Final Supplemental Environmental Impact Statement
Re-Analysis of Cumulative Impacts on the Sonoran Pronghorn

ORGAN PIPE CACTUS

National Monument • Arizona

U.S. Department of the Interior
National Park Service

Re-Analysis of Cumulative Effects on the Sonoran Pronghorn

Supplement to the Environmental Impact Statement For the 1997 General Management Plan/ Development Concept Plans For Organ Pipe Cactus National Monument

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Summary

At Organ Pipe Cactus National Monument, the National Park Service (NPS) is re-analyzing the cumulative impact of actions on the Sonoran pronghorn (*Antilocapra americana sonoriense*). The "cumulative impact" is the impact on the environment which results from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions.

The Sonoran pronghorn is an endangered species that inhabits Sonoran desert habitats found primarily on federally-managed lands in southwestern Arizona, and in northern Sonora, Mexico. Current estimates indicate that approximately 100 pronghorn exist in the United States today. Factors threatening the continued survival of the pronghorn include lack of recruitment (survival of fawns), insufficient forage and/or water, drought coupled with predation, physical manmade barriers to historical habitat, illegal hunting, degradation of habitat from livestock grazing, diminishing size of the Gila and Sonoyta rivers, and human encroachment.

The NPS is re-analyzing cumulative impacts on the pronghorn in response to a court order ruling (civil action No. 99-927) that found the environmental impact statement (EIS) on the 1997 Organ Pipe Cactus National Monument General Management Plan/Development Concept Plans/Environmental Impact Statement (GMP/DCP/EIS) failed to address the cumulative impacts of activities on the pronghorn.

Past, present, and foreseeable future actions described in this supplement are being added to actions contained in the 1997 (GMP/DCP/EIS) and analyzed to assess cumulative impacts on the Sonoran pronghorn.

Under the New Proposed Action Alternative, the cumulative impacts of all Federal and non-Federal actions are likely to result in a continued, incremental reduction in the ability of Sonoran pronghorn to maintain a viable population in the United States. Although there are many beneficial actions included in this cumulative scenario, they are outweighed by adverse impacts.

Note to Reviewers and Respondents
If you wish to comment on this draft supplemental EIS, you may mail comments to the name and address below. Our practice is to make comments, including names and home addresses of respondents, available for public review during regular business hours. Individual respondents may request that we withhold their home address from the record, which we will honor to the extent allowable by law. There also may be circumstances in which we would withhold from the record a respondent's identity, as allowable by law. **If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.** We will make all submissions from organizations or businesses, and from individuals identifying themselves as representatives or officials of organizations or businesses, available for public inspection in their entirety.

Please address written comments to:
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ABBREVIATIONS USED IN THIS REPORT

BLM	Bureau of Land Management
BMGR	Barry M. Goldwater (Air Force) Range
CPNWR	Cabeza Prieta National Wildlife Refuge
OPCNM	Organ Pipe Cactus National Monument
SEIS	Supplement to the Environmental Impact Statement
UDA	Undocumented Alien
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

PURPOSE AND NEED

Purpose of this Supplement

The National Park Service (NPS) proposes to re-examine the cumulative impacts of actions on the Sonoran pronghorn that were presented in the 1997 Organ Pipe Cactus National Monument General Management Plan/Development Concept Plan/Environmental Impact Statement (GMP/DCP/EIS). The Council on Environmental Quality (CEQ) regulations, which implement the National Environmental Policy Act, define cumulative impacts as *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions"* (40 CFR 1508.7)

This supplement to the GMP/DCP/EIS is pursuant to a 12 February 2001, United States District Court for the District of Columbia ruling of Defenders of Wildlife et al. vs. Babbitt, et al. (Civil Action No. 99-927), which ruled that the NPS issued an environmental impact statement (in the General Management Plan) that failed to address the cumulative impacts of their activities on the Sonoran pronghorn, when added to other past, present, and reasonable foreseeable future actions, regardless of what agency undertakes those actions.

Environmental Issues

The issue that this supplemental EIS addresses is the Sonoran pronghorn. Sonoran pronghorn, one of five subspecies of the American pronghorn, have evolved in the unique Sonoran desert environment found in southwestern Arizona and northwestern Sonora, Mexico. Population estimates indicate Sonoran pronghorn have decreased from approximately 142 in the U.S. in 1998 (Bright et al. 1999) to approximately 99 in 2000 (AGFD unpubl. data.). In Arizona, Sonoran Pronghorn habit occurs only on federal lands. Besides NPS lands, pronghorn occupy lands managed by the United States Air Force and United States Marine Corp. (Barry M. Goldwater Range), the U.S. Fish and Wildlife Service (Cabeza Prieta National Wildlife Refuge), and the Bureau of Land Management. The Immigration and Naturalization Service and the United States Border Patrol also operate in the area of the pronghorn habitat, primarily along the United States – Mexican Border. Although agency lands are contiguous, each agency has a specific mission that presents varying management practices to meet agency goals.

Factors threatening the continued survival of the Sonoran subspecies include lack of recruitment (survival of fawns), insufficient forage and/or water, drought coupled with predation, physical manmade barriers to historical habitat, illegal hunting, degradation of habitat from livestock grazing, diminishing size of the Gila and Sonoyta rivers, and human encroachment (USFWS 1998).

History of the General Management Planning Process

A Draft GMP/DCP/EIS for the park was released for public review in May 1995. The draft contained two alternatives; Continuation of Existing Conditions, and The Proposed Action. After reviewing public comments on the draft document, the NPS determined that a supplement to the document was needed to broaden the range of reasonable alternatives and to respond to public concerns. In March 1996, a supplement to the Draft GMP/DCP/EIS was released for public review. The supplement contained two new alternatives, including the new proposed action. Together, the draft and the supplement contained a total of four alternatives. Both the Draft GMP/DCP/EIS and the supplement to the draft assessed the environmental consequences of all four alternatives and their general costs of implementation.

The Record of Decision for the Organ Pipe Cactus NM 1997 General Management Plan was signed on January 28, 1998. The Final GMP/DCP/EIS ". . . addresses the issues and changes affecting the monument, and fulfills the legal requirements of the NPS to develop, make public, end execute a programmatic plan to guide management of the monument over 10-15 years."
The Record of Decision documented that the "New Proposed Action Alternative" and the "Actions Common to All Alternatives" would be the approved set of actions that the NPS would implement over the next 15 years.

Formal Consultation on Endangered Species

During the general management planning process, the NPS entered into formal consultation with the United States Fish and Wildlife Service (USFWS) through its May 22, 1996 submittal of a biological assessment (Appendix A). The biological assessment examined the effects on four endangered species in the park, including the Sonoran pronghorn. The analysis of the Sonoran pronghorn indicated that there were no proposed actions in the GMP/DCP/EIS that would directly effect the pronghorn. However, it was found that increased visitor use may lead to indirect effects on the Sonoran pronghorn if human presence in the front- and backcountry causes an alternation in behavior and habitat use. The potential for increased traffic on Highway 85 was also examined. Past observations of pronghorn movements suggested that traffic along Highway 85 acts as a barrier to pronghorn, restricting their movements across the highway.

The biological assessment concluded that existing and future road conditions along state Route 85 would continue to act as a barrier to pronghorn movements. It stated that " . . . these actions may adversely affect Sonoran pronghorn if it leads to a reduction in genetic exchange and reduced viability, potentially eliminating populations from this portion of their range." The USFWS Biological Opinion concluded with a number of reasonable and prudent measures proposed to help reduce the impact on the Sonoran pronghorn (Appendix A).

The USFWS issued a biological opinion on the NPS assessment on June 26, 1997. The opinion stated that the plan was "….not likely to jeopardize the continued existence of the Sonoran pronghorn." Although the USFWS anticipated incidental take of Sonoran pronghorn would be difficult to detect, more than one Sonoran pronghorn death on Highway 85 would result in re-initiation of the consultation process on the general management plan. To date, no such incidental take has been known to occur. The USFWS also provided a number of terms and conditions that implement reasonable and prudent measures for the Sonoran pronghorn (Appendix A).

The Defenders of Wildlife, et al. vs. Babbitt, et al. Memorandum Opinion and Order remanded the 1997 biological opinion to the USFWS. In consultation with the NPS, the biological opinion was revised and released as a draft on October 22, 2001 (Appendix E).

Summary of Scoping

History of Public Involvement

On February 27, 2001, agencies involved in the lawsuit met at the U.S. Fish and Wildlife Service office in Phoenix to discuss compilation of environmental baseline data for the Sonoran pronghorn. Agencies attending were: USFWS, Bureau of Land Management, Arizona National Guard, National Park Service, U.S. Marine Corps, U.S. Air Force, and a GIS contractor to the U.S. Air Force. Discussions involved the results of the litigation, action area, data needs, use of GIS to compile the data needs, and a review of existing environmental baseline information. On March 29, 2001 another meeting of agencies involved in performing environmental analyses remanded by the Court met at the Gila Bend Air Force Auxiliary Field in Gila Bend, Arizona. This meeting was organized by the U.S. Marine Corps, to coordinate the USMC's supplemental EIS with cooperating and other affected agencies. Discussions included the proposed schedule for the USMC SEIS, the study area, and projects to be considered in cumulative impacts.

Attendees included the USMC, USFA, BLM, USFWS, NPS, Arizona Game and Fish Department, and the consulting firm URS.

The Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on April 26, 2001. The NOI informed the public of a 30-comment period regarding preparation of this supplement. Concurrently, the NPS sent out 454 scoping letters to federal agencies, and affected or interested organizations and individuals informing them of the process, explaining the issues, and inviting them to offer any comments on either. Fourteen letters were received on or before May 25, 2001, the day the comment period closed. Twelve letters offered comments on past, present, and future actions, while two letters contained addresses for future correspondence.

The comment letters focused mainly on present or ongoing actions that are believed to affect Sonoran pronghorn, including increasing use on State Route 85 and the 1997 speed limit increase (from 55 mph to 65 mph); cattle grazing on adjacent BLM lands; the increase/presence of undocumented aliens using the monument; Border Patrol impacts resulting from control of illegal border activities; adjacent military activities/practices; and increasing visitation, particularly in the backcountry. Additional comments include concerns over potential conservation actions that may impact commerce between Mexico and the United States; daily, on-going activities in Mexico that may have impacts on Sonoran pronghorn habitat; and suggestions on alternative Sonoran pronghorn management techniques. These concerns have been evaluated in Appendices B-D and the results have been included in the cumulative effects analysis and conclusions sections of this document.

The draft supplemental EIS was released to the public through a Notice of Availability published in the Federal Register on July 27, 2001. The 45-day public review period was extended to 60 days, ending on September 28, 2001. Eight comment letters were received from the public. These letters and NPS responses to comments are included in appendix E of this final supplement.

Scope of this Supplement

Pursuant to the court order, the NPS proposes to re-analyze the cumulative impacts of actions on the Sonoran Pronghorn that were described in the approved GMP/DCP/EIS. The NPS does not intend to change or update the approved GMP/DCP/EIS in any way except to provide the court-ordered re-evaluation of the cumulative impacts on the Sonoran pronghorn. The NPS intends to use the date of the establishment of the monument, 1937, as a starting date for this re-analysis. The NPS does not propose to add, change, or delete any actions contained in the approved General Management Plan, nor does the NPS propose to add, change, or delete any other present or proposed park actions through this supplemental EIS. If changes to the GMP/DCP/EIS or any other approved park plan need to be made as a result of the findings of this supplement, a separate planning process will be initiated to address such changes.

This supplement re-examines the actions of two alternatives that were presented in the GMP/DCP/EIS: A) Existing Conditions/ No Action; and B) The New Proposed Action. In order to present the current environmental baseline at the park, Alternative A) Existing Conditions/No Action, has been updated with those actions, authorized by the plan, that have either occurred since its approval, or are currently underway. Alternative B) The New Proposed Action, appears exactly as it did in the approved GMP/DCP/EIS (Table 1.). The impacts of actions on other topics are not discussed in this supplement because the court order specifically rules that the NPS re-analyze impacts on the Sonoran pronghorn.

In addition to determining the environmental consequences of the preferred and other alternatives, National Park Service policy (*NPS Management Policies, 2001*) requires analysis of potential effects to determine whether or not actions would impair park resources. An impact to any park resource or value may constitute an impairment. An impact would be more likely to constitute an impairment to the extent it affects a resource or value whose conservation is: 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; 2) key to the natural or cultural integrity of the park or

to opportunities for enjoyment of the park; or 3) identified as a goal in the park's general management plan or other relevant NPS planning documents.

Impairment may result from National Park Service activities in managing the park, visitor activities, or activities undertaken by concessioners, contractors, and others operating in the park. A determination on impairment is made in the "Environmental Consequences" section for each alternative.

Impact Topics Dismissed from Further Consideration

As stated in the purpose and need section, the scope of this supplement is limited to the cumulative impacts of actions on the endangered Sonoran pronghorn. Therefore, mandatory EIS impact topics that are dismissed from further consideration include:

- *Wilderness*
- *Air Quality*
- *Other Endangered or threatened plants and animals and their habitats (including those proposed for listing, or on state lists).*
- *Wildlife*
- *Vegetation*
- *Cultural Resources*
- *Visitor Use and Experience*
- *Socioeconomics and Socio-cultural characteristics.*
- *Possible conflicts between the proposed action and land use plans, policies, or controls for the area concerned (including local, state, or Indian tribe)*
- *Energy requirements and conservation potential*
- *Natural or depletable resource requirements and conservation potential.*
- *Urban quality, historic and cultural resources, and design of the built environment.*
- *Socially or economically disadvantaged populations.*
- *Wetlands, floodplains, and other water resources.*
- *Prime and unique agricultural lands.*
- *Important scientific, archaeological, and other cultural resources, including historic properties listed or eligible for the National Register of Historic Places.*
- *Ecologically critical areas, Wild and Scenic Rivers, or other unique natural resources.*
- *Public health and safety.*
- *Sacred sites.*
- *Indian Trust resources.*

ALTERNATIVES CONSIDERED

Alternative A, No Action/Continuation of Existing Conditions

This alternative constitutes a no-action alternative in terms of providing a "baseline" condition for comparison to the preferred alternative. This alternative contains the same actions as the approved GMP/DCP/EIS (Alternative 2, Continuation of Existing Conditions, renamed in the Supplement to the Draft GMP/DCP/EIS to Existing Conditions/No Action). However, in order to reflect the current park management program, this alternative also includes all programs, projects and actions that are currently underway, even if they are being implemented as a result of the approved GMP. However, actions proposed in the GMP that have not yet been implemented are not considered under this alternative. A more complete description of ongoing actions is included in Appendix A.

Alternative B, The New Proposed Action (Preferred Alternative)

The preferred alternative analyzed in this supplement is New Proposed Action Alternative described in the Supplement to the Draft GMP/DCP/EIS. This alternative appears exactly as it did in the supplement. This alternative was approved in the Final 1997 GMP/DCP/EIS as the proposed action.

A summary of the alternatives is contained in Table 1. Alternative A., Existing Conditions/No Action Alternative, has been updated with specific completed or ongoing projects. Those projects are listed in italics.

Table 1. Summary Comparative of Alternatives

TOPICS	Alternative A: EXISTING CONDITIONS/ NO ACTION ALTERNATIVE	Alternative B: NEW PROPOSED ACTION ALTERNATIVE
	This alternative is based primarily on continuing the existing course of action within the monument.	**Constituting the NPS's proposed action, this alternative combines elements from the other alternatives to enhance visitor opportunities and resource preservation within the monument and the region, strengthens the monument's role as a Biosphere Reserve, and presents a cost-effective development strategy.**
	Land Use and Management	
Management Zones	Retain the existing management zone system: Natural Zone-largely unaltered lands with some use and facilities; divided into two subzones: Wilderness Subzone and Natural Environment Historic Zone-overlaps the prior subzones contains sites listed or pending nomination to the National Register. Development Zone-main visitor use and developed areas including State Route 85, Twin Peaks, and Lukeville. Special Use Zone-privately owned lands with uses not normally found in Natural Zone; divided into three subzones: Private Development Subzone, State Lands Subzone, and U.S. Customs and Immigration Reserve Subzone	Apply a new system derived from legislation, purpose and significance, and visitor experience. Wilderness Zone – preserves wilderness values identified in the Wilderness Act with two subzones: -Potential Wilderness; and -Quitobaquito Management Area: includes about 2400 acres and visitor use restrictions. Non-wilderness zone – provides for uses involving large concentrations of people or facilities; divided into three subzones: -Travel Corridor (includes roads except State Route 85) -Development Area -State Route 85 Corridor: a distinct management emphasis to ensure continued commerce and enhance conservation. Cultural Resources Zones – preserves, protect, and interprets cultural resources and settings.
	Natural and Cultural Resources Management and Associated Facilities	
Natural and Cultural Resources Management Plan	The NCRMP continues to guide the resources The NCRMP continues to guide the resources management program. Certain actions proposed in	Same as Existing Conditions Alternative except the proposed Wilderness Management Plan would be expanded to address wilderness and backcountry

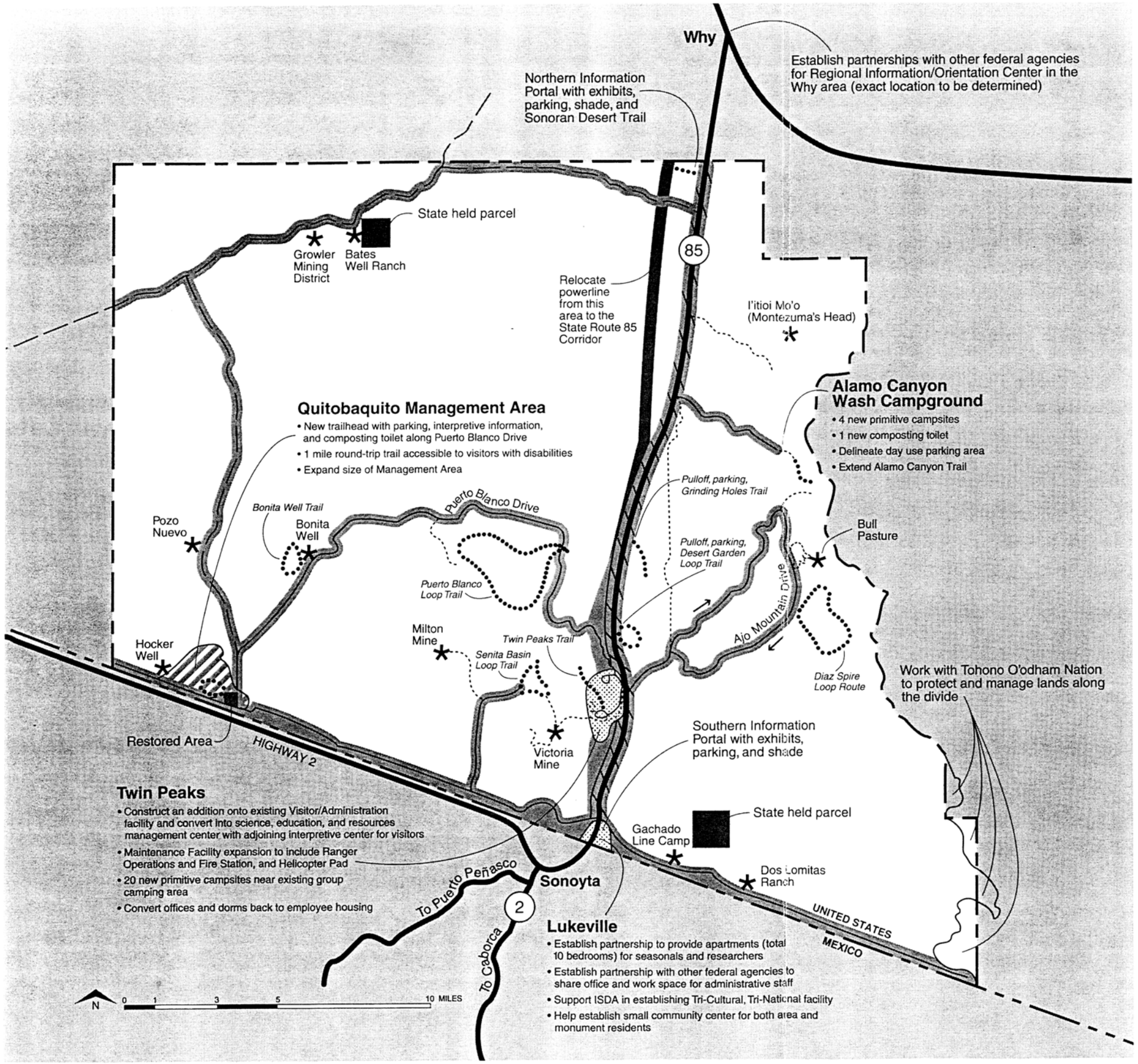
TOPICS	Alternative A: EXISTING CONDITIONS/ NO ACTION ALTERNATIVE	Alternative B: NEW PROPOSED ACTION ALTERNATIVE
(NCRMP)	the plan help resolve issues identified during scoping of this GMP including the need for: a comprehensive resources management program, mitigation strategies and species recovery plans, and increased efforts to preserve air, water, cultural, and other resources. *Specific completed or ongoing projects:* ▪ *Wildlife Surveys and Ecological Monitoring in Wilderness areas* ▪ *Threatened and Endangered Species Research and monitoring* ▪ *Backfilling abandoned mines* ▪ *Buffelgrass control* ▪ *Trespass Livestock Mgmt* ▪ *Revegetation of disturbed sites* ▪ *North boundary fence- bottom wire replacement* ▪ *Rebuild/rehabilitate Dos Lomitas* ▪ *Victoria Mine rehab work*	issues in a regional context. This inter-agency effort may include the NPS, U.S. Fish and Wildlife Service, Bureau of Land Management, and possibly other land managers in the area.
Resources Management Facilities	The former residential building used as office and workspace for resources management would remain. Some new structures may be added in the future to offset the need for more workspace.	A 5,000 s.f. Science, Education and Resource Management Center is proposed. However, in this alternative, it would be located in Twin Peaks by converting the existing visitor/administration facility, and a greenhouse and plant nursery would be constructed nearby for visitor education and research purposes. The existing resources management offices would be converted back to employee homes.
Cultural Resources	Continue stabilization, survey efforts, and the listing of historic properties in the National Register of Historic Places. New developments would be surveyed for archeological resources prior to construction and potential impacts mitigated.	Same as Existing Conditions Alternative. In addition, apply preservation and use treatments for the properties listed and eligible for listing in the National Register of Historic Places.
Native American Consultation	Develop a mutually-beneficial written agreement between the NPS and Tohono O'odham Nation to strengthen consultation, coordination, and involvement. (Note: the need and importance of this agreement was expressed in the Tohono O'odham Nation's comments to the NPS and subsequently, has been added to this and all of the alternatives.)	Same as Existing Conditions Alternative with one addition. The agreement would be expanded to include enhanced involvement of the Tohono O'odham Nation in the monument's interpretation program. The nature and extent of this involvement would be determined by both parties.
Visual Resources	No additional actions are proposed to enhance resource preservation.	Two actions are proposed to help preserve the visual resources of the Sonoran Desert landscape: relocating and placing powerlines underground at their next scheduled replacement and implementing sustainable design guidelines and practices prior to the design of new facilities. The supplement reinforced these actions with the following: The NPS proposes to work with Arizona Public Service to seek ways to off-set costs of relocating and burying lines, and One guideline has been added to help ensure preservation of regional design and maintenance practices.
Visitor Use and Associated Facilities		
Interpretation Objectives and Themes	Implement objectives and themes identified in 1993 Interpretive Prospectus. The *objectives* address comprehensiveness of the interpretive program, environmental awareness, outreach and regional cooperation, biosphere goals, and the adequacy of information and facilities for visitor use, and safety.	Same as Existing Conditions Alternative.

TOPICS	Alternative A: EXISTING CONDITIONS/ NO ACTION ALTERNATIVE	Alternative B: NEW PROPOSED ACTION ALTERNATIVE
	The *themes* address: the amazing richness and diversity of the land and the people from past to present, environmental factors and the delicate balance of Sonoran Desert ecosystems, and the monument as a unique living laboratory.	
Interpretative Facilities	Retain existing visitor center. Upgrade the existing amphitheater area since it is in poor condition. *Specific completed or ongoing projects* ▪ *Interpretive wayside, Estes Canyon/Bull Pasture* ▪ *Vegetation removal for preserving historical structures* ▪ *Installed Travelers' Information System Station* ▪ *Parking areas-amphitheater & Victoria Mine* ▪ *Reconstruct Amphitheater* ▪ *Interpretive programs at Bates Well and Bonita Well*	The following facilities are proposed to help satisfy the growing need for visitor services in the region and, achieve the objectives and themes within the monument: Support ISDA's center in Lukeville Develop partnerships to establish a regional information and orientation center in Why Convert part of the existing Twin Peaks visitor center and administrative building into an interpretive center with resources management as the major interpretive focus. (To accomplish this, 3,600 s.f. of new space would be added to the existing 5,900 s.f. structure; of the total, 4,500 s.f. would be devoted to the interpretive center and the remainder to the SERMC). Four pull-outs would be added along State Route 85.
Partnerships and Outreach	Increase partnerships with others and expand regional outreach efforts in response to Biosphere Reserve designation.	The potential for partnerships with ISDA, other federal agencies, State of Arizona, and Tohono O'odham Nation increases in this alternative because of the nature of some of the proposed facilities, programs, and agreements.
Camping	Retain existing facilities in Twin Peaks and Alamo Canyon Wash campgrounds.	Increase opportunities for primitive camping by providing: 20 new walk-in campsites up-canyon from the existing group campground in Twin Peaks area; the existing parking area would be expanded to provide parking for 20 vehicles and one restroom. Four new drive-in campsites at Alamo Canyon Wash; a day-use only parking area for 6 vehicles would be delineated on previously disturbed land.
Area Transportation Network: **Roads**	Retain existing road network. As described in the NCRMP, establish user capacities of roads providing access into the wilderness. *Specific completed or continuing projects:* ▪ *Rehabilitate Ajo Mtn Loop Drive* ▪ *Use of Armenta Road for Patrol and Management Purposes* ▪ *Pruning and/or removal of trees on all public drives.* ▪ *Remove vegetation from road shoulders for all paved roadways* ▪ *Maintenance of graded roads* ▪ *Borrow pit use* ▪ *Installation of new road signs* ▪ *Interpretive waysides, Scenic Drive Entrances* ▪ *Jersey barrier wall on Pozo Nuevo Road in Cipriano Pass* ▪ *Trenching and widening of South Puerto Blanco Drive* ▪ *Installation of gates on South Puerto Blanco Drive and elsewhere*	Same as Existing Conditions Alternative except that some roads in the Twin Peaks and Quitobaquito areas would be re-aligned. For Twin peaks, approximately 800 ft. of new road would be constructed; a 800 ft. length of existing two-lane road would be removed and the area restored; visitors and employees would each have separate access and parking areas; and a turn-around with about 400 ft. of new road would be added at the entrance to Puerto Blanco Drive. The road at Quitobaquito would be removed and restored to natural conditions.
Area Transportation Network: **State Route 85**	Work with the State and other agencies to minimize road-related impacts on monument resources. *Specific completed or ongoing projects:* ▪ *Installation of new road signs*	Same as Existing Conditions Alternative, except in this alternative, a program is proposed to minimize road-related impacts while ensuring continued commerce and enhancing visitor experience. The program would include establishing pull-outs with interpretive

TOPICS	Alternative A: EXISTING CONDITIONS/ NO ACTION ALTERNATIVE	Alternative B: NEW PROPOSED ACTION ALTERNATIVE
	▪ *Revise North boundary entrance portal* ▪ *Highway 85 road shoulder maintenance* ▪ *Highway 85 speed limit raised to 65mph* *Note: some of the aforementioned actions are not in keeping with the approved GMP.*	information, implementing a public education program, and experimenting with mitigation, such as the use of bridges over major washes and culverts in other areas to encourage safe wildlife movement.
Area Transportation Network: **Trails and Hiking Routes**	Retain the existing hiking system with the following improvements: *signs and exhibits would be posted at four trails and hiking routes *the Visitor Center Nature Trail would be doubled in length to .2 miles and made accessible to wheelchairs. *Specific completed or ongoing projects:* ▪ *Interpretive trail Quitobaquito* ▪ *Trail maintenance; vegetation trimming* ▪ *Alamo Canyon trailhead parking* ▪ *Bull Pasture/Estes Canyon trail work* ▪ *Interpretive Waysides, Arch Canyon and Estes Canyon/Bull Pasture trailhead* ▪ *Trail head parking, Old Sonoyta Road* ▪ *New route/trail segment: Red Tanks Tinaja to Milton Mine* ▪ *Installed new trailhead signs* ▪ *Established Baker Mine-Milton Mine trail*	Eleven new maintained trails, totaling approximately 30 miles, are proposed to provide visitors access to resources and an understanding of the park's interpretive themes. Signs and route descriptions would be improved for the existing unmaintained trails. In the supplement, trail additions were reduced to 8 new trails (8.9 miles) while the miles of accessible trails increases to 5.5. miles. These changes occur because: One trail proposed in the Former Preferred Future is near prime Rosy Boa habitat and consequently was not proposed here The Quitobaquito trail alignment reduces the total trail miles and increases accessible trail miles.
Park Operations and Associated Facilities		
Staffing	Approximately 27.3 employees are required to fully carry out the monument's purpose, programs, and legislative mandates. The monument would continue to use volunteers from the active VIP program to help offset expanding staff and program needs.	Since prior estimates may be unrealistic in light of current fiscal conditions, only 15 additional employees are proposed in this alternative. This number is based on the rate of past staffing increases averaging one employee per year instead of on projected total needs. In addition, the NPS would seek alternative funding or partnership arrangements to offset staffing costs. Use of volunteers would continue as in the Existing Conditions alternative.
Operations Facilities	Retain existing administrative and maintenance facilities. Add new 3,000 s.f. ranger operations and fire station to help protect lives and property, and offset the current shortage of office, work, and storage space. *Specific completed or ongoing projects:* ▪ *Visitor's Center access and parking area modifications* ▪ *Renovate residences to offices* ▪ *Construction of a compressor shed at maintenance shop* ▪ *Construction of new fire station* ▪ *Replacement of gas tanks in maintenance area* ▪ *Herbicide use to control vegetation at sewage lagoon* ▪ *Integrated Pest Management in the VC and other park buildings* ▪ *Telecommunications system improvements* ▪ *Maintenance shop extension* ▪ *Brush pile burning* ▪ *Install modular building at VIP campground* ▪ *Maintenance shop sewer system replacement* ▪ *Bates Well shed removal* ▪ *Fiber optic cable, residence area* ▪ *Chlorination lines to main water tank* ▪ *Installed self-serve fee stations*	The following is proposed to satisfy office, work, and storage space needs in a cost effective manner: Seek partnership for 2,000 s.f. of administrative office space in under-utilized federal facilities at Customs and Immigration Reserve in Lukeville area Expand maintenance area to include 2,000 s.f. office space, 9,100 s.f. covered parking, and 3,050 s.f. storage space, with the addition of a new 4,000 s.f. ranger operations and fire station with nearby helicopter pad.

TOPICS	Alternative A: EXISTING CONDITIONS/ NO ACTION ALTERNATIVE	Alternative B: NEW PROPOSED ACTION ALTERNATIVE
	▪ *Construction of restroom at Bonita Well*	
Employee Housing	The nine houses still used as employee homes would remain in the Twin Peaks housing loop. *Specific completed or ongoing projects:* ▪ *Campground for Volunteers-In-Parks* ▪ *Integrated Pest Management in the VC and other park buildings* ▪ *Snake relocation from residence and campground area* ▪ *Rodent exclusion/removal from buildings* ▪ *Finish two duplexes and landscape* ▪ *Residence area revegetation work*	Five buildings would be converted back to employee homes in the Twin Peaks housing area. The NPS would seek partnerships to provide the following in the Lukeville area: ▪ Apartments for seasonal employees and researchers ▪ A small community center for area and monument residents.
	Development Concept Plans	
Twin Peaks	The Twin Peaks area would stay essentially as it looks today. Since additional office space may be added to offset the space shortage, future plans may be developed to site facilities as they are needed. *Specific completed or ongoing projects:* ▪ *Install new 6" mainline water valves in select areas of the housing loop* ▪ *Rehabilitate visitor Center & campground comfort stations painting project* ▪ *Replacement of house roofs and additions of new ramadas and yard fences, residence area* ▪ *Install new sewer distribution box behind Visitor's Center* ▪ *Replace old fire hydrants & install new ones* ▪ *Bury electric cable and other electrical work in campground area.* ▪ *Remodel visitor center restrooms (97-01) (including leach field)* ▪ *Convert campsites from RV/pullthru to tent sites* ▪ *Residence 15 parking spaces* ▪ *Replace campground waterline* ▪ *Renovate residences to offices*	Several new developments are proposed in this development to serve expanding needs of visitor, staff, and the science community. All new structures would be located outside the probable maximum flood zone, although some new road construction would occur in this area. The new visitor center, science and resources management center, and rehabilitated administrative facility would become a central complex and include new picnic and parking areas for visitors. A parking area for employees would be located on the opposite side of the complex. The new ranger operations and fire station would be located a short distance away and would include a new parking lot. Expansion of the maintenance area would occur on disturbed lands in the location of the existing facility. Once the office is removed, the housing are would be used only for that purpose and would include a new community center and utility building. The supplement to the draft added the following: ▪ The extent of new buildings and road realignment is significantly reduced in this alternative ▪ Ranger operations and the fire station would be located next to the maintenance complex, on disturbed lands ▪ The NPS would seek to establish the new community center in Lukeville instead of Twin Peaks.
Quitobaquito Management Area	Existing road and parking areas would be retained and improved, and an orientation sign with information dispenser added. Due to safety concerns, the area would be staffed during daylight hours of high visitation periods. *Specific completed or ongoing projects* ▪ *Quitobaquito water transport system* ▪ *Quitobaquito Wetlands Conservation Projects*	The goal to improve visitor experience and safety would remain as in the Former Preferred Future Alternative. However, the facilities would be relocated based on discussions with the Tohono O'odham Nation. This development concept is general; due to the sensitive nature of this area, a multi-agency task force would be established to develop a detailed design for this area once funding is secured. The new trailhead would be developed at the confluence of Puerto Blanco Drive and the former entrance road. An easy, 1-mile round-trip walking trail network would be established, occurring along the existing entrance road. To help protect resources, visitors would need a permit or to take part in a guided tour to use this area. Administrative access to the border would be provided.
Lukeville Area	Due to recent land exchanges between the NPS and private landowners in the area, the 1978 DCP (Development Concept Plan) is obsolete and would	The 1978 DCP would be replaced with the following: The NPS would seek to enhance linkages between Lukeville and the monument's resources and values.

TOPICS	Alternative A: EXISTING CONDITIONS/ NO ACTION ALTERNATIVE	Alternative B: NEW PROPOSED ACTION ALTERNATIVE
	need to be amended in the future. *Specific completed or ongoing projects* ▪ *Lukeville land exchange*	The NPS would support ISDA's efforts and seek partnerships to: Provide housing, but only for NPS seasonal workers Develop a community center for all area residents Share office space at the border station, except for NPS administration.
	Name, Boundary, and Wilderness Area Changes	
Redesignation	The name would remain Organ Pipe Cactus National Monument.	Support change in status from monument to Sonoran Desert National Park, which would require congressional legislation. Redesignation would help draw attention to the value and significance of the monument's varied resources and the need to preserve them.
Boundary Adjustments	No adjustments to the boundary are proposed.	As in the Existing Conditions Alternative, no boundary adjustments are proposed since the Tohono O'odham Nation is not interested in a land exchange at this time. However, the NPS feels the land exchange with the Gu Vo District and the Tohono O' odham Nation along the crest of the Ajo Mountains (Tohono O'odham would receive 1502.6 acres from the NPS along the eastern portion of the divide. The NPS would receive 825.5 acres along the western portion of the divide and 677.1 acres from the western part of the Gunsight Hills) would improve its ability to manage the monument. In the future, if the Tohono O'odham Nation expresses an interest in this idea, the NPS would be willing to enter into discussions.
Wilderness Area Additions	Seek to acquire approximately 1,280 acres currently held by the State and designated "potential wilderness," then propose for wilderness designation.	After actions proposed in this alternative would be implemented, approximately 1,509 acres would be proposed for wilderness designation including: ▪ 1,280 acres of State held lands ▪ 206 acres along the powerline corridor ▪ 23 acres along the former road in the Quitobaquito area
	Plan Implementation and Costs	
Implementation Strategy	Implementation of development, programs, and staffing additions depends primarily on funding. The highest priority for development is construction of the ranger operations and fire station. Implementation of resource management projects and programs remain as described in the NCRMP.	Projects and programs in this alternative are prioritized and the highest priority projects and programs are the same. However, in this alternative, the fire station and maintenance facility would be located in the Twin Peaks area.
Development Costs	▪ General/park-wide: $ 314,400 ▪ Twin Peaks Area: $3,260.000 ▪ Quitobaquito Mgt. Area: 127.000	▪ Twin Peaks Area: $5,162,000 ▪ Quitobaquito Mgt. Area: 260,000 ▪ Alamo Canyon Wash: $ 57,000 ▪ Other (roads, pull-outs ▪ trails, and exhibits): $1,299,000 Costs involving partners are not included and in this alternative include: ISDA's facility in Lukeville, the regional facility in Why, sharing facilities in the border station for NPS administrative offices, and apartment type housing for NPS seasonal workers in Lukeville.



SONORAN DESERT
NATIONAL PARK

Figure 1. **NEW PROPOSED ACTION ALTERNATIVE**

SONORAN DESERT NATIONAL PARK
UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DSC/March 1996

Publ. as 157/20014
Now 157/20014A

MANAGEMENT ZONES

- Non-Wilderness Development Area
- State Route 85 Corridor Zone
- Non-Wilderness Travel Corridor
- Wilderness Zone
- Potential Wilderness Additions
- Wilderness Zone - Quitobaquito Management Area
- Cultural Resources Overlay Zone

GENERAL LEGEND

- Existing Trails
- Proposed Maintained Trails
- Paved Roads
- Graded Dirt Road
- Unimproved Dirt Road

SONORAN DESERT
NATIONAL PARK

NEW PROPOSED ACTION ALTERNATIVE

Figure 2.

TWIN PEAKS DEVELOPMENT CONCEPT PLAN

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE
DSC/March 1996

Publ. as 157/20016
Now 157/20016A

- EXISTING BUILDINGS AND FACILITIES
- NEW BUILDINGS AND STRUCTURES
- NEW ROADS, PAVED AREAS, AND OTHER FACILITIES
- REMOVE ROADS: RESTORE TO NATURAL CONDITIONS
- --- EXISTING TRAIL

Environmentally Preferred Alternative

The environmentally preferred alternative is determined by applying the criteria suggested in the National Environmental Policy Act of 1969 (NEPA), which is guided by the Council on Environmental Quality (CEQ). The CEQ provides direction that "[t]he environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA's Section 101:

1. Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;
2. Assure for all generations safe, healthful, productive, and esthetically and culturally pleasing surroundings;
3. Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;
4. Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;
5. Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and
6. Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.

Generally this means the alternative that causes the least damage to the biological and physical environment. It also means the alternative that best protects, preserves, and enhances historic, cultural, and natural resources" Council on Environmental Quality, "Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations" (40 CFR 1500-1508), Federal Register Vol.46, No. 55, 18-26-18038, March 23, 1981: Question 6a).

The No-Action alternative represents the current management direction for Organ Pipe Cactus National Monument. Although this supplement describes no-action alternative at the time the *GMP/DCP/EIS* was approved plus actions that have occurred or are on-going as a result of the plan, the current management scenario has yet to meet all of the goals and objectives in the approved *GMP/DCP/EIS*. Many of the existing facilities still remain and are not easily accessible and often crowded. The speed and volume of traffic on Highway 85 continue to result in noise, air and light pollution, and negatively impact wildlife and the visitor experience. Also, efforts to establish cooperative efforts and partnerships beyond park boundaries have not been fully achieved. As described in the plan, an ecological monitoring program has been expanded and provides the monument resource staff with information to better manage natural resources. An inordinate amount of staff time, however, must be concentrated on reducing impacts resulting from illegal drug and immigrant traffic and, as a result, other monument programs and projects tend to fall short. The No-Action alternative meets policy goals 1 and 4.

The New Proposed Action alternative is the environmentally preferred alternative. The overall effect of this alternative would be to enhance protection, understanding, and recognition of Sonoran desert ecosystems and further strengthen relations with the Tohono O'odham Nation, Mexico, and other neighbors of the monument. Some of the actions to reach these goals include promoting the Man in the Biosphere Program by adopting a regional perspective to improve visitor services and conserve resources, increasing the amount of wilderness and providing for protection of wilderness and wilderness values through a wilderness management plan, and stabilizing and applying preservation and use treatments for historic properties. Other actions to enhance the visitor experience and understanding of the Sonoran desert include providing visitors with updated facilities and traffic circulation, expanding the amount of interpretive trails, and expanding current interpretive programs. Actions to protect endangered species focus on monitoring the effects of visitation on the lesser long-nosed bat and the ferruginous pygmy owl, and working with other agencies to conceive, develop and implement actions to reduce the effect of current and future traffic patterns from State Route 85. These actions would move the park away from existing conditions to a state of conditions that offer more to protect, preserve, and enhance historic, cultural, and natural resources, as well as effectively managing an expected increase in park visitation over the next 10-15 years.

Although the no action alternative may achieve a greater level of environmental protection in isolated areas of the monument in the short-term (no new development, no reconfiguration of roads and trails), the preferred alternative overall more fully strives to (1) Attain the widest range of beneficial uses of the environment without degradations, risk to health or safety, or other undesirable and unintended consequences; (2) Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice; and (3) Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities.

This supplement meets the project objectives described in *Purpose and Need* of this document by addressing the order set forth in the 12 February 2001, United States Diestirct Court of the District of Columbia (Civil Action No. 99-927). The NPS reviewed all monument activities (both ongoing and proposed in the *GMP/DCP/EIS*), ranked those actions in terms of the context, duration, and intensity of impact they may have on the Sonoran pronghorn and its habitat (see *Cumulative Impacts – Methodology for Assessing Cumulative Impacts*), and added those activities to other past, present, and reasonably foreseeable future actions, regardless of what agency undertakes those actions.

AFFECTED ENVIRONMENT

Sonoran Pronghorn Habitat and Range

The Sonoran pronghorn inhabits broad alluvial desert valleys, bajadas, and to a lesser extent foothills areas in southwestern Arizona and northwestern Sonora (Hoffmeister 1986, USFWS 1998). Like other subspecies of the American pronghorn, they prefer open country with expansive views (USFWS 1998). Flat valleys and isolated hills are used more than other topographic features such as mountain slopes (AGFD 1985). The Sonoran pronghorn is found in the Lower Colorado River Valley and Arizona Uplands subdivisions of Sonoran Desertscrub (Brown 1982). The Sonoran pronghorn tends to inhabit relatively open expressions of these associations. However, seasonal shifts in habitat use are now known. In general, Sonoran pronghorn tend to occupy valley floor areas in winter (Lower Colorado River Valley subdivision), then move upslope (and southeastward) onto bajadas in spring and summer, into Arizona Uplands subdivision habitats (Wright and deVos 1986, Hervert et al. 1996). The valley floors used in winter tend to be open habitats of creosote-bursage associations with some perennial grasses, and some winter annual plants providing additional forage. Trees such as paloverde (*Cercidium* and *Parkinsonia* spp.), ironwood (*Olneya tesota*) and mesquite (*Prosopsis* sp.) are present primarily along dry watercourses, and are used for thermal cover. As the annual spring dry season progresses, pronghorn move eastward and upslope into the comparatively more dense and diverse Arizona Uplands association. It is likely that by making this seasonal movement, pronghorn may be able to access more forage plants that have substantial water content, and also escape a few degrees of heat by gaining altitude and greater access to thermal cover.

The Sonoran pronghorn range is functionally divided into two, possibly three subpopulations, by a combination of busy roadways and fences. The United States population is separated from the Mexico population by Mexico Highway 2 and the International Boundary fence (Figure 4). The Mexican population is likely to be further subdivided, by Highway 8, which connects the border city of Sonoyta, Sonora, with the coastal city of Puerto Penasco, Sonora. Available literature indicates that as Highway 8 has become improved and much busier in the 1990s, and being fenced for part of its length, it is now likely to prevent movement between pronghorn in the Pinacate region and those on the coastal plain east and south of Highway 8 and Puerto Penasco (Ockenfels et al. 1994, Ockenfels et al. 1997, USFWS 1998, Bright and van Riper III 2000, J. Hervert, AGFD, and C. Castillo, El Pinacate Biosphere Reserve, pers. comm.).

The pronghorn's current range in the United States is the area bounded on the north by Interstate 8, on the east by Highway 85, on the south by the International Boundary/Highway 2, and on the west approximately by the Tule Desert west of the Cabeza Prieta Mountains (Figure 3). In the United States, Sonoran pronghorn apparently no longer (or rarely) occur east of Highway 85. The last pronghorn known to occur east of Highway 85 in the Monument was a male found dead near the Ajo Mountain Loop Drive in 1972. The only indication of pronghorn crossing Highway 85 since then was a June 1996 sighting of a single female crossing east to west, approximately 12 miles north of Ajo on the Barry M. Goldwater Range (USFWS 1998). During 7 years of continuous radiotelemetry monitoring of a subset of the U.S. population, no radioed pronghorn have been detected east of Highway 85 (Arizona Game and Fish Department unpubl. data). Although observations along State Route 85 have been limited in past decades, pronghorn were supposedly not uncommon along the highway and throughout the Sonoyta Valley as recently as the 1960s (H. Coss, NPS Retired, pers. comm.). Long-time Ajo residents reported seeing more Sonoran pronghorn along the highway near Ajo and south in the Valley of the Ajo in previous decades (USFWS 1998). A recent remote-sensing habitat analysis indicated that suitable pronghorn habitat does exist east of Highway 85 in Organ Pipe Cactus (Marsh et al. 1999)
Organ Pipe Cactus National Monument is within the current and historic range of the Sonoran pronghorn. Pronghorn are present in the Monument year-round, but there is likely an increase in numbers in summer, when pronghorn from areas to the north and west move into Organ Pipe. Thus the monument serves as crucial habitat for pronghorn to survive the midsummer stresses of extreme heat and aridity. For example, in the summers of 1996 and 1997, up to 70% of the radiocollared subset of the population was in the monument (AGFD unpubl. data). While historically pronghorn probably ranged throughout suitable

habitat west of the Ajo Mountains, in contemporary times they are found only west of Highway 85 in the Monument. All valley floors, bajadas, smaller hills, and foothills areas west of Highway 85 are potentially occupied by pronghorn. Based on radiotelemetry data and incidental visual sightings, pronghorn most commonly occur in the Valley of the Ajo, the Puerto Blanco Mountains' foothills, Acuna Valley, Bates Mountains' foothills, Growler Valley and San Cristobal Wash.

Environmental and Human-Induced Factors Affecting Sonoran Pronghorn

The USFWS uses threat factors to determine whether a species should be listed, and the definition of "take," as presented in the Endangered Species Act of 1973 and its implementing regulations. The combination of those terms serves as a valuable categorization of the factors that may affect Sonoran pronghorn.

Loss or Modification of Habitat
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 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. 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 due to livestock grazing, burning, etc.

Curtailment of Habitat or Range
The curtailment of habitat and range are also in effect large-scale losses of Sonoran pronghorn habitat. Sonoran pronghorn are nomadic animals. They survive the demanding conditions of the desert by roaming widely, exploiting wide-spread and often ephemeral resources of food, water and shelter Hoffmeister 1986, Hervert et al. 1996). An individual Sonoran pronghorn may move many tens of miles in several days, simply following or seeking favorable conditions that result from localized rains and green areas. Curtailment of Sonoran pronghorns range equates to restriction of their nomadic movements, and probably significantly reduce their ability to survive. For example, Sonoran pronghorn tend to move east and upslope as the hot, dry weather of April-July develops. The animals appear to be making this movement to access more heavily vegetated desertscrub, where they find a wide variety of forage that allows them to survive through the annual spring drought (Hervert et al. 1996). Pronghorn, particularly Sonoran pronghorn, do not easily cross busy paved roadways (Ockenfels et al. 1994, Ockenfels et al. 1997, USFWS 1998, Bright and van Riper III 2000). In general, the wider and busier a road, the more likely it is to be a barrier to movements. State Highway 85 has become a barrier to the easternmost movements of Sonoran pronghorn, as Interstate 8 and Mexico Highway 2 are barriers to movements to the north and south, respectively. By denying Sonoran pronghorn seasonal access to these habitats, the survival options for the herd may be reduced. Fences are also barriers to movement, and probably confound movements within the area enclosed by these major roadways. Pronghorn generally prefer to go underneath fences, rather than leap or climb over them. Pronghorn are reluctant to go underneath the standard livestock fence, which has a barbed bottom wire, often fairly close (e.g. 10" or 12") above the ground.

To put place the curtailment of range and movements into perspective, the historical range of Sonoran pronghorn in the United States once included almost the entire southwestern quarter of Arizona, and extreme southeastern California, an area of roughly 8 million acres. Currently, movement barriers confine Sonoran pronghorn to an area of approximately 2.5 million acres. Organ Pipe Cactus NM provides approximately 200,000 acres of pronghorn habitat.

Disturbance
Disturbance is one of the more common and severe forms of stress on the Sonoran pronghorn. Sonoran pronghorn are quite "skittish" and shy of humans. Pronghorn in proximity to humans, on foot or in vehicles, will move away (USFWS, 1998; Krausman, et al., 2001). This effect can have several impacts: human presence causes Sonoran pronghorn to move from an area, thereby denying pronghorn access to

that specific site for what are probably crucial ecological functions (e.g. foraging, bedding, seeking thermal shelter, seeking mates, seeking fawning sites, seeking areas of relative safety from predators). Causing Sonoran pronghorn to move also increases physiological demands by expending calories and metabolic water. These may be critical stresses in normal seasonal hot-dry periods, and in extended periods of low forage availability. Disturbance may also lead indirectly to mortality; causing an animal to be alarmed, agitated, and fleeing a disturbance source may make it vulnerable to predator attack. Causes of disturbance of Sonoran pronghorn are likely to include: recreation; on-the-ground management activities; vehicles; aircraft; and movements of large numbers of illegal immigrants and smugglers.

Direct Mortality

Direct killing of Sonoran pronghorn from human/agency actions is possible, although rare. Roadkill is possible on Highway 85; the USFWS Biological Opinion contained in the GMP/DCP/EIS allows "take" of one Sonoran pronghorn in this fashion. As vehicular traffic on all roads increases, the possibility of roadkill also increases. It is not inconceivable that roadkill could happen on the park's unpaved roads. It is also possible that direct mortality could occur in the form of poaching. Poaching is known to have occurred in the U.S. and Mexico through the 1900s (USFWS 1939b, 1940, 1946a, 1946b, 1951, 1954a, 1966, 1971), and is suspected to have persisted into recent years (USFWS 1998).

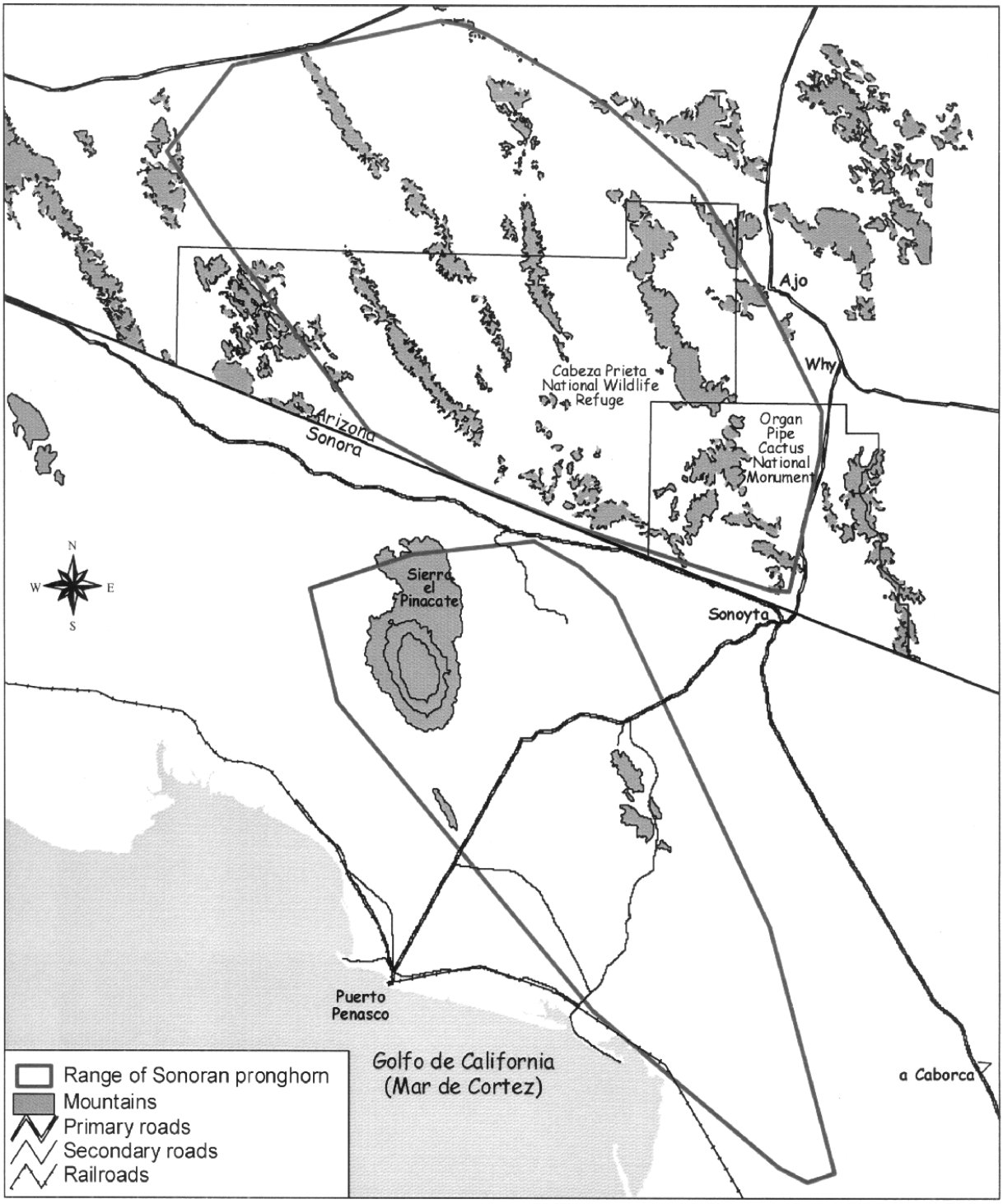
Disease and Predation

Sonoran pronghorn are susceptible to natural disease and predation. Potential diseases include epizootic hemorrhagic disease and bluetongue and Foot-and-Mouth disease (USFWS 1998). Predation by coyotes, bobcats, and mountain lions is likely to take place.

Other Natural or Manmade Factors that Affect Pronghorns' Continued Existence

Sonoran pronghorn may be impacted by other factors that are either natural or caused by humans. These may include extreme physiological stresses of drought and heat, competition for food from domestic livestock, and other factors (USFWS 1998).

Figure 3. Current U.S. Sonoran Pronghorn Distribution



ENVIRONMENTAL CONSEQUENCES

Regulations and Policy

As with all units of the National Park System, management of Organ Pipe Cactus National Monument is guided by the 1916 Organic Act; the General Authorities Act of 1970 and the act of March 27, 1978, relating to the management of the National Park System; *NPS Management Policies, 2001*, and other applicable federal laws and regulations. The conditions prescribed by laws, resolutions, and policies most pertinent to the planning and management of the monument are summarized below:

Desired Condition: Federal- and State-listed threatened and endangered species and their habitats are sustained.
Source: Endangered Species Act; NPS Management Policies

Desired Condition: Populations of native plant and animal species function in as natural condition as possible except where special management considerations are warranted.
Source: NPS Management Policies

Desired Condition: While Congress has given the Service the management discretion to allow certain impacts within parks, that discretion is limited by the statutory requirement (enforceable by the federal courts) that the Park Service must leave park resources and values unimpaired, unless a particular law directly and specifically provides otherwise.

The impairment that is prohibited by the Organic Act and the General Authorities Act is an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of park resources or values, including the opportunities that otherwise would be present for the enjoyment of those resources or values. Whether an impact meets this definition depends on the particular resources and values that would be affected; the severity, duration, and timing of the impact; the direct and indirect effects of the impact; and the cumulative effects of the impact in question and other impacts.
Source: NPS Management Policies

CUMULATIVE IMPACTS

Methodology for Assessing Cumulative Impacts

As stated before, the “cumulative impact” is the impact on the environment which results from the incremental impact of the action when added to the impacts of other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions.

Impacts are described in terms of type, duration, and intensity:

Type*:* Impacts are described as adverse or beneficial. Adverse impacts would result in negative consequences to Sonoran pronghorn, generally in the categories discussed above in Affected Environment. Beneficial impacts would improve or restore habitat or provide a greater chance for pronghorn survival, or in some other way reduce the adverse stresses discussed above in Affected Environment.

Duration: the following terms will be used to measure the duration of an impact
Short-term: impact lasts less than one year
Long-term: impact lasts greater than one year

Intensity: the following terms will be used to measure the intensity of an impact:

Negligible: an action that could result in a change to a population or individuals of a species or habitat, but the change would be so small that it would not be of any measurable or perceptible consequence.

Minor: an action that could result in a change to a population or individuals of a species or habitat. The change would be measurable but small and localized and of little consequence.

Moderate: an action that would result in some change to a population or individuals of a species or designated critical habitat. The change would be measurable and of consequence but would be of moderate scale and would occur over a limited area.

Major: an action that would result in a significant change to a population or individuals of a species or resource or habitat. The change would be measurable and either result in a major beneficial or major adverse impact upon a population, individuals of a species. The impacts or benefits are very significant and occur over a wide geographic area.

Action Area

The geographical area in which past, present, and foreseeable actions were identified was delineated and agreed upon by agencies affected by the Defenders of Wildlife et al. vs. Babbitt, et al., litigation, at a February 27, 2001 coordination meeting. This area, known as the "action area," was defined with the understanding that certain actions, whether federal or non-federal, may occur outside of the pronghorn's current range and even outside of its reasonably foreseeable range. Nevertheless, these activities could have some direct or indirect effect on the Sonoran pronghorn. The Action area is bounded on the north by Interstate 8; on the east by the eastern boundaries of the Barry M. Goldwater Range, Ajo area BLM lands, and Organ Pipe Cactus National Monument; on the south by the International Boundary; and on the west by the Tinajas Altas mountains. This area includes lands managed and/or used by the Bureau of Land Management, the US Air Force, US Marine Corp., the US Fish and Wildlife Service, and the National Park Service. This area includes all of the current range of the U.S. population of Sonoran pronghorn, plus additional adjacent areas that were historically part of the subspecies' range. Because of its proximity to Mexico, Organ Pipe Cactus National Monument is also considering actions in adjacent Mexico, including the El Pinacate Biosphere Preserve and areas in the Rio Sonoyta valley.

The Cumulative Scenario

The Cumulative Scenario is a list and brief description of all of the past, present, and reasonably foreseeable future actions occurring in the Action Area that agencies, organizations, or persons have, are, or plan on implementing (Appendices C and D). In the cumulative scenario presented in Appendices C-D, each individual action is briefly described, along with how each action may impact Sonoran pronghorn. The impacts of each action are then rated using the terms (type, duration and intensity) described in this methodology. Included in this scenario are past NPS actions as well as NPS actions that are not considered in either of the alternatives presented. Actions are not considered in either of the alternatives presented because 1) they have not been initiated, therefore they do not fall under the updated Existing Conditions/No Action alternative; or 2) they are not described under the New Proposed Action alternative. Cumulative impacts are analyzed by assessing the impact of the actions in the cumulative scenario against the impacts of the alternatives presented in this supplement.

Methodology for Screening and Rating Actions

The NPS has a large number of programmatic and specific actions occurring throughout the park, ranging from ongoing monitoring and maintenance to new construction. In order to determine if all past and current, and reasonably foreseeable future actions may have any type of effect on Sonoran pronghorn, each action was screened for their probable impacts on Sonoran pronghorn using the following methods described below (See also Appendices B, C, and D).

1. The anticipated impact of each project on the Sonoran pronghorn was attributed using previously defined impact intensity classes. Impacts were assessed with respect to pronghorn habitat, behavior, and demographics, i.e., reproductive biology/ecology.
2. The classified list was then sorted and all proposed projects judged to have no impact upon pronghorn were removed from this initial list. Examples of project proposals with no anticipated impacts on pronghorn include proposals involving administrative needs such as upgrading equipment or performing minor maintenance on existing building in a developed area such as replacing roofs, siding or upgrading electrical systems, or actions taking place outside of pronghorn habitat with no foreseeable effects within pronghorn habitat.
3. Both anticipated direct and indirect impacts of each proposal were assessed. For example, providing an artificial water source in pronghorn habitat may have direct beneficial impacts to pronghorn. However, that water source could also be an indirect adverse impact to pronghorn if it were to increase the presence of predators.
4. The remaining proposals, which were judged to have at least a negligible or more severe impact, were then assessed for their anticipated capacities in terms of impact duration, context (local, local scattered; i.e. several separate sites, and regional, i.e., impacts could be manifested anywhere within the monument.)

Impacts on the Sonoran Pronghorn from Alternative A: Existing Conditions/No Action Alternative

Impact Analysis
The impacts of Alternative A, the Existing Conditions/No Action Alternative are summarized and analyzed in Appendix B. Each individual action is briefly described, along with how each action may impact Sonoran pronghorn. The impacts of each action are then rated using the terms (type, duration and intensity) described in the methodology presented above. In addition to the detailed analysis presented in Appendix B following narrative provides an overview discussion of some of the major actions impacting Sonoran pronghorn, grouped under the major impact types discussed above under "Affected Environment."

Loss or Modification of Habitat
Under the Existing Conditions Alternative, the NPS is implementing a number of actions and activities that increase, conserve, or enhance Sonoran pronghorn habitat. Other actions may contribute (or have contributed) to the destruction or modification of habitat of the Sonoran pronghorn. Both types of impacts discussed in this section range from short-term to long-term in duration, from negligible to major in intensity, and from localized to regional in geographic context.

A number of NPS actions may result in short- to long-term beneficial impacts of moderate to major intensity (Appendix B). Actions to remove and/or control Buffelgrass allow natural vegetation processes within the monument to return, thereby providing more forage for pronghorn. Control of trespass livestock into the monument reduces competition for available forage and decreases the potential of disease transfer. Law enforcement efforts to control illicit immigrant and drug traffic decreases the amount of human presence in pronghorn habitat, thereby allowing pronghorn to more fully utilize their range within the monument. Developing long-term scientific information on endangered species and general ecological monitoring may result in increased knowledge about the species and its habitat.

Many NPS actions may have adverse impacts on Sonoran pronghorn. Although not an action undertaken by the NPS, the increase in traffic volume, speed, and the overall footprint of Highway 85 through the monument continues to have major, long-term adverse impacts to pronghorn by acting as a movement barrier. Developing and promoting new hiking trails in the Puerto Blanco and Sonoyta Mountains would likely increase foot traffic in this area and may result in modifications to the pronghorn's historic range. Illegal woodcutting in various areas of the monument directly degrades Sonoran pronghorn habitat. Illicit cross-country driving, the continued administrative use of Armenta Rd., and law enforcement efforts to control illicit immigrant and drug traffic all result in major, long-term, adverse impacts to the Sonoran pronghorn from the destruction of habitat and the restriction/modification of pronghorn movements. A range of other projects have minor to negligible adverse impacts on habitat, generally on localized scales (Appendix B).

Although not discussed under a specific project title in Appendix B, roads are also degrading habitat. Some sections of road are deeply entrenched and are becoming more so. The Bates Well Road near the Pozo Nuevo Road, and the North Boundary Road west of Armenta Ranch are examples of entrenched road sections in prime pronghorn habitat. Entrenched roads have various impacts, including changes to natural surface water flow patterns, gullying and other accelerated erosion features, and destabilization of ancient soil surfaces and topography. Vegetation patterns and productivity can change as a result of these impacts. The physical impacts of roads (versus behavioral impacts discussed below) are adverse, generally long-term, and moderate to major in intensity.

Curtailment of Habitat or Range
A number of actions and activities contribute (or have contributed) to the curtailment of habitat or range of the Sonoran pronghorn. Other actions have beneficial impacts, resulting in reducing curtailment of habitat or range. Both types of impacts range from long-term to short-term in duration, from negligible to major in intensity, and from localized to regional in geographic context.

Moderate to major beneficial impacts include removing the livestock fence along most of the boundary between the monument and Cabeza Prieta NWR; and modifying the monument's north boundary fence (between OPCNM and BLM lands, west of Highway 85). The removal of fencing allows pronghorn to move more freely within their range.

Moderate to major adverse impacts to pronghorn revolve mainly around Highway 85. Road shoulder maintenance (e.g. widening) may increase the movement barrier effect. Also, as traffic volumes and speeds continually increase, Highway 85 becomes a more and more firm barrier to pronghorn movement. The monument constitutes the eastern end of the current range of Sonoran pronghorn (Figure 3). While pronghorn are present in the monument at any time of year, a greater proportion of the U.S. population is present in the Monument from approximately February through August each year. This period corresponds with the annual spring warming-drying trend. Pronghorn move east into the monument and upslope onto more densely vegetated bajadas in search of forage, thermal cover, and a slight respite from the greater heat of valley floors. Thus pronghorn use the monument under conditions when they are at their greatest thermal and hydrational stress. Pronghorn used to cross Highway 85 to use bajada habitats in eastern portions of the monument, but they no longer do. Studies on pronghorn elsewhere indicate this change is likely because of steadily increasing volume and speed of traffic on Highway 85 (Ockenfels et al. 1994, Ockenfels et al. 1997, USFWS 1998, Bright and van Riper III 2000). Currently, Highway 85 bears heavy tourist and commercial traffic, with a posted speed limit of 65 mph.

Some fences remain which may adversely impact pronghorn movements. The monument's south boundary fence is standard livestock fence, and probably inhibits or prevents pronghorn passage. However, greater impacts to movement may likely be the result of Mexican Highway 2, located adjacent and parallel to the fence. The fence between BLM and Tohono O'odham lands east of Highway 85 remains as a standard livestock fence. The eastern boundary of the monument is primarily the high, rugged crestline of the Ajo Mountains. This boundary is fenced only in high saddles where domestic livestock might range; the remainder of that boundary is nearly vertical topography. Sonoran pronghorn are unlikely ever to occur in this steep, rugged area.

Some corridors of human activity may act as transient barriers to movement. The graded dirt roads west of Highway 85 are frequently crossed by pronghorn (AGFD unpubl. telemetry data and NPS staff pers. obs.). However, during transient periods of heavier vehicular traffic (e.g. during exceptional wildflower blooms), human activity on these roads may temporarily inhibit pronghorn movement and limit range. Some centers of human activity are likely to curtail the pronghorn's range. Twin Peaks developed area comprises an area of permanent human activity. This activity is likely to inhibit pronghorn from using adjacent landscapes.

Overall, under the Existing Conditions Alternative, Sonoran pronghorn retain essentially unrestricted freedom of movement throughout the monument west of Highway 85, and between the monument and Cabeza Prieta NWR. However, movements and habitat have been limited by surrounding highways and some remaining fences. Movement between the monument and BLM lands west of Highway 85 has been facilitated by improving the fence design, but may still be inhibited by the existence of even a pronghorn-friendly fence.

Disturbance

A number of actions and activities that either reduce or contribute to disturbance of the Sonoran pronghorn have been previously discussed in other sections (Loss or Modification of Habitat, Curtailment of Habitat or Range). These actions may result in impacts that range from short- to long-term in duration, from negligible to major in intensity, and from localized to regional in geographic context.

Law enforcement control of illicit immigrant and drug traffic has resulted in short- to long-term beneficial impacts of moderate to major intensity. A range of other projects have minor to negligible beneficial impacts by reducing disturbance, generally on localized scales.

Creating and promoting new hiking trails in the Puerto Blanco and Sonoyta Mountains; law enforcement efforts to control illicit immigrant and drug traffic that results in pushing traffic into backcountry habitat

areas; administrative use of Armenta Road; and, emergency operations all contribute to pronghorn disturbance and may have short- to long-term, adverse impacts of moderate to major intensity. A range of other projects have minor to negligible adverse impacts in the form of disturbance, generally on localized scales (Appendix B).

It is also likely that Sonoran pronghorn in the monument are subjected to disturbance events that vary substantially in intensity and are sporadic in time and place. Viewed as a whole, however, these actions may result in a nearly daily exposure to disturbance. For example, the graded roadways in western portions of the monument may have adverse impacts to pronghorn habitat at a minor to moderate level of intensity, but when added with park visitation pressures, illegal immigration, smuggling traffic, and related law enforcement efforts, major and fairly continuous disturbance takes place. Disturbance of this intensity and frequency may result in physiological stress, excessive movements, and avoidance of areas that might otherwise be preferred habitat. Ultimate consequences may include diminished physical fitness, reduced adult survival, reduced fawn survival, and susceptibility to predation. It has long been known that Sonoran pronghorn are wary of people on foot or in motor vehicles (USFWS 1998); Krausman et al. (2001) further substantiated this recently. This is the primary form of potential disturbance, and results from activities of both the visiting public and the monument management.

The progressive development of the Twin Peaks area has impacted several hundred acres from use as potential pronghorn habitat. In addition to that, the human activity associated with the Twin Peaks development area probably inhibits pronghorn from using the adjacent landscapes (Bright and van Riper III, 2000).

Direct Mortality

A number of actions and activities may result in direct mortality of Sonoran pronghorn. Other actions have beneficial impacts, resulting in reducing the potential for mortality.

NPS Law enforcement patrols aid in reducing the occurrence of poaching within the monument. Removing livestock fencing along most of the monument's northern boundary (between the monument, and Cabeza Prieta NWR and BLM lands, west of Highway 85) has helped reduce the potential for death by entanglement. Backfilling abandoned mining features help to prevent wildlife pitfalls. All of these actions result in long-term, beneficial impacts of moderate to major intensity.

The potential for roadkill on Highway 85 due to increasing volume and speed of traffic continues to be a potential adverse impact. Of equal concern but less probability is the potential for roadkill on scenic drives within the monument.

Overall, direct mortality of pronghorn due to human-induced factors seems to be a negligible to minor impact in the monument. No such events have been documented in over 30 years.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Few or no impacts under this category can be identified for the Existing Conditions Alternative. There are no permitted commercial or recreational uses of pronghorn taking place in the monument. The monument does issue an annual Scientific Research and Collecting Permit to AGFD, for the purpose of carrying out research and monitoring activities authorized by the USFWS. These activities primarily consist of weekly radiotelemetry flights, and biennial interagency aerial surveys of Sonoran pronghorn. The capture and radio-collaring operations themselves have resulted in deaths of pronghorn in the past. However, captures take place outside the monument, primarily because the Monument presents terrain that is inherently risky to pronghorn for capturing procedures.

Disease, Predation

A number of actions and activities may result in adverse increases in disease and predation of Sonoran pronghorn. Other actions have beneficial impacts, resulting in reducing the potential for these factors.

Disease - The monument's program for excluding domestic livestock is a beneficial impact, reducing the potential for transmittal of diseases such as Foot-and-Mouth disease. Currently, the monument does not

have a horse patrol program and does not maintain livestock, which could be potential disease vectors for Sonoran pronghorn. Recreational use of domestic livestock (horses) is allowable in the backcountry. Although this activity rarely takes place, it could constitute an adverse impact by introducing the possibility of disease transmission.

Predation - It is assumed that normal predation pressure takes place, from coyotes, bobcats, and mountain lions. In recent years, examination of the site of death of at least one radio-collared pronghorn in the monument indicated predation by a bobcat (J. Hervert AGFD pers. comm.). The monument does not census, monitor or control predator populations of potential pronghorn predators. It is assumed that predation is occurring at normal natural levels.

Other Natural or Manmade Factors Affecting Continued Existence

Several actions and activities may result in other adverse or beneficial impacts on Sonoran pronghorn. Primarily, the monument's program for excluding domestic livestock is a beneficial impact of major intensity, reducing the potential for competition with Sonoran pronghorn for forage.

Cumulative Impacts

The impacts of all other past, present, and reasonably foreseeable future actions, for the NPS and all other agencies and entities, are discussed and analyzed in Appendix C. Each individual action is briefly described, along with how each action may impact Sonoran pronghorn. The impacts of each action are then characterized using the terms (type, duration and intensity) described in the methodology presented above. The cumulative impacts of all those actions, when added to the impacts of Alternative A (Existing Conditions), are discussed here. The following discussion provides an overview of these cumulative impacts on Sonoran pronghorn, grouped under the major impact types discussed above under "Affected Environment."

Loss or Modification of Habitat

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), result in changes in the quantity and quality of habitat for the Sonoran pronghorn. Individual actions result in an entire range of impacts, from major beneficial to major adverse, from short-term to long-term durations, and vary in geographic scope from localized to widespread. Several major impacts are discussed below.

Livestock ranching on the monument, and probably other parts of the Sonoran pronghorn range in the U.S. had adverse and long-term impacts on the subspecies, just as livestock grazing has impacted other pronghorn populations (Bright and van Riper III, 2000). The excessive stocking rate and yearlong use exceeded sustainable use for more than half a century. Short-term overuse by livestock can lead to loss of plant vigor, decrease in plant cover, and decrease in seed input to the system. Longer-term overuse can cause further decreases in plant cover, plant density, and shifts in species richness, composition and diversity. Long-term grazing pressure of the sort that occurred on the monument and adjacent areas can have long-lasting impacts, including type conversions (changing one type of plant association to a less productive type), decrease in species richness, decrease in species and community diversity, and accelerated erosion. All these effects would have strong potential adverse impacts on the availability of forage for pronghorn (See Appendix C). Furthermore, desert plants, particularly long-lived species, and desert plant communities take many decades if not centuries to recover from such extensive disturbance. A major beneficial impact has been that livestock grazing was phased out on the monument, CPNWR and BMGR in the late 1970s. While the benefits of those actions are widespread, ecosystem recovery is only beginning to take place. Pronghorn habitat still bears the impacts of decades of overgrazing, but it is improving. Current actions to continually exclude livestock from the monument, CPNWR, and BMGR will aid in this ecosystem recovery. Livestock grazing persists on approximately 90,000 acres of potential pronghorn habitat on BLM lands west of Highway 85 near Ajo.

The increasing regional trend in human populations has also resulted directly and indirectly in loss and modification of habitat. Increasing human populations have resulted in various types of encroachment and conversion of pronghorn habitat to developed areas. These include towns (e.g. Ajo, Gila Bend, Tacna, Wellton, Hyder, Sentinel, Dateland, Yuma, Sonoyta MX) and agricultural development in the Gila

River and Rio Sonoyta valleys. Large increases in human population in Tucson, Phoenix, and southern California have resulted in dewatering the Gila River, and habitat impacts from increasing recreational use of pronghorn habitat (e.g. creating and maintaining roads, campgrounds, visitor's facilities, etc.). This latter effect also has disturbance impacts (see below).

Historic mining activities, grazing of livestock, and subsistence woodcutting are likely to have resulted in habitat impacts in the form of surface disturbance. Mining activities have been phased out on OPCNM, CPNWR, and BMGR.

Military activities are likely to have resulted in habitat impacts in the form of surface disturbance from ground-based activities and air-to-ground ordnance deliveries. In recent decades, air-to-ground ordnance deliveries have been confined to more restricted areas than during World War II and the decades immediately following.

The activities surrounding undocumented alien (UDA) immigration, smuggling, and related interdiction activities by federal, state and local law enforcement agencies have had adverse cumulative impacts on pronghorn habitat. Movement of UDAs takes place by foot and vehicles, on established roadways and cross-country, across OPCNM, CPNWR, and BMGR. By 2001, estimates of UDA traffic reached 1000 per night in the monument alone, with extensive drug smuggling taking place simultaneously. This traffic and related interdiction activities have resulted in numerous new dirt roads and trails being established through pronghorn habitat. Discarded trash is also ubiquitous, with unknown impacts on wildlife. Smugglers and UDAs also cut firewood and build fires; several escaped campfires have impacted habitat in OPCNM in recent years (OPCNM file reports). The activities surrounding UDA immigration, smuggling, and related interdiction activities also have adverse disturbance impacts.

Locally, cumulative habitat loss has occurred from establishing, maintaining, improving, and expanding facilities used for management of the monument and providing services to the visiting public. The majority of these actions center on the Twin Peaks area (visitor's center, residence area, maintenance area, campground; See Appendices B -C.). Establishing, maintaining, and incrementally developing the Twin Peaks area has removed several hundred acres from potential use as pronghorn habitat. This area is an upper bajada area with moderately dense desertscrub vegetation. This habitat type is used by pronghorn in spring and summer when they are at their peak physiological stress from heat and aridity. Pronghorn were observed in the Twin Peaks area during the early years of OPCNM (Superintendent's Monthly Reports), and a radiocollared animal briefly approached to within about one mile of the campground in 1997 (AGFD unpubl. radiotelemetry data). The continuing maintenance and incremental growth of the Twin Peaks developed area serves to perpetuate a center of human activity, rendering it unavailable as habitat

In addition to adverse impacts on habitat, some actions treated in Appendices B and C result in major or moderate beneficial impacts on pronghorn habitat. Phasing out mining on the monument and CPNWR reduced surface disturbance and subsistence woodcutting. Phasing out livestock grazing on OPCNM, CPNWR, and BMGR is resulting in widescale rehabilitation of habitat. Wilderness designation on the monument and CPNWR caused closure of informal road networks, resulting in rehabilitation of habitat. Increasing trends in rainfall since the late 1970s likely resulted in more favorable forage conditions. Reducing permanent human habitations in backcountry areas of the monument and CPNWR probably resulted in reduced local impacts from woodcutting and livestock grazing. Beneficial aspects of management plans for CPNWR, BMGR, and the monument have also aided in habitat recovery. Ecological research and monitoring projects should beneficially impact habitat by supporting improved management strategies.

Many of the activities listed and analyzed in Appendices B and C have negligible, minor, or moderate impacts, of local to regional scale. While these actions range from beneficial to adverse, the majority are adverse. Taken together the cumulative impact of these lesser actions is likely to result in moderate to major long-term regional adverse impacts on Sonoran pronghorn habitat.

Overall, the cumulative impacts analyzed in Appendices B and C have probably resulted in net improvements in habitat quality, due to cessation and initial recovery from several key, pervasive, adverse activities, e.g. livestock grazing. At the same time, losses of habitat that are negligible to moderate, and localized to regional in scale, continue to cause incremental loss and modification of habitat. Of critical importance is that major losses of access to habitat have occurred, which amount in a net overall loss of habitat, despite improving quality (see below).

Curtailment of Habitat or Range

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), result in curtailment of habitat or range for the Sonoran pronghorn. Individual actions span the range of impacts, from major beneficial to major adverse, from short-term to long-term durations, and vary in geographic scope from localized to widespread. However, several major adverse widespread actions are of greatest significance.

The actions listed in Appendices B and C will impose restrictions on the Sonoran pronghorn's nomadic ecological strategy. The impediments to movement are typical of impediments recognized for other pronghorn subspecies (Ockenfels et al. 1997, van Riper and Ockenfels 1998, Bright and van Riper 2000). It is likely that current barriers to movement will strengthen, and that new barriers may develop which further subdivide or restrict the species' range. Factors that contribute to restrictions on pronghorn range and movements include: Construction of U.S. Interstate 8; construction and gradually increasing use of Mexico Highway 2; potential expansion of Highway 2 from 2 to 4 lanes; construction and gradually increasing use of Highway 85; permanent establishment of a 65-mph speed limit on Highway 85; right-of-way fencing along Highway 85 between Why and Gila Bend; fences between BLM lands in the Ajo area and adjoining OPCNM and CPNWR lands; interior pasture fences on BLM lands in the Ajo area; increasing use and/or development of unpaved roads in OPCNM, CPNWR, and BMGR; establishment of new transportation and utility corridors; recreational activities; military ground developments; establishment of permanent or semi-permanent human occupation in backcountry areas; expansion of communities on the perimeter of pronghorn range (e.g. Lukeville, Why, Ajo, Gila Bend, Sentinel, Dateland, Wellton, Tacna); and establishment of additional physical barriers along International Boundary.

With respect to the monument locally, several types of barriers warrant discussion. Very few barbed-wire fences existed in Sonoran pronghorn habitat on the monument until the 1940s. During the late 1940s and early 1950s, the NPS constructed barbed-wire fences on all sides of its boundary. In addition, a number of interior fences existed to control movements of domestic livestock. The fences constructed by the NPS and other agencies are likely to have had a long-term adverse impacts on Sonoran pronghorn by inhibiting access to and within OPCNM, which although occupied year-round appears to be very important summer habitat (AGFD telemetry data). With the cessation of livestock grazing in the late 1970s, interior barbed-wire fences were taken down and/or allowed to deteriorate. Recognizing the impacts on pronghorn movement, in the late 1980s the monument began taking down its fence marking the boundary with CPNWR. Most of this fence was removed by 1995, with a few remaining stretches removed in 1999. While radiotelemetry data collected by AGFD in the 1990s indicate that pronghorn move freely between the monument and CPNWR, it remains to be confirmed that modifying the north boundary fence has resulted in pronghorn moving between the monument and BLM lands.

Until the late 1930s, the lack of paved roads within the monument allowed Sonoran pronghorn unobstructed access across all suitable habitat within the monument. Highway 85, which was paved in 1943, had a major long-term adverse impact on the Sonoran pronghorn. Pronghorn are reluctant to cross paved roads, especially paved roads with heavy traffic. As traffic volumes (and speed) on Highway 85 have increased steadily since it was paved, pronghorn use of the habitat east of Highway 85 has ceased. These eastern upslope areas of habitat are critical to pronghorn, because the animals move into them during the warm spring and summer months in search of water-containing forage.

These adverse curtailments of pronghorn range are likely to reduce the ability of animals to move freely in search of better forage or habitat conditions, thus limiting their ability to survive even moderate drought.

These adverse impacts may also impose a geographic range so small that its carrying capacity is less than a minimum viable population level of Sonoran pronghorn. Furthermore, curtailments of range may force animals to attempt to cross barriers (e.g. busy highways or fences), sustaining injury or death in the process (See "Mortality," below).

Disturbance or Harassment

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), result disturbance and harassment (and some reductions of these impacts) of Sonoran pronghorn. Individual actions span the range of impacts, from major beneficial to major adverse, from short-term to long-term durations, and vary in geographic scope from localized to widespread. These impacts are sufficient in number so that the overall effect is an essentially continual level of minor to major disturbance and harassment, varying from local areas to more regional impacts. This disturbance and harassment may result in physiological stress, excessive movements, and avoidance of areas that might otherwise be preferred habitat. Ultimate consequences may include diminished physical fitness, reduced adult survival, reduced fawn survival, susceptibility to predation, and injuries incurred while fleeing. Several major and moderate actions are summarized below.

The rapid growth in the human population of Arizona and southern California in recent decades has resulted in great increases in human presence in pronghorn range. Recreational use of OPCNM and CPNWR has particularly increased over the last 10 years (See narrative section, Appendix C). Closely related to increasing regional human population, recreational use of the monument, CPNWR, BMGR, and BLM lands has and continues to increase This brings people in vehicles and on foot into proximity to pronghorn, which is a known disturbance factor (Krausman et al. 2001). Federal agencies tend to facilitate such recreation, by maintaining or improving roads, allowing new informal camping areas, developing interpretive or promotional materials, or increasing allowable (permitted) use levels. In some cases, non-Federal entities also promote increasing recreational use, e.g. feature magazine articles and the Citizen's Initiative to establish Sonoran Desert National Park. Currently, seasonal recreational use is considerable in several areas used often by pronghorn: BLM lands around Ajo; El Camino del Diablo in CPNWR; the North Puerto Blanco Drive and trails in the Puerto Blanco Mountains in the monument. Increasing human populations also results in greater volumes of traffic on roads such as Highway 85, creating local disturbance and a barrier to movement.

In the past decade the U.S. Sonoran pronghorn range has experienced very high and still increasing activities involving Illegal immigration and smuggling. Very high numbers of people are moving generally northward from Mexico toward Interstate 8, Ajo, Gila Bend, and other destinations. These people travel on foot, bicycle, and automobile. Increasingly, automobile traffic is cross-country, establishing new roads through prime pronghorn habitat such as the Growler Valley, San Cristobal Valley, O'Neill Hills, etc. In the monument alone, estimates recently reached 1000 people per night travelling through the monument. This large volume of human presence in pronghorn habitat constitutes a major source of disturbance. In addition, U.S. law enforcement agencies respond to this illegal activity, resulting in additional traffic by automobiles, helicopter, airplane, and people afoot. To the extent that interdiction efforts are successful, they would achieve beneficial reductions in this pervasive form of disturbance.

Extensive military activities have taken place in pronghorn habitat since World War II (Appendix C). These have included both ground-based operations and training in air-to-ground and air-to-air munitions. Krausman et al. (2001) recently found that aircraft overflights of pronghorn did not have great effect on pronghorn, as measured by changes in observable behavior or movements. However, pronghorn in the presence of military activity tended to spend less time foraging than pronghorn without military activities. Krausman et al. (2001) determined that activities on the ground (vehicles, people) had greater discernable effect on pronghorn than did aircraft overflights.

Until recent decades, livestock ranching resulted in considerable human activity in pronghorn habitat. In the monument, activity was concentrated around ranching headquarters at Dos Lomitas, Bates Well, Alamo Canyon and Dowling Well. Periodic concentrated activity also occurred during spring round-ups at Pozo Nuevo, Aguajita, Bates Well, Walls Well, Gachado Well and Pozo Salado. Roundups occurred at

permanent water sites each year during the summer drought when pronghorn's access to water might have been important, and when pronghorn were more likely to be in their eastern range.

Concentrated human activity also occurred at the mines, particularly the Growler, Victoria, Milton and Copper Mountain mines in the monument. Mining activity would have included actions such as blasting and running heavy machinery that would have been heard at long distances. Most of the mining activity, however, was in short-term spurts covering relatively small areas. Currently, mining has essentially ceased in the U.S. range of the pronghorn.

A small village existed at Quitobaquito in the 1940s and 1950s. A few structures housed native Americans and staff of the Bureau of Animal Industry. The last O'odham occupant vacated the area in the late 1950s. Human presence might have caused—and might still cause—pronghorn to avoid this water source. The NPS caused the removal of a village that had established for a short time at Cipriano Well (also called Juan Well). The NPS noted that pronghorn had left the area while it was occupied.

Until the Wilderness Act of 1978, the NPS permitted unobstructed access to roads and trails in the monument. Most visitors probably stayed on maintained roads such as the Ajo Mountain Drive, the Puerto Blanco Drive, and the south boundary road to Quitobaquito. Some visitors used more remote roads such as the Palo Verde Camp Road, the Wall's Well Road, Acuna Valley Road, Cement Tank Road and the west boundary road. Driving in along wash beds was also permitted and preferred by the NPS. All parts of the monument, therefore, were accessible by road to all visitors, ranchers, staff and researchers. The wilderness designation in 1978 had the effect of closing a number of roads. The most notable impact of these road closures on Sonoran pronghorn was to reduce the potential for pronghorn to contact people.

Direct Mortality

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), may result in impacts on direct mortality of Sonoran pronghorn. The cumulative impacts of direct mortality of pronghorn are difficult to discern. In general, it is likely that mortality due to human influences was a moderate to major adverse impact in the first part of the 1900s. Hunting (including illegal poaching) was apparently fairly common up to about the middle 1900s (See narrative section of Appendix C). Peak hunting pressure on Sonoran pronghorn was probably during the 1920s through 1940s. Local residents and construction workers were taking an unknown but probably substantial number of pronghorn. In addition, commercial hunting operations (based in Sonoyta) in the 1930s and 1940s were taking at least several pronghorn per year, frequently during the winter season. However, indications are that hunting has decreased and is likely a rare impact currently. As law enforcement presence increases on OPCNM, CPNWR, BLM and BMGR, poaching should be further deterred.

Barbed-wire fences not only restricted the range of Sonoran pronghorn, they directly caused deaths. Although there is only one record of Sonoran pronghorn tangling to death in a fence in the U.S. population, other undocumented deaths may have occurred.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), are minor under this category. Commercial uses of Sonoran pronghorn are not known in the U.S. or Mexico. Similarly, no direct recreational use is apparent, unless visitation to the monument, CPNWR or BMGR for the purpose of viewing pronghorn is considered. The impacts of such recreational visitation are considered above with general recreation, under "Disturbance or Harassment." With regard to scientific use, the capture and radio-collaring operations carried out by AGFD have resulted in deaths of pronghorn in the past. This research effort yields important information regarding habitat use and population trends. The AGFD capture and radio-collaring operations are regulated under permit by the USFWS; the relative costs and benefits continue to be evaluated by those agencies and the Sonoran Pronghorn Recovery Team.

Disease or Predation

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), may result in impacts relating to disease and predation. These impacts are both adverse and beneficial, generally minor to moderate in intensity, and local to regional in context.

During the era when CPNWR, CPNWR and BMGR had livestock grazing, there would have been a potential for transmission of disease between domestic livestock and wildlife, including Sonoran pronghorn. High numbers of cattle, coupled with animal concentration areas near water sources, would have created favorable conditions for disease transmission. Part of the rationale for constructing the southern/International boundary fence in the 1940s was to keep out Mexican livestock, partly out of fear of diseases such as Foot-and-Mouth disease. Elimination of domestic livestock from most of the U.S. pronghorn range, and the now isolated nature of the U.S. herd, have probably reduced the risk of disease outbreak. However, the recent European outbreak of Foot-and-Mouth disease, the global trade network, and low Sonoran pronghorn numbers make this threat a contemporary concern.

Little is known regarding the cumulative impacts of predation on Sonoran pronghorn. It is assumed that normal predation pressure takes place, from coyotes, bobcats, and mountain lions. In recent years, examination of the sites of death of several radio-collared pronghorn indicated normal predation by canines and felines. A predator-control program undertaken by the USFWS 1946 until at least 1954 and periodically thereafter was thought to have improved pronghorn numbers, but no population data were gathered to substantiate that conclusion. If providing artificial water sources draws in both pronghorn and predators, artificially increased predation may result. The Sonoran pronghorn Recovery Plan (USFWS 1998) identifies predator control as a potential management strategy to increase fawn survival. In recent years, packs of feral dogs have been observed in the monument, most notably on La Abra Plain and the southern portions of the Puerto Blanco Mountains. It is possible these feral dogs could prey on pronghorn.

Other Natural or Manmade Factors Affecting Its Continued Existence

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), may result in other impacts on Sonoran pronghorn. These impacts are both adverse and beneficial, generally minor to moderate in intensity, and local to regional in context.

Drought may have had an impact on Sonoran pronghorn populations over the years. The severe droughts of the 1880s, the 1940s and early 1950s, and the lesser drought of the 1970s may have had significant adverse impacts. However, drought is unlikely to be solely at fault for recent population declines. Southwestern Arizona has had no severe drought in the last quarter-century. Individual dry years have occurred as is normal, most recently the record dry year of 2000. However those dry years have been interspersed among a large number of El Nino Southern Oscillation (ENSO) years of above-average rainfall, especially in the 1980s and 1990s (Rowlands 2000, OPCNM unpubl. climate data). Although substantial year-to-year variations exist, the general trend in the later 20th century has been one of slightly increasing rainfall (Rowlands 2000). Two major ENSO episodes have taken place in the last decade alone: 1992-1993, and another as recently as 1998. The several individual dry years experienced in the later 1990s should not have exerted nearly the adverse impacts that the true droughts of the 1940s and 1950s and the lesser drought of the 1970s did. If recent dry years have had an impact on Sonoran pronghorn, it may be 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.

Until the last quarter-century, Sonoran pronghorn experienced competition for forage from the livestock grazing that was prevalent on the monument, CPNWR, BMGR, and BLM lands. This impact would have been strongly adverse, long-term, and nearly range-wide. Stocking rates of domestic livestock were so excessive that even woody perennials such as ironwood and mesquite had browse lines. This level of

overgrazing would have severely reduced the quantity and quality of forage available to Sonoran pronghorn. This competition is likely to have resulted in reduced survivorship of adults and fawns, reduced overall fitness, and less than optimal recruitment and survivorship. As noted above, this grazing also resulted in habitat degradation. While Sonoran pronghorn in most of the U.S. range are no longer experiencing direct competition from domestic livestock for forage and water, they are probably still experiencing degraded habitat conditions as a result of the long-term ecological effects of livestock overgrazing in Sonoran Desert ecosystems. Domestic livestock grazing still takes place on BLM lands in the Ajo area, and overuse may be occurring in some areas. In those areas pronghorn would experience direct competition for forage. AGFD radiotelemetry data indicate pronghorn rarely enter actively grazed BLM lands, even though the fences between these BLM lands and the monument and CPNWR have been modified to be pronghorn-passable.

Conclusion

The cumulative impacts of the Existing Conditions Alternative (Appendix B), when considered with all other past, present, and reasonably foreseeable future actions (Appendix C), are likely to result in a continued, incremental reduction in the ability of Sonoran pronghorn to maintain a viable population in the United States. Although there are many beneficial actions included in this cumulative scenario, they are out weighed by adverse impacts. Of the 165 actions analyzed in Appendices B and C, 112 are wholly adverse, 26 are both adverse and beneficial, 27 are wholly beneficial, and 4 have unknown impacts.

In summary, it is likely that over the past quarter-century the quality of Sonoran pronghorn habitat has improved, but over the past 100 years pronghorn have experienced increasing restrictions on their range, and increasing exposure to potentially disturbing human activities. Regionally, in the early 1900s southwestern Arizona was a remote area with little human presence and few improved roads. However, extractive land uses such as grazing, mining, and woodcutting resulted in regionally degraded habitat conditions. Commercial and subsistence hunting placed a further stress on the Sonoran pronghorn. Severe droughts occurred in the 1880s and again in the 1940s and 1950s. By the latter decades of the 20th century habitat conditions were improving, but pronghorn were confined to a smaller area. Actions and activities in the foreseeable future would generally perpetuate these trends. Sonoran pronghorn habitat is likely to continue to improve in quality, because livestock grazing, mining, woodcutting, and other large-scale extractive uses that impacted habitat would remain excluded. These gradual gains in habitat quality would be partially offset by losses due to incremental habitat destruction and modification. However, the net beneficial aspects of habitat improvement are likely to be more than offset by adverse impacts of disturbance and curtailment of range. The clear trend is toward increasing frequency and types of human activities in Sonoran pronghorn habitat and range. Various actions and activities would continue to restrict pronghorn movements, although probably by smaller increments than did the construction of the highways that form the primary boundaries of their range. With increasing use and/or changes in status, some roads may become movement barriers and further reduce the size of the current range. The net adverse impacts of habitat, disturbance, and range restrictions are evident in the trend of Sonoran pronghorn over recent years. Despite conditions that should have substantially improved habitat conditions over the past 25 to 50 years, the population has not grown. Conversely, it recently diminished from approximately 140 animals to 98, between 1998 and 2000 (Hervert et al. 1997 and AGFD unpubl. data). This trend indicates that some influences are having very adverse impacts, to the extent that they override improving habitat conditions. For many actions and projects considered here, the impacts are often difficult to anticipate, much less quantify. And while many projects have negligible impacts on their own, the sheer number of these actions is likely to have major adverse impacts in aggregate. These adverse impacts are felt to the extent that the current population level of 98 animals is considered by the Sonoran Pronghorn Recovery Team to be critically low.

Although the NPS contributes to a fraction of the overall impact on Sonoran pronghorn, increasing human presence in the form of monument visitors; undocumented aliens; travelers on Highway 85; and law enforcement officers; constitute the greatest amount of adverse impacts on the pronghorn that the monument adds to the cumulative scenario.

Findings on Impairment

The purpose of Organ Pipe Cactus National Monument is founded on the monument's enabling legislation as well as the NPS Organic Act of 1916. Purpose statements further define the desired future of the monument as well as serve as guidelines for its management. The following purpose statements were created during the GMP/DCP/EIS planning process and are reaffirmed in the monument's 1997-2002 Strategic Plan.

Organ Pipe Cactus National Monument was created to:

- Perpetuate for future generations a representative sample of the natural and cultural resources and processes of the Sonoran Desert and provide for public understanding, use, and enjoyment of same.
- Preserve for future use and enjoyment the character and values of designated wilderness within the monument.
- Serve as a natural outdoor laboratory for understanding and managing Sonoran Desert ecosystems.
- Serve as a baseline indicator against which environmental changes can be identified.

The Sonoran pronghorn is a species unique to the Sonoran Desert and an integral part of the Sonoran Desert ecosystem. The pronghorn is not, however, key to the natural or cultural integrity of Organ Pipe Cactus National Monument or to opportunities for enjoyment thereof. The General Management Plan does not contain any additional specific goals to protect the pronghorn.

The cumulative impacts of this alternative have been determined to result in major adverse effects to the existing and future Sonoran pronghorn population in the United States. The loss of one of more Sonoran pronghorn would be a major adverse effect to a park resource. However, that loss would not be an impairment of park resources and values.

Impacts on the Sonoran Pronghorn from Alternative B: The *New Proposed Action*

Impact Analysis

The impacts of Alternative B: *The New Preferred Action* Alternative are summarized and analyzed in Appendix D. Each individual action is briefly described, along with how each action may impact Sonoran pronghorn. The impacts of each action are then characterized using the terms (type, duration and intensity) described in the methodology presented above. In addition to the detailed analysis presented in Appendix D, the following section summarizes the ways in which the cumulative impacts of Alternative B differ from the impacts of Alternative A, the *Existing Conditions* Alternative, in their impacts on Sonoran pronghorn (See also "Impacts on the Sonoran Pronghorn from Alternative A, the Existing Conditions Alternative," above). Once again, discussions are grouped under the major impact types identified above under "Affected Environment."

Loss or Modification of Habitat

Impacts would be the same as for Alternative A: Existing Conditions, with these exceptions:

- Some potential beneficial habitat impacts would accrue, if the NPS acquires 1,280 acres of State land. Half this acreage is an area known to be used by pronghorn; the other half provides suitable summer habitat, but lies east of Highway 85. Under NPS ownership these lands may be better preserved as pronghorn habitat.
- Some adverse impacts to habitat may result, if the Twin Peaks development area is expanded.

Curtailment of Habitat or Range

Impacts would be the same as for Alternative A: Existing Conditions, with these exceptions:

- Management of Highway 85 may either reduce or increase barrier effect on pronghorn movements

Disturbance or Harassment

Impacts would be the same as for Alternative A: Existing Conditions, with these exceptions:

- A change to national park status may result in increased visitation and human presence in pronghorn habitat, causing moderate to major, long-term, regional adverse disturbance impacts.
- Expansion of the Twin Peaks development area would result in increased size and scope of human presence, resulting in moderate, long-term, localized disturbance of pronghorn.
- Interpretive waysides along Highway 85 may result in increased visitor entries into the adjacent pronghorn habitat. A one-time occurrence of human activity in pronghorn habitat may cause minor to moderate, short-term, localized disturbance. Over the long term, repeated visits by humans may result in moderate to major disturbance.
- Relocating the powerline corridor may result in reducing use of this corridor by UDAs and smugglers, resulting in moderate, long-term, regional beneficial reductions in disturbance.
- Maintaining and/or adding hiking trails is likely to maintain or increase visitor presence in pronghorn habitat, resulting in long-term, moderate, adverse, regional disturbance impacts.
- Efforts to manage aircraft overflights may result in reductions in overflights of pronghorn habitat, and would then result in long-term, moderate, beneficial, regional reductions in disturbance.

Direct Mortality

Impacts would be the same as for Alternative A: Existing Conditions.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Impacts would be the same as for Alternative A: Existing Conditions.

Disease, Predation
Impacts would be the same as for Alternative A: Existing Conditions.

Other Natural or Manmade Factors Affecting Its Continued Existence
Impacts would be the same as for Alternative A: Existing Conditions.

Cumulative Impacts

The impacts of all other past, present, and reasonably foreseeable future actions, for the NPS and all other agencies and entities, are discussed and analyzed in Appendix C. Each individual action is briefly described, along with how each action may impact Sonoran pronghorn. The impacts of each action are then characterized using the terms (type, duration and intensity) described in the methodology presented above. The cumulative impacts of all those actions, when added to the impacts Alternative B, *The New Proposed Action* Alternative, are addressed here. In addition to the analyses presented in Appendices C and D, the following section summarizes the ways in which the cumulative impacts of Alternative B differ from the impacts of Alternative A, the *Existing Conditions* Alternative, in their impacts on Sonoran pronghorn (See "Impacts on the Sonoran Pronghorn from Alternative B: The New Preferred Action Alternative," and the "Cumulative Impacts" discussion for Alternative A, above). Once again, the discussion is grouped under the major impact types discussed above under "Affected Environment."

Loss or Modification of Habitat
Cumulative impacts would be the same as for Alternative A: Existing Conditions, with these exceptions:

- A potentially higher level of conservation and protection would be gained for 1,280 acres of State land, if they were acquired by the NPS. Half this acreage is an area known to be used by pronghorn; the other half provides suitable summer habitat, but lies east of Highway 85.

Curtailment of Habitat or Range
Cumulative impacts would be the essentially the same as for Alternative A: Existing Conditions.

Disturbance or Harassment
Cumulative impacts would be the same as for Alternative A: Existing Conditions, with these exceptions:

Adverse disturbance impacts would be increased due to:
- A change to national park status may result in increased visitation and human presence in pronghorn habitat, causing moderate to major, long-term, regional adverse disturbance impacts.
- Expansion of the Twin Peaks development area would result in increased size and scope of human presence, resulting in moderate, long-term, localized disturbance of pronghorn.
- Interpretive waysides along Highway 85 may result in increased visitor entries into the adjacent pronghorn habitat. A one-time occurrence of human activity in pronghorn habitat may cause minor to moderate, short-term, localized disturbance. Over the long term, repeated visits by humans may result in moderate to major disturbance.
- Maintaining and/or adding hiking trails is likely to maintain or increase visitor presence in pronghorn habitat, resulting in long-term, moderate, adverse, regional disturbance impacts.

Adverse disturbance impacts would be decreased due to:
- Relocating the powerline corridor may result in reducing use of this corridor by UDAs and smugglers, resulting in moderate, long-term, beneficial regional reductions in disturbance.
- Efforts to manage aircraft overflights may result in reductions in overflights of pronghorn habitat, and would then result in long-term, moderate, beneficial, regional reductions in disturbance.

Direct Mortality
Cumulative impacts would be the same as for Alternative A: Existing Conditions.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes
Cumulative impacts would be the same as for Alternative A: Existing Conditions.

Disease or Predation
Cumulative impacts would be the same as for Alternative A: Existing Conditions.

Other Natural or Manmade Factors Affecting Its Continued Existence
Cumulative impacts would be the same as for Alternative A: Existing Conditions.

Conclusion

Concluding remarks regarding cumulative impacts would be the same as for Alternative A: Existing Conditions.

Findings on impairment

The findings on impairment under this alternative would be the same as for Alternative A: Existing Conditions

CONSULTATION/COORDINATION

History of Public Involvement

On February 27, 2001, agencies involved in the lawsuit met at the U.S. Fish and Wildlife Service office in Phoenix to discuss compilation of environmental baseline data for the Sonoran pronghorn. Agencies attending were: USFWS, Bureau of Land Management, Arizona National Guard, National Park Service, U.S. Marine Corps, U.S. Air Force, and a GIS contractor to the U.S. Air Force. Discussions involved the results of the litigation, action area, data needs, use of GIS to compile the data needs, and a review of existing environmental baseline information. On March 29, 2001 another meeting of agencies involved in performing environmental analyses remanded by the Court met at the Gila Bend Air Force Auxiliary Field in Gila Bend, Arizona. This meeting was organized by the U.S. Marine Corps, to coordinate the USMC's supplemental EIS with cooperating and other affected agencies. Discussions included the proposed schedule for the USMC SEIS, the study area, and projects to be considered in cumulative impacts. Attendees included the USMC, USFA, BLM, USFWS, NPS, Arizona Game and Fish Department, and the consulting firm URS.

The Notice of Intent (NOI) to prepare an environmental impact statement was published in the Federal Register on April 26, 2001. The NOI informed the public of a 30-comment period regarding preparation of this supplement. Concurrently, the NPS sent out 454 scoping letters to federal agencies, and affected or interested organizations and individuals informing them of the process, explaining the issues, and inviting them to offer any comments on either. Fourteen letters were received on or before May 25, 2001, the day the comment period closed. Twelve letters offered comments on past, present, and future actions, while two letters contained addresses which to mail future correspondence.

The comment letters focused mainly on present or ongoing actions that are believe to affect Sonoran pronghorn, including increasing use on State Route 85 and the 1997 speed limit increase (from 55 mph to 65 mph); cattle grazing on adjacent BLM lands; the increase/presence of undocumented aliens using the monument; Border Patrol impacts resulting from control of illegal border activities; adjacent military activities/practices; and increasing visitation, particularly in the backcountry. Additional comments include concerns over potential conservation actions that may impact commerce between Mexico and the United States; daily, on-going activities in Mexico that may have impacts on Sonoran pronghorn habitat; and suggestions on alternative Sonoran pronghorn management techniques. These concerns have been evaluated in Appendices B-D and the results have been included in the cumulative effects analysis and conclusions sections of this document.

The draft supplemental EIS was released to the public for review through a Notice of Availability (NOA)published in the Federal Register on July 27, 2001. The draft was sent to 263 affected agencies and interested individuals The 45-day public review period on the draft was extended to 60 days, ending on September 28, 2001. Eight comment letters were received from the public. These letters and NPS responses are included in Appendix E of this final supplement.

Preparers

Organ Pipe Cactus National Monument
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- Bill Mikus, Chief of Maintenance
- Timothy Tibbitts, Wildlife Biologist
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Intermountain Support Office, Denver CO
- Laurie Domler, NEPA/106 Specialist
- Chris Turk, Regional Environmental Coordinator

List of Recipients – Draft and Final Supplement

Federal Agencies (U.S.)
- BIA- Papago Indian Agency
- Bureau of Land Management
- Coronado National Memorial
- Luke Air Force Base
- National Park Service Denver Service Center
- ational Park Service Western Archeological & Conservation Center
- National Park Service Southern Arizona Group Office
- Saguaro National Park
- U.S. Border Patrol
- U.S. Congressional Delegation for Arizona
- Sen. John Kyl
- Sen. John McCain
  - Rep. J.D. Hayworth
  - Rep. Jim Kolbe
  - Rep. Ed Pastor
  - Rep. Robert Stump
- U.S. Customs Service
- U.S. Department of Justice
- U.S. Environmental Protection Agency, Region IX
- U.S. Fish and Wildlife Service
- U. S. State Department--United States/Mexico Border Affairs

Mexican Agencies
- Alto Golfo Biosphere Reserve
- El Pinacate y Gran Desierto Biosphere Reserve
- El Vizcaino Biosphere Reserve
- Secretaria de Agricultura y Recursos Hidraulicos
- Secretaria de Fomento Alturismo
- Secretaria de Desarrollo Economico y Productividad

The Hopi Nation

The Tohono O'odham Nation
- Chairman
- Department of Disease Control
- Executive Branch
- Health Department
- Hia-Ced Program
- O'odham in Mexico Office
- Water Resources Department
- Cultural Preservation Committee
- District Governments
  - Chairperson, Baboquivari District
  - Chairperson, Chukut Kuk District
  - Vice Chairman, Chukut Kuk District
  - Chairman, Gu Achi District
  - Vice Chairman, Gu Achi District
  - Chairman, Gu Vo District
  - Chairman, Hickiwan District
  - Vice Chairwoman, Hickiwan District
  - Chairwoman, Pisinemo District
  - Vice Chairwoman, Pisinemo District
  - Chairwoman, San Lucy District
  - Vice Chairman, San Lucy District
  - Chairman, San Xavier District
  - Chairperson, Schuk Toak District
  - Vice Chairwoman, Schuk Toak District
  - Chairman, Sells District
  - Vice Chairman, Sells District
  - Chairwoman, Sif Oidak District
- Tohono O'odham Legislative Branch
  - Baboquivari District
  - Chukut Kuk District
  - Gu Achi District
  - Go Vo District
  - Hickiwan District
  - Pisinemo District
  - San Lucy District
  - San Xavier District
  - Schuk Toak District
  - Sells District
  - Sif Oidak District

State and Local Agencies
- Arizona Governor Jane Hull
- Arizona Department of Tourism
- Arizona Department of Agriculture
- Arizona Department of Environmental Quality
- Arizona Department of Transportation
- Arizona Department of Transportation
- Arizona Game and Fish Department
- Arizona Game and Fish Department
- Arizona Department of Commerce
- Arizona State Clearinghouse
- Arizona State Land Department
- Arizona State Museum
- AZ State Representative Elaine Richardson
- Commission on Arizona Environment (State)
- Pima County Parks and Recreation
- Pima County Community Services Department
- Pima County Economic Development Administrator
- Pima Association of Governments
- Pima County Board of Supervisors
- Tucson Public Library, Ajo Branch

Western Pima County Coordinating Committee
Yuma County Chamber of Commerce

Organizations

Ajo District Chamber of Commerce
Arizona Public Service Company, West Valley District
Arizona-Mexico Border Health Foundation
Arizona-Sonora Desert Museum
Audubon Society, Tucson Chapter
Border Research Institute
Center for Biological Diversity
Colorado State University Library
Dames & Moore Environmental Consultants
Defenders of Wildlife
Intercultural Center for the Study of Deserts & Oceans (CEDO)
Kaibab Forest Products Company
Land and Water Fund of the Rockies
La Ruta de Sonora
National Parks and Conservation Association
Pima Trails Association
Pronatura
Sierra Club, Tucson and Grand Canyon Chapters
Sonoran Arthropod Studies Institute
Southwest Natural Resource Management Consultants
Southwest Parks & Monuments Association
The Arizona Nature Conservancy
The Lukeville Economic & Environment Association
The Sonoran Institute
The Wilderness Society
The Wildlife Society, Arizona Chapter
United Nations Man & the Biosphere Program
Why Utility Company

Newspapers (including press releases)

Ajo Copper News
Rocky Point Times
The Arizona Republic
The Tucson Citizen
The Tucson Weekly
The Yuma Territorial
The Sun (Flagstaff)

Individuals

The draft supplement was sent to 263 affected agencies and/or interested individuals. The final supplement was sent to 269 agencies and individuals. A complete listing of these names is available from the Superintendent, Organ Pipe Cactus National Monument, 10 Organ Pipe Drive, Ajo, AZ 85321.

Appendix A. Organ Pipe Cactus National Monument Biological Assessment and Final Opinion May, 1995.

The following biological assessment appears as it was sent to the U.S. Fish and Wildlife Service as part of formal consultation regarding the potential affects of the proposed plan on endangered species in the monument. Also, the Final Opinion of the Fish and Wildlife Service is printed.

BIOLOGICAL ASSESSMENT

Effects of the Organ Pipe Cactus National Monument General Management Plan
on Threatened and Endangered Species

INTRODUCTION

The National Park Service (NPS) has recently prepared a Draft General Management Plan/Development Concept Plans/Environmental Impact Statement (May, 1995), and a Supplement to the Draft General Management Plan/Development Concept Plans/Environmental Impact Statement (April 1996) for Organ Pipe Cactus National Monument, Pima County, Arizona. The purpose of a general management plan is to guide future management of a park or other NPS unit for the next 10-15 years. Actions proposed in the plan are general in nature and present a program for comprehensive management of resources and visitor use.

The programmatic nature of many proposals contained in general management plans makes it difficult to quantify actions or environmental impacts. Consequently, before implementing some actions, more detailed plans would be prepared, and the specific consequences of the projects analyzed in compliance with the National Environmental Policy Act and other federal laws and regulations. Additional planning and analysis may also determine the need for further Section 7 consultation for some threatened and endangered species.

Some of the actions proposed in the General Management Plan (hereafter referred to as the GMP) include:

working with the Arizona Department of Transportation to ensure continued travel and commerce while enhancing resource protection along the State Route 85 corridor within the monument
seeking redesignation of the monument to Sonoran Desert National Park
establishing partnerships with federal agencies and private organizations to share facilities, staff, and costs in the Why and Lukeville areas
proposing an increase in designated wilderness and development of an interagency (National Park Service, Bureau of Land Management, and Fish and Wildlife Service) regional wilderness and backcountry management plan to coordinate and enhance protection of wilderness-related values
re-aligning the trail network in the Quitobaquito Springs area
retaining existing development in the Twin Peaks area with some additions and change in the use of some buildings
increasing the amount of primitive camping and designated trails in the monument
full implementation of the monument's Natural and Cultural Resources Management Plan

Section 7 of the Endangered Species Act, as amended, prohibits federal agencies such as the NPS from implementing any action that is likely to jeopardize the continued existence of a federally protected (i.e., endangered, threatened) species. Furthermore, the act requires that the NPS consult with the Fish and Wildlife Service (FWS) on any action it authorizes, funds, or executes that could potentially affect a protected species or its designated critical habitat. To help meet its responsibilities under the Act, this biological assessment evaluates the effects of the GMP on listed and proposed species known to occur within the boundaries of Organ Pipe Cactus National Monument.

Based on information received from the FWS's Arizona Ecological Services State Office (FWS reference: AESO/SE 2-21-89-I-078; dated March 29, 1995), and verified by the NPS, the following listed species, all endangered, are known to occur within the monument and are addressed in this biological assessment: lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), Sonoran pronghorn (*Antilocapra americana sonoriensis*), and desert pupfish (*Cyprinodon macularis*). Also known to occur within the monument is the cactus ferruginous pygmy-owl (*Glaucidium brasilianum cactorum*), which is proposed for listing as endangered. Proposed critical habitat for this owl has been identified in the vicinity of Alamo Canyon.

The NPS has determined that actions proposed in the GMP would have no effect on the American peregrine falcon (*Falco peregrinus anatum*) or brown pelican (*Pelecanus occidentalis*), both of which are endangered and known to occur within the monument. The brown pelican is a very rare visitor with only four reported sightings, the last of which occurred in July 1972 at Quitobaquito Pond (Groschupf et al. 1988). The peregrine falcon is a rare transient with no confirmed breeding accounts, although breeding habitat exists in remote backcountry areas of the monument. None of the actions proposed in the GMP would result in long-term effects on habitat or prey for either species.

LESSER LONG-NOSED BAT

The lesser-long nosed bat is a seasonal resident in the monument, occurring between April and September. In 1989, the largest known maternity colony in the U.S., consisting of approximately 20,000 bats, was discovered roosting in an abandoned mine adit (Copper Mountain Mine) near Alamo Canyon. Through coordination with the FWS, the NPS has instituted an annual monitoring program to obtain data on the colony including its size, productivity, diet, and habitat requirements.

Proposed Actions That May Affect the Lesser Long-Nosed Bat

Three actions proposed in the GMP have the potential to increase visitor use in the Alamo Canyon area and could possibly lead to human disturbance at the nearby maternity roost. These actions include:

· expanding the campground by four sites
· establishing a formal day-use parking area
· formalizing an existing social trail (an old road scar) into a designated trail

Visitor surveys and demand for camping at the Alamo Canyon Wash campground show increasing interest in a primitive camping experience, accessible by vehicle. During the heavy use period (late October through mid-April), this campground is almost always full. The existing campground currently contains four campsites, a composting/vault toilet, and a large parking area. Each campsite has a maximum user capacity of four persons per site, for a total campground capacity of 20 campers. To help accommodate visitor demand, the GMP proposes to expand this campground. A cluster of four campsites would be added, each containing a parking space (approximately 12' x 22'), picnic table (standard 6' in length), and cleared area for a tent (approximately 20' x 20'). No water would be provided. Depending on the distance to the existing campground, one composting or portable vault toilet would be installed in the area of the new campsites. The sites would be located within the non-wilderness road corridor (150 feet from either side of road centerline), in previously disturbed areas, to the extent possible, and somewhat separated from other sites to offer a sense of privacy. Approximately 0.1 acre of vegetation could be impacted by campground expansion.

Currently, a compacted area (roughly 3,500 square feet in size), encircled by large rocks, is located at the end of the access road and serves as a day-use parking and vehicle turn-around area. The GMP proposes to better delineate this parking area while restricting ground disturbance to the roadbed. To further manage visitor use, the existing social trail that follows an old road scar along the wash would be formalized into a designated hiking trail, about 2.25 miles in length. Because the parking area and trail would be constructed on previously disturbed ground, there would be no additional vegetation removed.

Analysis

The highly gregarious roosting behavior of the lesser long-nosed bat makes it vulnerable to catastrophic population loss caused by human disturbance (FWS 1993*a*). Such disturbance could have a potentially adverse affect on the species' survival if it resulted in abandonment of a major roost or a decline in juvenile survivorship or recruitment. The proximity of the maternity roost to Alamo Canyon campground, located 2.25 miles away, coupled with the fact that features such as mine adits are attractive destinations for hikers, increases the potential for human disturbance at the roost site.

Previous indications are that little, if any visitation presently occurs at the maternity roost, particularly at the time of year when bats are roosting. Moreover, the nondescript nature and hazardous appearance of the adit discourages all but the most determined hikers from visiting the site. (The entrance to the adit is fenced with four-strand barbed wire and signed in both Spanish and English as a dangerous site.) Although campground expansion and trail development are likely to lead to increased visitation and prolonged visitor stays in Alamo Canyon, these actions are not expected to result in disturbance to the nearby maternity colony of lesser long-nosed bats.

As outlined in the draft recovery plan for the lesser long-nosed bat (FWS 1993*a*), recovery actions should stress protection of known roosts, determination of foraging and mating behavior, population monitoring, and public education. The NPS is assisting in recovery efforts through ongoing monitoring of the maternity roost, protecting all potential roost sites and food plants within the monument, and educating visitors about the ecological importance of bats.

Reasonable and Prudent Measures Proposed

To ensure that management actions such as campground expansion do not result in adverse effects on the lesser long-nosed bat, the NPS would continue to monitor human disturbance at the roost. If monitoring reveals that human activity has become a problem at the site, the NPS would reconsider the appropriateness of campground expansion as well as the need for visitor use restrictions in the Alamo Canyon area.

Determination of Effect

Increased visitor use of the Alamo Canyon area resulting from campground expansion and trail development is expected to have no effect on the nearby maternity colony of lesser long-nosed bats for the following reasons: (1) visitation to the monument and use of Alamo Canyon is relatively low during the time of year that bats are roosting; and (2) the remote location and nondescript nature of the adit would discourage all but the most determined hikers from visiting the roost. Moreover, continuation of the annual monitoring program would aid in recovery efforts for this species.

SONORAN PRONGHORN

Organ Pipe Cactus National Monument is within the historic range of the Sonoran pronghorn. Prior to a recent verified sighting of two pronghorns just west of State Route 85 near the Alamo Canyon road in mid-August 1995 (Organ Pipe Cactus Natl. Mon., unpublished data), the last verified observation of a pronghorn near this highway was a carcass found on Ajo Mountain Drive in 1972. (There is an unconfirmed report of four Sonoran pronghorn crossing State Route 85 in August 1993, approximately 1.5 km north of the monument visitor center.) Although observations along State Route 85 have been limited in past decades, pronghorns were supposedly not uncommon along the highway and throughout the Sonoyta Valley as recently as the 1960s (H. Coss, pers. comm.). Long-time Ajo residents reported seeing more Sonoran pronghorn along the highway near Ajo and south in the Valley of the Ajo in previous decades (FWS 1994).

Proposed Actions That May Affect the Sonoran Pronghorn

There are no actions proposed in the GMP that would directly affect the Sonoran pronghorn. All proposed facilities would be located within areas of existing development (e.g. Twin Peaks, Lukeville, and Quitobaquito Springs) and would involve relatively small tracts of land surrounded by larger areas of undisturbed habitat. Consequently, there would be no significant loss of pronghorn habitat, nor would new construction significantly modify pronghorn behavior or habitat use.

However, increased visitor use may lead to indirect effects on the Sonoran pronghorn. Increased use of some front- and backcountry areas has the potential to adversely affect pronghorn if it causes an alteration in behavior and habitat use. Increased visitation to the monument is also expected to result in increased traffic along State Route 85, adding to the barrier effect that existing traffic patterns already present to pronghorn movements.

Approximately 22 miles of State Route 85 lie within the monument. The Arizona Department of Transportation (ADOT) maintains the road and shoulders within the monument under an 1941 Cooperative Areement with the State and Pima County that applies to an area extending 33 feet from each side of the road centerline. ADOT is also responsible for establishing the speed limit and performing road improvements along the highway. Under a separate agreement, the State of Arizona Department of Public Safety and the NPS share responsibility for patrolling the road and enforcing the posted speed limit of 55 mph within the monument.

The international port-of-entry at Lukeville is open from 6:00 a.m. until midnight each day. Average daily traffic on the road fluctuates, but has generally increased in recent years. In 1992, ADOT reported average daily traffic counts of 940 vehicles on the section of State Route 85 within the monument; in 1993 average daily traffic along this same section of highway fell to 728 vehicles, and in 1994, rose to 964 vehicles. Less than 25% of this traffic is attributed to monument visitors (Organ Pipe Cactus Natl. Mon., unpublished data).

Reasons for the increase in traffic are due to increased tourism in the region, including the Puerto Peñasco area in northern Sonora, Mexico; the North American Free Trade Agreement (NAFTA); and increased visitation to the monument. Actions proposed in the GMP that could further increase visitation and use of State Route 85 involve expanded visitor services and recreational opportunities including an increase in the number of trails (approximately 9 additional miles) and primitive camping opportunities (4 sites at Alamo Canyon campground and approximately 20 walk-in sites in the Twin Peaks area), as well as additional facilities offering interpretation and information to visitors particularly in the Why and Lukeville areas. Redesignation of the monument to national park status is expected to cause a temporary surge in visitation. However, it is unknown if the increase would be long-term.

Analysis

Observations of pronghorn movements suggest that traffic along State Route 85 acts as a barrier to pronghorn, restricting their movements to areas west of the highway (see attachment depicting regional pronghorn locations). Not only is the highway a deterrent to expanding pronghorn populations, but the resulting modified behavior patterns may lead to a reduction in genetic exchange, reduced viability, and the ability to adapt to environmental change. Mexico's Highway 2, located a short distance from the monument's southern boundary, as well as Interstate-8 to the north, present similar impediments to desert pronghorn (Ockenfels et al. 1996).

The NPS has examined the effectiveness of various mitigation strategies at reducing the barrier that State Route 85 currently presents to pronghorn. Eleven methods traditionally used to decrease wildlife-vehicle accidents and facilitate safe passage across highways were examined. These methods included driver education, speed and traffic volume reductions, vegetation removal along road shoulders, construction of underpasses and overpasses, and the use of fencing, lighting, warning signs, reflectors, and ultrasonic devices. Although past research has generally been limited to cervids, it is assumed that the behavioral response to such measures is probably similar among all ungulates (D. Reed, pers. comm.).

Several methods were dismissed from further consideration due to their impracticality (e.g., installation of ultrasonic devices on vehicles), or because of their incompatibility with the monument's wilderness values (e.g., highway lighting would be a source of light pollution and degrade night sky visibility; overpasses would provide a visual intrusion that would be conspicuous from many miles away [they would have to be at least 4.25 meters high to allow commercial trucks to pass safely beneath]). Other measures were dropped from consideration due to public controversy and because they were beyond the NPS's control (e.g., speed limit reductions; reducing traffic volume by rerouting non-monument traffic outside the park). Because fenced highways have been shown to fragment pronghorn habitat and isolate herds (Ockenfels et al. 1996), this technique was also dismissed from further study. Of the methods being considered for implementation (driver education, construction of underpasses, vegetation removal along road shoulders, use of warning signs and reflectors), a discussion of the effectiveness of each technique is provided below. This analysis is based largely on a review of the literature as well as discussions with biologists knowledgeable in the use of these techniques.

Driver Education

Del Frate and Spraker (1991) reported that a public awareness program on the Kenai Peninsula in Alaska increased motorists' understanding of the potential hazards of encountering moose on Peninsula roads. However, it is uncertain whether this measure was directly responsible for a reduction in roadkills. Reed (1985) hypothesizes that even with intensive driver education, the reduction of cervid-vehicle accidents under real conditions would be minimal since the demands of driving under nighttime conditions typically exceed the motorist's visual alertness and physical capabilities.

Construction of Underpasses

Wildlife underpasses have been shown to be effective at facilitating safe passage of cervids across highways, when designed and constructed with adequate openness. Reed (1985) referred to the primary stimulus of a given underpass to approaching cervids as the "openness effect", calculated as: height x width (or open-end surface area)/length. The greater the "openness effect", the greater the potential for use of a particular underpass.

Conversely, the confining characteristics of relatively long and narrow underpasses may prevent some animals from using these structures. Although underpasses would be most effective along State Route 85 in areas of known wildlife use, such as xeroriparian corridors, some pronghorn may have difficulty locating or simply refuse to enter underpasses. Moreover, any gains experienced by ensuring safe passage across the highway could be offset by a potential increase in predator-related mortality. Such structures could serve as a predator trap, allowing mountain lions and coyotes to sucessfully ambush pronghorn at underpass openings.

Vegetation Removal along Road Shoulders

Since removing vegetation along the shoulders of State Route 85 would result in a slight widening of the road corridor, it may also increase the barrier that the highway presents to pronghorn. Although limited research has been conducted on the effects of vegetation removal at reducing cervid-vehicle accidents, Pojar (1971) reported that clearing roadside vegetation did not significantly reduce the number of accidents despite increased motorist visibility and reduced cover for deer.

Use of Warning Signs

Of the five studies cited by Reed (1985), motorists' responses to warning signs were insufficient to affect the frequency of cervid-vehicle accidents along roadways. Although Mansfield and Miller (1975) reported that 76- by 76-cm symbol type warning signs reduced deer-vehicle accidents in 11 of 19 study areas in California, only 2 of these areas revealed a significant difference in accident numbers. Nor were lighted, animated deer crossing signs effective at significantly reducing deer-vehicle accidents in Colorado (Pojar et al. 1975). Similarly, game crossing signs were shown to have little or no effect on vehicle speeds in

Sweden (Edholm and Kolsrud 1960, Aberg 1981) despite being noticed by 60 percent of passing motorists (Johansson and Backlund 1970).

Use of Reflectors

Reed (1985) reports limited research on the effectiveness of wildlife reflectors at reducing cervid-vehicle accidents. Gordon (1969) and Almkvist et al. (1980) indicated that stainless steel mirrors were ineffective at reducing accidents. Studies of Swareflex reflectors revealed conflicting results with some studies citing their effectiveness (Morris, pers. comm. [cited in Reed 1985], Schafer and Penland 1985), while others note their ineffectiveness (Woodard et al. 1973, Ossinger and Schafer 1992) at reducing cervid-vehicle accidents. Moreover, Zacks (1986) found that white-tailed deer (*Odocoileus virginianus*) did not evade or overtly respond to red light, the basic premise underlying the use of Swareflex reflectors.

Conclusion. Despite efforts to educate motorists, enforce the existing speed limit, and create underpasses to facilitate safe passage across State Route 85, such measures may do little in alleviating the barrier that existing and future traffic patterns will present to Sonoran pronghorn. Pronghorn may still avoid the highway corridor due to the visual and noise disturbance associated with the heavy volume of traffic travelling at high speeds. Elevated heart rates have been correlated with auditory or visual disturbance among pronghorn (Thompson et al. 1968, Cherkovich and Tatoyan 1973, Moen et al. 1978 [cited in FWS 1994]). Hughes and Smith (1990) reported flight distances of 400-500 meters in response to an approaching vehicle. A continued increase in traffic levels along this highway due in part, to an anticipated increase in monument visitation, may adversely affect the Sonoran pronghorn by continuing to restrict pronghorn movements, which could lead to a reduction in genetic exchange and reduced viability, potentially eliminating populations from this portion of their range.

Reasonable and Prudent Measures Proposed

Most of the mitigation techniques studied to date have focused on reducing cervid-vehicle accidents, and not on alleviating the barrier that roadways may present to wildlife, particularly ungulates. To better facilitate pronghorn movements across highways and railroad rights-of-way, Ockenfels et al. (1996) recommend the following mitigation measures: (1) eliminate fences from known movement corridors; (2) move fences farther away from rights-of-way; (3) construct expansive underpasses or overpasses over rights-of-way; and (4) relocate rights-of-way out of pronghorn habitat. They also suggest that if none of these measures prove effective, translocating pronghorn may be the only solution to maintaining gene flow and supplementing numbers in isolated herds.

Because ADOT is responsible for all road improvements and maintenance along State Route 85, any mitigation practices undertaken within their perpetual easement (33 feet from either side of the road centerline) must be done with full approval of that agency. Consequently, methods suggested in this document are those that the NPS would like to see implemented along the road corridor, subject to the state's approval. To help promote cooperative efforts, the NPS would pursue an agreement between the two agencies to (1) establish a vehicle for continued communication regarding road-related issues; (2) construct underpasses at known movement corridors to facilitate safe passage of pronghorn across the highway; and (3) establish a program to explore other measures to better understand and subsequently reduce the impacts of State Route 85 on pronghorn. In the meantime, the NPS would continue working with the Arizona Department of Public Safety to enforce the existing speed limit within the monument.

Of the mitigation techniques evaluated, construction of underpasses at known movement corridors along the highway shows the greatest promise at reducing the barrier that State Route 85 presents to pronghorn. The NPS would work with the FWS, including biologists from the Cabeza Prieta National Wildlife Refuge, as well as personnel from the Arizona Department of Transportation, to determine the feasibility, best location(s), and optimum design for underpasses. (One potential location for an underpass is near miles 65-67, in an area dominated by chainfruit cholla [*Opuntia fulgida*]; habitat that

appears to be particularly important to pronghorn during periods of limited water availability [L. Thompson-Olais, pers. comm.]).

To help reduce the barrier that fences present to pronghorn, the top strand of barbed wire on the monument's northern boundary fence would be replaced with smooth wire (the bottom strand has already been replaced) to facilitate pronghorn movements between the monument and Cabeza Prieta National Wildlife Refuge. Similar modifications would be made to the monument's southern boundary fence to encourage pronghorn movements between the monument and Mexico.

An effort also would be made to educate motorists about the plight of pronghorn using a variety of interpretive media. Some of the techniques to be employed include the use of signs and wayside exhibits particularly at the north and south entrances to the monument and along the highway corridor. It is hoped that these efforts would elicit lower speeds and increased awareness among motorists. Although such actions may do little in alleviating the barrier that the roadway currently presents to pronghorn, it may provide a greater benefit to monument fauna by reducing wildlife-vehicle accidents along the road corridor.

Key components of the recently revised draft recovery plan for the Sonoran pronghorn include monitoring the present U.S. population, assisting with monitoring in Mexico, protecting and managing known habitat, and continuing research efforts to provide a better understanding of the subspecies (FWS 1994). The NPS will assist in Sonoran pronghorn recovery by continuing to serve as a member of the interagency Core Working Group. As called for in the monument's Natural and Cultural Resources Management Plan (NPS 1994), the NPS will implement activities outlined in the recovery plan, under the lead of the FWS, including development of a monitoring program. Furthermore, to reduce the potential for adverse impacts on pronghorn resulting from increased visitor use in front- and backcountry areas of the monument, the NPS would monitor visitor use and restrict access where necessary to minimize the potential for disturbance to pronghorn.

Determination of Effect

Since there would be no substantive changes to traffic levels or patterns along State Route 85, existing and future road conditions would continue to act as a barrier, restricting pronghorn movements to areas west of the highway. Such actions may adversely affect Sonoran pronghorn if it leads to a reduction in genetic exchange and reduced viability, potentially eliminating populations from this portion of their range.

However, to help reduce the impact of State Route 85 on pronghorn, the NPS proposes to:

pursue an agreement between the NPS and ADOT to (1) establish a vehicle for continued communication regarding road-related issues; (2) construct underpasses at known movement corridors to facilitate safe passage of pronghorn across the highway; and (3) establish a program to explore other measures to better understand and subsequently reduce the impacts of State Route 85 on pronghorn
continue working with the Arizona Department of Public Safety to enforce the existing speed limit within the monument
convert the top and bottom strands of the monument's north and south boundary fences to smooth wire to encourage pronghorn movements between the monument and Cabeza Prieta National Wildlife Refuge to the north, and Mexico to the south
educate motorists about the plight of pronghorn using a variety of interpretive media in an effort to elicit lower speeds and increased awareness of wildlife use of the highway corridor
continue to serve as a member of the interagency Core Working Group for Sonoran pronghorn recovery and implement activities outlined in the recovery plan, including development of a monitoring program
monitor visitor use and restrict access where necessary to minimize the potential for disturbance to pronghorn

QUITOBAQUITO DESERT PUPFISH

The Quitobaquito desert pupfish, endemic to the spring outflows and pond at Quitobaquito, is the only fish known to occur within the monument. Anthropogenic impacts (e.g., water pollution, introduction of non-native fish) and stochastic events (e.g., environmental perturbations) pose a potential threat to the subspecies' survival. Since 1975, a monitoring program has been conducted annually to assess the population's status. Population estimates have ranged from a high of 7,294 individuals in 1975, to a low of 1,800 in 1981, with intervening years reporting a population size of 3,000-6,700 individuals. A census conducted in 1993 reported 2,305 and 4,299 fish in the pond during the spring and fall censuses, respectively. More recently, 6,644 pupfish were reported during a 1995 census.

Observations made during the biannual census indicate that the population is in good condition with a healthy distribution of age and size classes. No non-native fish were discovered in either the pond or channel. However, a 10-inch black bullhead (*Ictalurus melas*) was caught and removed from the southwest spring during a census for the Sonoran mud turtle (*Kinosternon sonoriense*) on August 1, 1993. (It is unknown whether this fish represents an isolated introduction or is part of a larger population released into the Quitobaquito system.) Trapping for non-native fish is ongoing and continues at approximately 10-week intervals.

Because population counts appear to typically underestimate the actual number of fish present, the monitoring protocol requires a review and possible modification to ensure validity and usefulness of the data. The monument's Natural and Cultural Resources Management Plan (NPS 1994) recognizes this deficiency and calls for the implementation of an expanded Quitobaquito desert pupfish monitoring program.

Proposed Actions That May Affect the Quitobaquito Desert Pupfish

To enhance visitor experience and resource protection, the GMP proposes several actions that would alter visitor use patterns in the Quitobaquito area. These actions focus on relocating visitor facilities and establishing day-use standards and user capacities to be developed as part of an inter-agency wilderness management plan.

A new parking lot would be placed in a previously disturbed area at the current intersection of Puerto Blanco Drive and the Quitobaquito road (refer to the site plan on page S-49 of the GMP Supplement). An orientation sign, interpretive information, a composting or vault toilet, and picnic tables shaded by a simple ramada, would be provided near the parking area. (Moving the parking lot and other facilities is expected to decrease the incidence of vehicle break-ins and theft in the area.)

A well-defined trail network would be established along existing roads and disturbed areas. This relatively easy, approximately one-mile loop trail would be made accessible to visitors with disabilities. The new trail would begin at the proposed parking area and travel along what is now the road. Approximately 0.5-mile down the trail, a new trail segment would be added that leads to the springs and on to the historic pond. A small portion of the trail network would be established near the pond to offer views of the pond and good birding opportunities. From the pond, the trail would loop back along the former parking lot and road, returning to the trailhead.

Once funding is secured, a multi-agency task force would be established to determine the exact location of proposed facilities and trails, and to develop detailed design drawings for the site. At a minimum, the task force would include representatives of the Tohono O'odham Nation, the FWS, the State Historic Preservation Office, and the NPS. Team members would represent various disciplines including archeology, anthropology, landscape architecture, and wildlife biology.

Analysis

Establishment of a well-designed and maintained trail system would have a long-term beneficial affect on the Quitobaquito desert pupfish and its designated critical habitat. By encouraging visitors to remain on established trails, there would be a reduction and possibly an elimination of vegetation trampling along the pond's littoral zone. This highly productive zone, dominated by stands of bulrush and submerged aquatic vegetation, is rich in invertebrates and provides protective cover, along with important foraging, spawning, and resting areas for desert pupfish.

To further minimize the potential for impacts on the pupfish population or its critical habitat, visitor use would be closely regulated through development of a visitor carrying capacity for the area. Although the pupfish population would remain vulnerable to stochastic events, visitor use restrictions would help reduce the risk from anthropogenic impacts.

The NPS would continue to aid pupfish recovery efforts by implementing actions contained in the desert pupfish recovery plan (FWS 1993*b*). Some of the specific actions to be accomplished include an expansion of the current monitoring program to assess population status, detect trends, and evaluate the success of pupfish recovery. The NPS would continue to conduct habitat assessments and population estimates under site-specific protocols mutually established by the NPS and FWS, and assist with the collection of life history information to help determine factors affecting population persistence. In addition, the NPS would further its efforts to educate the public about the plight of the Quitobaquito desert pupfish through a variety of interpretive media (e.g., wayside exhibits, brochures, guided walks). The NPS would work closely with the FWS on the above actions.

Reasonable and Prudent Measures Proposed

The NPS would continue to monitor the effects of visitor use on desert pupfish habitat. Use of the Quitobaquito area would be closely regulated through establishment of a visitor carrying capacity which would be based primarily on the area's ability to withstand visitor use while ensuring resource protection. Activities determined to have an adverse impact on pupfish habitat would be further restricted or possibly eliminated.

Determination of Effect

Establishment of a well-defined and maintained trail system, as well as visitor use restrictions would have a beneficial affect on the Quitobaquito desert pupfish and its critical habitat by minimizing vegetation trampling along the pond's littoral zone. By restricting visitor access in the Quitobaquito area, the risk from anthropogenic impacts also would be reduced. The NPS would continue to aid pupfish recovery efforts by implementing actions contained in the desert pupfish recovery plan.

CACTUS FERRUGINOUS PYGMY-OWL

The cactus ferruginous pygmy-owl is an uncommon permanent resident that occurs in washes and saguaro stands. The most recent verified sighting of a pygmy-owl within the monument has occurred this spring in the employee housing area at Twin Peaks. Prior to this sighting, the last recorded observation was in 1995 on the Ajo Mountains bajada (T. Tibbitts, pers. comm.). The cause for the ferruginous pygmy-owl's decline within the monument and throughout the northern part of its range is unknown. However, the ongoing destruction of riparian habitat across the region may partially explain the reasons behind the decline.

Critical habitat for the cactus ferruginous pygmy-owl has been proposed from the well in Alamo Canyon (T16S, R4W, unsurveyed Section 6) downstream to the point where Growler Wash intersects the Bates Well Road. The boundaries encompass the current active channel, in addition to secondary, side, and overflow channels extending up to 100 meters laterally of the 100-year floodplain. Despite nearly annual

reports, a confirmed sighting of this owl has not occurred in the vicinity of the Alamo Canyon campground for nearly 10 years. However, the nearby wash has been proposed as critical habitat since it possesses suitable habitat characteristics and has the potential to support nesting owls.

Proposed Actions That May Affect the Cactus Ferruginous Pygmy-Owl

Three actions proposed in the GMP have the potential to increase visitor use or alter vegetation in the Alamo Canyon area which could affect the cactus ferruginous pygmy-owl or its proposed critical habitat. These actions are the same as those described for the lesser long-nosed bat and include:

· expanding the campground by four sites
· establishing a formal day-use parking area
· formalizing an existing social trail (an old road scar) into a designated trail

Visitor surveys and demand for camping at the Alamo Canyon Wash campground show increasing interest in a primitive camping experience, accessible by vehicle. During the heavy use period (late October through mid-April), this campground is almost always full. The existing campground currently contains four campsites, a composting/vault toilet, and a large parking area. Each campsite has a maximum user capacity of four persons per site, for a total campground capacity of 20 campers. To help accommodate visitor demand, the GMP proposes to expand this campground. A cluster of four campsites would be added, each containing a parking space (approximately 12' x 22'), picnic table (standard 6' in length), and cleared area for a tent (approximately 20' x 20'). No water would be provided. Depending on the distance to the existing campground, one composting or portable vault toilet would be installed in the area of the new campsites. The sites would be located within the non-wilderness road corridor (150 feet from either side of road centerline), in previously disturbed areas, to the extent possible, and somewhat separated from other sites to offer a sense of privacy. Approximately 0.1 acre of vegetation could be impacted by campground expansion.

Currently, a compacted area (roughly 3,500 square feet in size), encircled by large rocks, is located at the end of the access road and serves as a day-use parking and vehicle turn-around area. The GMP proposes to better delineate this parking area while restricting ground disturbance to the roadbed. To further manage visitor use, the existing social trail that follows an old road scar along the wash would be formalized into a designated hiking trail, about 2.25 miles in length. Because the parking area and trail would be constructed on previously disturbed ground, there would be no additional vegetation removed.

Analysis

Surveys for the cactus ferruginous pygmy-owl have been performed by NPS personnel in the Alamo Canyon area for the last two years. Surveys have been conducted approximately 12 times per year from December through June, with negative results.

Expansion of the Alamo Canyon campground would occur within proposed critical habitat for the cactus ferruginous pygmy-owl, eliminating less than 0.1 acre of desertscrub vegetation, primarily triangle-leaf bursage (*Ambrosia deltoidea*) and creosote (*Larrea tridentata*). Wherever possible, campsites would be situated to avoid the removal of large trees, shrubs, and columnar cacti. The proposed parking area would not involve new ground disturbance or vegetation removal since it would be located entirely within the existing roadbed. Similarly, the establishment of a formal hiking trail along Alamo Canyon wash would not result in additional habitat losses since the new trail would incorporate an existing social trail over its entire length.

Although day use in the Alamo Canyon area is typically limited to hikes along the wash, which is also within proposed critical habitat for the cactus ferruginous pygmy-owl, this type of visitor use is generally infrequent, occurs at low-levels, and is confined to the existing trail. Likewise, the current low-levels of overnight use do not appear to have an adverse impact on this species. However, the affect that doubling the size of the campground would have is unknown. Since campground expansion could result

in the presence of twice as many campers (a maximum of 40 vs 20 campers currently) in the area at dawn and dusk, periods when this owl is actively foraging, the potential for human disturbance would be greater than under existing conditions.

Reasonable and Prudent Measures Proposed

To ensure that campground expansion and increased visitor use of the Alamo Canyon area does not result in adverse effects on the cactus ferruginous pygmy-owl, the NPS would continue to conduct owl surveys at this location. If subsequent surveys reveal the presence of pygmy-owls, the NPS would reconsider the appropriateness of campground expansion as well as the need for visitor use restrictions in the Alamo Canyon area.

Determination of Effect

Proposed actions in the Alamo Canyon area would have no effect on the cactus ferruginous pygmy-owl due to the lack of this owl's confirmed presence in the area, the low potential for human disturbance, and negligible habitat losses.

LITERATURE CITED

Aberg, L.
1981 The human factor in game-vehicle accidents: a study of driver information acquisition. Dep.of Psychology, Univ. of Uppsala, Sweden. 130pp.

Almkvist, B., T. Andre', S. Ekblom, and S-A. Rempler
1980 Viltolychsprojektet (VIOL). Slutrapport. Statens vagverk TU 146. 117pp.

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.

Del Frate, G. G. and T. H. Spraker
1991 Moose vehicle interactions and an associated public awareness program on the Kenai Peninsula. Alces 27:1-7.

Edholm, S. and B. Kolsrud
1960 Hastighet pa vagar genom viltstrak. Statens vagverk.

Fish and Wildlife Service, U.S. Department of the Interior
1993*a* Lesser Long-nosed Bat Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 30pp.

1993*b* Desert Pupfish Recovery Plan. U.S. Fish and Wildlife Service, Phoenix, Arizona. 67pp.

1994 Sonoran Pronghorn Revised Recovery Plan. U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 40pp.

Gordon, D.F.
1969 "Deer mirrors"--a clearer picture. Colo. Div. Game, Fish and Parks. Game Inf. Leafl. 77. 3pp.

Groschupf, K. D., B. T. Brown, and R. R. Johnson
1988 An annotated checklist of the birds of Organ Pipe Cactus National Monument, Arizona. Southwest Parks and Monuments Association. 45pp.

Hughes, K. S. and N. S. Smith
1990 Sonoran pronghorn use of habitat in southwest Arizona. Final Rep. 14-16-009-1564 RWO #6. Arizona Coop. Fish and Wildl. Res. Unit, Tucson, Ariz. 58pp.

Johansson, G. and F. Backlund
1970 Drivers and road signs. Ergonomics 13:749-759.

Mansfield, T. M., and B. D. Miller
1975 Highway deer kill District 02 Regional study. Caltrans Environmental Branch, Sacramento, CA. 49pp.

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. Can. J. Zool. 56:1207-1210.

National Park Service, U.S. Department of the Interior
1994 Natural and Cultural Resources Management Plan. Organ Pipe Cactus National Monument. 589pp.

1995 Draft General Management Plan/Development Concept Plans/Environmental Impact Statement, Organ Pipe Cactus National Monument, Pima County, Arizona. Denver Service Center. 167pp.

1996 Supplement to the Draft General Management Plan/Development Concept Plans/Environmental Impact Statement, Organ Pipe Cactus National Monument, Pima County, Arizona. Denver Service Center. 114pp.

Ockenfels, R. A., W. K. Carrel, J. C. de Vos Jr., and C. L. Ticer
1996 Effects of highways and railroads on pronghorn movements in Arizona. Joint Annual Meeting of the Arizona-New Mexico Chapter of the American Fisheries Society and Arizona and New Mexico Chapters of the Wildlife Society. Sierra Vista, Arizona.

Ossinger, M. C. and J. A. Schafer
1992 Discovery Bay deer reflectors final research report. Washington State Dep. Transp., Environ. Branch. 7pp.

Pojar, T. M.
1971 Evaluation of devices to prevent deer-auto accidents. Pages 331-339 *in* Game Res. Rep., July Part III. Colo. Game, Fish and Parks Div. 366pp.

_____, R.A. Prosence, D.F. Reed, and T.N. Woodard
1975 Effectiveness of a lighted, animated deer crossing sign. J. Wildl. Manage. 39:87-91.

Reed, D. F.
1985 Efficacy of methods advocated to reduce cervid-vehicle accidents: research and rationale in North America. *Conference presentee lors du colloque international "Route et faune sauvage", Strasbourg, Conseil de l'Europe, 5-7 juin 1985.* (revised 1 Jan. 1995)

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. Am. J. Physiol. 214:41-44.

Schafer, J. A. and S. T. Penland
1985 Effectiveness of Swareflex reflectors in reducing deer-vehicle accidents.
J. Wildl. Manage. 49:774-776

Woodard, T. N., D. F. Reed, and T. M. Pojar
1973 Effectiveness of Swareflex wildlife warning reflectors in reducing deer-vehicle accidents. Colo. Div. Wildl. 5pp.

Zacks, J. L. and W. Budde
1983 Behavioral investigations of color vision in white-tailed deer, *Odocoileus virginianus*. Investigative Ophthalmology 24, Suppl., 185.

Appendix B. Impact Analysis for Existing Conditions (Alternative A) NPS Projects in Organ Pipe Cactus National Monument (Includes projects implemented or occurring 1997-2001)

Project Title	Project Description	Geographic Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Trespass livestock grazing,	Grazing of trespass 1937-current	Entire Monument	Loss and degradation of habitat due to livestock impacts; disturbance due to increased human activity; competition for forage and water; disease vectors. Possibly 50,000-200,000 acres affected.	Adverse	Long-term	Major	Regional
Illegal hunting	Poaching of Sonoran pronghorn	Potentially western OPCNM	Mortality. May take place on up to 200,000 acres, but this impact is believed to be very minor or absent at present.	Adverse	Long-term	Minor	Widespread
Illegal woodcutting	Intrusion of local U.S. and Mexico residents onto OPCNM to harvest wood; also near mines, ranches, roads, 1937-present	Mostly southern boundary area	Degradation of habitat; disturbance due to human activity. Area estimate difficult, probably thousands of acres	Adverse	Long-term	Moderate	Widespread
Removal fence between OPCNM and CPNWR	Removal fence between OPCNM and CPNWR 1990-1999	Western boundary	Removal of impediment to movement; reduced potential for mortality. Removed approx. 20 miles of fence.	Beneficial	Long-term	Major	Regional
Installation of soil moisture/temp probes.	Soil moisture/temperature probes were installed at 11 climate stations distributed around ORPI. 1997	Various	Some disturbance impacts possible. Several stations (Aguajita, Pozo Nuevo, Growler Valley, East Armenta) are in pronghorn habitat. Installation and maintenance/servicing introduces human presence in pronghorn habitat, also small permanent structures in habitat. Approx 0.1 ac total	Adverse	Long-term	Minor	Localized
Veg removal for preserving historical structures	Vegetation was trimmed around historical structures, to facilitate public experience and prevent possible damage. 1998	Bates Well, Bonita Well	Adverse disturbance impacts, in that the clearing facilitated and was part of increased visitation in pronghorn areas, e.g. organized interpretive programs at Bates Well and Bonita Well. Approx 0.1 ac	Adverse	Short-term	Minor	Localized
North boundary fence- bottom wire replacement	Bottom strand of barbed wire was replaced with smooth wire set at 18", for most of distance 1998-1999	North Boundary from Hhwy 85 west to 3-way corner of CPNWR/BLM/ORPI	Beneficial impacts. Modification should increase ability of pronghorn to pass underneath ORPI's north boundary fence, giving them access to additional range on BLM lands to the north. Approx 9 miles of fence modified.	Beneficial	Long-term	Moderate	Regional
Remodel visitor center restrooms (including leach field) OPCNM	New visitor center restrooms were constructed adjacent to the existing VC, and a new including leach field installed 1998-2000	Twin Peaks area	Incremental increase in VC/HQ developed area (habitat loss & disturbance); total disturbance of visitor center and restrooms, approx. 9 acres.	Adverse	Long-term	Minor	Localized
Parking areas-amphitheater & Victoria Mine	Two new parking areas, for 6-8 cars each, both at outer loop of main campground. 1998-2000	Twin Peaks area	Incremental increase in VC/HQ developed area (habitat loss & disturbance); Trailhead promotes additional use of Victoria Mine trail, facilitating increased human presence in backcountry pronghorn habitat. Approx 0.1 ac	Adverse	Long-term	Minor	Localized
Chlorination lines to main water tank	Campground and residence area lines. 1998-2000	Twin Peaks area	Approx. 16 acre incremental increase in VC/HQ developed area (habitat loss & disturbance). No restoration/mitigation	Adverse	Long-term	Minor	Localized
Alamo Canyon trailhead parking	Enlargement of parking area at Alamo Primitive Campground, Ajo Mts, to accommodate approx 4 additional vehicles. 1999	Alamo Canyon	Impacts negligible. Project would facilitate increased human use of backcountry area, but the site is in heavily vegetated upper-bajada habitat east of Hwy85. Probably rarely used by pronghorn even historically. Approx 0.1 ac	Adverse	Long-term	Negligible	Localized
Trail head parking, Old Sonoyta Road	Creation of a new trailhead with vehicle parking and self-service fee station, 2000	on Alamo Road just off Hwy85.	Disturbance impacts possible: introduces/promotes human presence in pronghorn habitat. Although this trail is just east of (and parallel to) Hwy85, increased promotion of this trail may reinforce barrier effect of Hwy85 corridor. Trailhead may also be used for hikers to go west of Hwy85, into nearby pronghorn high-use area. (Mile 66 Hill aka Eagle Pass) Approx	Adverse	Long-term	Minor	Localized

Project Title	Project Description	Geographic Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
			0.1 ac				
New route/trail segment: Red Tanks Tinaja to Milton Mine	A new trail constructed through the Puerto Blanco Mountains in southcentral ORPI. 1999	Puerto Blanco Mountains in southcentral ORPI	Possible disturbance impacts. Developing this trail system is likely to increase human foot traffic in and around the Puerto Blanco Mountains, in areas known to be used by pronghorn. Trail length approx 4 miles.	Adverse	Long-term	Moderate	Regional
Victoria Mine rehab work-Phases 1 and 2	Rehabilitation/restoration work done to old store structure. 1999	Victoria Mine complex, Sonoyta Mts	Potential negligible disturbance impacts from workers and project activity in pronghorn habitat. Approx 0.1 ac	Adverse	Short-term	Negligible	Local
Self-serve fee stations	Self-serve fee stations 2000.	Located at entrance to Monument on Bates Well Road, entrance to Alamo Road, entrance to North Puerto Blanco Drive.	Potential negligible disturbance impacts from installation activities, and creating site where vehicles will pause and people may linger (primarily Bates Well Road only.	Adverse	Short-term	Negligible	Local
Trail head signs	Installation of signs at formerly primitive trailheads. 1999-2000	Old Ajo-Sonoita Rd (2), Dripping Springs, Senita Basin, Milton Mine, Alamo & Victoria Mine.	Possible disturbance impacts. Developing parts of this trail system is likely to increase human foot traffic in and around the Puerto Blanco Mountains, in areas known to be used by pronghorn.	Adverse	Long-term	Moderate	Regional
Convert campsites from RV/pullthru to tent sites	Convert campsites from RV/pullthru to tent sites 1999-2000	In outer loops of main campground.	Possible beneficial impacts by reducing developed presence (replacing RV camping with tent/car camping), thereby reducing disturbance exclusion area around campground slightly Approx 2 ac.	Beneficial	Long-term	Minor	Local
Residence 15 parking space	Residence 15 was converted to dorm space, resulting in need for increased parking space. 1999	Twin Peaks area	Incremental increase in VC/HQ developed area (habitat loss & disturbance); Approx 0.1 ac	Adverse	Long-term	Negligible	Localized
Interpretive programs at Bates Well and Bonita Well	interpretive programs and "cowboy coffee" refreshments were provided at Bates Well and Bonita Well.	Bates Well and Bonita Well.	Adverse impacts through disturbance, by promoting large groups of vehicles and visitors present at these two locations in key pronghorn habitat. Area estimate difficult; local disturbance, possibly hundreds of acres.	Adverse	Short-term	Minor	Localized
Permitted backcountry and wilderness use	Use of remote areas by backpackers	Entire Monument	Potential disturbance from humans entering remote backcountry habitat areas. Up to 200,000 ac in pronghorn habitat	Adverse	Short-term	Minor	Localized
Wildland fire	Natural and man-caused fires occur in the backcounty	Scattered small sites throughout OPCNM	Potential loss of habitat due to fire Area estimate difficult, probably hundreds of acres.	Adverse	Long-term	Negligible	Localized
General LPOP-Type Counter Narcotics Operations	Listening Post - Observation Post surveillance for law enforcement purposes; personnel conduct surveillance in backcountry and frontcountry areas, using night-vision and other technologies.	Parkwide	Impacts depend on nature of "Listening Post-Observation Post" (LPOP) activities, and effectiveness at reducing illicit traffic through pronghorn habitat. Potential adverse disturbance impacts due to project activities, also potential beneficial disturbance –reducing impacts if project reduces illicit activities. Area estimate difficult; parkwide.	Adverse And Beneficial	Short-term	Moderate	Localized
Sensor placement	Placement of seismic, motion-sensitive, and other sensors along roads, trails, washes for law enforcement surveillance purposes.	Parkwide	Potential beneficial impacts if effective at reducing illicit traffic through pronghorn habitat. Area estimate difficult.	Beneficial	Short-term	Moderate	Regional

Project Title	Project Description	Geographic Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
LE Training	Law enforcement training in interdiction of drugs and undocumented aliens (UDAs)	Parkwide	Impacts depend on nature of activities, and effectiveness at reducing illicit traffic through pronghorn habitat. Potential adverse disturbance impacts due to project activities, also potential beneficial disturbance –reducing impacts if project reduces illicit activities. Area estimate difficult; parkwide.	Adverse And Beneficial	Short-term	Moderate	Localized
Coop Agreements/Activities with other Law Enforcement agencies	Facilitating interdiction operations for smuggling UDAs and drugs.	Parkwide	Impacts depend on nature of activities, and effectiveness at reducing illicit traffic through pronghorn habitat. Potential adverse disturbance impacts due to project activities, also potential beneficial disturbance –reducing impacts if project reduces illicit activities. Area estimate difficult; parkwide.	Adverse And Beneficial	Short-term	Moderate	Localized
Use of Armenta Road for Patrol and Management Purposes	Armenta/North Boundary Road closed to public use, but used frequently by NPS, BP, smugglers. This road connects Highway 85 to Bates Well Road, traversing Valley of the Ajo.	North-central boundary area	Adverse disturbance impacts possible. This road allows human presence to persist across the north end of the Valley of the Ajo. Pronghorn use this valley year-round, and especially in summer. Beneficial habitat protection impacts also possible as this road also allows access to maintain north boundary fence intensively, keeping domestic livestock out of important pronghorn habitat. Road is approx. 154 ac, 9 miles in length; approx. 22 acres.	Adverse	Long-term	Moderate	Localized
Emergency Operations	Search and rescue, emergency medical response, emergency traffic control, fire response (wildland and structural), etc.	Parkwide	Impacts depend on nature, scale and location of activities; use of helicopters, other backcountry activities, etc. Potential adverse disturbance from activities. Area estimate difficult; parkwide.	Adverse	Short-term	Moderate	Localized
Pruning and/or removing vegetation along all public drives.	Pruning and/or removal of trees on public drives to prevent vehicle damage, open up sight vistas, improve line-of-sight, etc.	Parkwide, on roads.	Project may facilitate faster vehicle travel, which may in turn increase noise disturbance and risk of pronghorn roadkill. Vegetation management may also alter pronghorn habitat. Potentially along up to ≈94 miles of roads	Adverse	Long-term	Minor	Localized
Dirt road maintenance	Routine grading maintenance of Ajo Mountain Drive, Puerto Blanco Drive, Armenta Road, Bates Well Road.	Parkwide, on dirt roads.	Adverse disturbance and habitat impacts; road maintenance facilitates increased human presence. If grading incrementally widens or otherwise "improves" roads, impacts could be more severe, e.g. if grading amounted to widening which in combination with tree trimming facilitated faster vehicle speeds, greater volume, incremental trend toward paved drives, etc. Also, noise of road grader would cause disturbance. Involves ≈ 87-110 miles of roads (21-30 east of Hwy85)	Adverse	Long-term	Minor	Regional
Borrow pit use	Sites where sand and gravel were and are removed for construction purposes.	Various locations, central corridor, Armenta Road, South Puerto Blanco	If borrow pits are in pronghorn habitat, disturbance and/or habitat degradation are possible. Area estimate difficult; several acres?	Adverse	Short-term	Minor	Localized

Project Title	Project Description	Geographic Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Wildlife Surveys and Ecological Monitoring in Wilderness areas	Ecological Monitoring Program data collection carried out at up to 14 sites annually. Includes: nocturnal rodent trapping grids; lizard transects; vegetation sampling; avian monitoring; climate stations and rain gages; sampling bats at tinajas; snake monitoring. Sites in often-used pronghorn habitat include: Pozo Nuevo, Aguajita Wash, Growler Valley, Bates Well area, Valley of the Ajo.	Parkwide	Potential impacts both adverse and beneficial. Presence of humans engaged in data collection may be disturbance factor, however data collection may lead to improved management. Area estimate difficult; parkwide.	Adverse And Beneficial	Short-term Long-term	Minor Moderate	Localized Widespread
Threatened and Endangered Species research and monitoring	Monitoring Sonoran pronghorn, Quitobaquito pupfish, lesser long-nosed bat, cactus ferruginous pygmy-owl, acuna cactus.	Parkwide	Adverse and beneficial, impacts. Capture/collaring of Sonoran pronghorn have been harmful, resulting in direct mortalities of pronghorn. Conversely, radiotelemetry yields information valuable in managing pronghorn. Monitoring Quitobaquito pupfish takes place only at Quitobaquito where pronghorn do not go; monitoring lesser long-nosed bat takes place east of Hwy85 where pronghorn no longer range; monitoring cactus ferruginous pygmy-owls occasionally takes place in two areas where pronghorn occasionally range. However, owl monitoring in these places takes place unobtrusively, and only about 8-10 mornings per year. Area estimate difficult; parkwide.	Adverse And Beneficial	Short-term Long-term	Minor Moderate	Localized Widespread
Brush pile burning	Scrap lumber and waste from tree pruning are stockpiled just off Highway 85 near Milepost 78, periodically burned in fire training.	Along Hwy85 approx. 2 mile south of VC	Impacts likely insignificant, unless fire escapes and becomes wildfire, which would alter habitat.	Adverse	Short-term	Negligible	Localized
Trail maintenance-vegetation trimming	Vegetation was trimmed along hiking trails. 1996-2000	Visitor's Center area, Campground, Victoria Mine trail	Maintains footprint of foot trails and human access into pronghorn habitat; possible disturbance. Approx 3 .5 mi of trails.	Adverse	Short-term	Negligible	Localized
Backfill abandoned mines	Backfilling abandoned mine features - mostly 1m-3m deep prospect holes - to prevent pitfalls deaths of wildlife. If present, barbed-wire fences were removed. 1998-2001	Various backcountry areas	Beneficial impacts: reduces chance of injury/death. Although all mines backfilled to date have been east of Hwy85, others to west are next. Backfilling reduces potential for tripping/pitfall injuries. One previously undocumented mine in Bates Mts was fenced, reducing pitfall hazard - pronghorn was seen running past mineshaft opening. Approx. 30 to be filled	Beneficial	Long-term	Minor	Localized
Renovate residences to offices	To provide needed office space, 3 residences have been or are in the process of being converted into office space. one conversion completed 1995, another nearly complete (2001)	Twin Peaks development area (VC, HQ, Campground, Residences)	Adverse impacts due to small habitat loss (increased areas cleared for parking) and slight increase in human activity levels. Historically Sonoran pronghorn may have ranged in area (primarily in summer); now they are unlikely to be in area due to development. Approx. 0.25 ac.	Adverse	Long-term	Negligible	Localized
Highway 85 road shoulder maintenance	Trimming vegetation and blading clear zone on road shoulders.	Highway 85 corridor	Adverse impacts possible in the form of potentially increasing the movement barrier that Hwy 85 constitutes, by increasing roadway footprint and facilitating higher traffic speeds. 22 miles of roadway	Adverse	Long-term	Major	Regional

Project Title	Project Description	Geographic Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Highway 85 speed limit	Current NPS policy is 55mph speed limit, GMP was premised on 55mph. ADOT signed Hwy85 as 65mph in 1997 (Actual increase in 85th percentile traffic speed was from 68 mph with 55 mph posted to 71 mph. With 65 mph posted). De facto speed limit continues as 65mph.	Highway 85 corridor	Adverse impacts effects in the form of potentially increasing the movement barrier that Hwy 85 constitutes, by increasing roadway footprint and facilitating higher traffic speeds. Increasing speed also increases roadkill possibilities. Increasing speeds may create demand for increasing road width, shoulder width, etc. which increases Hwy "footprint," therefore again increasing barrier effect. 22 miles of roadway, excludes pronghorn from approx. 90,000 acres of habitat.	Adverse	Long-term	Major	Regional
Jersey barrier wall in Cipriano Pass	A line of concrete jersey barriers were placed c1999 in Cipriano Pass in an attempt to close the Pozo Nuevo Road, which was being heavily used and damaged by smugglers.	Backcountry: Cipriano Hills	Impacts: Disturbance and habitat degradation. The wall caused illicit traffic to establish multiple new cross-country roads through pronghorn habitat in ORPI and CPNWR. Also, illicit traffic drove around the wall in local area, causing habitat impacts. Reduced amount of illicit traffic	Adverse Beneficial	Long-term Short-term	Major Minor	Regional Localized
Buffelgrass control	Nonnative grass is being manually removed throughout ORPI, especially along south boundary. 1995-present	Backcountry throughout ORPI	Beneficial impact: prevention of type conversion from Sonoran desertscrub to monotypic tallgrass association. Approx. 16,000 acres to date	Beneficial	Long-term	Major	Regional
Trenching and widening of South Puerto Blanco Drive	Trenches were excavated in 2001 along South Puerto Blanco Drive to discourage smugglers and UDAs from leaving the roadway and driving cross-country through ORPI to evade Border Patrol.	South Boundary west of Lukeville	Impacts are possibly both adverse and beneficial. Original trenching and continuing maintenance may cause disturbance, by operating heavy machinery in pronghorn habitat. If trenching successfully prevents off-road driving through pronghorn habitat, beneficial impacts by reducing disturbance and habitat degradation. If trenching causes illicit traffic to relocate elsewhere (e.g. to west in areas more heavily used by pronghorn), adverse impacts through disturbance and habitat degradation. Approx. 3 miles	Adverse And Beneficial	Short-term	Moderate	Regional
Placement of barrier in Red Tanks Wash	Jersey barriers were placed in Red Tanks Wash spring 2001 to control cross-country smuggling/UDA traffic, which used this route to access the North Puerto Blanco Drive.	Puerto Blanco Mts south of Red Tanks Tinaja	Possibly both adverse (disturbance & habitat impacts) and beneficial. (reduction of disturbance & habitat impacts). If barrier successfully prevented off-road driving through pronghorn habitat, beneficial effects by reducing disturbance and habitat degradation. If barriers caused illicit traffic to relocate elsewhere (e.g. to west in areas more heavily used by pronghorn), or drive around it in local area, adverse effects through disturbance and habitat degradation. Approx. 0.25 ac	Adverse And Beneficial	Short-term And Long-term	Minor to Moderate	Localized
Installation of gates on South Puerto Blanco Drive and elsewhere	Iron gates have been installed along South Puerto Blanco Drive and elsewhere to allow closure of roads and control traffic by smugglers and UDAs. Spring 2001	South Boundary west of Lukeville	Impacts are possibly both adverse (disturbance & habitat impacts) and beneficial. If gates successfully prevent off-road driving through pronghorn habitat, beneficial effects by reducing disturbance and habitat degradation. If gates cause illicit traffic to relocate elsewhere (e.g. to west in areas more heavily used by pronghorn), adverse effects through disturbance and habitat degradation. Area estimate difficult; up to several hundred acres impacted/saved depending on success.	Adverse And Beneficial	Short-term	Moderate	Regional
Baker Mine-Milton Mine trail	Creating, signing, promoting, and vegetation clearing for 1.2-mile Baker Mine-Milton Mine trail, In Puerto Blanco Mts.	Backcountry:Puerto Blanco Mts	Possible disturbance impacts. Developing this trail system is likely to increase human foot traffic in and around the Puerto Blanco Mountains, in areas known to be used by pronghorn. 1.2 miles	Adverse	Long-term	Moderate	Regional

Project Title	Project Description	Geographic Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Trespass Livestock Mgmt	Trespass livestock are controlled by continuous inspection of boundary fences. Most trespass is from BLM lands to north. Trespass cattle are typically relocated to BLM land by owner after notification by ORPI staff.	Generally on north boundary	Beneficial impacts through preventing (limiting) habitat degradation, competition, and potential transfer of disease. North and south boundary fences are maintained, and trespass livestock are herded out or removed by owners. Area estimate difficult; approx. several hundred acres.	Beneficial	Short-term	Major	Regional

Appendix C. Impact Analysis for Past, Present, and Foreseeable Projects in the Action Area (Actions of the NPS and Other State, Federal, County, Municipal Agencies and Private Entities)

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Part 1. Past Actions on Organ Pipe Cactus National Monument							
Permitted and trespass livestock grazing	Pre-1900s to latter 1970s, continuing on BLM	Grazing (cattle, horses & burros) on OPCNM, CPNWR, BLM, BMGR	Loss and degradation of habitat due to livestock impacts; disturbance due to increased human activity; competition for forage and water; disease vectors. Approx. 2-3 million acres affected.	Adverse	Long-term	Major	Widespread
Ranch improvements	Pre-1900s to latter 1970s, continuing on BLM	Construction or installation of wells, dams, charcos, corrals, internal fences, line camps, water haul sites	Loss and degradation of habitat; disturbance due to increased human activity; increased availability of water.	Adverse	Long-term	Major	Widespread
First OPCNM headquarters	1940-1957	Twin Peaks development area ; Constructed first visitor contact station, residences, campground, access roads and other structures	Loss and degradation of habitat; disturbance due to increased human activity; established permanent human habitations and facilities; associated developments and human activity precluded pronghorn from using Twin Peaks area. Approx. 100 acres direct impact.	Adverse	Long-term	Moderate	Localized
Illegal hunting	1937 - ?	Poaching of Sonoran pronghorn	Mortality. Possibly took place on OPCNM, CPNWR, BMGR, BLM – up to 2 million acres	Adverse	Long-term	Major	Widespread
OPCNM Mission '66 headquarters & campground,	late 1950s to early 1960s	Twin Peaks area: Constructed visitor center, residences, new campground, maintenance yard, paved access roads and other structures;	Loss of habitat; disturbance due to increased human activity; increased VC/HQ developed area, and facilitated greater human activity levels in VC/HQ area and surrounding area, precluding pronghorn from using wider Twin Peaks area. Roughly 400 acres.	Adverse	Long-term	Moderate	Localized
Highway 85	1942-1943	Construction & paving Hwy85, Why-Lukeville	Created movement barrier, ultimately excluding pronghorn from all historical habitat east of Hwy85 in OPCNM (Sonoyta Plain, western bajadas of Ajo Mts) Approx. 811 acres direct impacts in OPCNM, excluded pronghorn from approximately 90,000 acres habitat east of Hwy85 in OPCNM. Highway itself disturbs approx. 138 acres.	Adverse	Long-term	Major	Regional
Construction & Improvement of internal dirt roads and scenic loops, OPCNM	1950s	Improved or constructed Puerto Blanco Drive, Ajo Mountain Drive, Alamo Canyon Road, boundary road east of Lukeville, Armenta Road, etc.	Loss and degradation of habitat; disturbance due to facilitating increased human activity. Ajo Loop ≈ 44 ac, Puerto Blanco Loop ≈ 104 ac, Armenta/North Boundary Road ≈ 23 acres, Camino de Dos Republicas/Southeast Boundary Rd ≈ 32 ac	Adverse	Long-term	Moderate	Widespread
Off-road vehicle use, OPCNM	1937-1978	NPS motorized patrols used wash beds as transportation corridors	Disturbance due to increased human activity in roadless areas; some habitat degradation. Area estimate difficult, probably hundreds of acres.	Adverse	Short-term	Moderate	Widespread
Mining, OPCNM	1937-1976	Small mines and prospects located throughout OPCNM	Disturbance due to human activity; degradation & loss of habitat; potential direct mortality due to pitfalls; potential direct mortality due to subsistence poaching. Area estimate difficult, probably >1000 ac	Adverse	Long-term	Moderate	Localized
Illegal woodcutting	1937-present	Intrusion of local U.S. and Mexico residents onto OPCNM to harvest wood; also near mines, ranches, roads.	Degradation of habitat; disturbance due to human activity. Area estimate difficult, probably thousands of acres	Adverse	Long-term	Moderate	Widespread
OPCNM perimeter fences	1940s to 1950s	Construction of boundary fences	Impediment to movements; occasional mortality Approx. 64 miles of fence	Adverse	Long-term	Major	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Removal fence between OPCNM and CPNWR	c1990-1999	Removal fence between OPCNM and CPNWR	Removal of impediment to movement; reduced potential for mortality. Removed approx. 20 miles of fence.	Beneficial	Long-term	Major	Regional
Boundary Patrols, OPCNM	1940-1950s	Various agencies patrolled south boundary of OPCNM; including U.S. Army, Border Patrol, Customs, Bureau of Animal Industry	Disturbance due to intermittent human activity. Patrols along approx. 30 mile international boundary.	Adverse	Short-term	Minor	Localized
Human occupation outside NPS headquarters area	1937-1976.	Occupation of ranch headquarters , residences, line camps, e.g.. Bates Well, Bonita Well, Quitobaquito, Pozo Nuevo	Disturbance due to concentrated human activity; degradation and loss of habitat; possible direct mortality due to subsistence poaching. Impact area difficult to estimate, possibly approx. 100 –200 acres	Adverse	Long-term	Major	Localized
Road closures, OPCNM	Late 1970s to early 1980s	Roads closed due Wilderness Act of 1978, then entry portals revegetated,	Reduced disturbance due to human activity; dramatically reduced human presence in backcountry areas; allowed habitat recovery to begin. Approx. 97 acres closed/under restoration	Beneficial	Long-term	Major	Regional
Construction of fence at Quitobaquito	Year of construction unknown	Barbed-wire fence was constructed around Quitobaquito springs and pond to exclude cattle.	Exclusion from water source; habitat impacts due to cattle use increasing at other water sources. Fenced area approximately 5 ac.	Adverse	Long-term	Moderate	Regional
Removal of fence at Quitobaquito	1980	Barbed-wire fence was removed	Restored potential access to water source. 5ac	Beneficial	Long-term	Moderate	Regional
Removal of residents at Cipriano (Juan) Well and Quitobaquito	1950s-1960s	Hia Ced O'odham residents were removed from these sites and residences removed	Potential for disturbance reduced by removing concentrated human activity; allowed recovery of habitat to begin. Approx. 20 ac	Beneficial	Long-term	Moderate	Regional
Parking lot at Quitobaquito	1980s	Former parking area near the pond was removed and another was constructed to the east and closer to the international boundary.	Former parking area continues to naturally revegetate & may become habitat with higher resource value to pronghorn. Approx. 0.5 ac	Beneficial	Long-term	Minor	Localized
Supplemental wildlife waters, OPCNM	1976-c1982	NPS hauled water to former livestock water sites to provide water for wildlife, Blankenship, Bonita Well, Bates Well	Supplemental water may have enhanced pronghorn fitness and survival, but may also have served to enhance and localize predator populations. Area estimate difficult, probably tens of acres.	Beneficial And Adverse	Short-term	Minor and Minor	Localized
Purchase of Dowling Ranch, OPCNM	1970s	Dowling Ranch purchased in the from Al Gay (Gringo Pass Inc)	Secured NPS ownership/protection for 160 acre habitat area near Lukeville, preserving as potential habitat	Beneficial	Long-term	Minor	Localized
Management of Accelerated Erosion, OPCNM	1940s - 1950s and 1980s	Erosion control structures built in Growler Valley, Valley of the Ajo, Dos Lomitas, Armenta Ranch	Efforts may have prevented long-term habitat degradation, but also resulted in short-term degradation from ground disturbance, activity of heavy machinery; also short-term disturbance from heavy machinery.	Adverse	Long-term	Minor	Localized
Mistletoe control program, OPCNM	1950s	Mistletoe treated with 2,4,5-D in Cherioni Wash & other sites	Effects on other plants, and more widespread effects unknown. Possible adverse toxic impacts on pronghorn due to exposure to herbicide compounds; possible adverse impacts by reducing vegetation and thermal cover.	Adverse	Short-term	Minor	Localized
Campground for Volunteers-In-Parks,	1983-1984	Constructed campground with 10 RV sites & large	Incremental loss of habitat in already-developed area; incremental increase in disturbance due to human activity. Approx. 1ac	Adverse	Long-term	Minor	Localized

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
OPCNM		turnaround area, located in Residence area.					
Quitobaquito water transport system	1989	New gunnite channel was built to conduct water 700' from springs to pond.	May have increased availability of water to pronghorn . Approx 1 ac.	Beneficial	Long-term	Minor	Localized
Lukeville land exchange, OPCNM	1989-1990.	Exchanged land w/ Gringo Pass Inc., for net gain of acres for ORPI, adjacent to Lukeville	Potential beneficial impacts by preserving acreage adjacent to Lukeville, although area unlikely to be use due t human activity	Beneficial	Long-term	Minor	Localized
Meteorological tower installation, OPCNM	Project completed 1990, tower removed 2000	USGS built approx. 80' guyed tower w/ meteorological instruments near Ajo Mountains,	Possible slightly adverse impacts due to disturbance during construction, although pronghorn have not occurred in area since 1970s. Approx. 0.1 ac	Adverse	Short-term	Negligible	Localized
Rehabilitate Ajo Mt Loop Drive, OPCNM	1991-1992	Several hills, and wash crossing sections were paved; disturbed areas were revegetated.	Possible adverse Impacts (disturbance and movement barriers). Historically Sonoran pronghorn ranged in area (primarily in summer), but have not been confirmed in area recently. Approx. 2 mile or less actually paved	Adverse	Long-term	Minor	Localized
Construction of new fire station, OPCNM	1994-1995	New fire station constructed at maintenance yard.	Incremental increase in VC/HQ developed area (habitat loss and disturbance); historically Sonoran pronghorn may have ranged in area (primarily in summer); now they are unlikely to be in area due to development. Approx. 0.25 ac	Adverse	Long-term	Minor	Localized
Install new sewer distribution box behind Visitor's Center, OPCNM	1994-1995	Install new sewer distribution box behind Visitor's Center	Facilitated maintaining VC/HQ developed area (habitat loss & disturbance); historically Sonoran pronghorn may have ranged in area (primarily in summer); now they are unlikely to be in area due to development. 1 ac.	Adverse	Long-term	Negligible	Localized
Construction of a compressor shed at maintenance shop, OPCNM	1994-1995	Construction of a compressor shed at maintenance shop	Incremental increase in VC/HQ developed area (habitat loss & disturbance); historically Sonoran pronghorn may have ranged in area (primarily in summer); now they are unlikely to be in area due to development.	Adverse	Long-term	Minor	Localized
Bury electric cable and other electrical work in campground area. OPCNM	1995-1996	Bury electric cable and other electrical work in campground area.	Beneficial reduction of disturbance buy reducing visual profile of campground; adverse habitat impacts through ground disturbance.	Beneficial And Adverse	Long-term	Negligible	Localized
Maintenance shop extension, OPCNM	1995-1997	Maintenance shop extension	Incremental increase in VC/HQ developed area (habitat loss & disturbance); historically Sonoran pronghorn may have ranged in area (primarily in summer); now they are unlikely to be in area due to development. Approx. 0.1 ac	Adverse	Long-term	Negligible	Localized
Construct duplexes and landscape, OPCNM	1995-1996	Construct residential duplexes; one adjacent to main campground, the other in main residence loop.	Incremental increase in VC/HQ developed area (habitat loss & disturbance); historically Sonoran pronghorn may have ranged in area (primarily in summer); now they are unlikely to be in area due to development. Approx. 1 ac	Adverse	Long-term	Minor	Localized
Install modular building at VIP campground, OPCNM	1997	A prefabricated building was installed in the Volunteer's campground, to serve as a supplemental community/meeting facility.	Incremental increase in VC/HQ developed area (habitat loss & disturbance); Approx. 0.1 ac	Adverse	Long-term	Minor	Localized
Travelers' Information System Station, OPCNM	1996	Small automated radio broadcast station, built 0.75 mile west of Hwy 85 along the Armenta Road.	Possible disturbance impacts. The TIS is in pronghorn habitat. Installation and maintenance/servicing introduces human presence in pronghorn habitat, also small permanent structure in habitat. Approx. 100 square ft	Adverse	Long-term	Negligible	Localized

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Construction of restroom at Bonita Well, OPCNM	1980s?	A vault toilet was installed at Bonita Well.	Possible disturbance impacts by contributing to incremental upgrading of Bonita Well to a more developed visitor destination. 110 square feet	Adverse	Long-term	Minor	Localized
Discontinuing water sources at backcountry wells e.g. Bates, Bonita, etc., OPCNM		Old wells and water troughs were allowed to deteriorate or were dismantled, to avoid maintaining water sources to encourage UDAs. Some like Bates Well were dismantled to eliminate refugium populations of Quitobaquito pupfish.	Possible adverse impacts, through removing potentially usable water sources. However, most of these water sources were in heavily vegetated and partly developed areas, so pronghorn tendency to use them is unknown. Area estimate difficult; approximately 8 water sources.	Adverse	Long-term	Negligible	Regional
Part 2. Past Actions in Action Area, by all State Federal, County, Municipal, or Other Agencies, and Private Entities							
Dewatering of the Gila River and Agricultural Development	pre-1900s to present	Construction of dams along the Gila and Salt Rivers have impounded and diverted water to agricultural areas in the region. Dams include Ashurst-Hayden, Roosevelt, Gillespie, Wellton, Mohawk, Tacna, Waddell, Coolidge, and Painted Rock.	Adverse impacts on habitat (major loss and degradation of habitat; loss of access to water; loss of cover sites; introduction of weed plant species); adverse impacts by creating barriers to movement; increased disturbance due to presence of humans; surface noise disturbance; increased probability of mortality; increased probability of disease transmission; exposure to toxins; increase in predators. Approx 240 river-miles dewatered between Phoenix-Colorado River	Adverse	Long-term	Major	Range-wide
Historic Ranching and Small Mining Activities	pre-1900s to 1980s	Prospecting and small- and large-scale mining; permitted livestock grazing; trespass grazing of cattle, horses and burros	Adverse impacts on habitat (major loss and degradation of habitat; loss of access to water; loss of cover sites (woodcutting); introduction of weed plant species); disturbance due to presence of humans and livestock in pronghorn habitat; availability of artificial water sources; increased probability of mortality; competition for forage; reduced forage quantity and quality; barriers to movement (fences); increased probability of disease transmission; exclusion from habitat; diminished recruitment. Area estimate difficult; Approx 1.5 million ac.	Adverse	Long-term	Major	Range-wide
Copper Mine at Ajo	1910s-1985	Major commercial production of copper; open pit 390 acres, 1.5 miles across and 1,000 ft. deep. Tailings dam, slag dump and overburden dump cover several miles	Loss and degradation of habitat; disturbance (blasting, drilling & other loud noises); barrier to movement; increased presence of humans in pronghorn habitat (disturbance); exclusion from habitat; exposure to toxins; introduction & increase of weedy plant species. Approx 4000 ac.	Adverse	Long-term	Moderate	Regional
Transportation and Utility Corridors	Past and Ongoing	Unmaintained dirt roads from 1937 to present. Proposed roads include Sonoyta-Rocky Point Rd.	Barriers to movement; loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; loss of cover sites; introduction of weed plant species (habitat degradation). Hundreds of miles of corridors have enclosed U.S. pronghorn population in restricted area, and prevented interchange with Mexican population.	Adverse	Long-term	Major	Range-wide

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Boundary fences, CPNWR	1940s-1970s	Boundary fences constructed along International Boundary and east boundary of CPNWR.	Adverse impacts by creating movement barriers that excluded pronghorn from habitat; increased potential for mortality via fence entanglement; Potential beneficial impacts by reducing numbers of trespass livestock in habitat on CPNWR. Approx. 75 miles of fence.	Adverse And Beneficial	Long-term	Moderate	Regional
Predator Control	1940s-1970s?	Shooting and poisoning of predators, mostly on the eastern part of CPNWR	Unknown impacts on Sonoran pronghorn population (no data); possible beneficial impacts by reducing predation. May have taken place over thousands of acres.	Beneficial	Short-term	Negligible	Regional
Hickiwan Casino, Convenience Store, and RV Park	Recent Past	Convenience store, RV park, and casino built in 1998.	Adverse impact in the form of habitat loss and strengthening movement barriers, by incremental increase in the populated zone at the margins of current habitat. Approx 15 ac.	Adverse	Long-term	Minor	Localized
Kuakatch development	Recent Past	Increase in number of people and houses at this townsite	Adverse impact in the form of habitat loss and strengthening movement barriers, by incremental increase in the populated zone at the margins of current habitat. Approx 10 ac.	Adverse	Long-term	Minor	Localized
Military Training Routes	Past, present & future	Air force realigned and/or widened portions of 6 out of 7 military training routes.	Possible adverse impacts in the form of disturbance and behavior modification. Takes place over ≈1 to 2 million ac	Adverse	Long-term	Moderate	Range-wide
Undocumented Migrant Traffic	Past, Present, and Future	Estimates of 1,000 UDA's per day through OPCNM alone.	Adverse impacts in the form of loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; spread of weed plant species (habitat degradation); increased probability of mortality (possible poaching); diminished recruitment. Takes place over ≈1 to 2 million ac	Adverse and Beneficial	Short-term to Long-term	Minor to Major	Range-wide
BLM Livestock Grazing Allotments	1934-Present	Five BLM grazing allotments (Camerson, Childs, Coyote Flat, Sentinel, Why) within the vicinity of the BMGR and the active distributions of the Sonoran pronghorn.	Adverse impacts in the form of Loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; presence of livestock in pronghorn habitat (disturbance); loss of cover sites; introduction of weed plant species (habitat degradation); availability of artificial water sources; increased probability of mortality; competition for forage; reduced forage quantity or quality; barrier to movement (fences); increased probability of disease transmission; exclusion from habitat; diminished recruitment. Approx 90,000 ac west of Hwy85	Adverse	Long-term	Major	Regional
Recreation on the Ajo Block, BLM	Past and Ongoing	Mainly vehicle-based camping. OHV travel is increasing. Border patrol uses area for patrols. Wildcat dumping occurs.	Adverse impacts in the form of loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; loss of cover sites; introduction of weed plant species (habitat degradation); increased probability of mortality; barrier to movement;; exclusion from habitat; diminished recruitment; increase in predators (including domestic dogs). Approx 90,000 ac west of Hwy85	Adverse	Long-term		Regional
Permitted outdoor recreation on the BMGR	Past and Ongoing	Sightseeing, OHV travel, vehicle camping, backpacking, hiking, picnicking	Adverse impacts in the form of loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; loss of cover sites; introduction of weed plant species (habitat degradation); increased probability of mortality; barrier to movement; exclusion from habitat; diminished recruitment). Takes place over ≈500,000? ac	Adverse	Long-term	Minor	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
ADOT maintenance activities	Past and Ongoing	Activities include use & development of staging areas & materials sources, pavement overlays, chip-sealing, culvert extensions, roadside vegetation management.	Loss and degradation of habitat ; presence of humans; surface noise disturbance; introduction and spread of weed plant species. Generally involves approx. 80 miles of highway, Gila Bend-Lukeville.	Adverse	Long-term	Moderate	Localized
Regional Trend of Population Growth	Past, present and future	In 2000, Arizona ranked the second fastest growing state. Yuma, Maricopa, and Pima counties population increased by 40% from 1990-2000.	Loss and degradation of habitat; surface noise disturbance; barrier to movement; increased presence of humans in pronghorn habitat (disturbance); exclusion from habitat; increase in predators; introduction & increase of weedy plant species. See Narrative for population increases and locations.	Adverse	Long-term	Major	Widespread
Illegal Subsistence and Sport Hunting of Sonoran Pronghorn	pre-1900s to present	Unrestrained hunting during monument establishment. A few poaching cases reported from 1950-1971	Adverse impacts through direct mortality. May have taken place over ≈1 to 2 million ac	Adverse	Long-term	Major	Range-wide
AZ Game and Fish Dept Activities	Past, Current, and Ongoing	Issue hunting permits, enforce permit reqs., work on pronghorn recovery programs, maintain 23 wildlife water catchments on BMGR, participate in habitat mgmt. Programs.	Impacts both adverse and beneficial; improved knowledge base; surface noise disturbance; presence of humans in pronghorn habitat; availability of artificial water sources (increase in predators); increased probability of disease transmission; mortality from radio-collaring activities. Take place over ≈2 million ac	Beneficial and Adverse	Various	Moderate	Range-wide
Cabeza Prieta National Wildlife Refuge Management	1937-Future	860,010 acres of Sonoran desert established for conservation of native wildlife and resources. Recreation opportunities include backpacking, hunting, camping, 4x4 driving, Mt. biking, etc. A Comprehensive Conservation Plan/EIS is currently underway with an anticipated completion date of 2003.	Beneficial and adverse impacts: Beneficial management policies & activities (present); restricted access (present); loss and degradation of habitat (past grazing); predator control (past); disturbance from permitted presence of humans in pronghorn habitat (recreation and mgmt); aerial noise disturbance; presence of livestock in pronghorn habitat (past); loss of cover sites (illegal woodcutting, past overgrazing); spread of weed plant species by visitors; availability of artificial water sources; increased probability of mortality (past military activities); increased probability of survivorship; competition with livestock for forage (past); barriers to movement (fences); increased probability of disease transmission (artificial water); poaching (past, mostly). Approx 850,000 ac.	Beneficial and Adverse	Various	Major And Minor	Regional
NAFTA Related Developments	Current and Ongoing	North American Free Trade Agreement of 1995. Resulting in increased commerce between Mexico and U.S.	Adverse impacts in the form of strengthening movement barriers, due to increased traffic volume and truck traffic on Highway 85 and Mexico Highway 2. Approx 80 miles of Highway 85, Approx 150 on Hwy2.	Adverse	Long-term	Major	Regional
Residential Development in the Vicinity of the BMGR Boundary	Current and Probable Future	Several residential development near Yuma, increasing development in Dome, Ligurta, WIlton, Roll Tacna, and Mohawk.	Incremental increase in populated zone; increased human activity; increased pressure to provide recreational access; possible increase in poaching; strengthening movement barriers on perimeter of pronghorn range. Area estimate difficult: thousands of acres?	Adverse	Long-term	Major	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
U.S. Border Patrol Activities	Current and Probable Future	Traditional operations include patrolling roads, off-road areas, dragging unimproved roads, aerial reconnaissance, inspecting vehicles at checkpoints.	Loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; aerial noise disturbance; spread of weed plant species (habitat degradation); increased probability of mortality; diminished recruitment; improved knowledge base of pronghorn activities (past). Area estimate difficult: thousands of acres?	Adverse	Long-term	Major	Range-wide
BMGR Integrated Cultural Resources Management Plan	Current and Probable Future	Plan and programmatic agreement expected by 12/31/01. Included inventory of traditional cultural places, ethnographic study.	Presence of humans in pronghorn habitat (disturbance); surface noise disturbance.	Adverse	Short-term	Negligible	Localized
Changes in Land Use in Paloma Ranch Area of Gila Bend	Current and Ongoing	Approx. 100,000 acres of undeveloped and fallow agricultural land west of Gila Bend planned for future development.	Increase in surface noise disturbance; increase in human presence; loss & degradation of habitat; increase in predators; increased probability of disease transmission; barrier to movement. Area estimate difficult: thousands of acres?	Adverse	Long-term	Minor	Localized
Development of Fallow Agricultural Land in the Dateland Area	Current	Town of Dateland has encouraged development of fallow agricultural land no. and so. of Hwy. 8.	Continued loss of and exclusion from habitat; barrier to movement; surface noise disturbance. Area estimate difficult: thousands of acres?	Adverse	Long-term	Moderate	Regional
Low-level Military Overflights Over CPNWR	Past, present and future	Continuation of low-level overflights of fixed-wing aircraft on 2 flight corridors over CPNWR for up to 60 days per year.	Continuation of aerial noise disturbance. ≈850,000 ac	Adverse	Long-term	Minor	Regional
Ground Support Zones	Past, Present and Future	Consolidation of former ground support areas into fewer but larger ground support zones.	In these zones, continuation of surface noise disturbance; continued loss and degradation of habitat (reduced from previous); temporary exclusion from habitat. Area estimate difficult: thousands of acres?	Adverse	Long-term	Moderate	Regional
Add TACTS Range Threat Emitters	Past and Ongoing	Operate permanent small facilities that emit radar energy to simulate aerial combat scenarios for training purposes.	Exclusion from habitat; increased surface & aerial noise disturbance. Area estimate difficult: hundreds of acres?	Adverse	Long-term	Minor	Localized
Low-level Flight Corridors for Military Helicopters	Past and Probable Future	Low-level helicopter flights over core habitat; 11 flight corridors reduced to 3 corridors in YTRC FEIS.	Continuation of aerial noise disturbance; decrease in aerial noise disturbance. Area estimate difficult: thousands of acres?	Adverse	Long-term	Minor	Regional
Sonoran Pronghorn Recovery Plan	Current and Ongoing	See Narrative	Sets beneficial management direction. Approx. 2 million ac range	Beneficial	Long-term	Major	Range-wide
Sonoran Desert National Monument Establishment and Management	Current and Ongoing	496,337 acres of land in NE portion of BMGR proclamation by Clinton in 2001. Mgmt. Plans are underway.	Beneficial land use designation, but outside action area and current pronghorn range. Approx 500,000 ac.	Beneficial	Long-term	Major	Regional
Flat-tailed Horned Lizard Rangewide Management Strategy	Current and Ongoing	Rangewide mgmt. strategy calls for establishment of mgmt. areas – 0ne in AZ. That includes BMGR west lands.	Sets management direction. Protects pronghorn habitat. Could force adverse actions into pronghorn habitat. Area estimate difficult: thousands of acres?	Beneficial	Long-term	Minor	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Mohawk Mountains and Sand Dunes ACEC	Past and Ongoing	Continuation of special land-use designation.	Protection of pronghorn habitat.	Beneficial	Long-term	Major	Regional
Man and the Biosphere Program	Current and Ongoing	UNESCO recognition of the park's global and regional significance.	Beneficial land use designation. Relevant to ≈330,000 ac at OPCNM	Beneficial	Long-term	Negligible	Range-wide
BMGR Land Withdrawal	Past and Ongoing	BMGR land withdrawal is reserved for (1) an armament and high hazard testing area; (2) training for aerial gunnery, rocketry, electronic warfare, and tactical maneuvering and air support; and (3) other defense related purposes. The restricted airspace associated with the BMGR is designated by the FAA to denote defined airspace areas where military activities such as aerial gunnery, artillery firing, or missile firings can occur.	Continuation of: loss and degradation of habitat; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; aerial noise disturbance; loss of cover sites; introduction of weed plant species (habitat degradation); availability of artificial water sources; increased probability of mortality; barriers to movement; exclusion from habitat; exposure to toxins; diminished recruitment; restricted recreation access (beneficial).	Beneficial and Adverse	Long-term	Major and Minor	Regional
El Pinacate y El Gran Desierto de Altar	Current and Ongoing	South of Border in pronghorn range. Protected ecosystems include core area and buffer zone.	Benefits: beneficial land use designation; protection of resources; professional management; regulation of recreational use. Adverse: livestock grazing, mining, residential areas.	Beneficial and Adverse	Long-term	Major and Major	Regional
Lower Gila South Resource Management Plan (Goldwater Amendment)	1990-2001	1990 plan addresses non-military land use and natural and cultural resources.	Increased probability of mortality; surface noise disturbance; availability of artificial water sources; presence of humans in pronghorn habitat; beneficial land use designation.	Beneficial and Adverse		Regional	
Archaeology and Other Resource Management Activities	Ongoing	Ongoing archeological and resource study and monitoring activities.	Presence of humans in pronghorn habitat (disturbance); surface noise disturbance; improved knowledge base. Area estimate difficult.	Beneficial and Adverse	Short-term	Minor and Minor	Regional
Mitigation for Military Operations in Sonoran Pronghorn Habitat	Current and Probable Future	Daily air and vehicle patrols for presence of pronghorn. Every attempt is made to avoid disturbance.	Presence of humans in pronghorn habitat (disturbance); surface noise disturbance; improved knowledge base. Area estimate difficult.	Beneficial and Adverse		Moderate	
BLM Management Plan for other BMGR Parcels not renewed by the Military Lands Withdrawal Act of 1999	Current and Ongoing	Report to Congress in 2000 renewed the withdrawal of BMGR except for approx. 107,000 acres. BLM future mgmt. of withdrawn lands possible.	Impacts and acreages unknown, pending management plans.	Unknown	Unknown	Unknown	Unknown

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Arizona State Parks Arizona Trails 2000 Plan	1999	Recommends actions to help guide off-hwy. and vehicle and nonmotorized trails programs through 2005.	Impacts and acreages unknown, pending management plans.	Unknown	Unknown	Unknown	Unknown
BLM Off-Highway Vehicle Policy	2001 to present	Guidance and recommendations for off-hwy vehicle mgmt.	Impacts and acreages unknown, pending management plans.	Unknown	Unknown	Unknown	Unknown
Discontinued low-level holding areas for military aircraft over CPNWR	Present & Ongoing	Discontinuation of low-level holding areas for fixed-wing military aircraft over pronghorn habitat	Beneficial impacts, by reducing potential disturbance and behavior alterations by decreasing aerial noise. Approx 850,000 acres	Beneficial	Long-term	Major	Regional
Lechuguilla-Mohawk Habitat Management Plan	1997-2001	Wildlife improvement projects on 930,000 acres of public land including BMGR-west and public lands to the north and west of BMGR-west.	Surface noise disturbance; increase in predators; presence of humans in pronghorn habitat; availability of artificial water sources; increased possibility of disease transmission.	Adverse And Beneficial	Short- And Long-term	Minor to Moderate	Regional
Reopening of Copper Mine at Ajo (Possible Future)	Possible Future	A workforce of 350-400 and approx. $240 million in improvements are proposed if the mine reopens. Annual production is estimated at 135 million lbs. copper and 25,000 oz. of gold.	Increased loss and degradation of habitat; disturbance (blasting & other loud noises); barrier to movement; increased presence of humans in pronghorn habitat (disturbance); exclusion from habitat; possible exposure to airborne and runoff toxins.	Adverse	Long-term	Moderate	Regional
Cellular Telephone Tower construction along Highway 85	Possible Future	4 towers constructed along Hwy 85, between Ajo and Gila Bend	Incremental increase in utility/road corridor disturbance; loss of habitat; temporary increase in human presence and noise. Four towers in 39 miles of Hwy85.	Adverse	Long-term	Negligible	Localized
Gila Bend to Ajo 230kV Transmission Line	Possible Future	Approx. 47 miles long by 110 ft. wide from Gila Bend to Ajo. Currently, there are no plans to construct unless mine at Ajo resumes.	Incremental increase in utility/road corridor disturbance; movement barrier; loss of habitat; temporary increase in human presence and noise. 40-mile corridor.	Adverse	Long-term	Moderate To Major	Regional
Flash Burning of Military Munitions Residue	Ongoing	Burning of ignitable energetic materials to ensure safety within the recycling chain. Materials consist of munitions scrap from practice bombs, rockets, etc.	Presence of humans in pronghorn habitat (disturbance); surface noise disturbance. Flash-burning is within footprint of currently-impacted target areas.	Adverse	Short-term	Minor	Localized
Clean-up of Inactive Air Force Targets	Probable Future	Cleanup at 17 inactive sites and 3 non-target sites. 11,514 acres subject to clearance	Presence of humans in pronghorn habitat (disturbance); surface noise disturbance. 11,514 acres.	Adverse	Short-term	Minor	Localized
Air Force "Target Town"/Mission Support Plan	Possible Future	Designed to resemble an urban area. It would consist of stacked shipping containers with exterior lighting. A "no drop" target used for target I.D. and	Loss and degradation of habitat; increased probability of mortality; decrease in recruitment; presence of humans in pronghorn habitat (disturbance); surface noise disturbance; aerial noise disturbance. 250 acres or 1 km square	Adverse	Long-term	Major	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
		siting.					
Air Force Gravel Extraction	Probable Future	Excavation of sand and gravel from dry washes for use in road repairs and reconditioning of manned range strafe pits. Seven proposed sites. Acreage unknown.	Loss and degradation of habitat; presence of humans in pronghorn habitat; surface noise disturbance; aerial noise disturbance; spread of weedy plant species. Area estimate not available.	Adverse	Long-term	Moderate	Localized
Increasing Air Force Night Training Operations	Possible Future	All military airspace is being evaluated for an increase in night attack training operations. Guidelines on when and where have not occurred.	Aerial noise. Impacts of Night Operations included under "BMGR Land Withdrawal" Potentially approx. 1 million acres	Adverse	Long-term	Moderate	Regional
Transporting Boilers to Palo Verde Nuclear Generating Station	Probable Future	Summer 2002. Three nuclear generators will be transported in a 150 ft. self-propelled modular transporter travelling 4 mph. on Hwy. 85. Ten day travel time is expected.	Potential adverse disturbance impacts from human activity and surface noise. 80 miles of Hwy85	Adverse	Short-term	Negligible	Localized
Future Aircraft and Weapons Systems	Possible Future	Training with long range weapons at their full stand off range. Could require the closure of BMGR to public. No firm plans for this type of training.	Increase in probability of mortality & aerial noise (disturbance). Area estimate unavailable.	Adverse	Long-term	Moderate	Regional
Panda Power and Gila Bend Power Partners, LLC Power Plants	Probable Future	Two elec. power plants proposed in the vicinity of Gila Bend. Land is being purchased around the site of the plants for potential mixed use development.	Loss and degradation of habitat; surface noise disturbance. Area estimate unavailable.	Adverse	Long-term	Minor	Regional
National Guard Beddown of Apache Helicopters at WAATS	Future	Addition of 32-50 Apache helicopters for use in BMGR. An EA and FONSI is completed. Additions could begin in 2002.	Presence of humans in pronghorn habitat (disturbance); surface noise disturbance; aerial noise disturbance; increased probability of mortality. Area estimate unavailable	Adverse	Short-term	Moderate	Localized
Reduced 5-year EOD Clearance Requirements	Probable Future	EOD sweeps of manned ranges.	Impacts ongoing but reduced area affected. Impacts of EOD clearance included under "BMGR Land Withdrawal"	Beneficial	Short-term	Minor	Localized
Sonoran Pronghorn Forage Enhancement	Possible Future	Annual and perennial forage enhancement in 10 areas on BMGR, fall 2001.	Increase in forage; increase in predators; degradation of native habitat; increase in human activity. Approx 2470 acres.	Beneficial and Adverse	Short-term	Moderate And Minor	Localized
BMGR Integrated Natural Resources Management	After 2001	Joint plan (Navy, AF, DOI) for the mgmt. of BMGR. EIS is initiated. Issues identified include	Setting management policies; beneficial land use zoning; improved knowledge base; presence of humans in pronghorn habitat (disturbance); surface noise disturbance.	Beneficial and Adverse	Long-term	Major and Minor	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Plan		protection of natural and cultural resources, mgmt, of brush fires, design of range gates for wildlife, and use of BMGR for hunting and trapping.					
Citizen's Initiative: Sonoran Desert National Park	Possible Future	Proposal to consolidate multiple-agency management into one large national park.	Beneficial management strategies; professional management; regulation of recreation; increased human visitation. Approx 3 million acres	Beneficial and Adverse	Long-term	Major and Minor	Regional
Part 3. Future NPS Actions in Organ Pipe Cactus National Monument that are not included in the 1997 General Management Plan. (This list is comprised of potential projects; these projects may not be funded. Impacts would only accrue if projects were funded and carried out)							
South Puerto Blanco Drive Improvement	Possible Future	Reconstruct the South Puerto Blanco Drive. Widen to 18' (increase of approx 2') to meet NPS standard and eliminate safety hazard	Negative impact due to human presence and activities. Habitat loss approximately 3.2 acres	Adverse	Both short-term acute and long-term, chronic effects on pronghorn	Minor	Local, scattered
Fuel management, Quitobaquito	Possible Future	Project would reduce accumulated fuels that create a wildfire hazard at Quitobaquito Pond - mesquite, acacia, hackberry, etc. Dead and down plant material would be removed, and some live trees and shrubs removed.	Impacts depend on nature & scale of project. Project activities may be detrimental (local disturbance), and new configuration may have effects. Fuel reduction may increase accessibility for pronghorn (beneficial effect). Approx. 5 acres	Beneficial Adverse	Long-term Short-term	Negligible Negligible	Localized
Change Status of North Puerto Blanco Loop Drive	Possible Future	Project will allow 2-way traffic on the first 5.1 miles of North Puerto Blanco drive and will widen the first 5.1 miles of the drive from its present 14' width to a 20' to meet the NPS standard for dirt roads with 50-200 average daily traffic (ADT). Concrete low water crossings will be installed in four major wash crossings. A small parking area (6 vehicle) with adequate space to safely turn around will be constructed at the end of the two-way section near the current "Valley of the Ajo" pullout. Interpretive waysides will be installed at the drive entrance and terminus of the two-way section and at 4 pullouts. Vault toilets	Adverse impacts in the form of disturbance and possible movement barrier. This change in the NPB will increase human presence in vehicles and on foot in and adjacent to the project area and in and around the Puerto Blanco Mts. Widening the road and increasing traffic on it may make the NPB a movement barrier. Some beneficial impacts may accrue, if the NPB is closed at the 5.1 mile point from Feb 15- Sept 30, by reducing traffic along the north side of Puerto Blanco Mts. However, draft Wilderness Mgmt Plan has 2 Alternatives which would also make NPB 2-way jeep trail beyond Mile 5.1. This may increase traffic in that area, which would increase disturbance. Approx. 5.8 acres of habitat loss	Adverse Beneficial	Both short-term acute and long-term, chronic effects on SHPA	Major Major	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
		and picnic tables may be added at the terminus in the future if health concerns ands visitor needs require.					
Inventory Dirt Roads and Evaluate Their Impact on Soils and Vegetation	Possible Future	Study the physical parameters of abandoned roads and surrounding areas to determine environmental barriers to natural recovery.	Anticipated negative impact on SPHA due to human presence. 100+ miles of closed road, 97 acres May lead to restored habitat.	Adverse Beneficial	Initial short-term acute impacts,	Negligible Minor	Regional
Highway 85 passing/turn lanes	Possible Future	At new Visitor's Center entrance area.	Effects possible, through increasing foot print of Hwy85 Habitat loss approximately 1.1 acre adjacent to already disturbed area	Adverse	Long-term	Minor	Localized
Cherioni Wash/highway 85 bridge	Possible Future	Bridge proposed for construction at Cherioni Wash - Mile70.4 – where there is currently a low-water crossing.	Effects possible; possible disturbance effects, due to construction activity. Also, some short term habitat loss due to bypass lanes, approximately 1 acre	Adverse	Short-term	Moderate	Localized
Wilderness Management Plan	Possible Future	Draft WMP under development in '00-'01, so far with 2 alternatives in addition to "No Action" alternative."	Depending on Alternative selected, potential adverse as well as beneficial impacts. Changes in status/configuration of roads and trails, and possible establishment of new trails, could cause disturbance. Other changes in road status could reduce disturbance.	Unknown	Unknown	Unknown	Unknown
Monument boundary fence, Lukeville area	Possible Future	Possible standard barbed-wire boundary fence to be built around perimeter of private lands comprising Lukeville.	Very minor adverse impacts. Busy developed area; pronghorn would avoid area. However, this would be another fence in habitat. Approx. 3 miles	Adverse	Long-term	Negligible	Localized
Vehicle Access-Montezuma's Head	Possible Future	Members of the Tohono O'odham Nation approached ORPI requesting to use motor vehicles to cross approximately 3 miles of wilderness to access Montezuma's Head in northeastern ORPI, for ceremonial purposes.	Some adverse effects possible (disturbance/movement barrier). Although pronghorn no longer range east of Hwy85, if they were able to again this area at the north end of the Ajo Mts. May provide a movement corridor connecting to other suitable pronghorn habitat in San Simon Valley, to Vekol Valley, etc	Adverse	Short- And Long-term	Moderate	Regional
overflights	Possible Future	Low-level helicopter overflights, to interdict UDAs and drug smuggling	Overflights likely to be form of disturbance, especially low-level helicopter flights, and night flights. Effects include disturbance, physiological stress from causing pronghorn to run, etc. Possible beneficial impacts if effective at reducing illicit traffic through pronghorn habitat, etc. 200,000 acres. Approx 1 flight/month	Adverse Beneficial	Short-term	Moderate Moderate	Regional
Undocumented Aliens (UDAs) and Smugglers	Possible Future	Essentially an unregulated activity. Up to 500-1000 UDAs and smugglers pass through ORPI per day, mostly walking, driving, or bicycling across wilderness backcountry. By far the greatest human presence in the ORPI backcountry, resulting in new trails, new	Adverse effects through disturbance and habitat degradation. Intensive cross-country foot and vehicle traffic (>1000 people per day estimate April 2001) is likely a strong disturbance factor for pronghorn. Secondarily, traffic causes habitat degradation due to trampling, fires, etc. Up to 200,000 acres. Illegal traffic has created over 30 miles of road and over 100 miles of trail. 140 vehicles/month on west side “Pozo Nuevo” road.	Adverse	Unknown, assumed to be long term	Major	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
		roads, rampant littering, and general resource damage.					
Repair and Cleanup Backcountry Trails	Possible Future	This project includes repairing, vegetation trimming, water bar construction and general clean up and removal of trash from illegal campsites and along park trails.	Adverse impact due to human presence and activities. Potential beneficial impact by encouraging visitors to stay on trails. Approximately 30 miles of trail	Adverse And Beneficial	Short- And Long-term	Minor	Local, scattered
Drug Enforcement	Possible Future	Request $5,000 for OT, and travel to provide effective special operations. Request $5,000 for rental of a water truck four times a year to work in conjunction with heavy equipment to reduce the number of illegal drive thrus associated with the US/Mexico border.	Negative impact due to human presence and activities Beneficial impact due to reduced illegal traffic	Adverse Beneficial	Mostly periodic, short-term acute with some long-term, chronic effects	Minor Moderate	Local, scattered
Determine Visitor Use Impacts on OPCNM Resources—Undocumented Aliens.	Possible Future	A study of impacts due to UDAs on monument resources will be undertaken.	Anticipated adverse impact on pronghorn due to human presence. Area estimate not available.	Adverse	Short-term	Negligible	Regional
Stabilize Building Ruins at Victoria Mine	Possible Future	1. Remove deteriorating lime-cement mortar and tuck point interior and exterior faces of all walls. 2. Reset all loose stones. 3. Stabilize and repair door and window frames.	Anticipated adverse impact on pronghorn due to human presence. Approx 0.1 acre.	Adverse	Short-term	Negligible	Local
Photographic Documentation of NRHP Ranching Structures	Possible Future	Three ranch sites will be photo-documented - Bates Well, Blankenship and Gachado Line Camp. This archival baseline information will be used in the future for monitoring, planning, condition assessments, and reconstruction or stabilization efforts.	Anticipated adverse impact on pronghorn due to human presence. Approx 3 acres.	Adverse	Short-term	Negligible	Local
Maintain and Stabilize Ruins and Historic Structures	Possible Future	Routine general housekeeping, IPM, annual maintenance, and cyclical maintenance will be performed to preserve and protect historic structures and features.	Anticipated adverse impact due to human presence and activities in a previously disturbed area.	Adverse	Long-term	Minor	Local, scattered
Conduct Cultural / Archeological Surveys for	Possible Future	Conduct cultural/archeological survey of existing 12 miles of trails which	Anticipated negative impact on SPHA due to human presence. 20 miles of trails.	Adverse	Short-term	Negligible	Regional

Action	Timing of Action(s)	Description	Impact on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
Approximately 20 Miles of Trail		have not previously been surveyed and the proposed 7.5-mile Pinkley Peak Trail. Trails include: Bull Pasture / Estes Canyon Trail, Palo Verde Trail, Desert View Nature Trail, Victoria Mine Trail, and Baker Mine loop trail.					
Human use effects on cactus ferruginous pygmy-owl: reproductive and behavioral ecology	Possible Future	A research study will provide information on behavior and reproductive ecology of the CFPO.	Anticipated negative impact on SPHA due to human presence. Approx. 600 acres	Adverse	Short-term	Negligible	Regional
ARPA	Possible Future	Work will involve initial GPSing, mapping, and monitoring of 15 archeological sites that are at risk within the monument.	Anticipated negative impact on SPHA due to human presence.	Adverse	Short-term	Negligible	Local, scattered
Border Anti-Drug Interdiction	Possible Future	Park law enforcement activities to deter smuggling activity across the monument includes vehicle and foot patrol, aircraft use, and special operations	Anticipated negative impact due to human presence and activities Reduced illegal traffic	Adverse Beneficial	Continuous-Short-term And Long-term	Major Major	Local
Smuggling Prevention by Preventing Cross Border Access to Park Roads	Possible Future	Request $10,000 for road ditch maintenance and heavy metal bollard installation near gates to prevent drug smugglers from driving around gates and across the desert form Mexico onto roads that parallel the international border with Mexico.	Anticipated adverse impact due to human presence and activities in a mostly previously disturbed area. Habitat loss less than 1 acre. Reduced illegal traffic	Adverse Beneficial	Periodic with short-term acute effects and some long-term, chronic effects on SPHA	Moderate Moderate	Local, scattered
Cost of Collection – Operations	Possible Future	This project consists of collecting fees through the sales of single entry permits at four (4) self-service "Iron Rangers" pipe safes.	Anticipated negative impact due to human presence and some habitat removal. Less than 0.1 acres.	Adverse	Short-term acute impacts during construction,	Negligible	Local, scattered

Appendix D. Impact Analysis for Specific NPS Actions in the 1997 General Management Plan's New Preferred Alternative (Alternative B)

	Project Title	Project Description	Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
1	Wilderness Management Plan	Develop Wilderness Management Plan, including establish use capacities and activities related to park management and research	OPCNM	Unable to determine; possibly both adverse and beneficial, depending on specifics of plan. Impacts would likely be in the form of either increasing or decreasing disturbance caused by human presence in backcountry and on remote scenic drives.	Unknown	Long-term	Various	Regional
2	Name Change	Seek designation as a national park	OPCNM	Possible beneficial impacts due to increased funding and management capabilities; possible adverse impacts due to increased visitation. 200,000 acres pronghorn habitat	Beneficial & Adverse	Long-term	Various	Regional
3	Manage Developed Zone	Expand and convert existing visitor center to create science, education and resources management center with adjoining interpretive center; expand maintenance facility to include Protection Division offices and to provide additional workspace and other utilities; fire station and helipad; partner with other Federal agencies for administrative office space in Lukeville; establish visitor orientation center with regional focus in Why; convert offices and dorms back to employee housing; maintain current number of housing units; establish partnership with Lukeville owner to provide apartments for seasonals and researchers; maintain current capacity at the VIP campground; reconfigure VC parking area and entrance to Puerto Blanco Drive.	Developed Zone	Adverse impacts in the form of habitat loss and disturbance, by increasing size of Twin Peaks development area and increasing potential disturbance due to increased human activity levels. Possible beneficial impacts from increased beneficial management capacity. Approx 10 acres	Adverse Beneficial	Long-term	Moderate	Local
4	Historic Property Management	Stabilize and apply preservation and use treatments for historic properties	Localized	Possible adverse impacts in the form of disturbance, due to project activities Approx 3 acres	Adverse	Short-term	Negligible	Local
5	Highway 85 Corridor Management	Acknowledge and manage for dual purpose road: maintain traffic mobility and traveler safety; determine traffic speed; manage roadside vegetation; provide 4 wayside exhibits for visitor education; provide for resource protection and conservation	North-south corridor through OPCNM	Possibly both adverse and beneficial impacts. Beneficial in the form of reducing disturbance and reducing movement barrier. Adverse in the form of increasing human activity areas at waysides, maintaining movement barrier effect, and disturbance. 22 miles of Hwy85	Adverse And Beneficial	Long-term	Moderate To Major	Linear corridor
6	Quitobaquito Springs Management	Relocate parking area; construct loop trail accessible to mobility-impaired visitors; design and install interpretive	Local area	Adverse impacts due to facilitating increased human use of area. Beneficial impact due to improved management of human activity and vehicles in area	Adverse And Beneficial	Long-term	Moderate	Local

	Project Title	Project Description	Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
		signs; construct comfort station; construct road connecting the South Puerto Blanco Road with the boundary patrol road; expand size of management area.		Approx 20 acres				
7	Relocate Powerline Corridor	Move powerline to the State Route 85 corridor	Localized	Beneficial impacts in the form of reducing human activity (disturbance) along this corridor. Short-term adverse disturbance impacts from project activities. Approx 22 mile corridor	Beneficial And Adverse	Long-term Short-term	Moderate	Regional
8	Sonoran Pronghorn Management	Study impacts of highway traffic volume and speed on pronghorn; reduce impacts of highway; educate visitors about impacts of highway; monitor and restrict human use and access to minimize disturbance to pronghorn.	OPCNM	Beneficial impacts in the form of reducing disturbance caused by human activities, and possibly by reducing movement barrier effect of Hwy85. 200,000 acres pronghorn habitat, 22 miles of highway	Beneficial	Long-term	Major	Regional
9	Alamo Canyon Campground	Study impact of adding additional campsites; delineate day use parking area.	Local	Very small adverse impacts due to disturbance due to increased human activity. Area not currently used by pronghorn, but probably was historically (pre-Hwy85).	Adverse	Long-term	Negligible	Local
10	Trails	Maintain existing trails: Arch Canyon, Estes Canyon/Bull Pasture; Alamo Canyon; Old Ajo-Sonoyta Road; Grass Canyon-SR85; Desert View; Desert Discovery (VC). Add foot trails: Desert Garden Loop (near Highway 85); Grinding Holes Trail (near Highway 85); Puerto Blanco Loop; Bonita Well Trail; Twin Peaks Trail; Diaz Spire Loop; Alamo Canyon Trail extension	Scattered throughout OPCNM	Adverse impacts in the form of disturbance, due to facilitating human activity in pronghorn habitat. Potential beneficial impacts if human activity can be concentrated in non-sensitive areas.	Adverse And Beneficial	Long-term Short-term	Moderate	Local to Regional
11	Abandoned Mine Lands	Maintain safety fences and signs; close and restore selected mine and well sites.	Scattered throughout OPCNM	Beneficial impacts by reducing potential mortality due to pifall hazards. ≈400 mine features	Beneficial	Long-term	Moderate	Regional
12	Land Acquisition	Acquire 2 sections of State Land (Growler Wash/Bates Well and Dos Lomitas)	Local	Beneficial impacts in the form of preserving habitat. 1280 acres	Beneficial	Long-term	Moderate	Local
13	Vegetation Management	Control non-native vegetation; revegetate disturbed areas; monitor and mitigate impacts of woodcutting	OPCNM	Beneficial impacts in the form of habitat restoration and protection. Area estimate difficult, but exceeds 20,000 acres	Beneficial	Long-term	Major	Regional
14	Wildlife Management	Study effects of poaching; control non-native animals (e.g. cattle)	OPCNM	Beneficial impacts in the form of reduced mortality and reduced competition; impacts minor because poaching and trespass grazing are currently minor	Beneficial	Long-term	Minor	Regional
15	Inventory and Monitoring	Inventory plants and animals; monitor land use trends; monitor special status birds, mammals and plants; monitor reptiles, nocturnal rodents, climate, vegetation structure and diversity, post-grazing	Scattered	Adverse impacts in the form of disturbance. Potential beneficial impacts in the form of better management due to better ecological information	Adverse And Beneficial	Short-term Long-term	Minor Moderate	Local Regional

	Project Title	Project Description	Location	Impacts on Sonoran Pronghorn	Impact Type	Impact Duration	Impact Intensity	Impact Context
		recovery and invasive plants; water resources.						
16	Aircraft Overflight Management	Monitor overflights; assess impacts on resources and visitors; work with military to reduce impacts.	Widespread	Beneficial impacts in the form of reduced disturbance, if effort is successful	Beneficial	Long-term	Moderate	Regional
17	Miscellaneous	Develop user capacities and maintenance standards for non-wilderness areas (e.g. scenic loop drives).	Loop drives and developed areas	Beneficial impacts in the form of decreased disturbance and decreased movement barriers, if user capacities place pronghorn conservation as high priority	Beneficial	Long-term	Moderate	Regional

Appendix E. Comments on the Draft Supplement and Responses to Comments

The 45-day comment period for the draft Supplement concluded on September 14, 2001. The Plaintiffs of Defenders of Wildlife, et al. vs. Babbitt, et al., asked the court to extend the comment period for a total of 60 days. The court extended the public comment period for 15 days, and the comment period ended on September 28, 2001.

The National Park Service received a total of eight letters during the comment period. Several of the letters provide a point of view about the draft supplement and do not require a response. For letters with comments to be addressed, the comment is summarized and a response is provided below the comment.

Letters

1. June D. Marcus, Ajo, Arizona
2. Linda Z. Leblang, Scottsdale, Arizona
3. Sonoran Institute, Luther Propst, Executive Director, Tucson, Arizona
4. Arizona Department of Transportation, Melissa G.E. Maiefski, Environmental Planner/Biologist, Tucson, Arizona
5. Defenders of Wildlife, Rennie Anderson, Associate Counsel, Washington, D.C.
6. University of Southern Maine, Christine R. Maher, Ph.D., Associate Professor of Biology, Portland, Maine
7. Arizona Game and Fish Department, Russell K. Engel, Habitat Program Manager, Region IV, Yuma, Arizona
8. United States Environmental Protection Agency, Region IX, Lisa B. Hanf, Manager, Federal Activities Office, San Francisco, California

1820 Rocalla
Ajo, AZ. 85321
August 4, 2001

Organ Pipe Cactus National Monument
10 Organ Pipe Drive
Ajo, AZ. 85321

Dear Sir,

Evidently the government thinks more of the comfort of the pronghorn than it does of its citizens.

The money should be spent on the need of the citizens that are homeless.

Open up the water holes in the Sonoran Desert and the Pronghorn will multiply and thrive.

There is no need to spend money for underground passageways for the animals.

There is no need to spend money for the employee housing.

There are rentals and housing for sale in Ajo and Why.

What next, are you going to propose grade schools in National Parks for the children of the employees?

The National Parks need more maintenance before money is spent for frivolous ideas.

Sincerely,

June D. Marcus

June D. Marcus
1820 Rocalla
Ajo,AZ.85321

cc Honorable Jon Kyl
cc honorable John McCain
cc Honorable Ed. Pastore

LINDA Z. LEBLANG
7849 E. PLEASANT RUN COURT
SCOTTSDALE, ARIZONA 85258
USA
Home Phone 480-483-7252
Email LZL1@AOL.COM

July 26, 2001

U.S. Fish and Wildlife Service
Caheza Prieta National Wildlife Refuge
Don Tiller, Manager
1611 North Second Avenue
Ajo, AZ 85321

Dear Sir,

I am very concerned about the potential plans to improve State Road 85 (SR 85) through the Organ Pipe Cactus National Monument. My concern is for the highly endangered Sonoran pronghorn antelope. As you know, there are less then 100 Sonoran pronghorn left in the United States. That is real problem. They all live here in our beautiful state of Arizona. Most of these few antelopes live in Organ Pipe.

These antelopes are endangered and even more so with such few numbers. The current protected area constitutes a large portion of the remaining pronghorn habitat. It is a know fact, from research on other endangered animals, that anytime we humans built roads, enlarge roads, etc, we are causing more harm to the safety, the diversification of the gene pool, and the stability of a species. If you widen this road or improve this road in anyway, you will be encouraging faster traffic on SR 85. You will add an additional stress and endangerment on these animals.

I along with the thousands of other citizens, ask you to reconsider your plan. Protect this species before there are none left in the wild. I have traveled this road extensively to go to Mexico. I have never seen a pronghorn, but I know they are there. The only trouble with the road, is that everyone is in a hurry and don't think about anything else but themselves.

Sincerely,

Linda Z. LeBlang

CC:
Bill Wellman
Sue Rutman

SONORAN INSTITUTE

September 7, 2001

Mr. Bill Wellman, Superintendent
Organ Pipe Cactus National Monument
National Park Service
10 Organ Pipe Drive
Ajo, AZ 85321

RE: *Comment on the Draft Supplemental Environmental Impact Statement; Re-Analysis of Cumulative Effects on the Sonoran Pronghorn/Organ Pipe Cactus National Monument General Management Plan/Development Concept Plan*

Dear Mr. Wellman:

Thank you for the opportunity to review the *Supplement to the Environmental Impact Statement,* and I commend your efforts on the reanalysis of the cumulative effects on the Sonoran Pronghorn. I wish to address my comments to the proposed action activities that affect the Lukeville area.

The Sonoran Institute (SI) works with communities in western North America to conserve and restore their unique natural landscapes, wildlife, and cultural values. SI has worked in partnership with the National Park Service since 1991 to promote cross-boundary approaches for protecting and restoring the integrity of the Sonoran Desert.

The reanalysis of cumulative impacts on the Sonoran Pronghorn accurately identifies that increased traffic on State Route 85, associated with increased commerce between Mexico and the United States and with increased tourism to Puerto Peñasco and northern Sonora, threatens to have significant impacts on Sonoran Pronghorn habitat and on park resources in general. SI endorses Organ Pipe Cactus National Monument's (ORPI) recognition that the pronghorn's historic range straddles the international border, as Figure 3 in the document indicates. Accordingly, long-term protection and recovery of the species requires coordination between federal land management agencies in the United States and their counterparts in Sonora—specifically the Pinacate y Gran Desierto de Altar Biosphere Reserve.

Both US Highway 85 and Mexico Highway 2 present barriers to pronghorn movement throughout their historic range. Given the historic and current range of the Sonoran Pronghorn, efforts to reverse the incremental reduction in the ability of the pronghorn to maintain a viable population will require enhanced cooperation across both park and international boundaries.

For these reasons, we commend ORPI for its efforts to establish and strengthen partnerships for the protection of the pronghorn beyond ORPI's boundaries. Long-term recovery requires strengthening these partnerships, as well as anticipating potential threats to continued progress and taking actions to avoid or mitigate these threats.

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The reanalysis points to least two measures necessary for long-term, regional, bi-national recovery of the Sonoran Pronghorn. One measure is the expansion to a regional scale of the long-term ecological monitoring activities that have occurred within ORPI. We recognize the on-going collaboration between ORPI and the Pinacate Biosphere Reserve. With this experience, ORPI's partnership with the Tohono O'odham Nation, and neighboring federal land management agencies will greatly assist ecosystem monitoring efforts in the Sonoran Desert. We see collaborative ecosystem monitoring as a critical, long-term tool to assist particular species recovery, such as the Sonoran Pronghorn, as well as assessing habitat condition (including the extent of invasive plants) and overall environmental health.

A second measure is to capitalize on the current opportunity to prevent private property in Lukeville from being more intensely developed, or converted to a use that is less compatible with the Sonoran Pronghorn specifically and park values generally. National Park Service acquisition of Lukeville is needed for effective implementation of measures related to Lukeville in the reanalysis, and provide an opportunity to further the bi-national cooperative efforts that are described as essential to the recovery of the pronghorn. In addition, concentration of visitor services, employee residences, and maintenance areas in the already disturbed Lukeville area will provide an alternative to continued incremental development of potential pronghorn habitat in the Twin Peaks area.

We suggest that the reanalysis provide a more detailed description of the beneficial impacts of National Park Service acquisition of private land in Lukeville to Sonoran Pronghorn recovery and to park values generally. For example, in Appendix D, Number 3, it would be appropriate to revise the project description that includes "...establish partnership with Lukeville owner to provide apartments for seasonals and researchers." Acquisition of Lukeville would provide the National Park Service and ORPI with a much higher level of ability than described here to ensure that future activities in Lukeville are compatible with Sonoran Pronghorn recovery and other resource values.

We appreciate the collaborative activities initiated by Organ Pipe Cactus National Monument and continued partnership and outreach with gateway communities such as Ajo and Sonoyta, and with the Tohono O'odham Nation. Again, thank you for the opportunity to comment on this important document.

Sincerely,

Luther Propst

Luther Propst
Executive Director

Arizona Department of Transportation

Environmental Planning Group
1221 South 2nd Avenue Mail Drop T100 Tucson, Arizona 85713
Phone 520.620.5419 FAX 520.628.5387

Jane Dee Hull
Governor

Mary E. Peters
Director

September 10, 2001

Mr. William E. Wellman, Superintendent
Organ Pipe National Monument
10 Organ Pipe Drive
Ajo, Arizona 85321-9626

Dear Mr. Wellman:

On behalf of the Arizona Department of Transportation (ADOT) I would like to thank you for the opportunity to review the draft Supplement to the Environmental Impact Statement for Organ Pipe National Monument's General Management Plan/ Development Concept Plan/ Environmental Impact Statement. Since potential impacts of State Route 85 (SR 85) and Interstate 8 to the threatened Sonoran pronghorn were prominent within this document ADOT appreciates the opportunity to provide some input concerning these impacts.

To begin with, the impact of SR 85 itself to the Sonoran pronghorn was mentioned in numerous sections of the document. Although the road itself may very well affect the movement of pronghorn, the actual impacts of the road to pronghorn movement were not clearly communicated within the document. On page 2 of the document it states: "Past observations of pronghorn movements suggested that traffic along Highway 85 acts as a barrier to pronghorn, restricting their movement across the highway." Furthermore, on page 24 the document states that "...the overall footprint of Highway 85 through the monument continues to have major, long-term adverse impacts to pronghorn by acting as a movement barrier". Also, on page 25, the document states that "pronghorn used to cross Highway 85 to use bajada habitats in eastern portions of the monument, but they no longer do. Studies on pronghorn elsewhere indicate this change is likely because of steadily increasing volume and speed of traffic on Highway 85" (this statement assumes that the reactions of other subspecies of pronghorn to increased road usage will also be the same reaction that Sonoran pronghorn will have to traffic on SR 85 and that this is the reason that Sonoran pronghorn no longer cross SR 85. This may not be an entirely accurate assumption).

Even though the document states many times that SR 85 is a barrier to pronghorn movement, it also states otherwise. Unlike the statement on page 25 that pronghorn no longer cross Highway 85, on page 17 the document states "the only indication of pronghorn crossing Highway 85 since then [1972] was a June 1996 sighting of a single female crossing east to west, approximately 12 miles north of Ajo on the Barry M. Goldwater Range (USFWS 1998)". In addition, within Attachment A (Organ Pipe Cactus National Monument Biological Assessment and Final Opinion) it states "Prior to a recent verified sighting of two pronghorns just west of State Route 85 near the Alamo Canyon Road in mid august 1995 (Organ Pipe Cactus Natl. Mon.,, unpublished data), the last verified observation of a pronghorn near this highway was a carcass found on Ajo Mountain Drive in 1972. (There is an unconfirmed report of four Sonoran pronghorn

crossing SR 85 in August 1993, approximately 1.5 km north of the monument visitor center)."

Based on the information provided, it is difficult to assume that SR 85 is acting as a barrier to pronghorn movement. The document states that the pronghorn no longer cross SR 85, yet it also states that they have been seen crossing the road as little as 5 years ago. One also has wonder if pronghorn are not seen crossing SR 85 on a regular basis because they are afraid of the road and associated traffic, or because the chance of a qualified person being in the right place at the right time to see an animal from a small population actually cross the road is so small.

In either event, if we were to assume that SR 85 was some sort of barrier to pronghorn movement, it is difficult to state that any work along the highway that would widen the actual pavement at any point would have an adverse impact to the pronghorn. If the pronghorn already will not cross a paved road that is, say, 30 foot wide, it is very doubtful that they will cross a 36 foot road. If the road in its current condition prevents pronghorn from crossing to the east side of the highway, the additional pavement width should not impact the pronghorn to any greater degree than the current width does.

In addition, the document quite frequently mentions the speed limit on SR 85. In more than one instance, the document states that the increase in speed limit from 55mph to 65mph is detrimental to the pronghorn. On page 58, it states that the 65mph speed limit has "adverse impact effects in the form of potentially increasing the movement barrier that Hwy 85 constitutes, by increasing roadway footprint and facilitating higher traffic speeds. Increasing speeds also increase roadkill possibilities. Increasing speeds may create demand for increasing road width, shoulder width, etc, which increases Hwy footprint, therefore again increasing barrier effect. 22 miles of roadway excludes pronghorn from approximately 90,000 acres of habitat". Again, if the existing roadway is a barrier to pronghorn movement, the higher speed limit should not impact the pronghorn because the pronghorn are not crossing the roadway and therefore are not at higher risk of being hit by a car with the higher traffic speeds. In addition, if the pronghorn are not currently crossing the road, then wider shoulders on the road should not impact the pronghorn either.

Furthermore, the document discusses the impacts of vegetation clearing along the highways to the pronghorn. The issue of vegetation management along our highways was brought up within various parts of the tables found at the end of the document. Vegetation removal was discussed under appendix B (existing conditions), appendix C (past, present and reasonably foreseeable projects), and under appendix D (Impact analysis for specific NPS actions). The reoccurrence of this action within the various tables seems to give more weight to this activity than it deserves. In addition, the impact type for this activity was labeled as adverse. Again, if the pronghorn are not utilizing the habitat directly adjacent to the roadways, nor are they crossing the roadways, then this action should not be identified as adverse. In addition, even if a pronghorn approached the roadway in an attempt to cross, the removal of vegetation along the shoulder would increase the likelihood of any passing motorists seeing the animal as well as increase the likelihood of the animal seeing the vehicle. This, in turn, may help to prevent a vehicle/animal collision. When looking at any potential vegetation clearing in this light, it could be viewed as beneficial as opposed to adverse. ADOT has completed many projects throughout the state to remove large vegetation in areas of high vehicle/animal collisions and it appears as though the practice has decreased the number of vehicle/animal collisions within these areas. It is also important to note that ADOT only removes large vegetation within the designated clear zone for a roadway. Within Organ

Pipe National Monument, ADOT only removes the large vegetation within the immediate shoulder of the roadway.

Another issue that needs to be clarified deals with the proposed waysides along SR 85, which were requested of ADOT by the Monument. On page 24, the document states "although not an action undertaken by the NPS, the increase in traffic volume, speed and the overall footprint of Highway 85 through the monument continues to have major, long-term adverse impacts to pronghorn by acting as a movement barrier". Of the proposed highway improvement projects to SR 85 through Organ Pipe, the one that has the largest potential impact to the pronghorn could be the establishment of these waysides. At least one of these waysides will be built on the west side of the highway, will entail a large footprint to construct, and will in all likelihood involve the establishment of new hiking trails from the waysides for people to enjoy in the future. However, on page 35 of the document, it states that the waysides will have a "minor to moderate, short term, localized disturbance." Also, the only mention of the waysides within the tables in the back is in Appendix D, under the Highway 85 corridor management portion. Here, the waysides are listed to be an adverse, long-term, moderate to major disturbance. There needs to be consistency on the impact analysis due to the waysides on the pronghorn. In addition, it needs to be clarified that these waysides, and the associated highway widening required for them, are being done by ADOT at the request of Organ Pipe National Monument.

There is also one additional statement within the document that needs to be clarified. On page 29 it states that there may be "future possible widening of Highway 85 to four lanes". Please clarify where this possible widening may occur. To my knowledge, there are no plans to widen SR 85 through Organ Pipe, which is what could be implied by this statement.

In closing, ADOT looks forward to working with the Monument in addressing the impacts of future highway projects within the region to the pronghorn. According to page 47 of the document, the NPS proposes to pursue an agreement with ADOT to " (1) establish a vehicle for continued communication regarding road related issues; (2) construct underpasses at known movement corridors to facilitate safe passage of pronghorn across the roadway; and (3) establish a program to explore other measures to better understand and subsequently reduce the impacts of State Route 85 on pronghorn". To my knowledge this has not occurred yet, although ADOT, the Federal Highway Administration and the Monument are currently looking at the potential impacts of the proposed SR 85 projects within the Monument to threatened and endangered species. Perhaps this can be a starting point.

Respectfully,

Melissa G.E. Maiefski
Environmental Planner/Biologist
Arizona Department of Transportation, Environmental Planning Group

Cc: Dennis Alvarez, Arizona Department of Transportation Tucson District Engineer
Richard Duarte, Arizona Department of Transportation Environmental Planning Group Manager

September 27, 2001

William E. Wellman, Superintendent
Organ Pipe Cactus National Monument
10 Organ Pipe Drive
Ajo, AZ 85321

Re: Draft Supplemental Environmental Impact Statement for Organ Pipe Cactus National Monument General Management Plan

Dear Mr. Wellman,

Defenders of Wildlife is a national nonprofit organization dedicated to the protection of native wild plants and animals in their natural communities. As an integral part of its mission, Defenders is actively involved in efforts to preserve Arizona's unique Sonoran Desert, one of the most biologically rich and diverse desert ecosystems in the world. In connection with these efforts, Defenders has been working for many years to protect the critically endangered Sonoran pronghorn, a subspecies of pronghorn that is specially adapted to life in the hot desert. The decline of this once-abundant species to the brink of extinction, where it now stands, is attributable in large part to human activities that have resulted in both the degradation and fragmentation of pronghorn habitat and the direct injury and mortality of pronghorns. The National Park Service's ("NPS") management of Organ Pipe Cactus National Monument ("OPCNM") in Arizona is among the activities impacting the few remaining pronghorn in their last remaining habitat.

The Sonoran pronghorn, which once roamed in the thousands throughout its range in the Sonoran Desert, has been reduced to a population of roughly 100 animals or fewer in Arizona and a total of perhaps 200-300 individuals in Mexico. Despite these dire circumstances, the NPS and other federal agencies that operate within the pronghorn's last remaining Arizona habitat have further undermined the survival and recovery of the species by, thus far, failing to adequately address and account for the synergistic and collective threats to the pronghorn posed by all of their activities in combination.

On February 12, 2001, a federal district court ruled that such a cumulative impacts analysis is required by the Endangered Species Act ("ESA") and the National Environmental Policy Act ("NEPA"). Thus, the NPS's "Draft Supplemental Environmental Impact Statement: Re-Analysis of Cumulative Impacts on the Sonoran Pronghorn" ("DEIS") is required of the agency pursuant to federal environmental law and the order of the court in Defenders of Wildlife v. Babbitt. On behalf of our more than 475,000 members and supporters, Defenders is pleased to submit these comments on the DEIS for the NPS's consideration in developing a final supplemental EIS to address cumulative impacts to the pronghorn. Defenders also incorporates by reference the comments it filed on May 23, 2001, in response to the NPS's April 26th scoping notice announcing development of the DEIS now at issue.

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The National Environmental Policy Act ("NEPA") requires each federal agency, when undertaking a major action significantly affecting the quality of the human environment, to prepare an EIS analyzing both the impacts of and alternatives to the proposed action. 42 U.S.C. § 4332(C). As an essential element of this analysis, NEPA's implementing regulations require agencies to thoroughly examine and assess the cumulative impacts of their activities – i.e., "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency ... or person undertakes such other actions." 40 C.F.R. § 1508.7.

Thus, in Defenders of Wildlife v. Babbitt, 130 F. Supp.2d 121 (D.D.C. 2001), the court simply made clear what was already well-established law: compliance with NEPA demands comprehensive and meaningful analysis of direct, indirect, and cumulative impacts to the pronghorn. Id. at 136. The court held that the Park Service's General Management Plan/Development Concept Plans/Environmental Impact Statement (collectively, "Plan") for OPCNM failed to satisfy NEPA regulations because, while it acknowledged certain impacts associated with management of the monument, it lacked actual analysis of cumulative or incremental effects stemming from those impacts. Id. at 138-39. Accordingly, the court concluded that the NPS's EIS was "deficient," and remanded the document to the agency for "consideration and analysis of such impacts." Id.

Unfortunately, the NPS does not appear to appreciate the nature of the cumulative impacts analysis mandated by federal law and the court's order. Although the DEIS compiles information on a range of activities by various agencies operating in pronghorn habitat and analyzes certain impacts associated with those activities, it falls short on the cumulative impacts analysis in several respects. Among other things, the DEIS relegates most of its "discussion" of activities impacting the pronghorn to recitation in a list; fails to adequately explain or justify its methodology for assessing cumulative impacts[1]; fails to consider new or modified alternatives that would redress or mitigate the cumulative impacts identified; neglects to incorporate synergistic impacts into its analysis; and glosses over the most crucial aspect of the task before it – meaningful analysis of cumulative impacts. Nowhere in the document does the Park Service actually perform, as required, a comprehensive evaluation of all impacts on the Sonoran pronghorn, including indirect, synergistic, and lasting effects from past, present, and reasonably foreseeable future actions.

Given the dire state of the pronghorn and the NPS's paramount role in managing an area of admittedly "crucial habitat for pronghorn," (DEIS at 17) it is particularly important that the agency recognize and observe its obligation to manage for the protection of this creature. Instead, however, the NPS appears determined to merely rubberstamp the activities it has already approved, thus dismissing the potential for harm to the pronghorn with such statements as: "[t]he pronghorn is not ... key to the natural or cultural integrity of Organ Pipe Cactus National

[1] With regard to methodological concerns, Defenders agrees with and incorporates by reference the comments on this DEIS filed by Christine R. Maher of the University of Southern Maine.

Monument or to opportunities for enjoyment thereof," (DEIS at 34) and "the NPS contributes to [only] a fraction of the overall impact on Sonoran pronghorn." (DEIS at 33) Yet the simple fact that the monument was not established for the express purpose of preserving the pronghorn, or that other activities may also impact the pronghorn, does not make the NPS's obligation to preserve this species any less essential, nor excuse the agency's refusal to prioritize the pronghorn in its management decisions for the monument.

The shortcomings in this DEIS are particularly troubling in light of the Park Service's own admission that the cumulative impacts of both alternatives presented "are likely to result in a continued, incremental reduction in the ability of Sonoran pronghorn to maintain a viable population in the United States," and that any "beneficial actions included in this cumulative scenario ... are outweighed by the adverse impacts." (DEIS at 33). Moreover, the NPS expressly recognizes that the pronghorn is "unique to the Sonoran Desert and an integral part of the Sonoran Desert ecosystem," (DEIS at 34). Under these circumstances, and given the agency's overarching conservation mandate embodied in the NPS organic act and policies, as well as in the ESA and other legislation, preservation of the critically endangered Sonoran pronghorn must clearly be a top priority to the NPS in developing its management plan for OPCNM.

***

In addition to the general weaknesses identified above, the following comments elaborate briefly upon two specific shortcomings in the Park Service's DEIS:

• ***Failure to Consider New or Modified Alternatives***. From the outset, the NPS has artificially limited the scope of its cumulative impacts analysis by determining that no new or modified alternatives will be considered in the DEIS. (DEIS at 3) Indeed, the NPS does not even include all of the Plan's original alternatives in its cumulative impacts analysis, instead limiting the DEIS to consideration of the two extremes (the no action alternative and the preferred action alternative), and thus exposing the NPS's apparent intention to simply "select" a predetermined course of action without regard to the findings of its cumulative impacts analysis.

The Council on Environmental Quality's ("CEQ") implementing regulations for NEPA make clear that the alternatives section "is the heart of the [EIS]." 40 C.F.R. § 1502.14. Moreover, the CEQ's handbook for conducting cumulative impacts analyses under NEPA specifically includes "modify or add alternatives to avoid, minimize, or mitigate significant cumulative effects" as one of the key steps in determining the environmental consequences stemming from the cumulative effects of a proposed action. CEQ Handbook at 10, 37, 45; see also id. at v ("Generally it is also critical to incorporate cumulative effects analysis into the development of alternatives for an ... EIS. Only by reevaluating and modifying alternatives in light of the projected cumulative effects can adverse consequences be effectively avoided or minimized."). Clearly, NEPA envisions a rigorous analysis and objective evaluation of cumulative impacts as a critical component in the formative stage of decision making; in other words, the relevant decision makers should have this information before them in developing proposals and alternatives and in selecting preferred actions.

Unfortunately, by foreclosing consideration of new or even modified alternatives in its DEIS, the NPS apparently has in mind a far more superficial attempt to cure the deficiencies identified by the court while rubberstamping the agency's predetermined course of action for management of OPCNM. As explained in Defenders' scoping comments for the DEIS, the NPS's Plan for OPCNM fails to consider a sufficient range of alternatives to address adverse impacts to the pronghorn resulting from, among other things, the speed and volume of traffic on State Road 85 and the increase in recreational use of and visitor facilities on the monument. Yet the NPS's DEIS fails to redress this deficiency and, as such, fails to remedy the key failing identified by the court in Defenders of Wildlife v. Babbitt.

• ***Failure to Cumulate Impacts Identified.*** Although the DEIS identifies numerous impacts to pronghorn associated with activities conducted by the NPS and other agencies operating in pronghorn habitat, the document only superficially addresses the critical component of the required analysis – namely, cumulative impacts. For one thing, by organizing its analysis in terms of "impact categories" (e.g., habitat loss, direct mortality, etc.), the NPS emphasizes certain types of impacts while glossing over the central question of how these various impacts combine and interact to produce adverse effects on the pronghorn. The agency's conclusion – even a conclusion acknowledging that cumulative effects will likely contribute to the continued decline of the pronghorn – cannot substitute for a comprehensive evaluation of what those impacts are, including synergistic and other effects.

In lieu of a more rigorous discussion and analysis in the text of the DEIS, the NPS repeatedly refers to the reader to the appendices for a "detailed analysis" of impacts. (DEIS at 24). Yet the appendices contain no such "analysis," instead presenting a compilation of effects in chart format, with brief descriptions of impacts followed by generic, qualitative evaluations of type, duration, and intensity. This approach fails to incorporate any of the more sophisticated, quantitative methodologies now widely recognized in the field of ecology, and effectively limits the agency's ability to actually cumulate the many impacts identified. Most importantly, this approach again provides no substitute for the meaningful analysis that NEPA demands.

***

Notwithstanding the Sonoran pronghorn's unique adaptation to its desert environment, the subspecies is at serious risk of going extinct due, among other things, to human activities. Given the few remaining individuals, their extremely limited habitat, and the multitude of natural and human factors adversely impacting the pronghorn, any additional impact – even a seemingly minor one – could spell the ultimate demise of this special creature. Under these circumstances, it is imperative that the NPS and other agencies adequately consider the cumulative impacts of their actions on the pronghorn.

In Defenders of Wildlife v. Babbitt, the court recognized both the obligation and failure of multiple federal agencies, including the NPS, to address such cumulative impacts in their environmental impact statements and biological opinions pertaining to activities in pronghorn habitat. Thus, among other things, the court remanded both the Park Service's EIS and the FWS's biological opinion addressing activities for OPCNM.

The pronghorn's dire situation makes every individual animal and the limited remaining habitat all the more critical to the subspecies' survival and recovery and highlights the NPS's obligation to manage for the protection of this special creature. Indeed, the Park Service's own determination in this DEIS that the cumulative impacts identified will likely contribute the pronghorn's decline only further underscores this responsibility. Thus, in developing the final supplemental EIS and in consulting with the FWS on the preparation of a new biological opinion, the NPS must take seriously its obligations under federal law and court order to conduct a comprehensive and meaningful analysis of the cumulative impacts from Park Service activities and other factors, including both additive and synergistic effects, on this highly imperiled species.

Thank you for the opportunity to comment on this important matter.

Sincerely,

Rennie Anderson
Associate Counsel

Jenny Neeley
Southwest Program Coordinator

cc: Laurie Dolmer, National Park Service

USM UNIVERSITY OF
Southern Maine

Department of Biological Sciences
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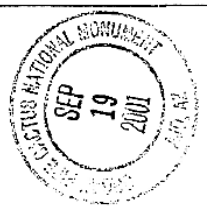


6 September 2001

Bill Wellman, Superintendent
Organ Pipe Cactus National Monument
10 Organ Pipe Drive
Ajo, AZ 85321

RE: Request for comments on Draft Supplemental Environmental Impact Statement, Reanalysis of Cumulative Impacts on the Sonoran Pronghorn

Dear Mr. Wellman:

I am an Associate Professor and Chair of the Department of Biological Sciences here at the University of Southern Maine. I also am a behavioral ecologist who has spent over 10 years studying the behavior and ecology of pronghorns in several areas within the U.S. I would like to submit comments on the National Park Service's (NPS) Draft Supplemental Environmental Impact Statement (SEIS) that addresses cumulative impacts on Sonoran pronghorns.

The NPS clearly has made a concerted effort to identify a large number of activities that could impact Sonoran pronghorns and to discuss the nature of those impacts. However, several methodological issues raise concerns to me as a scientist.

First, the categories relating to description of the impacts (pages 21-22) are qualitative in nature, and the definitions of some terms are vague. For example, "minor" intensity is considered to effect a "measurable but small" change to a population or individuals. How would such change be measured, and what would constitute "small" as opposed to the next grade of "moderate"? Furthermore, what types of consequences are considered, i.e., nutritional, reproductive, behavioral?

Likewise, the SEIS includes terms such as "localized", "moderate scale" and "limited area". These terms should be defined more explicitly. Sonoran pronghorns use large areas, and "localized" could still encompass many square kilometers.

On p. 23 of the SEIS, item 2 states that proposed projects deemed to have no impact were removed from the list. However, how was the lack of impact determined? It might be helpful to have a complete list of those projects so readers could judge for themselves, or at least have a more explicit description of the criteria used to remove "no impact" projects.

The methods do not describe how the cumulative impacts were determined. Item 3 on p. 23 suggests that impacts from some projects could offset each other, but only if they were considered to have equal, yet opposite, effects. However, that requires that each project be weighted, and that process was not undertaken except for the somewhat vague categories of "minor", "moderate", etc.

Within the field of ecology today, many quantitative techniques are available that would allow a more rigorous analysis of impacts. For example, an overly simple approach might be to assign a rank from 1-10 (positive or negative) for each impact, based on our best available knowledge from either Sonoran pronghorns or other suitable species, then calculate the overall effects by summing them together.

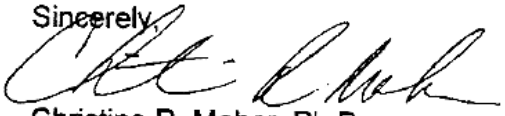
The SEIS does a commendable job of listing potential impacts on Sonoran pronghorns. Yet, the cumulative impacts analysis is somewhat superficial. As stated above, weighting or ranking the impacts and using a more quantitative analysis perhaps could yield results that are more meaningful. Indeed, the first paragraph of the Conclusions (p. 33) marks the only attempt to quantify effects – by listing the number of projects with adverse and (or) beneficial impacts. As a biologist, I understand the difficulty of quantifying sometimes unknown factors, but knowledge gained from other areas and other species might provide some insights.

Finally, the concluding paragraph under "Findings on Impairment" (p. 34) contains language that seems inconsistent to me. On one hand, the NPS states that loss of one or more pronghorns would represent a "major adverse effect to a park resource"; yet, they then state that the "loss would not be an impairment of park resources and values". I understand that protecting the endangered Sonoran pronghorn is not a specific goal of Organ Pipe Cactus National Monument's General Management Plan and thus falls outside the definition of "impairment". However, given the critical situation surrounding this unique component of the Sonoran Desert ecosystem, loss of these animals would seem to impair the park's resources and values. Sonoran pronghorns are one piece of the desert ecosystem, and their loss would disrupt the "natural... integrity of the park" (p. 3).

Results of the cumulative impacts analysis suggest the continued downward slide of Sonoran pronghorns toward extinction. The majority of projects, past, present and future, "adversely" impact pronghorns. However, the NPS apparently refuses to reconsider their management plan and would continue to operate as originally decided in 1997. Yet, the findings of the SEIS seem to warrant reconsideration of the original EIS, especially given increased visitor traffic to Organ Pipe Cactus National Monument and increased vehicular traffic on Route 85. Despite improved knowledge of the situation, the NPS chooses to stay the course, and perhaps we consequently lose an important member of the desert ecosystem. This not only would represent an ecological loss but a moral defeat as well.

Thank you for the opportunity to submit these comments.

Sincerely,



Christine R. Maher, Ph.D.
Associate Professor of Biology

THE STATE OF ARIZONA
GAME AND FISH DEPARTMENT
2221 WEST GREENWAY ROAD, PHOENIX, AZ 85023-4399
(602) 942-3000 • WWW.AZGFD.COM
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September 14, 2001

Mr. Bill Wellman
Organ Pipe Cactus National Monument
10 Organ Pipe Drive
Ajo, AZ 85321

Re: Draft Supplemental Environmental Impact Statement (DSEIS) Re-Analysis of Cumulative Impacts on the Sonoran Pronghorn

Dear Mr. Wellman:

The Arizona Game and Fish Department (Department) has reviewed the above-referenced DSEIS and the following comments are provided for your consideration. The Department understands that this DSEIS was prepared to comply with a February 12, 2001 ruling from the U.S. District Court (Civil Action No. 99-927, Defenders of Wildlife, et al. v. Bruce Babbitt, et al.) that the Organ Pipe Cactus National Monument 1997 Final General Management Plan/Development Concept Plans/Environmental Impact Statement did not comply with the National Environmental Policy Act of 1969 because the cumulative impacts on Sonoran pronghorn antelope from all agency activities were not fully analyzed. We further understand that this document only addresses the re-analysis of cumulative impacts on Sonoran pronghorn.

The Department concurs with findings presented in this document. While the cumulative impact analysis identified several beneficial impacts, we believe that they are outweighed by the total of adverse impacts.

Thank you for the opportunity to review and comment on this DSEIS. Please send me a copy of the final SEIS when it becomes available. If you have any questions, please contact me at 928-342-0091.

Sincerely,

Russell K Engel

Russell K. Engel
Habitat Program Manager
Region IV, Yuma

cc: Larry Voyles, Regional Supervisor, Region IV
John Kennedy, Chief, Habitat Branch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

Tim:
For files / Admin Record.

September 12, 2001

William Wellman, Superintendent
Organ Pipe Cactus National Monument
10 Organ Pipe Drive
Ajo, Arizona 85321

Dear Superintendent Wellman:

The United States Environmental Protection Agency (EPA) has reviewed the Draft Supplemental Environmental Impact Statement (SEIS) for **Re-Analysis of Cumulative Impacts on the Sonoran Pronghorn–Organ Pipe Cactus National Monument** [CEQ #010253] in accordance with our responsibilities under the National Environmental Policy Act (NEPA), the Council on Environmental Quality NEPA regulations at 40 CFR 1500-1508, and Section 309 of the Clean Air Act. Section 309, independent of NEPA, directs EPA to review and comment in writing on the potential environmental impacts associated with all major federal actions. In addition, EPA is directed to assess the adequacy of EISs in the context of meeting NEPA's procedural requirements. EPA's assessment is expressed in written comments and an alpha-numeric rating system which summarizes our views concerning potential environmental impacts and document adequacy.

EPA commented on Draft and Supplemental Draft versions of the EIS for the Organ Pipe Cactus National Monument General Management Plan (GMP) in letters dated July 10, 1995 and June 12, 1996, rating the documents EO-2 (Environmental Objections–Insufficient Information) and EC-2 (Environmental Concerns–Insufficient Information), respectively. EPA did not send a formal comment letter on the Final EIS, although our records indicate that the National Park Service adequately responded to our concerns. A Record of Decision approving the GMP was signed on January 28, 1998. The present SEIS, which was prepared pursuant to a court order, analyzes cumulative effects on Sonoran pronghorn that would result from implementation of the selected alternative when combined with other past, present, and reasonably foreseeable future actions in the region. A "no action" alternative has also been analyzed, as required by NEPA.

EPA commends the National Park Service for its thorough evaluation of cumulative effects associated with activities that could potentially impact Sonoran pronghorn. We have assigned a rating of **LO (Lack of Objections)** to the SEIS. Please consult the enclosed document for more information on EPA's rating system. Although we have no objections to the approved GMP or this SEIS, we remain concerned about the continuing decline of Sonoran pronghorn, and encourage the National Park Service to continue to work with federal, state, and local partners to address the continuing incremental reduction in the ability of Sonoran pronghorn to maintain a viable population in the United States, and to take all necessary actions to stem this decline.

EPA appreciates the opportunity to review and offer comments on this project. If you have any questions concerning this letter, please contact Leonidas Payne of the Federal Activities Office [phone: (415) 744-1571; e-mail: payne.leonidas@epa.gov]. Please send a single copy of the Final EIS to the Federal Activities Office when it becomes available.

Sincerely,

Lisa B. Hanf, Manager
Federal Activities Office

Enclosures: Ratings Summary

United States Department of the Interior

NATIONAL PARK SERVICE
Organ Pipe Cactus National Monument
10 Organ Pipe Drive
Ajo, Arizona 85321-9626

In Reply Refer To:
L7617

October 10, 2001

Mr. David Harlow
Field Supervisor
United States Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 W. Royal Palm Rd. Suite 103
Phoenix, Arizona 85021

Dear Mr. Harlow:

Please find enclosed the Organ Pipe Cactus National Monument revised response to the United States Fish and Wildlife Service's proposed conservation measures for the remanded biological opinions for the Sonoran Pronghorn. This revised conservation measure incorporates the specific items agreed to during the conference call between the National Park Service and the Fish and Wildlife Service on October 3.

If you have any further questions, please contact me at 520-387-5840. Thank You.

Sincerely,

William E. Wellman
Superintendent

Conservation Measures at Organ Pipe Cactus National Monument for Sonoran Pronghorn

1. Close key roads and backcountry west of SR 85 to all traffic during pronghorn fawning period and dry summer period (3/15 – 7/15)

The National Park Service will take the following actions to reduce impacts by park visitors during the fawning season:

1. Pozo Nuevo Road: Close to public use from March 15 to July 15.

2. Bates Well Road: Close to public use from March 15 to July 15. Closure will be coordinated with Cabeza Prieta National Wildlife Refuge.

3. North Puerto Blanco Drive:
   1. Reconfigure the road to provide two-way traffic for the first five miles.
   2. Institute a pronghorn monitoring program, with monitoring starting no later than March 1. An area 5 miles in diameter will be closed to public use around known pronghorn locations and administrative use will be reduced to a minimum in these areas. When this area of closure includes any portion of North Puerto Blanco Drive, the road will be closed to public use at the end of the two way section.
   3. Close to public use from March 31 to July 15.
   4. Gates and signage will be installed at the points of closure and other appropriate points.

4. Backcountry Permits: Backcountry permits will be limited to areas south of North Puerto Blanco Drive and east of State Route 85 from March 15 to July 15.

These actions will allow the National Park Service to provide reasonable access to the Monument for visitor use and enjoyment while minimizing disturbance of pronghorn by park visitors.

Letter 1. June D. Marcus
No response necessary.

Letter 2. Linda Z. Leblang
No response necessary.

Letter 3. Sonoran Institute

3-1. *The NPS should provide and reanalyze a more detailed description of the beneficial impacts of the NPS acquisition of private land in Lukeville to Sonoran pronghorn recovery and to park values generally. (i.e., establish partnership with Lukeville owner to provide apartments for seasonals and researchers.)*

As with all of the actions listed in the appendix D of the supplement, the NPS reviewed the actions listed in the GMP/DCP/EIS against the screening and rating criteria outlined in the methodology section of the SEIS. Since the printing of the draft, the possibility of NPS acquisition of private land in Lukeville has progressed, however, formal acquisition is not certain. If such an acquisition progresses further and partnership plans with the Lukeville owner become more foreseeable, then the NPS will complete the environmental compliance necessary to assess any beneficial as well as any adverse impacts that could result from the action. Consultation with the US Fish and Wildlife Service regarding the Sonoran pronghorn and any other affected threatened and endangered species would also be completed prior to any approved action.

Letter 4. Arizona Department of Transportation

4-1. *Based on the information provided, it is difficult to assume that Highway 85 acts as a barrier to Sonoran pronghorn.*

The SEIS cites radiotelemtry data from Arizona Game and Fish Department and Organ Pipe Cactus National Monument records as demonstrating that pronghorn have rarely, if ever, occurred east of Highway 85 since 1972. Similarly, casual records kept by the monument show that pronghorn did occur east of Hwy85 prior to 1972. Further, the supplement cites multiple published reports that document that pronghorn are reluctant to cross highways, with their reluctance roughly in proportion to the intensity of traffic that occurs. It has therefore been inferred that, as Hwy. 85 has borne increasing volumes of traffic at increasing speeds over the past 30 years, it has become an effective barrier to pronghorn movement.

4-2. *If Highway 85 does act as a barrier to traffic, widening the highway at any point, clearing it of brush, or increasing the speed limit would not impact the pronghorn to any greater degree than the current situation does.*

As previously stated in comment 4-1, published reports indicate that as the size and activity/use of roadways increases, the barrier effects on pronghorn also increase. Therefore, it is reasonable to conclude that widening the highway and/or further increasing vehicle speeds will increase the barrier effect on pronghorn. The net effect may not be much different (pronghorn would remain west of Hwy85 and be reluctant to cross the highway), but qualitatively there would likely be an even smaller likelihood that pronghorn would cross the highway.

4-3. *On page 35 (draft SEIS), the document states "….the waysides will have a minor to moderate short term, localized disturbance". The only mention of waysides within the tables in the back is in Appendix D, under the highway 85 corridor management portion. Here, the waysides are listed to be an adverse, long-term moderate to major disturbance."*

The bullet statements on pages 35-36 are incomplete. Impacts to pronghorn would be both short-term and long-term in duration. Visitors stopping and being present at waysides when pronghorn are nearby could result in a disturbance to or a harassment of the animal. The impact resulting from the possible event was determined to be direct, localized, short-term in duration

and of minor to moderate intensity. The possibility of continued and repeated disturbance or harassment due to repeated presence of humans at permanent waysides adjacent to pronghorn habitat can be seen as a long-term impact with moderate to major intensity. The increase in intensity would correlate with repeated sightings of humans over time. As described on page 18-19 of this document, Sonoran pronghorn are quite "skittish" and shy of humans. Pronghorn in proximity to humans, on foot or in vehicles, will move away (USFWS, 1998; Krausman, et al. 2000). The bullet statements regarding waysides (page 35, Impact Analysis, 3rd bullet under *Disturbance or Harassment*, page 36, Cumulative Impacts, 3rd bullet under *Disturbance or Harassment*) have been changed to more accurately reflect the potential impacts.

4-4. "On page 29 it states that there may be future possible widening of Highway 85 to four lanes. Please clarify where this possible widening may occur. To my knowledge, there are no plans to widen SR 85 through Organ pipe, which is what could be implied by this statement."

The monument staff has heard through comments from private citizens, a desire for and against the highway widened to four lanes from Gila Bend to Lukeville. However, the NPS has not seen any conceptual or other plans for widening. Therefore, "possible future widening of Highway 85 to four lanes" (Page 29*,* under *Curtailment of Habitat or Range)* has been deleted from the text.

Letter 5. Defenders of Wildlife

5-1. From the outset, The NPS has artificially limited the scope of its cumulative impacts analysis by determining that no new or modified alternatives will be considered in the DEIS.

The court order resulting from the civil suit (Defenders of Wildlife, et al. vs. Babbitt, et al.) declared that the National Park Service (Organ pipe Cactus National Monument) issued an Environmental Impact Statement that failed to address the cumulative impacts of their activities on the Sonoran pronghorn. The court remanded the EIS to the National Park Service to reconsider the cumulative impacts of the actions identified in the 1997 General Management Plan/Development Concept Plan/Environmental Impact Statement. The agency feels that it has prepared a supplement that is sufficient in satisfying the court order by extensively assessing the past, present, and future actions that may impact the pronghorn, regardless of what agency undertakes those actions. The findings of this supplement, along with the findings of a remanded USFWS biological opinion and recovery plan, may result in the implementation of specific actions aimed to protect the Sonoran pronghorn. Initial consultation between the USFWS and the NPS indicate that such actions will likely consist of modifications to park operations (i.e., seasonal road closures) that are administrative in nature. However, these actions would not be the type of actions that would require future amendments or revisions to the current General Management Plan.

5-2. The NPS glossed over the central question of how various impacts combine and interact to produce adverse effects on the pronghorn.

The SEIS provides the reader with a detailed methodology for analyzing cumulative impacts. Definitions for analyzing the intensity, duration, and type of impact are provided, along with a description of an action area (the geographical area in which past, present, and foreseeable actions were identified), and a cumulative scenario (a list and description of all of the past, present, and reasonably foreseeable future actions occurring in the action area that agencies, organizations, or persons have, are or plan on implementing). The supplement then provides a methodology for screening or rating each of the individual actions known listed in the cumulative scenario and known to occur in the action area. The "listing" of actions may be considered intermediate organizational steps in the overall analysis and not the heart of the analysis.

Using the analysis of individual actions contained in the appendices of the supplement, the preparers were able to draw a cause and effect relationship from individual actions. In turn these

actions could be grouped as to their intensity of the impact they create as well as the specific type of impact they have on the pronghorn.

In both alternatives, the analysis describes a number of similar and dissimilar actions that, when accrued, tend to have similar impacts (e.g., past livestock ranching and mining activities, expanding NPS visitor use facilities, military activities, agricultural development, and the presence of undocumented aliens are all fairly dissimilar actions, but all have an incremental and interactive impacts on the loss or modification of Sonoran pronghorn habitat). In addition to grouping similar and dissimilar actions and evaluating them by the type of impact, the NPS further analyzes these impacts by concluding with the overall cumulative effect of the actions contained in a given alternative (from the 1997 GMP) when considered with all other past, present, and reasonably foreseeable future actions.

Letter 6. University of Southern Main

6-1. *The categories relating to description of the impacts (pages 21-22) are qualitative in nature, and the definitions of some terms are vague.*

The preparers have provided a methodology for assessing impacts that provides the reader with a qualitative description of intensity levels (negligible to major), duration (short-term vs. long-term), and impact type (adverse vs. beneficial). CEQ (1502.22) requires agencies to obtain information if it is "relevent to reasonable foreseeable significant adverse impacts", if it is "essential to a reasoned choice among alternatives", and if "the overall costs of obtaining it are not exorbitant" Costs are not only measured by money, but also by time. Given the purpose of the supplement (to analyze cumulative impacts rather than choose between viable alternatives), the short amount of time and the enormous complexity and variety of the past, present, and foreseeably future actions occurring in the action area, and the fact that quantifiable data is not available for a majority of these projects, the preparers feel that the level of analysis that these definitions provide is comprehesive and sufficient, and accomplishes the goal of assessing the overall status of the pronghorn.

6-2. *Proposed projects deemed to have no impact were removed from the project list. However, how was the lack of impact determined?*

Projects that were not included in the analysis were those that had no measurable impacts (i.e., negligible impacts) on the Sonoran pronghorn. Each project was screened and rated using the methodology described on pgs. 22-23 of the draft supplement. Although some projects were determined to not have measurable impacts, they were included in the analysis because, given the nature of the project, they may contribute possible additive or interactive effects on the overall cumulative scenario. An example of a project that has no apparent measurable impacts on the Sonoran pronghorn is the proposed addition of campsites at Alamo Wash. Although the area is no longer used by pronghorn, an increase in visitation in the area could have an additive effect on the overall visitation that is believed to restrict pronghorn movements. Other projects such as the example given in the methodology (replacing a roof or upgrading an electrical system in the developed area) were dismissed because there were no apparent direct, indirect, or cumulative effects on the Sonoran pronghorn.

6-3. *The SEIS includes terms such as "localized", "moderate scale", and "limited area". These terms should be defined more explicitly. Sonoran pronghorns use large areas, and "localized" could still encompass many square kilometers.*

The impacts of various actions were evaluated with respect to the geographic context of the Sonoran pronghorn range, including "localized", "limited area", "moderate scale", and "widespread". Due to the wide range in scale and nature of actions and the large area used by Sonoran pronghorn, a formulaic, numerical evaluation was deemed to be cumbersome and ineffective. The NPS, however, believes that the meaning of these terms become more clear

when the reader considers the project description and the text summarizing impacts on pronghorn (Appendices B – D). Those descriptions provide information that helps specify what size area might be impacted by a specific project. Projects consisting of several hundred acres having impacts on several hundred acres of pronghorn habitat may still be as much of a "localized" impact as much smaller projects consisting of an acre or less. For example, the "Sonoran Pronghorn Forage Enhancement" project consists of about 2,470 acres. An impact such as predation could occur throughout the entire area, but due to the infrequent occurrence, the event may still be considered a "localized" impact. However, a project such as boundary fences throughout pronghorn habitat may cover very little acreage, but may have impacts on pronghorn that are within and beyond the range of their habitat and considered regional.

Letter 7. Arizona Game and Fish Department
No response necessary.

Letter 8. United States Environmental Protection Agency
No response necessary.

Appendix F. Draft Revised Biological Opinion, US Fish and Wildlife Service, October 22, 2001.

Consultation No. 2-21-89-F-078R1

Memorandum

To: Regional Director, National Park Service, Denver, Colorado

From: Regional Director

Subject: Biological Opinion for the Organ Pipe Cactus National Monument General Management Plan

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the proposed General Management Plan (GMP) for the National Park Service's (NPS) Organ Pipe Cactus National Monument (NM), located in Pima County, Arizona, and its effects on the Sonoran pronghorn (*Antilocapra americana sonoriensis*), lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), and cactus ferruginous pygmy owl (*Glaucidium brasilianum cactorum*) in accordance with section 7 of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (ESA).

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

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

This biological opinion is based on information provided during the previous consultation on this action, updated information on the proposed action provided by your agency, new information on the status of pronghorn, telephone conversations, field investigations, and other sources of information as detailed in the consultation history. Other species covered in the original biological opinion remain covered, but will not be revisited here. A complete administrative record of this consultation is on file at the Phoenix, Arizona Ecological Services Field Office (ESO).

CONSULTATION HISTORY

On June 26, 1997, the Service issued its biological opinion on the GMP. The biological opinion provides a history of the consultation that occurred between April 4, 1989 and the issuance of the biological opinion, and is hereby incorporated by reference. The opinion found that the effects of the action were not likely to jeopardize the continued existence of the Sonoran pronghorn, lesser long-nosed bat, or cactus ferruginous pygmy owl. In regard to the Sonoran pronghorn, the Service anticipated take of one pronghorn every ten years in the form of mortality or injury resulting from vehicular traffic on State Route 85 (SR 85). The opinion contained four reasonable and prudent measures to minimize take of pronghorn: (1) reduce effects of current and future SR 85 traffic patterns on pronghorn, (2) modify fences of Organ Pipe Cactus NM border to facilitate movement of pronghorn through Organ Pipe Cactus NM, (3) educate

motorists about the vulnerability of pronghorn to traffic, and (4) restrict access to areas of Organ Pipe Cactus NM in relation to pronghorn use.

On June 30, 1997, the NPS requested via e-mail that the Service change language in the biological opinion. The requested changes were only editorial except this substantive change in content regarding jurisdiction of SR 85: "Approximately 22 miles of State Route 85 lie within Organ Pipe Cactus NM. The State of Arizona and Pima County are responsible for maintaining the federally constructed road under an [sic] 1941 cooperative agreement. Since Organ Pipe Cactus NM was established before the road was constructed and the federal government never deeded a legal interest in the road to the State or County, the NPS believes that neither the State nor County has a right-of-way for State Route 85 through Organ Pipe Cactus NM. Therefore, the NPS believes it may impose reasonable resource protection and public safety regulations on the road's use." On July 1, 1997, we sent a memo to NPS acknowledging that we had made the requested changes to the biological opinion.

On September 29, 1997, NPS released the final version of the GMP including an Environmental Impact Statement (EIS). In a December 15, 1997, memorandum, the NPS informed the Service that it had begun implementation of the reasonable and prudent measure from the biological opinion which required modification of the north boundary fence to allow pronghorn movements. The NPS anticipated completing the fence modifications by mid-March 1998. We received the Record of Decision for the GMP EIS on March 5, 1998. On July 27, 2000, we received a letter from NPS requesting reinitiation of formal consultation. The request resulted from a change of the posted speed limit on SR 85 through Organ Pipe Cactus NM. In 1997, the Arizona Department of Transportation changed the posted speed limit of SR 85 within Organ Pipe Cactus NM from 55 to 65 miles per hour (mph). Although the GMP and accompanying biological assessment (BA) were based on the 55 mph speed limit, Service files indicate that the change in speed limit occurred before the final biological opinion was delivered, and the final opinion reflects this new information.
As discussed in the introduction to this opinion, Civil Action No. 99-927 [ESH], *Defenders of Wildlife, et al. v. Bruce Babbitt*, *et al.* precipitated this remanded biological opinion and 4 others. In a February 12, 2001, order, Judge Ellen Huvelle ruled (in part), "...that the Fish and Wildlife Service has acted in a manner that is arbitrary and capricious and contrary to law by issuing biological opinions that fail to address the impact of each defendant's activities on the pronghorn when added to the environmental baseline, 50 C.F.R. §§ 402.02, 402.12(g), and fail to include in the environmental baseline the impacts of all Federal activities in the area in which defendants are proposing or engaging in action that may affect, directly or indirectly, the pronghorn, 50 C.F.R. §402.02." And the court "further ordered that this matter is remanded to Fish and Wildlife Service, which has 120 days from the date of the Order to reconsider, in consultation with defendants, those portions of the Biological Opinions that have been found to be contrary to the dictates of the Endangered Species Act."

The Judge's order also required preparation of a supplemental EIS for the GMP, as well as for the Marine Corps Air Station (MCAS)-Yuma's Yuma Training Range Complex (YTRC). In regard to the Sonoran pronghorn recovery plan, the Judge required the Service to develop objective, measurable recovery criteria and schedules for implementing recovery actions.

On March 15, 2001, we received a letter from NPS requesting that several actions be included in the remanded opinion. The NPS stated that given the due dates mandated by the Court for the remanded opinion, NPS staff would not be able to prepare BAs for the new projects, but that the necessary information could be provided. The NPS also stated that if the Service deemed that any of the projects should be omitted from the remanded opinion and consulted on separately, they would agree to handle them in that manner.

On April 12, 2001, the deadline for completion of the remanded opinions was extended by the Court to November 16, 2001. A draft supplemental EIS for the YTRC was produced in June 2001. This document clarified those actions that may affect Sonoran pronghorn and described how those effects would manifest. A draft supplemental EIS was produced by Organ Pipe Cactus NM and distributed for public comment on July 16, 2001.

On July 24, 2001, the Service met with personnel from NPS to discuss the biological opinion. In our analysis, we had identified significant adverse effects to pronghorn and its habitat. We proposed several revisions to the proposed action to minimize or eliminate these effects. At that meeting, NPS personnel committed to exploring the addition of these measures to its GMP to conserve pronghorn. We met again with NPS and other agencies involved in management of the Sonoran pronghorn at an August 2, 2001, meeting of the Barry M. Goldwater Executive Council (BEC). We met to discuss the remanded biological opinions and measures that we had proposed to avoid or minimize adverse effects of proposed actions. On August 22, 2001, we received a letter from Organ Pipe Cactus NM in response to the conservation measures we had proposed at the July 24, 2001, meeting. Organ Pipe Cactus NM outlined several measures incorporated for pronghorn conservation which were not included as part of the GMP. After a conference call between the Service and the NPS on October 3, 2001, additional measures to conserve pronghorn were incorporated into the NPS GMP. These measures were formalized in an October 10, 2001, letter from Organ Pipe Cactus NM.

BIOLOGICAL OPINION

I. DESCRIPTION OF PROPOSED ACTION

A GMP is a guide for future management of a park or other NPS unit for the next ten or fifteen years. The proposed action for the Organ Pipe Cactus NM (Figure 1) GMP has changed since the 1997 plan was released, most notably with regard to GMP projects which are now ongoing or have been completed. The NPS has provided two alternatives in their supplemental draft EIS for the GMP (NPS 2001), the "Existing Conditions/No Action Alternative" and the "New Proposed Action Alternative." These alternatives represent the elements of the GMP that have been accomplished to date absent implementation of any new actions, and the GMP including all its as yet unimplemented actions, respectively. The NPS identifies the New Proposed Action Alternative as the "environmentally preferred alternative" and summarizes this alternative in the draft GMP. We analyzed effects of the New Proposed Action Alternative as the proposed action.

Land Use and Management Zones

The GMP will apply a new system of management derived from legislation, purpose and significance, and visitor experience, and consisting of three general zones. The Wilderness Zone preserves wilderness values identified in the Wilderness Act within two subzones: Potential Wilderness and the Quitobaquito Management Area. The Non-Wilderness Zone provides for uses involving large concentrations of people or facilities, and is divided into three subzones: Travel Corridor, includes all roads other than SR 85; Development Area; and SR 85 Corridor, a distinct management emphasis to ensure continued commerce and enhance conservation. A third zone, the Cultural Resources Zone, preserves, protects, and interprets cultural resources and settings.

Natural and Cultural Resources Management Plan (NCRMP)

The NCRMP guides Organ Pipe Cactus NM's resources management program. Certain actions proposed in the plan help resolve issues identified during scoping of the GMP, including the need for a comprehensive resources management program; mitigation strategies and species recovery plans; and increased efforts to preserve air, water, cultural, and other resources. This includes the following completed or ongoing projects:

- Wildlife surveys and ecological monitoring in wilderness areas
- Threatened and endangered species research and monitoring
- Backfilling of abandoned mines
- Control of non-native bufflegrass
- Management of trespass livestock
- Revegetation of disturbed sites
- North boundary fence-bottom wire replacement
- Rebuilding and rehabilitating Dos Lomitas

- Rehabilitating the Victoria Mine

Also included is a Wilderness Management Plan, which will be expanded in the future to include a regional context. An interagency effort will be developed to implement the Wilderness Management Plan which may include the NPS, Service, BLM, and possibly other land managers in the area.

NPS also added a number of conservation measures for Sonoran pronghorn to its proposed action as a result of discussions with the Service. These actions include:

- Closing Pozo Nuevo Road to public use at its intersection with Puerto Blanco Drive from March 15 to July 15
- Closing Bates Well Road to public use at the northern monument boundary from March 15 to July 15
- Closing North Puerto Blanco Drive at a point approximately 5.1 miles from the Visitor's Center, and also at its intersection with Pozo Nuevo Road from March 31 to July 15
- Implementing a pronghorn monitoring program and closing areas within a 5 mile diameter of known pronghorn locations, specifically targeting Puerto Blanco Road for potential closure between March 1 and March 31
- Restricting backcountry use, from March 15 to July 15, to areas east of State Route 85 and south of North Puerto Blanco Drive
- Limiting future development to the area south of North Puerto Blanco Drive and east of Senita Basin Road/Baker Mine Trail/Dripping Springs Mine Trail and limiting timing of construction to occur outside the pronghorn fawning period (March 15 to July 15)
- Establishing a 3-year experimental pronghorn crossing zone on SR 85 from milepost 67 to 71, consisting of a temporary speed limit reduction to 35 - 45 mph from 0400 - 0900 hours seasonally, including a monitoring program to assess effectiveness
- Removing the north boundary fence if BLM agrees to remove livestock from its lands for a period of at least 20 years
- Placing temporary water sources in key areas, primarily during the dry season, and including a monitoring program to assess effectiveness of temporary waters
- Continuing to support pronghorn radiotelemetry
- Implementing erosion control measures utilizing a hydrologist/sedimentologist
- Maintaining and expanding a non-native species removal program including removal of bufflegrass and Sahara mustard
- Providing an annual report of pronghorn conservation efforts
- Contributing to 51 recovery projects within NPS regulations, either by providing in-kind contributions or by commitment of funds

Resources Management Facilities
A 5,000 square foot Science, Education, and Resource Management Center would be constructed by converting the Twin Peaks visitor/administration facility. Also a greenhouse and plant nursery would be constructed nearby for visitor education and research purposes. The existing resources management offices would be converted to employee homes.

Cultural Resources

The GMP strives to continue stabilization, survey efforts, and the listing of historic properties in the National Register of Historic Places. New developments would be surveyed for archeological resources prior to construction and potential impacts mitigated. Preservation and use treatments would be applied for the properties listed and eligible for listing in the National Register of Historic Places.

Native American Consultation

A mutually beneficial written agreement between the NPS and Tohono O'odham Nation to strengthen consultation, coordination, and involvement will be developed. The agreement will be expanded to include enhanced involvement of the Nation in Organ Pipe Cactus NM's interpretation program.

Visual Resources

Powerlines would be placed underground and/or relocated at their next scheduled replacement, and sustainable design guidelines and practices will be implemented prior to the design of new facilities. The NPS will work with Arizona Public Service to seek ways to off-set costs of relocating and burying lines, and will preserve regional design and maintenance practices.

Interpretation Objectives and Themes

Implement objectives and themes identified in the 1993 Interpretive Prospectus. The objectives address comprehensiveness of the interpretive program, environmental awareness, outreach and regional cooperation, biosphere goals, and the adequacy of information and facilities for visitor use, and safety. The "themes" will address the amazing richness and diversity of the land and the people from past to present, environmental factors and the delicate balance of Sonoran Desert ecosystems, and Organ Pipe Cactus NM as a unique living laboratory.

Interpretive facilities

The following specific projects were identified as on-going or completed:

- Interpretive wayside at Estes Canyon/Bull Pasture
- Vegetation removal for preserving historical structures
- Installed Traveler's Information System Station
- Parking areas - amphitheater and Victoria Mine
- Reconstruct Amphitheater
- Interpretive programs at Bates Well and Bonita Well

The following facilities are proposed to help satisfy the growing need for visitor services in the region and achieve the objectives and themes within Organ Pipe Cactus NM:

- Support the International Sonoran Desert Alliance's (ISDA) center in Lukeville
- Develop partnerships to establish a regional information and orientation center in Why
- Convert part of the existing Twin Peaks Visitor Center and administrative building into an interpretive center with resources management as the major interpretive focus. To accomplish this, 3,600 square feet of new space would be added to the existing 5,900 square feet structure; of the total, 4,500 square feet would be devoted to the interpretive center and the remainder to resources management. Four pull-outs would be added along SR 85.

Partnerships and Outreach

Increase partnerships and outreach with others and expand regional outreach efforts in response to Biosphere Reserve designation. Potential for partnerships with ISDA, other federal agencies, State of Arizona, and Tohono O'odham Nation.

Camping

Primitive camping opportunities will be increased by providing 20 new walk-in campsites up canyon from the existing group campground in Twin Peaks area; the existing parking area would be expanded to provide parking for 20 vehicles and one restroom. Also, four new drive-in campsites would be created at

Alamo Canyon Wash; a day-use only parking area for 6 vehicles would be delineated on previously disturbed land.

Area Transportation Network: Roads

The existing road network would be retained, and, per the NCRMP, user capacities of the roads providing access into the wilderness would be established. The following specific projects are completed or on-going:

- Rehabilitate Ajo Mountain Loop Drive
- Use Armenta Road for Patrol and Management Purposes
- Prune and/or remove tress on all public drives
- Remove vegetation from road shoulders of all paved roadways
- Maintain graded roads
- Use borrow pits
- Install new road signs
- Install interpretive waysides, Scenic Drive Entrances
- Install jersey barrier wall on Pozo Nuevo Road in Cipriano Pass
- Trench/widen South Puerto Blanco Drive and elsewhere

New roads to be constructed or removed:

- On Twin Peaks Road approximately 800 feet of new roadway will be constructed and approximately 800 feet of existing two-lane road would be removed and the area restored
- A turn-around and approximately 400 feet of new road would be added to Puerto Blanco Drive
- The road at Quitobaquito will be removed and restored to natural conditions

Area Transportation Network: SR 85

The NPS will work with the State and other agencies to minimize road-related impacts on Organ Pipe Cactus NM resources. In the future, NPS will implement a program to reduce and minimize road-related impacts while ensuring continued commerce and enhancing visitor experience. The program would include establishing pull-outs with interpretive information, implementing a public education program, and experimenting with mitigation, such as the use of bridges over major washes and culverts in other areas to encourage safe wildlife movement. Specific completed and ongoing projects include:

- Installation of new road signs
- Revision of North boundary entrance portal
- Maintenance of SR 85 road shoulder
- Raising SR 85 speed limit to 65 mph

Area Transportation Network: Trails and Hiking Routes

The existing hiking system is to be retained with the following improvements:

- Signs and exhibits would be posted at four trails and hiking routes
- Visitor Center Nature Trail would be doubled in length to 0.2 miles and made accessible to wheelchairs

Specific completed or ongoing projects include:

- Interpretive trail at Quitobaquito
- Trail maintenance; vegetation trimming
- Alamo Canyon trailhead parking
- Bull Pasture/Estes Canyon trail work Interpretive Waysides, Arch Canyon and Estes Canyon/Bull Pasture trailhead
- Trail head parking, Old Sonoyta Road
- New route/trail segment: Red Tanks Tinaja to Milton Mine
- New trailhead signs
- Baker Mine-Milton Mine trail

Eleven new maintained trails, totaling approximately 30 miles, are proposed to provide visitors access to resources and an understanding of Organ Pipe Cactus NMs interpretive themes. Signs and route descriptions would be improved for the existing unmaintained trails. In the supplement, trail additions were reduced to 8 new trails (8.9 miles) while the miles of wheelchair accessible trails increases to 5.5 miles. These changes occurred because the new Quitobaquito trail alignment reduces total trail miles and increases the number of wheelchair accessible trail miles, and because one trail proposed in the original preferred alternative is near prime rosy boa (*Lichanura trivirgata*) habitat and was consequently removed from consideration.

Staffing

Since prior estimates may be unrealistic in light of current fiscal conditions, only 15 additional employees are proposed in this alternative. Organ Pipe Cactus NM would continue to use volunteers from the active Volunteers in Parks (VIP) program to help offset expanding staff and program needs.

Operations Facilities

The NPS will seek a partnership for 2,000 square feet of administrative office space in under-utilized Federal facilities at the Customs and Immigration Reserve in the Lukeville area. The maintenance area will include 2,000 square feet office space, 9,100 square feet covered parking, and 3,050 square feet storage space, with the addition of a new 4,000 square-foot ranger operations and fire station with nearby helicopter pad. Specific completed or ongoing projects include:

- Modify Visitor's Center access and parking area
- Renovate residences to offices
- Construct a compressor shed at the maintenance shop
- Construct new fire station
- Replace gas tanks in maintenance area
- Use herbicide to control vegetation at sewage lagoon
- Utilize integrated pest management at the Visitor Center and other park buildings
- Improve telecommunications system
- Construct maintenance shop extension
- Burn brush piles
- Install modular building at VIP campground
- Replace maintenance shop sewer system
- Remove Bates Well shed

- Install fiber optic cable, residence area
- Install chlorination lines to main water tank
- Install self-serve fee stations
- Construct restroom at Bonita Well

Employee Housing

The nine houses still used would remain in the Twin Peaks housing loop. Five buildings would be converted back to employee homes in the Twin Peaks housing area. The NPS would seek partnerships to provide the following in the Lukeville area:

- Apartments for seasonal employees and researchers
- A small community center for area and Organ Pipe Cactus NM residents

Specific completed or ongoing projects:

- Campground for VIPs
- Integrated Pest Management in the Visitor Center and other park buildings
- Snake relocation from residences and campground
- Rodent exclusion/removal from buildings
- Finish two duplexes and landscape
- Residence area revegetation work

Development Concept Plans: Twin Peaks

Several new developments are proposed in the Twin Peaks Area to serve expanding needs of visitors, staff, and the science community. All new structures would be located outside the probable maximum flood zone, although some new road construction would occur in this area.
The new Visitor Center, science and resources management center, and rehabilitated administrative facility would become a central complex and include new picnic and parking areas for visitors.

A parking area for employees would be located on the opposite side of the complex. The new ranger operations and fire station would be located a short distance away and would include a new parking lot. Expansion of the maintenance area would occur on disturbed lands in the location of the existing facility. Once the office is removed, the housing area would be used only for that purpose and would include a new community center and utility building. The supplement to the draft EIS added the following:

- The extent of new buildings and road realignment is significantly reduced in this alternative
- Ranger operations and the fire station would be located next to the maintenance complex, on disturbed lands
- The NPS would seek to establish the new community center in Lukeville instead of Twin Peaks

Specific completed or ongoing projects:

- Install new 6-inch mainline water valves in select areas of the housing loop
- Rehabilitate Visitor Center and painting project in the campground comfort stations
- Replace house roofs and additions of new ramadas and yard fences in the residence area
- Install new sewer distribution box behind Visitor's Center
- Replace old fire hydrants and install new ones
- Buy electric cable and other electrical work in campground area
- Remodel Visitor Center restrooms including leach field
- Convert campsites from RV/pull-through to tent sites
- Create 15 residential parking spaces
- Replace campground waterline
- Renovate residences to offices

Development and Concept Plans: Quitobaquito Management Area

The primary goal is to improve visitor experience and safety. Facilities would be relocated based on discussions with the Tohono O'odham Nation. This development concept is general; due to the sensitive nature of this area, a multi-agency task force would be established to develop a detailed design for this area once funding is secured. The new trailhead would be developed at the confluence of Puerto Blanco Drive and the former entrance road. An easy, 1-mile round-trip walking trail network would be established, occurring along the existing entrance road. To help protect resources, visitors would need a permit or to take part in a guided tour to use this area. Administrative access to the border would be provided. Specific completed or ongoing projects include:

· Quitobaquito water transport system
· Quitobaquito Wetlands Conservation Projects

Development Concept Plans: Lukeville Area

The NPS would seek to enhance linkages between Lukeville and Organ Pipe Cactus NM's resources and values. The NPS would support ISDA's efforts and seek partnerships to provide housing, but only for NPS seasonal workers; develop a community center for all area residents; and share office space at the border station, except for NPS administration. Specific completed or ongoing projects:

· Lukeville land exchange

Redesignation
Organ Pipe Cactus NM would pursue a legislative change in status from National Monument to the Sonoran Desert National Park, which would require congressional legislation. Redesignation would help draw attention to the value and significance of Organ Pipe Cactus NM's varied resources and the need to preserve those resources.

Boundary Adjustments

No boundary adjustments are proposed since the Tohono O'odham Nation is not interested in a land exchange at this time. However, NPS feels the land exchange with the Gu Vo District and the Tohono O'odham Nation along the crest of the Ajo Mountains would improve its ability to manage Organ Pipe Cactus NM (Tohono O'odham would receive 1,502.6 acres from the NPS along the eastern portion of the divide. The NPS would receive 825.5 acres along the western portion of the divide and 677.1 acres from the western part of the Gunsight Hills). In the future, if the Tohono O'odham Nation expresses an interest in this idea, the NPS would be willing to enter into discussions.

Law Enforcement

Several types of activities were included in the NPS supplemental draft EIS (2001) as part of the GMP under existing conditions which relate to law enforcement type maintenance activities on Organ Pipe Cactus NM. These include law enforcement training activities, and law enforcement maneuvers with other law enforcement agencies conducted via cooperative agreements. Little specific information was provided about these activities since they relate to confidential or restricted information. The goal of these activities is primarily to interdict undocumented migrants and drug smugglers. These activities take place throughout Organ Pipe Cactus NM.

II. STATUS OF THE SPECIES

A. Description and Legal Status

Pronghorn are long-legged, small-bodied artiodactyls (hoofed mammal with an even number of toes on each foot). Upper parts are tan; the underpart, rump, and two bands across the neck are white. The male has two black cheek patches. Both sexes have horns, although they are larger in males. Males

weigh 100 to 130 pounds, while females weigh 75 to 100 pounds. The Sonoran subspecies (*Antilocapra americana sonoriensis*) was first described by Goldman (1945) from a type specimen taken near Costa Rica, Sonora, Mexico by Vernon Bailey and Frederic Winthrop on December 11, 1932, and is currently recognized as one of five subspecies of pronghorn (Nowak and Paradiso 1983). The Sonoran pronghorn is the smallest subspecies of *Antilocapra americana*.

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

B. Life History

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

Pronghorn consume a wide variety of plants. Fecal analysis indicated Sonoran pronghorn consume 69 percent forbs, 22 percent shrubs, 7 percent cacti, and 0.4 percent grasses (Service 1998a). However, Hughes and Smith (1990) reported cacti are the major diet component (44 percent). Consumption of cacti, especially chain fruit cholla (*Cylindropuntia fulgida*), provides a source of water during hot, dry conditions (Hervert *et al.* 1997b). Other important plant species in the diet of the pronghorn include pigweed (*Amaranthus palmeri*), ragweed (*Ambrosia* sp.), locoweed (*Astragalus* sp.), brome (*Bromus* sp.), and snakeweed (*Gutierrezia sarothrae*) (Service 1998a, 2000b).

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, and Growler mountains. Does usually have twins, and fawns suckle for about 2 months. Does gather with fawns, and fawns sometimes form nursery groups (Service 1998a). Hughes and Smith (1990) recorded an average group size of 2.5 animals; however, group size observed by Wright and deVos (1986) averaged 5.1, with the largest group containing 21 animals.

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

Causes of pronghorn mortality are often difficult to determine; however, some telemetered Sonoran pronghorn have been killed by coyotes, mountain lions, and a bobcat. Some of these mortalities may have been influenced by dry periods, which predisposed pronghorn to predation (Service 1998a). Of 580 coyote scat examined on the Cabeza Prieta NWR, 5 contained pronghorn remains (Simmons 1969), but some or all of these remains may have resulted from scavenging carcasses. Hervert *et al.* (2000) found that the number of fawns surviving until the first summer rains was significantly correlated to the amount

of preceding winter rainfall, and negatively correlated to the number of days without rain between the last winter rain and the first summer rain.

C. Habitat

Data collected from radio-collared animals and fecal pellet analysis have provided some data on habitat use by Sonoran pronghorn. All three Sonoran pronghorn populations occur in Sonoran desert scrub vegetation communities (Turner and Brown 1982). Turner and Brown (1982) discussed seven subdivisions of the Sonoran Desert, two of which encompass the habitat of Sonoran pronghorn in the U.S. and the Pinacate Region of Sonora (Felger 2000). These are the Lower Colorado River Valley and the Arizona Upland subdivisions. Creosote (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) are dominant perennials of the Lower Colorado River Valley subdivision. Plant species along major water courses include ironwood (*Olneya tesota*), blue palo verde (*Parkinsonia floridum*), and mesquite (*Prosopis velutina* and *P. glandulosa*). Species in the Arizona Upland include foothill palo verde (*Parkinsonia microphyllum*), catclaw acacia (*Acacia greggii*), chain fruit cholla, teddy bear cholla (*Cylindropuntia bigelovii*), buckhorn cholla (*C. acanthocarpa*), and staghorn cholla (*C. versicolor*).

On the Gulf Coast of Sonora, pronghorn also occur in the Central Gulf Coast subdivision of Sonoran desert scrub. This form of Sonoran desert scrub is very rich in species, particularly stem succulents, but there is a general absence of a low shrub layer. Elephant tree (*Bursera microphylla, B. hindsiana*), sangre de drago (*Jatropha cuneata*), and *Jatropha cinerea* are common, but creosote is only locally abundant. The habitat of the pronghorn in the U.S. consists of broad alluvial valleys separated by block-faulted mountain and surface volcanics. In December 1984, 40 percent of the pronghorn observed during a telemetry flight were in the Growler Valley, from the Aguila Mountains to the International Border. The AGFD (1985) reported that pronghorn use flat valleys and isolated hills to a greater degree than other topographic features.

Drainages and bajadas are used by pronghorn during spring and summer. Washes flow briefly after rains during the monsoon season and after sustained winter rains. The network created by these washes provides important thermal cover (shade) for pronghorn during the hot summer season. Bajadas are used as fawning areas in the spring. Pronghorn were observed using palo verde, ironwood, and mesquite for cover during weekly AGFD telemetry flights, which began in 1994 (Hervert *et al.* 1997b). Pronghorn were observed in playas in April and May of 1988 and 1989 when forbs were abundant, later vacating these areas when desiccation of annuals occurred (Hughes and Smith 1990). In years with sufficient winter and spring precipitation, some playas produce abundant annual plant growth due to drainages into these areas.

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

D. Distribution and Abundance

United States

Prior to the identification of the subspecies known as the Sonoran pronghorn (Goldman 1945), specimens of pronghorn taken within its range were identified as other subspecies (AGFD 1981). Historically, the Sonoran pronghorn ranged in the U.S. from Arizona's Highway 15 to the east; the Altar Valley and the Tohono O'odham Nation (formerly the Papago Indian Reservation) to the north; and Imperial Valley,

California, to the west (Nelson 1925, Monson 1968, Wright and deVos 1986, Paradiso and Nowak 1971) (Figure 2).

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

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

Repeatable, systematic surveys were not conducted in Arizona until 1992. Since 1992, Sonoran pronghorn in the United States have been surveyed biennially (Bright *et al.* 1999, 2001) using aerial line transects (Johnson *et al.* 1991). Population estimates from these transects have been derived using three different estimators (Table 2); currently the sightability model (Samuel and Pollock 1981) is considered the most reliable estimator (Bright *et al.* 1999, 2001). The sightability model involves calculating sighting rates by group size using Sonoran pronghorn groups with radio-collared animals that were either observed or missed during previous surveys. Sightability population estimates were subsequently calculated for all survey years, 1992-2000, and are the population estimates for these years that are shown Table 2 (Bright *et al.* 1999, 2001; J. L. Bright, AGFD, pers. comm. 2001). Table 2 presents observation data from transects and compares estimates derived from the 3 population models from 1992 through 2000.

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

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

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

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

The sightability model population estimates from 1992 to 2000 show an alarming 45 percent decrease in population size (Table 2). The estimates indicate a steady decline in population size, with the exception of the 1994 survey. The 1994 estimate may be somewhat inflated due to inconsistencies in survey timing. The 1994 survey occurred in March (whereas those of other years occurred in December) and therefore is likely to have included newborn fawns that did not survive the remainder of that year.

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

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

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

Mexico

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

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

Population surveys in Mexico (Table 3) have not been exhaustive and no statistically valid estimate of pronghorn population size existed until suitable habitat within the current known range of the Sonoran pronghorn in Mexico was surveyed in December 2000 (Bright *et al.* 2001). Although the 1993 estimate was approximate, survey results suggested a decline in the population of 16 percent from 1993 to 2000 (Table 4). The December 2000 estimate was 346 individuals. This estimate, together with the 2000 U.S. estimate, brings the total estimated size of the U.S. and Mexico Sonoran pronghorn populations to approximately 445 individuals.
Although the Sonoran pronghorn population in Mexico declined approximately 16 percent from 1993 to 2000, the decrease was not experienced equally across pronghorn range. Sonoran pronghorn habitat in Mexico is bisected by Highway 8. The population southeast of Highway 8 remained stable or even increased slightly between 1993 and 2000 (Table 4). Forage conditions in 2000 were notably better in this area than the rest of Sonoran pronghorn range in Mexico and the U.S. (J. L. Bright *et al.*, AGFD, unpubl. data). The population west of Highway 8 ranges throughout suitable habitat on and surrounding Volcan Pinacate, and is adjacent to the U.S. population. Mexico Highway 2 (and to a lesser extent the international boundary fence) acts as a barrier to movement between El Pinacate and U.S. populations. The El Pinacate population declined by approximately 73 percent between 1993 and 2000 (Table 4). Dry periods and associated poor forage conditions, likely exacerbated by extensive livestock grazing, may have figured prominently in the significant decline observed in the El Pinacate population. Loss of the El Pinacate population would result in further fragmentation and isolation of the remaining pronghorn populations in the U.S. and Mexico. The U.S. population has experienced good fawn production and survival thus far in 2001; we do not know whether similar fawn production and survival is occurring in the Sonoran populations.

E. Threats

Barriers that Limit Distribution and Movement

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

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

Between Gila Bend and Lukeville, Arizona, SR 85 appears to be a barrier preventing pronghorn from dispersing eastward from their current range. Traffic volume and average speeds have increased substantially over the last 30 years as international trade and tourism have increased. The Arizona Department of Transportation increased the posted speed limit on SR 85 from 55 to 65 miles per hour (mph) in 1997, and 85th percentile traffic speed has increased from 68-71 mph in the same period (Organ Pipe Cactus NM 2001). This highway corridor is unfenced in Organ Pipe Cactus NM, allowing free movement of pronghorn and other wildlife, but has livestock fencing on both sides for most of the remaining mileage on BLM, Department of Defense (DoD), and private lands between Interstate 8 and Organ Pipe Cactus NM. Interstate 8, the Wellton-Mohawk Canal, agriculture, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. De-watering of much of the Sonoyta River and barriers to pronghorn accessing the Gila River, such as Interstate 8 and the Wellton-Mohawk Canal, have caused significant loss of habitat and access to water (Wright and deVos 1986). Agricultural, urban, and commercial development at Sonoyta, Puerto Penasco, and San Luis, Sonora, and Ajo, Yuma, and along the Gila River, Arizona, have removed habitat and created barriers to movement. BLM grazing allotment fences in the Ajo area may have been a barrier to movement, but were modified after 1997 to allow safe passage of pronghorn (BLM, *in litt*. 2000). Fences between the BLM lands and Organ Pipe Cactus NM and Cabeza Prieta NWR are also designed to allow passage of pronghorn.

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

Human-caused Disturbance

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

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

A pronghorn can canter effortlessly at 25 mph, gallop without straining at 44 mph, and run flat out at speeds of 55-62 mph (Byers 1997). During an aerial reconnaissance, one herd of Sonoran pronghorn was observed 12 miles away from the initial observation location 1.5 hours later (Wright and deVos 1986). Hughes and Smith (1990) found that pronghorn immediately ran 1,310-1,650 feet from a vehicle and that military low-level flights (<500 feet AGL) over three pronghorn caused them to move about 330 feet from their original location. Krausman *et al.* (2001) examined effects of ground-based and aircraft military activities on Sonoran pronghorn at the North and South TACs at the BMGR and concluded that behavioral patterns were similar with and without presence of military stimuli. Military activities were associated with some changes in behavior (e.g., from standing to trotting or running, or bedded to standing) but the authors concluded that these changes were not likely to be detrimental to the animals. No conclusions could be drawn about effects to fawns due to poor fawn productivity during the study. During times of drought, disturbances that cause pronghorns to startle and run would energetically have a more significant effect. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971).

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

American ranchers were running livestock by the early 1900s in much of the area that would later become Organ Pipe Cactus NM (Rutman 1997) and Cabeza Prieta NWR (Cabeza Prieta NWR files). Because there was no international boundary fence until 1947, livestock from both the U.S. and Mexico ranged freely across the border (Rutman 1997). Rutman (1997) estimates 1,000 head of burros and horses were present in 1942 on the southern half of Organ Pipe Cactus NM, and as many as 3,000 cattle on Organ Pipe Cactus NM at one time. Cattle were removed from Organ Pipe Cactus NM, Cabeza Prieta NWR, and the BMGR in 1978, 1983, and 1986, respectively (Service 1998a). Grazing continues to be an important use of former pronghorn habitat on the Tohono O'odham Nation. Wright and deVos (1986) stated that poor habitat conditions (caused in part by livestock grazing) still appeared to be the leading cause in the decline in Sonoran pronghorn numbers. In Sonora, livestock grazing occurs in ejidos (community ranches or farms) and other ranch lands throughout much of the range of the pronghorn. Cattle range farther in years with abundant annual growth, and are more limited to areas near water during hot and dry periods and seasons. In Arizona, cattle grazing continues on lands administered by the BLM in currently occupied pronghorn habitat near Ajo, Why, and Sentinel. The BLM is in the process of performing allotment analyses on these areas in terms of their current conditions and ongoing uses to determine if grazing is in compliance with the Arizona standards for rangeland health. If current grazing practices prove to be a factor in these areas not meeting established standards, then the BLM must change grazing through the permitting process to ensure significant progress is made towards achieving standards as required by a 1997 biological opinion (T. Hughes, BLM, pers. comm. 2001).

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

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

southeastern California, have pushed undocumented migrant traffic into remote desert areas, such as Cabeza Prieta NWR, Organ Pipe Cactus NM, and the BMGR (Klein 2000).

Small Population Size and Aging Demographics

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

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

F. Recovery Plan

The 1982 Sonoran Pronghorn Recovery Plan (Service 1982) was revised in 1998 (Service 1998a). The recovery criteria presented in the revised plan entailed the establishment of a population of 300 adult pronghorn in one self-sustaining population for a minimum of five years, as well as the establishment of at least one other self-sustaining population in the U.S. to reclassify the subspecies to threatened.

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

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

As outlined in the supplement, recovery efforts should focus on: (1) improving habitat for fawn survival and recruitment through the establishment and evaluation of forage enhancement plots on the BMGR; (2) initiating a quantitative evaluation of pronghorn use and reliance on sources of free water (temporary and permanent); (3) reducing predation through the selective removal of coyotes from specific areas and at times of the year when adult female pronghorn are most susceptible to predation; (4) evaluating potential

transplant locations, establishing relocation methodology and protocols, developing interagency agreements (including with Mexico as required), acquiring funding, and initiating a reintroduction; (5) increasing frequency and expanding scope of aerial monitoring in Mexico to improve comparability with U.S. surveys; and (6) investigating potential pronghorn disease vectors.

III. ENVIRONMENTAL BASELINE

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

A. Action Area

The "action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action. Within the U.S. portion of the Sonoran pronghorn's range, pronghorn interact to form one population in which interbreeding may occur. The U.S. population is effectively separated from populations in the Pinacate Region and on the Gulf Coast of Sonora by Mexico Highway 2 and the U.S.-Mexico boundary fence. Activities that may affect animals in any portion of the U.S. range of the pronghorn may affect the size or structure of the U.S. population, or habitat use within the U.S. range. The action area for this biological opinion is defined as the range of the pronghorn within the U.S. (Figure 3), plus that area of Organ Pipe Cactus NM east of SR 85 and west of the Ajo Range (Figure 1).

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

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

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

Climate is characterized by extreme aridity, mild winters, and hot summers. Approximately 2.7 inches of precipitation fall annually at Yuma, with slightly more than half of this occurring in the winter months

(Turner and Brown 1982). Annual precipitation increases from west to east across the BMGR; at Aguajita/Quitobaquito, precipitation is 10.5 inches annually. Infrequent chubascos (tropical storms) bring heavy rains in September or October that can produce spectacular growth on warm-season perennial plants (Felger 2000).

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

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

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

C. Status of the Sonoran Pronghorn in the Action Area

Distribution

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

On Cabeza Prieta NWR, pronghorn groups were most often observed on the southwestern edge of the Sierra Pinta Mountains and in the Pinta Sands, in the valley between the Sierra Pinta and Bryan Mountains, in the San Cristobal and Growler valleys, and near Daniel's Arroyo. At Organ Pipe Cactus NM, pronghorn were most often observed near Acuna and Bates wells, and west of the Bates Mountains

and Cipriano Hills. On the BMGR, concentrations of animals were observed near HE Hill on South TAC, with scattered sightings through the San Cristobal Valley and into the Mohawk Valley. John Hervert (AGFD, pers. comm. 1996) also believes that pronghorn frequent the northern portion of the Agua Dulce Mountains. Pronghorn may have used the Pinta Sands area to a greater degree in the early 1970s (AGFD 1981).

Pronghorn often seek the thermal cover found in the Arizona Upland subdivision of Sonoran desert scrub during the hot, dry summer months. This cover is best developed in the southeastern portion of their range in Arizona. With the onset of summer rains or cooler temperatures, pronghorn may move to the more open valleys and flats, such as the Growler Valley and Pinta Sands. Rocky, mountainous terrain, such as the slopes of the Growler or Mohawk Mountains, is not considered habitat for the Sonoran pronghorn (deVos 1990); however, pronghorn may be found on lower slopes and in associated washes (L. Thompson-Olais, Service, pers. comm.1996).
While pronghorn are present in Organ Pipe Cactus NM at all times of year (Figure 4), a greater proportion of the U.S. population is present in Organ Pipe Cactus NM from approximately February through August each year. This period corresponds with the fawning period and the annual spring warming-drying trend. Pronghorn move east into Organ Pipe Cactus NM, in part to fawn, and also to move upslope onto more densely vegetated bajadas in search of forage, thermal cover, and a slight respite from the greater heat of valley floors. Thus, pronghorn use Organ Pipe Cactus NM under conditions of greatest thermal and hydrational stress. Pronghorn historically crossed SR 85 to use bajada habitats in eastern portions of Organ Pipe Cactus NM.

Population Size and Dynamics

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

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

In 1995, there was abundant rainfall in the spring. Productivity of Sonoran pronghorn was between 1 and 1.4 fawns per doe. In July, the proportion of fawns to does was as high as 50 percent. However, as dry conditions set in from July to December, most fawns died. Recruitment for the year was only 12 fawns per 100 does (12 percent). Dry conditions continued in 1996 and 1997, during which no fawns were known to have been recruited into the population. The heavy and steady precipitation during winter of 1997-98 produced perhaps the best annual plant production since 1978, and good fawn recruitment occurred that year (33 fawns per 100 does). The spring of 1999 was drier than normal, and no fawns were known to have survived by December. Fawn production was 14 fawns per 100 does in 2000 (Bright *et al.* 2001). An exceptional fawn crop in 2001 of 30-60 fawns surviving as of October 2001 may reflect good precipitation in spring and summer of 2001 (J. Hervert, pers. comm. 2001). At a population viability analysis workshop conducted for the Sonoran pronghorn, recruitment at a level of 30 fawns per 100 does was deemed to be necessary for the subspecies to persist (Hervert 1996, Defenders of Wildlife 1998).

Although there is a close relationship between fawn survival and precipitation, in the context of the last 100 years, the 1990s were not characterized by drought (Rowlands 2000); thus factors other than precipitation likely contributed to population decline.

Adult mortality has been high in recent years, with predator-related mortality being the most frequently identifiable cause of death. Thirty-five adult pronghorn have been radio-collared by AGFD since 1994. Of these, 22 (63 percent) have died. A total of 11 of these mortalities were attributed to predation, while the remaining were from unknown causes. Some of the 11 mortalities attributed to unknown causes were likely caused by predation (J. Hervert, pers. comm. 1999); however, unavoidable lag times between time of death and scene investigation caused evidence to be obscured. No collared pronghorn mortalities were documented during dry periods and no evidence of predation of pronghorn was documented near water sources (J. Hervert, pers. comm. 1997). Capture myopathy may have played a role in up to four of the mortalities (Hervert *et al.* 1997b). In the majority of documented mortalities, bone marrow condition was assessed. Only one specimen was determined to be in poor to fair condition, while all others were determined to be in good condition.

Drought

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

Rowlands (2000) examined trends in precipitation for southwestern Arizona and Organ Pipe Cactus NM from 1895-1999. For southwestern Arizona, no trend in precipitation was found for the period, but low precipitation occurred around 1895 and during the 1950s. Periods of high precipitation occurred in 1915-1920 and in the 1980s. For Organ Pipe Cactus NM, there was a slightly increasing trend in monthly and annual precipitation over the period 1895-1999, a strong drought occurred in the 1950s, and a lesser drought occurred in the 1970s (Felger 1980 notes a 34-month period, from September 1969-August 1972, without precipitation in the Sierra del Rosario). No discernable trend in precipitation in southwestern Arizona or Organ Pipe Cactus NM was found in the 1990s, which is when the current decline in the U.S. pronghorn population began. At four stations in southwestern Arizona, Hervert *et al.* 2000 note below normal precipitation in the winters of 1995/1996 (-2.78 inches) and 1996/1997 (-2.87 inches), and wet winters in 1994/1995 (+1.97 inches) and 1997/1998 (+4.29 inches). Annual plant production was exceptional in the winter of 1997/1998 and spring of 1998. Winter of 1992/1993 and spring of 1993 also saw a very good crop of annual plants.

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

Disease

Leptospirosis is a contagious, febrile (fever) disease caused by a spirochete bacteria (*Leptospira interrogans*) that affects mammals (including humans), birds, reptiles, amphibians, and insects. The

infection is usually transmitted through skin or mucous membrane contact with the urine of infected animals and by contact with soil, water, or plants that have been contaminated by infected urine. It is believed that the bacteria may live outside the host organism for up to six months under favorable conditions. In general, infections may be very mild and symptomless or may result in disease conditions, including fever, jaundice, hemoglobinuria (a disorder that destroys red blood cells, resulting in the presence of hemoglobin in the urine), renal failure, abortion, and/or death (Merck and Company 1986). Following an abortion caused by leptospirosis, fetal membranes may be retained and fertility may be impaired (Merck and Company 1986). Leptospirosis is considered a serious disease in the livestock industry. Confirmed cases of leptospirosis in the United States are relatively low, but because symptoms of the disease can be nonspecific, actual incidences of the disease may be higher.

The closely related hemorrhagic diseases, bluetongue virus (BTV) and epizootic hemorrhagic disease (EHD), are noncontagious, insect-transmitted viral diseases of wild and domestic ruminants. The biting midge (*Culicoides* sp.) is a suspected vector of the transmission of both diseases (Hoff and Trainer 1981). BTV has also been found in naturally infected cattle lice (*Haematopinus eurysternus*) (Hoff and Trainer 1981). The viruses are associated with wet weather and/or moist, low-lying areas, which would facilitate favorable breeding conditions for the midge. The midge larvae are aquatic or semiaquatic and found in moist sand, mud, and decaying vegetation of salt and freshwater marshes, ponds and streams (Lyon 2000). New research by the U.S. Department of Agriculture, indicates that *Culicoides sonorensis* is likely the primary vector (Stellijes 1999). This species is found in the southern and western states. EHD occurs throughout the distribution of the white-tailed deer (*Odocoileus virginanus*). The diseases are sometimes difficult to distinguish from each other because symptoms and lesions are nearly identical and both viruses can be active at the same time.
Like leptospirosis, BTV is considered a serious disease in the livestock industry. In the United States, all evidence of disease transmission between species suggests that BTV is spread from domestic livestock to wildlife (Hoff and Trainer 1981). The impacts of EHD are not as clear in the livestock industry, but are obvious on free-ranging artiodactyls, causing sporadic but locally severe die-offs of white-tailed deer and occasional mortality reported in pronghorn (*Antilocapra americana*) and mule deer (*Odocoileus hemionus*) (Hoff and Trainer 1981). Both disease are often fatal in wild ruminants, causing extensive hemorrhaging. Cattle infected with BTV typically show no clinical signs, but abortion or the birth of abnormal calves may occur if the cow becomes infected during gestation (Merck & Company 1986). Pronghorn infected naturally with EHD have been observed to have convulsions, “running fits,” and ataxia (the inability to coordinate voluntary muscular movements); experimental infections additionally showed signs of anorexia, dyspnea (difficult or labored breathing), and central nervous system depression (Hoff and Trainer 1981). With both diseases, reproduction of wild ruminants may be adversely affected if does are infected during gestation, resulting in early absorption of the fetus, uncomplicated abortion, and higher susceptibility of fawns to infection, usually resulting in death. Additionally, does who have survived an infection “may succumb to the stress of pregnancy as a result of their earlier infection” (Hoff and Trainer 1981).

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

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

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

Before the Taylor Grazing Act of 1934, and land use designations such as Organ Pipe Cactus NM, the BMGR, and Cabeza Prieta NWR, unregulated cattle grazing was widespread in the current range of the pronghorn. Forage and precipitation is greater in the eastern portion of the current range, thus it is likely that grazing was more prevalent in BMGR-East, Cabeza Prieta NWR and Organ Pipe Cactus NM, than in BMGR-West (MCAS-Yuma 2001). However, cattle grazing presently occurs west of Volcan Pinacate and near the Sierra del Rosario in northwestern Sonora, which are as dry as much of BMGR-West; thus we suspect cattle grazing historically occurred throughout the current U.S. range. The degree to which cattle grazing may have affected soils and vegetation communities in this area is impossible to quantify. Humphrey (1987) compared vegetation in historic photos taken at boundary monuments in the early 1890s with photos taken in the 1980s and could not discern any temporal differences in vegetation in what is now Organ Pipe Cactus NM, Cabeza Prieta NWR, and BMGR. However, the changes may have occurred before 1890. In reference to monument 172 at the southern end of the Quitobaquito Hills, Humphrey notes “the entire region near the spring has probably been grazed by domestic livestock since their introduction by the Spaniards in the early eighteenth century. Any grasses that might have grown there prior to that time had probably been grazed out long before the monument was erected.” Organ Pipe Cactus NM (2001) discusses possible effects of long-term grazing in pronghorn habitat, and apparent evidence and impacts of grazing still visible at Organ Pipe Cactus NM 25 years after cattle were removed.

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

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

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

Numbers of undocumented migrants and smugglers have increased dramatically in the action area. Deportable migrant apprehensions by Border Patrol agents in the Ajo Station increased steadily from 9,150 in 1996 to 20,340 in 2000. A total of 25,074 pounds of marijuana were apprehended by Ajo Station agents in 2000 (U.S. Immigration and Naturalization Service 2001). In 2001, estimates of undocumented migrant traffic reached 1,000 per night in Organ Pipe Cactus NM alone (Organ Pipe Cactus NM 2001). These activities have resulted in route proliferation, off-highway vehicle (OHV) activity, increased human

presence in backcountry areas, discarded trash, and abandoned vehicles. Habitat degradation and disturbance of pronghorn almost certainly results from these illegal activities. Increased illegal activities have precipitated increased law enforcement presence, particularly Border Patrol, with additional associated adverse effects.

E. Past and Ongoing Federal Actions in the Action Area

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

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

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

Federal Actions For Which Consultation Has Not Been Completed

Management at Cabeza Prieta NWR

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

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

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

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

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

Tucson Sector of the Border Patrol

The Tucson Sector Border Patrol section 7 consultation is not yet complete (consultation number 2-21-99-I-138). This consultation encompasses all field activities conducted by the Border Patrol-Tucson Sector, as part of the program to detect, deter, and apprehend undocumented migrants and drug traffickers. The Tucson Sector is comprised of nine stations: Ajo, Casa Grande, Tucson, Nogales, Sonoita, Naco, Douglas, Wilcox, and Phoenix. The activities within 8 of these stations, Phoenix excluded, are addressed by the consultation. Activities within the Ajo Station have the greatest potential to adversely affect pronghorn. Adverse effects may result from patrol road activities, drag road activities, off-road operations, aircraft overflights, and the use and maintenance of sensors.

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

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

Yuma Sector Border Patrol Beacon Stations

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

Federal Actions Addressed in Section 7 Consultations

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

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

<u>BLM's Lower Gila South Management Area</u>

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

The Lower Gila South Habitat Management Plan (HMP) (consultation number 2-21-89-F-213) provided management guidance for both specific and general actions in southwestern Arizona. Four actions were addressed in the HMP, including an exchange of 640 acres near Ajo, rehabilitation work on two catchments, and assessment of livestock removal from pronghorn habitat. Exchange of land out of public ownership may facilitate development or other uses that would preclude use by pronghorn. The Service provided the following conservation recommendations: a study to determine the effects of water developments on pronghorn and their competitors and predators, and development of a water catchment

renovation plan in coordination with Cabeza Prieta NWR. No incidental take was anticipated. The non-jeopardy opinion was issued on May 15, 1990.

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

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

BLM grazing allotments in the vicinity of Ajo, Arizona

The biological opinion (consultation number 2-21-94-F-192), issued December 3, 1997, addressed effects to pronghorn resulting from issuance of grazing permits on five allotments, four of which are located near Ajo and Why (Cameron, Childs, Coyote Flat, and Why allotments); and the fifth near Sentinel (Sentinel allotment). All but the Child's allotment were considered to be within the current distribution of the Sonoran pronghorn. According to the BLM, livestock use of the five allotments had been relatively low in the previous ten years. The effects of stocking the allotments at any level had not been analyzed. Monitoring of the Coyote Flat and Why allotments had not occurred. Of the allotments with monitoring data available, the BLM permittees had not fully stocked the allotments for a sustained period of time. According to the BLM, monitoring data had not shown overutilization of the vegetation or a change in vegetation composition. The BLM estimated that if allotments were stocked at permitted levels, forage utilization rates could approach 40 percent. Preliminary data from the BLM and the AGFD showed that there is little dietary overlap between pronghorn and cattle. Because of this, the amount of forage on allotments, and the likely utilization levels, we found that adequate forage for the pronghorn should be available. Maintenance of livestock waters, fences, and other improvements may temporarily disrupt pronghorn activity. Pronghorn may also become entangled in livestock fences.

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

The BLM has provided two reports regarding the implementation of reasonable and prudent measures. The 1998-1999 report (dated April 13, 2000) stated that no maintenance work was authorized within the "area covered by this opinion". BLM established "utilization studies" on the Sentinel, Coyote Flat, and

Why allotments in November 1998. The studies appear to consist of one transect for each of the allotments. The utilization transects for the Sentinel, Coyote Flat, Why, and Cameron allotments were read in 1998 and 1999. BLM reported low level of utilization within the study areas. The 2000 report (dated November 28, 2000) stated that BLM modified 18 miles of fence within the allotments (three fencelines between Cameron, Why, and Coyote Flat and a small fence area within Coyote Flat) by replacing the bottom strand with smooth wire, raised 18 inches above ground level. The work was conducted June through August of 2000. The report stated that removed wire was disposed of properly. The report does not specify how, or if, biological monitoring of work requiring heavy equipment was implemented. Utilization transects for the four allotments were read in 2000. Again, BLM reports low levels of utilization. Both reports state that there had been no incidental take of pronghorn as of the date of each report.

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

This biological opinion (consultation number 2-21-95-F-114), issued on April 17, 1996, addressed all proposed and authorized actions on the BMGR by MCAS-Yuma, including proposed changes to military flights over Cabeza Prieta NWR, ongoing flights over BMGR, and operation of various training facilities such as landing strips, a rifle range, targets, a parachute drop zone, a transmitter/telemetry system, and ground support areas. MCAS-Yuma conducts Weapons Tactics Instructors (WTI) courses twice a year (March-April and October-November). During a typical WTI course, one flight/day of two to eight helicopters traverse Cabeza Prieta NWR and the BMGR within established flight corridors from west to east. Helicopters use the corridors for 5-17 days. Additional low-level fixed-wing aircraft corridors over Cabeza Prieta NWR are used for six days per course.

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

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

NWR. This map should be provided to Cabeza Prieta NWR for analysis of the effects of aircraft noise on pronghorn habitat use.

Implementation of MCAS's proposed mitigation (minimization) measures, the reasonable and prudent measures, and terms and conditions is unclear because of inadequate reporting by MCAS. The Service has only received annual reports for 1998 and a draft report for 1999. With few exceptions, these reports have not detailed, action by action, what steps MCAS-Yuma has taken to implement the opinion. In 1999, MCAS reported that no pronghorn habitat was modified, Range Management received no reports of Sonoran pronghorn encounters, and all air and ground crews were briefed on the requirements of the opinion. The Service is not aware of any incidental take of pronghorn attributable to MCAS-Yuma YTRC activities. On March 18, 1998, an amendment was requested on the consultation by MCAS-Yuma. This request slightly changed the description of the equipment and personnel to be used in the Stoval Field exercise area. The Service determined that the changes would have no additional effects not already anticipated in the biological opinion.

Organ Pipe Cactus NM General Management Plan

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

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

Recreational activities include hiking, camping, horse-back riding, and biking. These activities can disturb pronghorn and degrade habitat. Maintaining and/or adding hiking trails at Organ Pipe Cactus NM is likely to maintain or increase visitor presence in pronghorn habitat, resulting in long-term, moderate, adverse, regional disturbance to pronghorns. All proposed facilities would be located within areas of existing development and would involve relatively small tracts of land surrounded by larger areas of undisturbed habitat. However, development of facilities that result in increased visitor use may adversely affect the pronghorn. Increased use of some frontcountry and backcountry areas has the potential to adversely affect pronghorn if it causes an alteration in behavior or habitat use. Increased visitation to Organ Pipe Cactus NM was also expected to result in increased traffic along SR 85, adding to the barrier effect of existing traffic patterns. Approximately 22 miles of SR 85 lie within Organ Pipe Cactus NM. The Service concluded that the highway is a deterrent to expanding pronghorn populations, and resulting modified behavioral patterns may lead to a reduction in genetic exchange, reduced viability, and a concomitant reduction in the ability of pronghorn to adapt to environmental change.

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

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

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

The biological opinion (consultation number 2-21-96-F-094), issued August 27, 1997, addressed military use of airspace and ground space on the eastern half of the BMGR by Luke AFB. At the time of the consultation, about two-thirds of the BMGR was located on lands managed primarily by the BLM, with the remaining third located within Cabeza Prieta NWR. Approximately 5 percent (7.6 percent, not including Cabeza Prieta NWR) of the range had been impacted by military activities. Military activities within the area of overlap with the Cabeza Prieta NWR were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. The eastern part of the BMGR is known as the Gila Bend segment. Military activities occurring within the Gila Bend segment are managed by Luke AFB and included: airspace use, four manned air-to-ground ranges, three tactical air-to-ground target areas, four auxiliary airfields, Stoval Airfield, and explosive ordnance disposal/burn areas.

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

Implementation of the reasonable and prudent measures have been documented in their annual reports for which the Service is in receipt of the 1998, 1999, and 2000 reports. While the 1998 report was the most complete, the 1999 report was delivered without the three attachments and the 2000 report did not have the biological monitoring annual report as an attachment. The Service is not aware of any take of pronghorn attributed to Luke AFB use of the ground-surface and airspace on the BMGR, although a pronghorn found dead near a target may have been strafed.

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

This biological opinion (consultation number 2-21-96-F-334), issued September 5, 2000, addressed all Border Patrol activities along the United States/Mexico border in Yuma County from the Colorado River to about the area of Pinta Sands at the south end of the Sierra Pinta Mountains. Border Patrol activities within the Yuma Sector/Wellton Station included helicopter and ground patrols; drag road preparation and assessment of road maintenance; remote sensor installation and maintenance; apprehensions and rescues; and assistance to other sectors and agencies. To reduce adverse effects on pronghorn, the Border Patrol agreed to implement the following measures: (1) purchase new, quieter MD600N helicopters to replace existing OH-06As; (2) contact the AGFD weekly for an update on weekend telemetry flights to avoid areas of pronghorn concentration; (3) modify helicopter flights to avoid fawning areas during the three peak months of the fawning season (April-June); (4) make confidential monthly reports to the manager of Cabeza Prieta NWR detailing the law enforcement actions and wildlife observations made during the previous month; (5) finalize the Memorandum of Understanding between the Border Patrol and Cabeza Prieta NWR to address objectives that will minimize potential conflicts including limiting of routine patrols and off-road use in wilderness and provide a framework for cooperation; and (6) conduct an annual interagency meeting with Cabeza Prieta NWR, the Arizona ESO, and BLM to present the annual report and discuss ways to improve coordination.

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

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

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

Western Army National Guard Aviation Training Site Expansion Project

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

This biological opinion did not address the pronghorn, but, in the Court's opinion, should have and was therefore remanded by the Court. Per the final EIS for WAATS, ARNG use of East TAC did not cause existing training to shift to North or South TACs because the USAF eliminated F-15 training on East TAC and began F-16 training, which can only occur on the North and South TACs. Therefore, the EIS did not consider impacts to the pronghorn and none were anticipated. All activities that are part of the proposed action occur outside the current range of the pronghorn, with the exception of training at North TAC. Training at East TAC contributes to continuing disturbance that prevents recovery of historic habitat. Training at North TAC only occurs when East TAC is closed for five weeks each year. Effects to pronghorn at North TAC are minimized by monitoring protocols established by Luke AFB.

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

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

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

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

and declining population of pronghorn in the U.S., take at the levels anticipated in the biological opinions would constitute a substantial impact to the population.

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

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

IV. EFFECTS OF THE PROPOSED ACTION

In their supplemental EIS (NPS 2001), NPS used a combination of terms derived from the Service's regulations in section 4 of the ESA as a model to categorize and analyze factors that may affect pronghorn resulting from the GMP. This analysis proved effective and much of it has been incorporated here. It should be noted that the preferred alternative in that analysis was defined as all currently implemented, on-going, and planned actions identified in the approved GMP.

Habitat Loss or Modification

Some actions in the NPS GMP will result in destruction of pronghorn habitat. Development such as new construction of trails, roads, buildings, etc., as well as the expansion of existing facilities, including existing roads and trails will cause habitat loss and/or modification. Completed and planned GMP roadway construction projects include construction of interpretive waysides at scenic drive entrances, trenching and widening of South Puerto Blanco Drive, construction of approximately 800 feet of new roadway at Twin Peaks, installation of a turn-around and approximately 400 feet of new road on Puerto Blanco Drive, and construction of rest areas or pull-outs on SR 85. Completed and planned GMP trail construction includes 8 new trails totaling 8.9 miles. New trails being established in pronghorn habitat include the Red Tanks Tinaja to Milton Mine Trail, and Baker Mine to Milton Mine Trail.

Construction of new buildings would occur primarily in the Twin Peaks area, including a new Visitor Center, a new sciences and resource management center, new ranger operations and fire station building, new parking area for employees, new maintenance area, new community center and a new utility building. These types of activities would have minor adverse effects to pronghorn through direct loss or modification of habitat. Indirectly though, the Twin Peaks developments will serve to increase the footprint and amount of visitor use of this area, resulting in increased overall disturbance to pronghorn.

Roads and associated soil erosion are degrading habitat. Some sections of road are deeply entrenched and are becoming more so. The Bates Well Road near the Pozo Nuevo Road and the North Boundary Road west of Armenta Ranch, are examples of entrenched road sections in pronghorn habitat. Entrenched roads have various impacts, including changes to natural surface water flow patterns, gullying and other accelerated erosion features, and destabilization of ancient soil surfaces and topography. Vegetation patterns and productivity can change as a result of these impacts. Thus, the physical impacts of roads (versus behavioral impacts discussed below) are adverse and can be long term. The NPS has proposed to fund and implement a program to address soil erosion issues, to include surveys and recommendations by a hydrologist/sedimentologist.

NPS has proposed limiting development to occur within an area of the Organ Pipe Cactus NM south of North Puerto Blanco Drive and east of Senita Basin Road/Baker Mine Road/Dripping Springs Mine Trail as a conservation measure for pronghorn. Development would not occur in other areas of Organ Pipe Cactus NM used by pronghorn. Within the construction area, only two projects would be considered:

widening the first 5.1 miles of North Puerto Blanco Drive to allow two-way traffic and constructing a new trail around Pinkley Peak. These projects would result in some loss of pronghorn habitat from the direct footprint of the projects. All project construction would take place outside of the fawning period and summer dry period (March 15-July 15). Although the NPS has not provided an estimate of the total amount of pronghorn habitat lost or modified by the New Proposed Action Alternative, the total acreage of habitat loss is relatively small compared to its current range.

A number of NPS actions are likely to result in beneficial effects to pronghorn habitat. Actions to remove and/or control bufflegrass will allow natural vegetation processes within Organ Pipe Cactus NM to return, thereby providing more forage for pronghorn. Removal of bufflegrass also reduces the likelihood of fire, thereby protecting pronghorn habitat. The NPS has proposed to continue to fund and expand this program to include additional non-native species such as Sahara mustard. Control of trespass livestock into Organ Pipe Cactus NM will reduce competition for available forage and decrease the potential of disease transfer. Law enforcement efforts to control illegal immigrant and drug traffic will decrease the amount of human presence in pronghorn habitat, thereby allowing pronghorn to more fully utilize the habitat available within Organ Pipe Cactus NM. The NPS plans to acquire 1,280 acres of State land within Organ Pipe Cactus NM. Half of this acreage is an area known to be used by pronghorn; the remainder provides suitable summer habitat, but lies east of SR 85.

The NPS proposes initiation of a program to place temporary waters for pronghorn around Organ Pipe Cactus NM to offset pronghorn water needs, particularly in dry periods, and they will also monitor these waters to assess success. Fox *et al.* (2000) found that while pronghorn water budgets could be met through forage alone, existing conditions within the range of the species do not provide sufficient forage quality to accomplish this. A pilot study by AGFD found that temporary waters (portable 15-20 gallon containers) were used by Sonoran pronghorn. This program will be beneficial to pronghorn and will serve to augment existing habitat. These beneficial actions are expected to offset adverse impacts to the pronghorn from habitat loss and modification.

Curtailment of Range and Disturbance

A number of actions and activities of the GMP contribute to the curtailment of the range of the pronghorn. Other GMP actions have beneficial effects by reducing the amount or extent of curtailment of range. Curtailment of the pronghorns' range can be long-term to short-term in duration, from negligible to major in intensity, and from localized to regional in geographic context.

Currently, SR 85 bears heavy tourist and commercial traffic, with a posted speed limit of 65 mph. State Route 85 curtails the pronghorn range by acting as a barrier to movement east of SR 85. As traffic volumes and speeds increase on SR 85, it becomes more impassable to pronghorn movement. Organ Pipe Cactus NM constitutes the eastern edge of the current range of the pronghorn (Figure 3). Pronghorn historically crossed SR 85 to use bajada habitats in eastern portions of Organ Pipe Cactus NM. Increasing speeds and volume of traffic on SR 85 have likely increased its effectiveness as a barrier over the years (Service 1998a). The last pronghorn known to occur east of SR 85 in Organ Pipe Cactus NM was a male found dead near the Ajo Mountain Loop Drive in 1972. Few sightings of pronghorn have occurred since that time. On June 12, 1996, an adult doe pronghorn was observed crossing SR 85 (east to west) on the north end of the Crater Range (R. Barry, Luke AFB, pers. comm. 1996). There also exists an unconfirmed report of four Sonoran pronghorn attempting to cross SR 85 in August 1993 approximately 1 mile north of the Organ Pipe Cactus NM visitor center. A juvenile pronghorn crossed the highway (two lanes) to the east, but with the approach of a vehicle, ran back across the road to rejoin a group of three pronghorn (T. Ramon, Luke AFB, pers. comm. 1993). During 7 years of continuous radiotelemetry monitoring of a subset of the U.S. population, no radioed pronghorn have been detected east of SR 85 (AGFD, unpubl. data). A recent remote-sensing habitat analysis indicated that suitable pronghorn habitat exists east of SR 85 in Organ Pipe Cactus NM (Marsh *et al.* 1999). Road shoulder maintenance (e.g., widening) may increase the movement barrier effect.

The NPS has proposed to offset the barrier effect of SR 85. A three-year experimental pronghorn crossing zone will be established in the northern portion of the Valley of the Ajo from SR 85 milepost 67 to

71. In the crossing zone, the speed limit will be reduced to 35 or 45 mph on a seasonal basis, and at times of day when pronghorn are most likely to cross (e.g., 0400 - 0900 hours). The zone will be monitored by NPS personnel to assess pronghorn use of the crossing zone. This project has potential to benefit pronghorn by ameliorating the barrier effect of SR 85.

Some fences on Organ Pipe Cactus NM may prevent or minimize pronghorn movements. Organ Pipe Cactus NM's south boundary fence is a standard livestock fence, and probably inhibits or prevents pronghorn passage. However, the greater impact to movement in this area is likely Mexican Highway 2, located adjacent, parallel, and just to the south of the fence. The highway and the fence, in combination, prevent pronghorn from moving between the two countries and accessing available habitat in Mexico. The north boundary fence between Organ Pipe Cactus NM and BLM lands east of SR 85 is a standard livestock fence which is a barrier to pronghorn movement, but SR 85 is more of a barrier to pronghorn movement. The BLM boundary fence west of SR 85 has been modified to provide pronghorn access. Nevertheless, this fence probably inhibits pronghorn use of BLM lands more so than if it where removed altogether. Prohibiting movement into BLM lands minimizes the pronghorn's range and subsequently limits their ability to find forage during dry seasons and years. The NPS has proposed to remove fencing between their land and BLM lands if BLM were to remove cattle for a period of 20 years from adjacent BLM lands. The eastern boundary of Organ Pipe Cactus NM is primarily the high, rugged, crest line of the Ajo Mountains. This boundary is fenced only in high saddles where domestic livestock might range; the remainder of that boundary is nearly vertical topography. Sonoran pronghorn are not likely to occur in this area.

Some corridors of human activity may act as occasional barriers to pronghorn movement. The graded dirt roads west of SR 85 are frequently crossed by pronghorn (AGFD unpubl. telemetry data; NPS staff, pers. obs.). However, during periods of heavy vehicular traffic (e.g. during exceptional wildflower blooms), human use of these roads may temporarily inhibit pronghorn movement. Likewise, human use of the backcountry and various trails west of SR 85 peaks in the spring fawning period of the pronghorn (T. Tibbitts, pers. comm. 2001). Creation of new roads and trails, or expansion of existing roads and trails in pronghorn habitat (e.g., North Puerto Blanco Drive expansion, Pinkley Peak trail, creation of waysides and pullouts on SR 85) will amplify this effect. The fawning period is generally February through May and, along with the dry season of May through July, is the season when pronghorn are most likely to be in Organ Pipe Cactus NM because when the pronghorn's range begins to become dry, Organ Pipe Cactus NM provides better forage than the other parts of the pronghorn's current range (Service 1998a). Additionally, pronghorn fawns and mothers with fawns are much more sensitive to disturbance (Krausman *et al.* 2001). Frequent use of trails and roads in Organ Pipe Cactus NM creates disturbance that acts as barriers to pronghorn movement. Because a great deal of visitors come in the late winter and early spring (T. Tibbitts pers. comm. 2001), the resulting disturbance barriers may limit pronghorn access within Organ Pipe Cactus NM at a time when pronghorns need it most.

Some centers of human activity are likely to curtail the pronghorn's range. The Twin Peaks developed area is an area of permanent human activity. The progressive development of the Twin Peaks area has already affected several hundred acres of potential pronghorn habitat. The activity in this area is likely to inhibit pronghorn from using adjacent landscapes (Bright and van Riper III 2000). The GMP proposes some new construction in the Twin Peaks area such as a ranger and fire station, parking lots, and other buildings. This will increase the footprint of the Twin Peaks area, increasing the zone of pronghorn disturbance caused by this center of activity. Closure of adjacent areas will benefit the pronghorn and help reduce these curtailment effects.

Overall, pronghorn generally retain freedom of movement throughout Organ Pipe Cactus NM west of SR 85 and to Cabeza Prieta NWR. Still, pronghorn cannot fully use the available habitat within Organ Pipe Cactus NM west of SR 85. Sonoran pronghorn are nomadic animals. They survive the harsh conditions of the desert by roaming widely, exploiting wide-spread and often ephemeral resources of food, water, and shelter (Hoffmeister 1986, Hervert *et al*. 1996, Bright *et al*. 2001). An individual pronghorn may move many tens of miles in several days, simply following or seeking favorable conditions that result from localized rains and green areas. Curtailment of pronghorn range equates to restriction of their nomadic movements, and significantly reduces their ability to survive. For example, Sonoran pronghorn tend to

move southeast and upslope as the hot, dry weather of April - July develops. The animals appear to be making this movement to access more heavily vegetated desertscrub, where they find a wide variety of forage that allows them to survive through the annual spring drought (Hervert *et al.* 1996). State Route 85, Interstate 8, and Mexico Highway 2 are barriers to movements of pronghorn to the east, north, and south, respectively. Smaller roads within Organ Pipe Cactus NM west of SR 85 act as intermittent barriers. Fences are also barriers to movement, and probably confound movements within the area enclosed by these major roadways. The aforementioned seasonal closures will help offset these effects.

A recent study by 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 observers 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.

Causes of disturbance of pronghorn within Organ Pipe Cactus NM include: recreation, on-the-ground management activities, vehicles, aircraft, and movements of large numbers of undocumented migrants and smugglers. According to Organ Pipe Cactus NM's website (http://www.nps.gov/orpi/pphtml/facts.html), they had a total of 156,107 recreational visits in 1999. Human presence causes Sonoran pronghorn to move from an area, thereby denying pronghorn access to that specific site for what may be crucial ecological functions (e.g. foraging, bedding, seeking thermal shelter, seeking mates, seeking fawning sites, seeking areas of relative safety from predators). Causing pronghorn to move also increases their physiological demands by expending calories and metabolic water. These may be critical stresses in seasonal hot-dry periods and in extended periods of low forage availability. Disturbance may also lead to mortality. Causing a pronghorn to be alarmed or agitated, or flee from a disturbance may make it vulnerable to predator attack. This is especially true for fawns and females during the fawning season.

Law enforcement control of illegal immigrant and drug traffic has resulted in short- to long-term beneficial effects of varying intensity by reducing illegal foot and vehicle traffic and thereby reducing habitat degradation and disturbance of pronghorn. However, these law enforcement efforts may also push such traffic into backcountry habitat areas. Administrative use of Armenta Road is ongoing for law enforcement purposes, and the vehicular traffic of NPS vehicles causes disturbance to pronghorn, as does NPS emergency operations (e.g., high speed vehicle chases) throughout Organ Pipe Cactus NM.

Recreation is recognized as having significant environmental impacts (Knight and Gutzwiller 1995). Non-motorized human recreation activities, such as hiking, rock climbing, and skiing have increased in popularity, are continually expanding, and are extensive in nature. These activities have the ability to disrupt wildlife in many ways, particularly by displacing animals (Knight and Gutzwiller 1995). McArthur *et al*. (1982) reported elevated heart rates and flight among mountain sheep approached by humans. Mountain sheep reactions to hikers were greater than reactions to road traffic, helicopters, or fixed wing aircraft. Peak levels of hiking and skiing displaced chamois from nutritionally important habitats for prolonged periods (Hamr 1988). Orienteering activities in Denmark displaced roe and red deer from their home ranges; however, the animals eventually returned to these areas after disturbances ceased (Jeppesen 1987a, 1987b). Cassirer *et al*. (1992) found that elk in Yellowstone National Park moved an average of 1,765 meters to avoid cross country skiers, often moving to another drainage. Krausman *et*

al. (2001) found that the effects of disturbance from vehicular use of roads on Sonoran pronghorn was a more significant impact than disturbance from aircraft (helicopter, jet and fixed wing). Creation of new roads and trails and expansion of existing roads and trails in pronghorn habitat (e.g., North Puerto Blanco Drive expansion, Pinkley Peak trail) will create new areas of human disturbance and serve to amplify the already significant disturbance effects to pronghorn from visitor use in this area.

Part of the proposed action involves relocating powerlines and placing powerlines underground. This would likely result in a small amount of disturbance to pronghorn and their habitat. However, relocating the powerline corridor and revegetating the disturbed area may result in reducing use of this corridor by undocumented migrants and smugglers.

Sonoran pronghorn in Organ Pipe Cactus NM are subjected to disturbance events that vary substantially in intensity and are sporadic in time and place. Viewed as a whole, these actions may result in a nearly daily exposure to disturbance. For example, the graded roadways in western portions of Organ Pipe Cactus NM may have adverse impacts to the pronghorn at a minor to moderate level of intensity, but when added to park visitation pressures from hikers, vehicular use of roads, undocumented migrants on foot and in vehicles, drug smuggling traffic, and the related law enforcement efforts, major, widespread, and continuous disturbance takes place. Disturbance of this intensity and frequency may result in physiological stress to pronghorn, excessive movements, and avoidance of areas that might otherwise be preferred habitat. Ultimate consequences may include diminished physical fitness, reduced adult survival, reduced breeding capability, reduced fawn survival, susceptibility to predation, and death. Seasonal closures of roads and backcountry areas should effectively minimize disturbance of pronghorn from visitors during the fawning period.

To address the effects of curtailment of range and disturbance, Organ Pipe Cactus NM has proposed to institute a monitoring and closure program to protect pronghorn, especially during the critical fawning period. North Puerto Blanco Drive will be closed to public use from April 1 to July 15. The Bates Well Road and Pozo Nuevo Road will also be closed to public use from March 15 to July 15. Also, a monitoring program will be employed, and any pronghorns detected in Organ Pipe Cactus NM will result in a 5-mile diameter buffer zone around the animal which will be closed to all activity, except for a minimal amount of administrative traffic. This effort would be concentrated in areas, for example, to evaluate the need for closure of North Puerto Blanco Drive during the month of March. Additionally, backcountry permits will be limited to areas east of SR 85 and south of North Puerto Blanco Drive. These efforts should effectively minimize disturbance of pronghorn from visitors during the fawning period, and offset curtailment of pronghorn range through public use of Organ Pipe Cactus NM.

Direct Mortality or Injury

Direct mortality or injury of Sonoran pronghorn from the proposed actions is possible, but unlikely. Vehicular strikes are possible on SR 85. As vehicular traffic on all roads increases, the possibility of injury or mortality to pronghorns also increases. A vehicle strike could occur on the unpaved roads, although there are no recent documented occurrences of pronghorn mortality from vehicles anywhere in Organ Pipe Cactus NM, including SR 85.

Other proposed actions have beneficial effects by reducing the potential for mortality. The NPS Law Enforcement patrols aid in reducing the likelihood of poaching within Organ Pipe Cactus NM. Removing livestock fencing along most of Organ Pipe Cactus NM's western boundary and modifying the fence on the northern boundary, has helped reduce the potential for pronghorn death by entanglement. Backfilling abandoned mining features help to prevent wildlife pitfalls.

Disease

Potential diseases spread from livestock include epizootic hemorrhagic disease and bluetongue and foot-and-mouth disease (Service 1998a). Organ Pipe Cactus NM's program for excluding domestic livestock reduces the potential for transmittal of diseases such as Foot-and-Mouth disease. Recreational use of

horses is allowable in the backcountry. However, this recreational activity rarely takes place and is therefore unlikely to result in an adverse impact by introducing the possibility of disease transmission.

V. CUMULATIVE EFFECTS

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

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

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

VI. CONCLUSION

After reviewing the current status of the Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed NPS GMP for Organ Pipe Cactus NM, and the cumulative effects, it is the Service's biological opinion that the GMP, as proposed, is not likely to jeopardize the continued existence of the Sonoran pronghorn. No critical habitat has been designated for this species, therefore, none will be affected.

We base our conclusion on the conservation measures proposed by the NPS. Effects of human disturbance on pronghorns within Organ Pipe Cactus NM have been ameliorated through the closure of key roads and backcountry areas and through the implementation of a suite of conservation measures specifically directed at pronghorn.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulation pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an

otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the terms and conditions of this incidental take statement.

Amount or Extent of Take Anticipated

The Service does not anticipate any incidental take of Sonoran pronghorn as a result of the proposed action.

CONSERVATION RECOMMENDATIONS

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

1. Continue to fund and support basic research, inventory, and monitoring of the Sonoran pronghorn. NPS should fund or staff recovery projects in Appendix 1.

2. Explore additional methods of ameliorating the barrier effects of SR 85, such as establishing a lower speed limit on SR 85 and investigating the feasability of installation of underpasses on SR 85.

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

REINITIATION STATEMENT

This concludes formal consultation on the Organ Pipe Cactus NM GMP. 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.

Changes in the proposed action since the 1997 biological opinion warrant reevaluation of effects to the lesser long-nosed bat, cactus ferruginous pygmy owl, and possibly other species.

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

Sincerely,

Nancy M. Kaufman
Regional Director

cc (w/attachments):

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LITERATURE CITED

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

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

Arizona Game and Fish Department. 1986. Final Report on Sonoran Pronghorn Status in Arizona, Arizona Game and Fish Department, Phoenix, AZ.

Bright, J.L., J.J. Hervert, L.A. Piest, R.S. Henry, and M. T. Brown. 1999. Sonoran pronghorn1998 aerial survey summary. Nongame and Endangered Wildlife Program Technical Report No. 152. Arizona Game and Fish Department, Phoenix, AZ.

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

Bright, J.L. and C. van Riper, III. 2000. Pronghorn home ranges, habitat selection and distribution around water sources in Northern Arizona. U.S. Geological Survey Technical Report Series USGSFRESC/COPL/2000/18.

Bunch, T.D., G.W. Workman, and R.J. Callan. 1989. Remote body temperature and heart rate monitoring in desert bighorn sheep. Desert Bighorn Council Transactions 33: 1-5.

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

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

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

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

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

Cassier, E.F., D.J. Freddy, E.D. Ables. 1992. Elk responses to disturbance by cross-country skiers in Yellowstone National Park. Wildlife Society Bulletin 20: 375-381.

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

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

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.

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

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

Felger, R.S. 2001. Flora of the Gran Desierto and Rio Colorado of Northwestern Mexico. University of Arizona Press, Tucson, AZ.

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

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

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

Fox, L.M., P.R. Krausman, M.L. Morrison, and T.H. Noon. 2000. Mineral content of Sonoran pronghorn forage. California Fish and Game 86(3):159-174.

Geist, V. 1971. A behavioral approach to the management of wild ungulates. *In* A. W. Lance, ed., The scientific management of animal and plant communities for conservation. Symposium of the British Ecological Society No. 11. Blackwell Science Publications, Oxford, U.K.

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

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

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

Halloran, A.F. 1957. A note on Sonoran pronghorn. Journal of Mammalogy 38(3):423.

Hamr, J. 1988. Disturbance behavior of chamois in an alpine tourist area of Austria. Mountain Research and Development 8:65-73.

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

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

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

Hervert, J.J., B. Henry, M. Brown, and L. Piest. 1996. Sonoran pronghorn population monitoring: progress report. Nongame and Endangered Wildlife Program Technical Report No. 110. Arizona Game and Fish Department, Phoenix, AZ.

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

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

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

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

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

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

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

Jeppesen, J.L. 1987a. The disturbing effects of orienteering and hunting on roe deer (*Capreolus capreolus*). Danish Review of Game Biology 13:1-24.

Jeppesen, J.L. 1987b. Immediate reactions of red deer (*Cervus elaphus*) to orienteering and hunting in a Danish environment (in Danish with an English summary). Danske Vildtundersogelser 43:1-26.

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

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

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

Knight, R.L. and K.J. Gutzwiller, eds. 1995. Wildlife and recreationists: coexistence through management and research. Island Press, Washington, D.C. 372 pp.

Krausman, P.R. 1997. An annotated bibliography on the effects of aircraft noise on pronghorn and other species. Harris Environmental Group, Tucson, AZ.

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

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

McArthur, R.A., V. Geist, and R.H. Johnson. 1982. Cardiac and behavioral responses of mountain sheep to human disturbance. Journal of Wildlife Management 46:351-358.

MacArthur, R.A., R.H. Johnson, 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.

Maier, J.A., S.M. Murphy, R.G. White, and M.D. Smith. 1998. Responses of caribou to overflights by low-altitude jet aircraft. Journal of Wildlife Management 62:752-766.

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.

Marine Corps Air Station - Yuma. 1996. Yuma Training Range Complex, Environmental Impact Statement. U.S. Department of Defense, Marine Corps Air Station, Yuma, AZ.

Marsh, S.E., C. Wallace, and J. Walker. 1999. Evaluation of satellite remote sensing methods for regional inventory and mapping of desert resources. Arizona Remote Sensing Center, Office of Arid Lands, The University of Arizona, Tucson, 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.

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.

Nicol, A.A. 1941. Game reconnaissance of southwestern Arizona, South of the Gila River. Unpublished. Arizona Game and Fish Department, Phoenix, AZ.

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.

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

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

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

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

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

Rowlands, P.G. 2000. Low temperature and other climatic trends at Organ Pipe Cactus National Monument. *In* W.L. Halvorson and B.S. Gebow, eds., Creative Cooperation in Resource

Management, extended abstracts. U.S. Geological Survey, Western Ecological Research Center, Sonoran Desert Field Station, University of Arizona, Tucson, AZ.

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

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

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

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

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

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

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

U.S. Air Force. 1997. Revised biological assessment for Sonoran pronghorn on the Barry M. Goldwater Range. Luke Air Force Base, AZ.

U.S. Fish and Wildlife Service. 1982. Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Denver, CO.

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

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

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

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

U.S. National Park Service. 2001. Re-Analysis of cumulative effects on the Sonoran pronghorn, supplement to the Environmental Impact Statement for the 1997 General Management Plan/Development Concept Plans for Organ Pipe Cactus National Monument. Organ Pipe Cactus National Monument, Ajo, AZ.

University of Arizona. 1986. Natural Resources Management Plan for Luke Air Force Range: Executive Summary. Report to U.S. Air Force-Tactical Air Command, Luke Air Force Base, AZ.

Villa, R.B. 1958. Partial account of Prof. Bernard Villa R. Concerning the study of bighorn sheep and antelope in northern Mexico. Inst. Biol., Mexico, D.F. Unpublished.

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

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

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

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

Literature Cited (Supplemental EIS)

Ajo Copper News. 2001. Ajo History and Points of Interest at http://www.tabletoptel.com/~cunews/AjoHist.html. Accessed 19 March 2001.

Albers, J. 2001. General Plan Analyst, City of Yuma Department of Community Development. Personal communication between Jennifer Albers and Lesley Johnson, URS. 9 February 2001.

Antone, R. 2001. Manager, Hickiwan Casino Recreational Vehicle Park. Personal communication between Roselind Antone and Sunny Bush, URS. 30 March 2001.

Arizona Department of Water Resources (online). 2001. http://www.water.az.gov/AZWaterInfo/OutsideAMAs/LowerColoradoRiver/lowergilariver.htm. Accessed 17 April.

_____. 2001. http://www.water.az.gov/azwaterinfo/OutsideAMAs/LowerColoradoRiver/default.htm. Accessed 1 May.

Arizona Game and Fish Department. 1985. Interim Report on the Sonoran Pronghorn antelope (*Antilocapra americana sonoriensis*). October 1983 – March 1985. Phoenix, Arizona. 57 pp.

_____. 1997. Hunter use days for deer, javelina, and bighorn sheep from 1991 to 1996. AGFD, Phoenix, Arizona.

_____. 2001a. Barry M. Goldwater Range Water Database. Provided by J. Hervert, AGFD, via e-mail to Beth Defend, URS. 24 April 2001.

_____. 2001b. Draft Sonoran Pronghorn 2000 Aerial Survey Summary. AGFD, Phoenix, Arizona. February 2001.

Arizona State Parks. 1989. Statewide Comprehensive Outdoor Recreation Plan—Arizona Rivers, Streams & Wetlands Study. Arizona State Parks, Phoenix.

_____. 1999. Arizona Trails 2000, State Motorized and Nonmotorized Trails Plan. Arizona State Parks, Phoenix. October 1999.

Bright, J. L. and C. van Riper III. 2000. Pronghorn home ranges, habitat selection and distribution around water sources in Northern Arizona. USGS Forest and Rangeland Ecosystem Science Center, Colorado Plateau Field Station, Northern Arizona University. Technical Report USGSFRESC/COPL/2000/18. 28pp.

Bright, J. L., J. Hervert, L. Piest, R. Henry, and M. Brown. 1999. Sonoran pronghorn 1998 aerial survey summary. Technical report 152, Nongame and Endangered Wildlife Program, Arizona Game and Fish Department. 9 pp.

Brown, D. E. 1982. Biotic communities of the American Southwest, United States and Mexico. Desert Plants. 4 pp.

Brown, D. 2001. Arizona Army National Guard. Personal communication between Col. Doug Brown and Lesley Johnson, URS. 13 April 2001.

Bryan, K. 1922. Routes to Desert Watering Places in the Papago Country, Arizona. U.S. Geological Survey, Water Supply Paper 490-B. Government Printing Office, Washington, D.C.

Bureau of Land Management. 1966. Forage Resource Inventory of the Organ Pipe Cactus National Monument: Narrative Report for the National Park Service. Unpublished Report, Bureau of Land Management, Phoenix, Arizona. 24 pp + appendices.

Bureau of Land Management. 1971. A Special Study for the National Park Service: Range Conditions on the Organ Pipe Cactus National Monument, Arizona. Unpublished report, Bureau of Land Management, Phoenix, Arizona. 19 pp + appendices.

Carrasco, M. 2001. Land Use Specialist, Yuma County Planning Department. Personal communication between Maggie Carrasco and Lesley Johnson, URS. 12 February 2001.

Colburn, R. 2001. Assistant Chief Patrol Agent, United States Border Patrol. Personal communication between Ron Colburn and Lesley Johnson, URS. 12 April 2001.

Cory, P. 2001. Superintendent, Hyder School District. Personal communication between Pat Cory and Lesley Johnson, URS. 8 February 2001.

Dille, S. 2001. Town Manager, Town of Gila Bend. Personal communication between Shane Dille and Lesley Johnson, URS. 5 February 2001.

Environmental Protection Agency, Council on Environmental Quality. 1981. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. *Federal Register* Vol. 46(55):18026-18038; March 23, 1981.

Gallagher, G. 2001. Yuma County Planning Department. Personal communication between Gail Gallagher and Lesley Johnson, URS. 30 January.

Garcia, D. 2001. Environmental Science Manager, Luke Air Force Base. Personal communication between Major D. Garcia and Sunny Bush, URS. 16 April.

Greene, J. A. 1977. Historic Resource Study, Organ Pipe Cactus National Monument. Unpublished Report, NPS- Denver Service Center, Historic Preservation Division, Denver, Colorado.

Hansen, R. 2001. Recreation Manager, Bureau of Land Management. Personal communication between Rich Hansen and Lesley Johnson, URS. 12 April.

Hansen, T. 2001. Airspace Manager and Indian Liaison Officer, Luke Air Force Base. Personal communication between Terry Hansen, Beth Defend, and Sunny Bush, URS. 30 March.

Harp, V. 2001. E-mail communication between Virgial Harp, Cabeza Prieta NWR, and Carol Wirth, URS. 23 March.

Harper, J. 2001. Board Member, Border Trade Alliance. Personal communication between Joe Harper and Lesley Johnson, URS. 4 April.

Heathington, C. 2001. Archaeologist, Luke AFB. Personal communication between Carol Heathington and Lesley Johnson, URS. 11 April.

Hervert, J. J., R. S. Henry, M. T. Brown, L. A. Piest. 1996. Sonoran pronghorn population monitoring: Progress report. Technical report 110, Nongame and Endangered Wildlife Program, Arizona Game and Fish Department. 5 pp.

Hoffmeister, D.F. 1986. Mammals of Arizona. The University of Arizona Press. 602pp.

Johansson, G. and F. Backlund. 1970. Drivers and road signs. Ergonomics 13:749-759.

Immigration and Naturalization Service. 2001. Preliminary Draft Programmatic Environmental Impact Statement U.S. Border Patrol Tucson and Yuma Sectors, Arizona. January.

Krausman, P. R., L. K. Harris, and J. Francine. 2001. Draft report: Long-term study of the noise effects of military overflights on the Sonoran pronghorn, Barry M. Goldwater range, Luke Air Force Base, Arizona. Draft report to the 56th FW/RMO, Luke Air Force base, Arizona. The University of Arizona, School of Renewable Natural Resources, Tucson. 100 pp.

Leon, J. 2001. Manager, Hickiwan Casino. Personal communication between Julie Leon and Sunny Bush, URS. 30 March.

Luke AFB. 1996. Range Access Control Log Database for Federal Fiscal Year 1996.

Marsh, S. E., C. Wallace, and J. Walker. 1999. Evaluation of satellite remote sensing methods for regional inventory and mapping of desert resources. Arizona Remote Sensing Center, Office of Arid Lands, The University of Arizona, Tucson. 27 pp plus tables and figures.

McCarrick, L. 2001. Environmental Planner, Luke Air Force Base. Personal communication between Lisa McCarrick and Lesley Johnson, URS. 5 April.

Melanson, J. 2001. Consultant, ADOT Roadway Engineering. Personal communication between John Melanson and Lesley Johnson, URS. 10 April.

Miller, B. 2001. Biologist, Luke AFB. Personal communication between Bill Miller and Lesley Johnson, URS. 5 April.

Miller, D. 2001. Highway Maintenance Supervisor, Arizona Department of Transportation, Gila Bend Maintenance Yard. Personal communication between Dave Miller and Lesley Johnson, URS. 22 March.

Morgart, J. 2001a. Wildlife Biologist, Cabeza Prieta NWR. Personal communication between John Morgart and Sunny Bush, URS. 2 April 2001.

_____. 2001b. Wildlife Biologist, Cabeza Prieta NWR. Personal communication between John Morgart and Sunny Bush, URS. 10 April 2001.

National Park Service. 1995. *Draft* Organ Pipe Cactus National Monument General Management Plan/Development Concept Plans/Environmental Impact Statement. On file at Organ Pipe Cactus National Monument, Arizona.

_____. 1996. *Supplement to the Draft* Organ Pipe Cactus National Monument General Management Plan/Development Concept Plans/Environmental Impact Statement. On file at Organ Pipe Cactus National Monument, Arizona.

_____. 1997. Final Organ Pipe Cactus National Monument General Management Plan/Development Concept Plans/Environmental Impact Statement. On file at Organ Pipe Cactus National Monument, Arizona.

_____. 2001. National Park Service Management Policies. Online http://www.nps.gov/refdesk/mp/index.html. On file at the Intermountain Regional Office, Denver.

Ockenfels, R. A., A. A. Alexander, C. L. Dorothy Ticer and W. K. Carrel. 1994. Home ranges movement patterns and habitat selection of pronghorn in central Arizona. Arizona Game and Fish Department Technical Report 13. 80 pp.

Ockenfels, R. A., W. K. Carrel, and C. van Riper III. 1997. Home range and movements of pronghorn in northern Arizona. Biennial Conf. Research on the Colorado Plateau 3:45-61.

Pearce, R. 2001a. Director, Range Management Department, MCAS Yuma. E-mail communication. 4 April.

_____. 2001b. Director, Range Management Department, MCAS Yuma. E-mail communication. 9 April.

Phelps Dodge Corporation. 2001. Phelps Dodge Corporation News Release. At http://www.phelpsdodge.com/news/PDMCGeneral/detail_51.html#top dated 17 May 1997. Accessed on 19 March.

Petrie, B. 2001. Article in *The Arizona Republic* titled "To Make Arizona 85 Stretch Safer, 3 Things Are Needed." 19 April.

Reinhart, G. 2001. Town Manager, Town of Wellton. Personal communication between Gary Reinhart and Lesley Johnson, URS. 1 February 2001.

Rickard, F. R. 1996. Exploring, Mining, Leaching, and Concentrating of Copper Ores as Related to the Development of Ajo, Arizona. Published by F. R. Rickard, Ajo, AZ. 348 pp.

Rowlands, P. G. 2000. Low temperature and other climatic trends at Organ Pipe Cactus National Monument. Pages 81-83 In Creative Cooperation in Resource Management: Third Conference on Research and Resource Management in the Southwestern Deserts, May 2000. Eds. Halvorson, W. L. and B. S. Gebow. 109 pp.

Rutman, S. 1996. An Assessment of Accelerated Erosion and Its Management at Organ Pipe Cactus National Monument. Unpublished report, Organ Pipe Cactus National Monument, Arizona. 33 pp + appendix.

Sizemore, T. 2000. E-mail communication between Tim Sizemore, 56 FW/RMO/QAEO and Carol Wirth, URS/Dames & Moore. 13 April.

Smith, G. 2001. Principal, Southwest Asset Solutions, Inc. Personal communication between Gary Smith and Lesley Johnson, URS. 26 April.

Spude, R. L. 1997. History of Transportation Corridors and the Current Highway Through Organ Pipe Cactus National Monument. Unpublished draft report for Organ Pipe Cactus National Monument, Arizona. 48 pp.

Stillwell, D. 2001. Property Manager, Phelps Dodge Corporation. Personal communication between Don Stillwell and Lesley Johnson, URS. 28 March.

Thompson-Olais, L. 1997. Personal communication between Laura Thompson-Olais, Ecologist, and Carol Young, Dames & Moore. 8 January.

Tiller, D. 2000. Personal communication between Don Tiller, Cabeza Prieta NWR manager, and Lesley Johnson, URS/Dames & Moore. 8 December.

Turner, M. 2001. Biologist, Michael Baker Corporation. Personal communication between Mark Turner and Lesley Johnson, URS. 5 April.

U.S. Census Bureau (online). 2000. www.census.gov. Accessed 6 April.

U.S. Fish and Wildlife Service. 1939a. Kofa Refuge and Cabeza Prieta Refuge Annual Report, Fiscal Year Ending June 30, 1939. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1939b. Quarterly Narrative Report, Kofa and Cabeza Prieta Refuges, Quarter Ending July 31, 1939. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1940. Cabeza Prieta Game Range, Quarterly Narrative Report, May - July 1940. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1942a. Cabeza Prieta Game Range, Quarterly Narrative Report, November 1941 - January 1942. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1942b. Refuge Narrative Report, Cabeza Prieta Game Range, May - August 1942. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1943a. Report on Patrol Trip, Cabeza Prieta Game Range, March 6th to 10th, 1943, Gale Monson, Junior Refuge Manager. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1943b. Summary of the Year's Activities, Cabeza Prieta Game Range, May 1942 - April 1943. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1945. Cabeza Prieta Game Range, Narrative Report, January - April 1945. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1946a. Cabeza Prieta Game Range, Narrative Report, January – April 1946. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1946b. Cabeza Prieta Game Range, Narrative Report, September - December 1946. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1948a. Cabeza Prieta Game Range, Narrative Report, September – November 1948. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1948b. Cabeza Prieta Game Range, Narrative Report, May – August 1948. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1949a. Cabeza Prieta Game Range, Narrative Report, January – April 1949. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1950. Cabeza Prieta Game Range, Narrative Report, January – April 1950. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1951. Cabeza Prieta Game Range, Narrative Report, September – December 1951. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1952a. Cabeza Game Range Narrative Report for May – August 1952. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1952b. Cabeza Game Range Narrative Report for September – December 1952. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1953. Cabeza Game Range Narrative Report for January – April 1953. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1954a. Cabeza Game Range Narrative Report for January – April 1954. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1954b. Cabeza Game Range Narrative Report for September – December 1954.

_____. 1955a. Cabeza Game Range Narrative Report for January – April 1955. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1955b. Cabeza Game Range Narrative Report for May – August 1955. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1955c. Cabeza Game Range Narrative Report for September – December 1955. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1957a. Cabeza Game Range Narrative Report for January – April 1957. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1957b. Cabeza Game Range Narrative Report for May – August 1957. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1958a. Cabeza Game Range Narrative Report for January – April 1958. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1958b. Cabeza Game Range Narrative Report for May – August 1958. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1960. Cabeza Game Range Narrative Report for January – April 1960. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1961a. Cabeza Game Range Narrative Report for May – August 1961. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1961b. Cabeza Game Range Narrative Report for September – December 1961. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1963a. Cabeza Game Range Narrative Report for January – April 1963. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1963b. Cabeza Game Range Narrative Report for September – December 1963. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1965. Cabeza Prieta Game Range Narrative Report, 1965. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1966. Cabeza Prieta Game Range Narrative Report, 1966. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____.1971. Cabeza Prieta Game Range Narrative Report, 1971. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____.1974. Cabeza Prieta Game Range Narrative Report, 1974. Cabeza Prieta National Wildlife Refuge, Ajo, Arizona.

_____. 1998. Final Revised Sonoran Pronghorn Recovery Plan. Albuquerque, NM. 70 pp.

U.S. Navy, Naval Facilities Engineering Command, Southwest Division, 1995. Tactical Aircrew Combat Training System (TACTS) Range Upgrade, 100% Review EA. June.

University of Arizona. 1986. Natural Resources Management Plan for Luke Air Force Range. Prepared for U.S. Air Force—Tactical Air Command, Luke Air Force Base, Arizona. November 1986.

University of Arizona, Bureau of Applied Research in Anthropology. 2000. A Statement of Natural and Cultural Resources Management Capability. 3 July.

van Riper III, C., and R. A. Ockenfels. 1998. The influence of transportation corridors on the movement of pronghorn antelope over a fragmented landscape in northern Arizona. ICOWET February 9-12 1998, 241-248.

Wright, R. L. and J.C. deVos, Jr. 1986. Final report on Sonoran pronghorn status in Arizona. Arizona Game and Fish Department, Phoenix AZ.

Zalaznik, S. 2001. E-mail communication between Scott Zalaznik, Wildlife Specialist, AGFD Game Branch and Carol Wirth, URS. 14 March.

_____. 2000. E-mail communication between Scott Zalaznik, Wildlife Specialist, AGFD Game Branch and Lesley Johnson, URS. 1 December.

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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