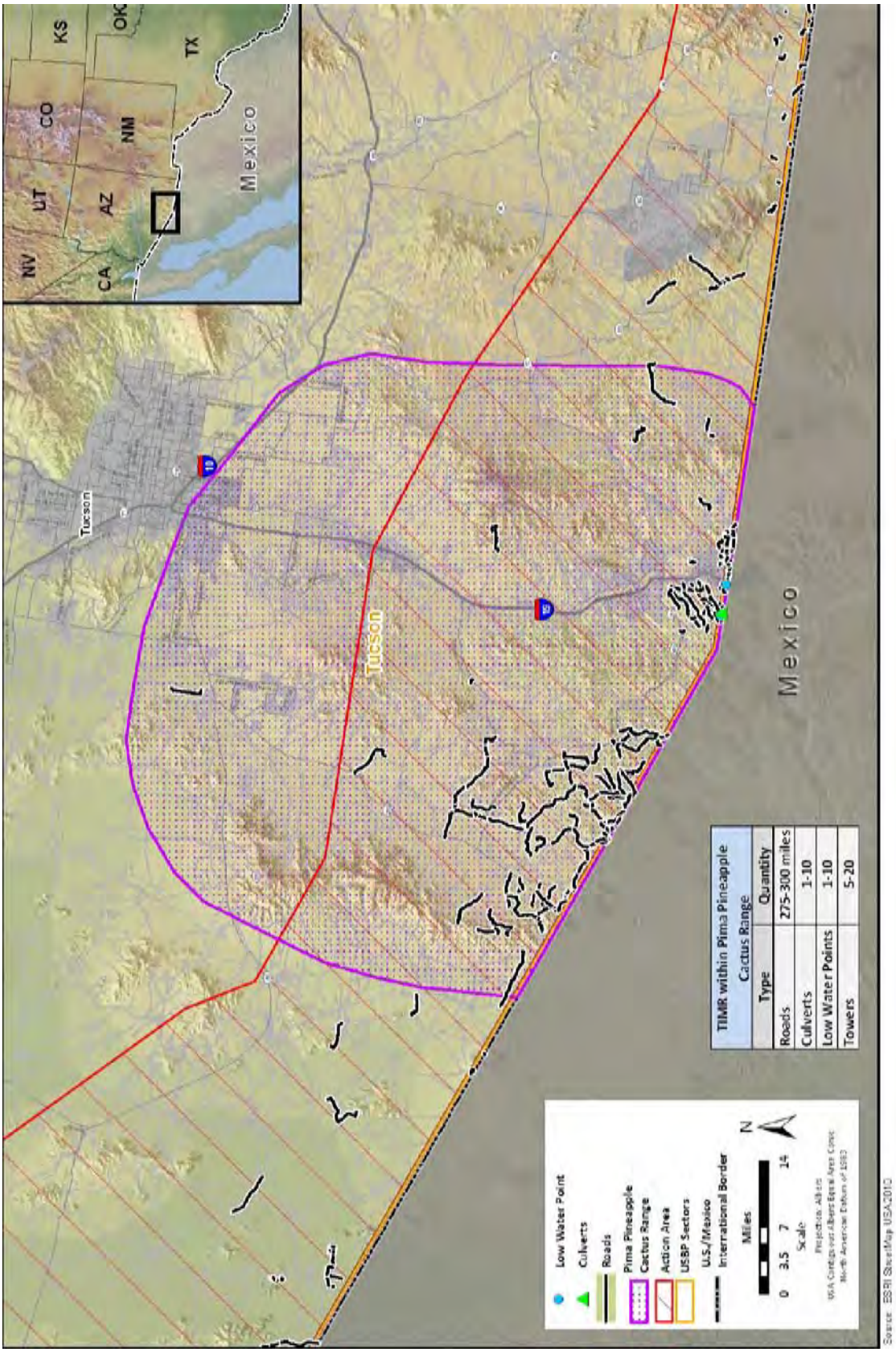


Figure 10. TIMR within Pima Pineapple Cactus Range

THIS PAGE INTENTIONALLY LEFT BLANK