



United States Department of the Interior



Fish and Wildlife Service
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In Reply Refer To:
AESO/SE

22410-2006-F-0416-R002
(Cabeza Prieta National Wildlife Refuge Comprehensive Conservation Plan)
22410-1989-F-0078-R007
(Organ Pipe Cactus National Monument General Management Plan)
22410-2001-F-0109-R002
(Formerly 02-21-01-F-0109; OPCNM North Puerto Blanco Drive Widening)
22410-2005-F-0120-R002
(Formerly: 02-21-94-F-192) (Five Livestock Grazing Allotments in the Vicinity of Ajo in Tails)
22410-1996-F-0094-R004
(Military Operations on Barry M. Goldwater East, Luke Air Force Base)
22410-2005-F-0492-R003
(Barry M. Goldwater Integrated Natural Resources Management Plan, Luke Air Force Base)

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Dear Mr. Slone, Mr. Range, Mr. Kender, and Mr. Buchanan:

Thank you for your requests for reinitiation of formal consultation with the U.S. Fish and Wildlife Service (FWS) pursuant to section 7 of the Endangered Species Act of 1973 (16 U.S.C. 1531-1544), as amended (ESA). Your requests were received by us on July 24 (Cabeza Prieta National Wildlife Refuge; CPNWR); August 6 (Organ Pipe Cactus National Monument; OPCNM), August 8 (Bureau of Land Management; BLM), and August 1, 2013 (Luke Air Force Base; LAFB). At issue are possible effects of the proposed action on the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*). All agencies have requested to end seasonal restrictions on public use during the Sonoran pronghorn fawning season; these seasonal restrictions were included as conservation measures in biological opinions for your respective agency actions. These conservation measures and biological opinions are described below in the description of the proposed action. One of these biological opinions is for the CPNWR Refuge Comprehensive Conservation Plan (CCP). Because this opinion was reinitiated recently on November 21, 2013, herein we revise specific sections of this latest biological opinion relating to the status and baseline of the Sonoran pronghorn. Status and baseline sections not addressed or revised herein remain as presented in the CPNWR CCP biological opinion issued on August 22, 2006 and the other referenced biological opinions, as appropriate. With regard to the effects analysis, only the sections on seasonal closures in the referenced biological opinions will be revised. Sections not addressed or revised herein remain as presented in the last biological opinions for your respective agency actions.

This biological opinion is based on information provided in the agency letters, telephone conversations and meetings between our staffs, and other sources of information found in the administrative record supporting this biological opinion. Literature cited in this biological opinion is not a complete bibliography of all literature available on the action addressed in this consultation or on Sonoran pronghorn. A complete administrative record of this consultation is on file at this office.

CONSULTATION HISTORY

2012 to 2013: FWS and the Sonoran Pronghorn Recovery Team discussed and corresponded regarding seasonal restrictions on public use within the Sonoran pronghorn range in the U.S.

July 11, 2013: The Sonoran Pronghorn Recovery Team made their final recommendation to the FWS to end seasonal restrictions on public use within the Sonoran pronghorn range.

July 24, 2013: CPNWR requested reinitiation of consultation on their CCP.

August 1, 2013: LAFB requested reinitiation of consultation on their military training and operations program and INRMP.

August 8, 2013: BLM requested reinitiation of consultation on their five livestock grazing allotments project.

August 6, 2013: OPCNM requested reinitiation of consultation on their GMP and three other actions referenced above.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

A complete description of the proposed action is found in your July 24 (CPNWR), July 31 (OPCNM), August 8 (BLM), and August 1, 2013 (LAFB) requests to reinitiate consultation, and are incorporated herein by reference. The purpose of these requests is to end seasonal restrictions on public use during the Sonoran pronghorn fawning season on CPNWR, OPCNM, BLM, and LAFB lands. The seasonal restrictions on public use were included as conservation measures in biological opinions for your respective agency actions. These conservation measures and biological opinions are described below.

Cabeza Prieta National Wildlife Refuge (CPNWR)

The biological opinion on the CPNWR CCP, issued on August 22, 2006 (biological opinion number 22410-2006-F-0416), included a number of conservation measures for Sonoran pronghorn in the Description of the Proposed Action. Among these was the following, “Restrict public access to pronghorn habitat during the fawning season¹, until it has been determined that the U.S. subpopulation of Sonoran pronghorn has stabilized (i.e., either it has met the criteria for downlisting described in the “Status of the Species” and it has been downlisted or the environmental documents are being processed to finalize the downlisting, or the pronghorn population has remained stable with over 200 individuals for several years; Curtis McCasland, CPNWR, personal communication, June 30, 2006).

Organ Pipe Cactus National Monument (OPCNM)

Seasonal restrictions on public use were included in a number of biological opinions relating to actions on the OPCNM subsequently described. The biological opinion on the OPCNM General Management Plan (GMP), issued on November 16, 2001 (biological opinion # 02-21-89-F-078R1), and subsequent revisions included a number of conservation measures for Sonoran pronghorn in the Description of the Proposed Action. Among these was the following “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”; and “closing North Puerto Blanco Drive at a point approximately 5.1 miles from the Visitor’s Center, and also and its intersection with Pozo Nuevo Road from April 1 to July 15”. The third reinitiation

¹ Under this measure, the eastern three-quarters of the CPNWR (roughly from five miles east of Tule Well to the eastern boundary) has generally been closed to public access from March 15 to July 15. During wet years, however, the eastern three-quarters of the CPNWR may be closed at a later date, such as April 1, if the CPNWR receives concurrence from the Arizona Ecological Services Office and the Sonoran Pronghorn Recovery Team that a later closure date will not affect pronghorn.

of the GMP biological opinion issued on March 10, 2005 (biological opinion number 02-21-89-F-0078-R3) revised the public use closure on OPCNM to April 30-July 15 in years when spring forage conditions are good. This conservation measure is reiterated in the other three OPCNM biological opinions referenced above.

Bureau of Land Management (BLM)

The biological opinion on BLM's Five Livestock Grazing Allotments Project, issued on June 21, 2004 (biological opinion number 02-21-94-F-192R3) included a number of conservation measures for Sonoran pronghorn in the Description of the Proposed Action. Among these was the following, "11) BLM will continue to implement the seasonal closure to public access and use to the area west of SR 85 and south of the Darby Well/Scenic Loop Road/Chico Shunie Road, excluding the area signed for camping at Gunsite Wash, between March 15 -July 15 annually or as agreed upon by the SOPH Recovery Team. This closure will be carried forward into the land use plan being developed for the area."

Barry M. Goldwater Range East (BMGR-East)/Luke Air Force Base (LAFB)

Seasonal restrictions on public use were included in two biological opinions relating to actions on the BMGR East as subsequently described. The biological opinion on Military Training on the BMGR East, Arizona, issued May 4, 2010 (biological opinion number 22410-1996-F-0094-R003) included a number of conservation measures for Sonoran pronghorn in the Description of the Proposed Action. Among these was the following, "Conservation Measure 11: The San Cristobal Valley is closed to public use with access limited to authorized federal and state personnel and individuals holding a special use permit issued by 56th RMO. Special use permits for San Cristobal Valley are generally not issued for the time period beginning 15 March through 15 July to protect Sonoran pronghorn during the fawning period. Special use permits will only be issued during this period on an extremely limited basis and only if the proposed activity is not in conflict with pronghorn. These dates may be adjusted as recommended by the Recovery Lead at CPNWR." LAFB has no record of a special use permit being requested by the public during the closure period over the past 12 plus years.

The biological opinion on the Integrated Natural Resources Management Plan (INRMP) for the BMGR, issued on August 26, 2005 (biological opinion number 02-21-05-F-0492), included a number of wildlife management actions. Among these was the following, "About 32 percent of the current pronghorn range within the BMGR is in areas that are generally open to public access (that portion within Management Units 2 and 3 and the road open to the public in Unit 4); the remainder is within areas that are closed to public access. Additionally, beginning in 2002, Unit 3 is closed to public entry from March 15 to July 15 each year as part of the overall effort to recover the pronghorn. This timeframe spans the normal period for pronghorn births and is critical to the early survival of fawns." Management Units 2 and 3 are in BMGR West and managed by personnel at Marine Corps Air Station Yuma who plan reinitiate consultation on their training and operations program in 2014. During this reinitiation, they intend to request ending seasonal closures as well. The "road open to the public in Unit 4" is in BMGR East. This loop road connects two public use

roads from BMGR West (Unit 3), thus allowing the public to drive without hitting dead-ends at the BMGR East boundary.

Background and Justification for Ending Seasonal Closures

According to your requests, the concerted efforts of the Sonoran Pronghorn Recovery Team have resulted in tremendous gains for the Sonoran pronghorn in the U.S. in recent years. The semi-captive breeding program produces over 30 fawns annually, a second Sonoran pronghorn breeding pen and a wild population were recently established at Kofa National Wildlife Refuge, and an array of forage plots, feed stations, and water catchments supplement the natural habitat conditions. All of these actions are working to increase the wild population within the U.S. In December 2012, the U.S. endangered Sonoran pronghorn population was estimated at 159 animals, a rebound from the crash of 2002, when severe drought nearly extirpated the population.

The Sonoran Pronghorn Recovery Team has assessed the continued need for the seasonal restriction on public access and concluded it is not required at this time. If the Sonoran pronghorn population declines or if otherwise indicated, the recovery team may reevaluate the need for seasonal restrictions on public access during the fawning season. Public vehicular access in pronghorn habitat is limited to only a few roads, which are currently used predominantly by law enforcement in response to illegal border activities and agencies for administrative purposes. Off-road vehicle driving by the public is prohibited and speed limits are in place on CPNWR, OPCNM, BLM, and LAFB lands.

The additive vehicle traffic from the recreating public is anticipated to be minimal, with negligible effects on pronghorn fawning. According to the BLM, public use on the BLM lands in the Ajo area consist mainly of low-speed driving, sightseeing, and flower viewing during daylight hours between March 15 and April 15. On BLM, public use declines to near zero once temperatures increase in about mid-April. On CPNWR, it public use sharply declines by mid-May.

SONORAN PRONGHORN STATUS OF THE SPECIES

A. Description, Legal Status, and Recovery Planning

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

B. Life History and Habitat

No changes.

C. Distribution and Abundance

United States

Endangered Wild Population

The December 2004, 2006, 2008, 2010, and 2012 aerial surveys resulted in an estimated 58, 58, 68, 85, and 159, respectively, pronghorn in the U.S. endangered population (Tables 1 and 2), a substantial increase brought on by the implementation of ongoing recovery measures and improved range conditions since 2002. The 2006, 2008, and 2012 estimates included a number of captive-born individuals that were newly released into the wild (see below). During the 2008 and 2010 surveys, observers noted a skewed sex ratio (approximately 2:1) with more males than females; this affects the rate at which the population may increase.

Since 2002, when the Sonoran pronghorn population in Arizona declined to about 21 animals, recovery efforts of the Team and its partners have helped the wild population in Arizona increase nearly eight-fold. Key recovery actions include implementing captive breeding, waters, and supplement feeding programs, as well as operating forage enhancement plots. Although the U.S. Sonoran pronghorn population has increased significantly, until the most recent survey of 2012, the increase was not as great as the Team had predicted given the adequate to favorable range conditions since 2002, as well as the previously mentioned recovery efforts. Some members of the Team believe that this slow pronghorn population growth (caused by low fawn recruitment) is likely correlated with high cross-border violator (CBV) and USBP activity within the pronghorn range. Strong evidence of this correlation has been seen during the biennial aerial surveys where, since 2000, off-road vehicle tracks have been seen progressively increasing in extent and density, throughout the pronghorn's U.S. range (electronic mail from Tim Tibbitts, Organ Pipe Cactus National Monument and member of the Sonoran Pronghorn Recovery Team, September 21, 2009). It has been well documented that human presence in wildlands can disturb animals, causing them to unnecessarily expend energy avoiding people, thereby potentially reducing reproductive success (e.g., Manville 1983, van Dyke *et al.* 1986, Goodrich & Berger 1994, Primm 1996; as cited by Kerley *et al.* 2002) or increasing the likelihood of fatal encounters with humans (Kasworm & Manley 1990, Saberwal *et al.* 1994, Khramtsov 1995, Mattson *et al.* 1996; as cited by Kerley *et al.* 2002). Between 2010 and 2012, the wild pronghorn population (of nearly 100) benefitted from better than average rainfall during 2011 and 2012 which resulted in a robust fawn crop of 78 fawns per 100 does during 2012.

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

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

As part of a comprehensive emergency recovery program, a total of 11 adult pronghorn (10 females and one male) were initially captured (from Sonora and Arizona) and placed into a semi-captive breeding pen at CPNWR in 2004. The breeding program has been very successful and there are

currently (as of January 2014) 61 pronghorn in the enclosure at CPNWR. Since establishing the program, about 19 pronghorn older than current year have died in the pen due to various causes, including one confirmed case of epizootic hemorrhagic disease, two from malnutrition prior to the introduction of alfalfa hay in the pen, two from bobcat predation, one from entanglement in the fence, and two from capture operations. Eight deaths were from unknown causes and although disease was suspected, it could not be confirmed. Sonoran pronghorn have been released from the pen every year since 2006. As of January 2014, about 100 individuals have been released into the endangered population, many of which are known to still be alive.

The objective is to produce at least 20 fawns each year to be released into the current U.S. population, and to establish additional U.S. populations at Kofa NWR and BMGR East, east of Highway 85. The additional populations are being established as experimental, nonessential populations under section 10(j) of the Act. A final Environmental Assessment and final 10(j) rule were published in April and May, 2011, respectively. In December 2011, 13 Sonoran pronghorn were moved from the CPNWR breeding pen to the newly built breeding pen in the King Valley on Kofa NWR. One of the animals died due to capture myopathy and one died of unknown causes, leaving 11 (9 does and 2 bucks) in the pen for breeding purposes. In December 2012, 11 additional pronghorn were moved to the Kofa NWR from the CPNWR breeding pen, including two replacement breeder does for the Kofa breeding pen and nine pronghorn (three does and six bucks) for release into the wild. In September 2012, one adult doe was killed by a bobcat in the Kofa breeding pen. In December 2013, 16 additional pronghorn were moved to the Kofa NWR from the CPNWR, all of which were for release into the wild (one doe, however, had to be moved back into the breeding pen). As of February 2014, the Kofa pen contains 17 pronghorn.

Sonoran pronghorn have now been released in the King Valley on Kofa NWR in January 2013 (nine animals) and January 2014 (24 animals, including 9 from the Kofa pen and 15 from the CPNWR pen). Of the nine released in 2013, five are known to still be alive, one is unaccounted for. Three of these (two does and a buck) have been documented using a water source on the Yuma Proving Ground; most recently, in January 2014, they were documented near the Neversweat Mountains in King Valley. Two bucks released in 2013 were recaptured in the Kofa breeding pen because their collars prematurely failed and there was no way to track them. One of them was re-released in 2014. All 24 of the animals released in 2014 are still alive. Therefore, in total there should be 27 wild pronghorn in the 10(j) population, as of February 2014.

Mexico

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

in the pronghorn range. Additionally, an increasing number of fences and mine expansion within the range of the southeastern pronghorn population may be adversely affecting this population. In December 2009, surveys indicated pronghorn numbers increased somewhat with an estimated total of 482 (311 observed) individuals combined for both populations (including 381 pronghorn [258 observed] in the area southeast of Mexico Highway 8 and 101 [53 observed] to the west of the highway). In December 2011, surveys indicated pronghorn numbers drastically decreased with an estimated total of 241 (197 observed) individuals combined for both populations (including 189 pronghorn [167 observed] in the area southeast of Mexico Highway 8 and 52 [30 observed] to the west of the highway). In December 2013, surveys could not be conducted for the Sonoran pronghorn population west Mexico Highway 8 (Pinacate region) due to aircraft shortage; however, surveys of the population in the area southeast of Mexico Highway 8 indicated pronghorn numbers increased since 2011, with an estimated total of 434 (372 observed).

E. Threats

Barriers that Limit Distribution and Movement

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

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

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

De-watering of reaches of the Río Sonoyta and lower Gila River has also caused significant loss of habitat and loss of access to water (Wright and deVos 1986). Agricultural, urban, and commercial development at Sonoyta, Puerto Peñasco, and San Luis Río Colorado, Sonora; in the Mexicali Valley, Baja California; and at Ajo, Yuma, and along the Gila River, Arizona, have further removed habitat and created barriers to movement.

Vehicular Collision with Sonoran Pronghorn

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

Human-caused Disturbance

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

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

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

particularly in the western portions of the sector, due to USBP presence at Camp Grip, increased numbers of agents, and recently completed tactical infrastructure.

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

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

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

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

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

It has been well documented that human presence in wildlands can disturb animals, causing them to unnecessarily expend energy avoiding people, thereby potentially reducing reproductive success (e.g., Manville 1983, van Dyke *et al.* 1986, Goodrich & Berger 1994, Primm 1996; as cited by Kerley *et al.* 2002) or increasing the likelihood of fatal encounters with humans (Kasworm & Manley 1990, Saberwal *et al.* 1994, Khramtsov 1995, Mattson et al. 1996; as cited by Kerley *et al.* 2002). Range abandonment has been documented in response to human disturbance (Jorgenson 1988), and investigators have shown that heart rate increases in wildlife in response to auditory or visual disturbance in the absence of overt behavioral changes (Thompson *et al.* 1968, Cherkovich and Tatoyan 1973, Moen *et al.* 1978).

Studies of captive pronghorn, other than the Sonoran subspecies, have shown that they are sensitive to disturbance such as human presence and vehicular noise. Human traffic, such as a person walking or running past pronghorn in an enclosed pen, a motorcycle driving past, a truck driving past, a truck blowing its horn while driving past, or a person entering a holding pen, caused an increased heart-rate response in American pronghorn in half-acre holding pens (Workman *et al.* 1992). The highest heart rates occurred in female pronghorn in response to a person entering a holding pen, or a truck driving past while sounding the horn. The lowest heart rates occurred when a motorcycle or truck was driven past their pen. Pronghorn were more sensitive to helicopters, particularly those flying at low levels or hovering, than fixed wing aircraft. Luz and Smith (1976) observed pronghorn reactions to overhead helicopter flights which suggested mild disturbance (muscle tensing and interruption of grazing) by helicopter noise levels at approximately 60 dBA and strong reaction (running) at approximately 77 dBA.

Disturbances that cause pronghorn to startle and run would energetically have a more significant effect during times of drought. Such energetic expenditures, particularly during times of stress, may lead to lower reproductive output and/or survival of individual animals (Geist 1971). Landon *et al.* (2003) evaluated whether Sonoran pronghorn used areas, as defined by noise levels produced by military aircraft, in proportion to their availability on the BMGR. Using 15% of the Arizona Sonoran pronghorn population, Landon *et al.* studied pronghorn use of areas with varying sound pressure (ambient sound) levels and found that pronghorn did not use the areas with different ambient sound levels in proportion to their availability (2003). In general, they found that Sonoran pronghorn select areas with the lower noise levels and avoid areas with the higher noise levels; however, they did not consider habitat in their analysis. Whether pronghorn avoid these areas because of the noise or because of some other human-related factor is unknown; however, the various potential factors (i.e. noise levels, human presence, reduced vegetation or cover, disturbance) are interrelated. Hughes and Smith (1990) found that pronghorn immediately ran 1,310- 1,650 feet from a vehicle, and that military low-level flights (less than 500 feet above the ground) over three pronghorn caused them to move about 330 feet from their original location.

Krausman *et al.* (2001, 2004, 2005) examined effects of military aircraft and ground-based activities on Sonoran pronghorn at the North and South tactical ranges (TACs) on the BMGR and concluded that military activities, both ground-based and aerial, were associated with some changes in behavior (e.g., from standing to trotting or running, or bedded to standing). In response to stimuli, on days without stimuli, pronghorn foraged more and bedded less than on days with stimuli; the opposite was true for fawns (Krausman *et al.* 2001). Krausman *et al.* (2001) only considered a change in behavior to trotting or running in response to stimuli as biologically significant. Eighty-seven (4.1%) of the 2,128 events with ground-based stimuli resulted in pronghorn changing their behavior to trotting or running; often moving > 10 m (Krausman *et al.* 2004). Pronghorn tend to exhibit a predator response to human activities, but can habituate to chronic human disturbance in some instances (Krausman *et al.* 2004). The authors concluded that these changes were not likely to be detrimental to the animals; however, sightings of Sonoran pronghorn were biased towards disturbed habitats on the TACs and other areas of military activities, which also corresponded to areas of favorable ephemeral forage production (Krausman *et al.* 2005). No specific conclusions

could be drawn about effects of military activities on fawns during the Krausman et al. study, but the data suggests that fawns and their mothers may be more sensitive to anthropogenic stimuli than other pronghorn (Krausman et al. 2004). In general, the study did not detect differences in the behavior of pronghorn with and without anthropogenic stimuli; however, Krausman et al. (2004) recommends that all ground stimuli and activities that alerts or startles females and their fawns should be terminated. However, the long-term behavioral and physiological effects of military activities have not been quantified (Krausman et al. 2004).

Habitat Disturbance

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

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

As discussed above, CBV activities and required USBP response have resulted in increased human presence in remote areas and widespread habitat degradation. For instance, all the valleys at CPNWR are now criss-crossed with a network of unauthorized north-south routes and trails, even though those areas are designated as Wilderness. A mapping effort conducted by CPNWR showed almost 8,000 miles of illegal routes as of 2008. Similar levels of impacts are expected to exist at OPCNM, and a report summarizing existing impacts is being produced (electronic mail from Mark Sturm, OPCNM, August 31, 2011); however, we have not yet received this report. A cooperative effort was completed recently by CBP, FWS, NPS, and BLM to map and mark roads within the range of the Sonoran pronghorn to indicate those roads that are open for use by these agencies, and roads that are closed to vehicle traffic. It is hoped that this effort will reduce the use of unauthorized roads and the associated impacts to Sonoran pronghorn.

Prior to the completion of the vehicle fences on OPCNM and CPNWR (construction was started on these fences in late 2003 and 2007 and completed 2006 and 2009, respectively), CBVs frequently crossed the border in vehicles and created countless illegal routes, many of which were continuously used both by CBVs and responding USBP agents. Subsequent to the construction of the vehicle fences on OPCNM and CPNWR, CBV vehicular traffic was significantly reduced (there are occasional breaches in the fence; however, this CBV vehicular activity represents a fraction of that

prior to the presence of the fences). NPS notes that CBV vehicle activity has decreased at OPCNM since about 2004 (electronic mail, Tim Tibbitts, OPCNM, 2009 and 2011); however, the number of off-road tracks, and new roads ("unauthorized vehicle routes") in OPCNM continues to increase (electronic mail, Tim Tibbitts, OPCNM, September 1, 2011). Decreased CBV vehicle traffic in pronghorn habitat as a result of the fences has significantly alleviated the adverse effects of this traffic on pronghorn and their habitat. USBP, however, continues to respond (by vehicle, horseback, foot, and aircraft) to ongoing CBV activity (mostly foot traffic) in these areas. Frequently, this required response involves driving off of authorized roads which, when conducted in pronghorn habitat, results in significant degradation of pronghorn habitat and disturbance to pronghorn as discussed above. Because of concern over the dramatic increase in disturbance since 2005/2006, NPS has collected data over time to document the trend. The proliferation of unauthorized roads is a major impact on multiple resources, and provides an index of the level of human activity currently taking place in pronghorn habitat.

Fire

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

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

Drought and Climate Change

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

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

Small Population Size and Random Changes in Demographics

In populations of fewer than 100 pronghorn, population viability declines at an increasingly steep rate. To maintain genetic diversity over the long term, a population of at least 500 is desirable (Defenders of Wildlife 1998). At an estimated 21 pronghorn in 2002, the U.S. wild endangered population was critically endangered and likely experienced a substantial loss of genetic diversity resulting from the 2002 bottleneck. At an estimated 159 pronghorn in 2013, the U.S. wild endangered population has dramatically increased but is still below desired numbers. At an estimated 25 pronghorn in 2002 and 52 pronghorn in 2011, the Pinacate population is also well below desired numbers. At an estimated 434 pronghorn in 2013, the third population (southeast of Highway 8) is much closer to, but still below the desired size to maintain genetic diversity. Loss of the U.S. population would dramatically reduce our ability to manage or recover this subspecies. Populations at low levels may experience random variations in sex ratios, age distributions, and birth and death rates among individuals, which can cause fluctuations in population size and possibly extinction (Richter-Dyn and Goel 1972). In very sparse populations, males may have trouble finding females, reducing productivity (Ehrlich and Roughgarden 1987). Small populations are also sensitive to variations in natural processes, such as drought and predation (Hecht and Nickerson 1999).

Disease

Sonoran pronghorn can potentially be infected by a variety of viral and bacterial diseases, as well as parasites. Epizootic hemorrhagic disease and Bluetongue virus are the most common cause of disease caused die-off in wild pronghorn (Brown and Ockenfels 2007). Blood testing has shown pronghorn exposure to these diseases by increases in antibody titers over time. The diseases relevant to pronghorn can be transmitted indirectly through vectors, such as infected midges or ticks, or directly via aerosolized or direct contact of infected fluids or tissues. Diseases that potentially infect pronghorn are all serious diseases of cattle, which can act as vectors. Cattle within the current range of the pronghorn have not been tested for these diseases.

ENVIRONMENTAL BASELINE

A. Action Area

No changes.

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

No changes.

C. Status of the Sonoran Pronghorn in the Action Area

Drought

As discussed in the Status of the Species, climate change in the Southwest and the Sonoran Desert is predicted to result in warming trends and drier conditions, with accompanying changes in vegetation communities (Weiss and Overpeck 2005, Seager *et al.* 2007). Rowlands (2000) examined trends in precipitation for southwestern Arizona and OPCNM from 1895-1999. For southwestern Arizona, no trend in precipitation was found for the period, but low precipitation occurred around 1895 and during the 1950s. Periods of high precipitation occurred in 1915-1920 and in the 1980s. For OPCNM, there was a slightly increasing trend in monthly and annual precipitation over the period 1895-1999, a strong drought occurred in the 1950s, and a lesser drought occurred in the 1970s. No discernable trend in precipitation in southwestern Arizona or OPCNM was found in the 1990s, which is when the current decline in the U.S. pronghorn population began.

Since Rowland's analysis, there was one year characterized by above-average rainfall and abundant ephemeral forage (2001) followed by a year with virtually no precipitation or ephemeral forage (2002). Recruitment and survival were high in 2001 and very low in 2002 (Bright and Hervert 2005). Based on the lack of forage and water, and the condition of pronghorn observed, drought is considered the proximate cause of the 79% decline in the U.S. pronghorn population from 2000 to 2002. From 2003 to 2013, rainfall and Sonoran pronghorn range conditions have varied, but have improved overall when compared to 2002. The January 2014 long-term (48-months) drought status report (<http://www.azwater.gov/azdwr/StatewidePlanning/drought/DroughtStatus2.htm>) indicates that southwestern Arizona is experiencing conditions of abnormally dry to severe drought conditions. However, the current Sonoran pronghorn range conditions, as of March 2014, are very good.

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

Recovery Actions (Formerly “Emergency Recovery Actions”)

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

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

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

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

The Status of the Species section describes a variety of human activities that have affected the Sonoran pronghorn since initiation of livestock grazing over 300 years ago (Officer 1993). Many

non-Federal activities that have affected the pronghorn are historical in nature, and pronghorn have been all but extirpated from private, state, and Tribal lands. However, increased illegal activities have likely had a significant impact on Sonoran pronghorn in the U.S. in recent times, particularly since the turn of the millennium. See the “*Human-caused Disturbance*” and “*Habitat Disturbance*” portions of the “Threats” section under “Status of the Species” above for further detail.

E. Past and Ongoing Federal Actions in the Action Area

Because of the extent of Federal lands in the action area, with the exception of CBV activities, most activities that currently, or have recently, affected the U.S. population or their habitat are Federal actions. The primary Federal agencies involved in activities in the action area include the MCAS-Yuma, Luke Air Force Base, FWS, BLM, OPCNM, and USBP. 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

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

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

Federal Actions Addressed in Section 7 Consultations

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

1. Capture and collaring of pronghorn for research purposes, consultation number 02-21-83-F-0026. No incidental take was anticipated.
2. Capture and collaring of pronghorn for research purposes, consultation number 02-21-88-F-00060. No incidental take was anticipated.
3. Installation of a water source in the Mohawk Valley for pronghorn, consultation number 02-21-88-F-0081. No incidental take was anticipated.
4. Implementation of the CPNWR Comprehensive Conservation Plan, consultation number 22410-2006-F-0416, with a reinitiation issued on November 21, 2013. No incidental take was anticipated.
5. Change in aircraft type from the F-15A/B to the F-15E on BMGR-East [F-15E Beddown Project], consultation number 02-21-89-F-0008. Incidental take was anticipated only for the Beddown Project in the form of harassment as a result of aircraft overflights. This project was later incorporated into the biological opinion on Luke Air Force Base’s activities on the BMGR, listed below.

6. Widening of North Puerto Blanco Road, consultation number 02-21-01-F-0109. No incidental take was anticipated.
7. Improvements to SR 85 roadway and drainages, consultation 02-21-01-F-0546. No incidental take was anticipated.
8. Construction of a vehicle barrier on OPCNM, consultation number 02-21-02-F-237. No incidental take was anticipated.
9. U.S. Border Patrol Activities in the Yuma Sector, Wellton Station, Yuma, Arizona, consultation number 02-21-96-F-0334, issued September 5, 2000. Incidental take was anticipated in the form of harassment that is likely to injure up to one pronghorn in 10 years.
10. The BLM Lower Gila South Resource Management Plan-Goldwater Amendment, consultation number 02-21-90-F-0042, issued April 25, 1990. No incidental take was anticipated.
11. The BLM Lower Gila South Habitat Management Plan, consultation number 02-21-89-F-0213 issued on May 15, 1990. No incidental take was anticipated.
12. BLM Lower Gila South Resource Management Plan and Amendment, consultation number 02-21-85-F-0069, issued on March 27, 1998. No incidental take was anticipated.
13. BLM grazing allotments in the vicinity of Ajo, Arizona, consultation number 02-21-94-F-0192, issued on December 3, 1997, with reinitiations issued on November 16, 2001, September 30, 2002, June 21, 2004, March 3, 2005, and March 8, 2007. No incidental take was anticipated.
14. Organ Pipe Cactus National Monument General Management Plan, consultation number 02-21-89-F-0078, issued June 26, 1997, with reinitiations issued on November 16, 2001, April 7, 2003, March 10 and August 23, 2005, March 8, 2007, and December 10, 2009. In the latest versions of the opinion, no incidental take of pronghorn was anticipated.
15. U.S. Marine Corps Air Station-Yuma in the Arizona Portion of the Yuma Training Range Complex, consultation number 02-21-95-F-0114, issued on April 17, 1996, with reinitiations issued on November 16, 2001, August 6, 2003, and October 21, 2009. In the 2003 and 2009 versions of the biological opinion, no incidental take of pronghorn was anticipated.
16. Luke Air Force Base Use of Ground-Surface and Airspace for Military Training on the BMGR, consultation number 02-21-96-F-0094, issued August 27, 1997, with reinitiations issued on November 16, 2001, August 6, 2003, and May 3, 2010. In 2010 opinion, we anticipated take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury; and one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment.
17. Western Army National Guard Aviation Training Site Expansion Project, consultation number 02-21-92-F-0227, issued on September 19, 1997; however, Sonoran pronghorn was not addressed in formal consultation until reinitiations and revised opinions dated November 16, 2001 and August 6, 2003. No incidental take was anticipated.
18. BMGR Integrated Natural Resources Management Plan, consultation number 22410-2005-F-0492, issued on August 26, 2005, with a reinitiation issued on January 7, 2013.
19. CBP and USBP Permanent Vehicle Barrier from Avenue C to OPCNM, Arizona, consultation number 22410-2006-F-0113, issued September 15, 2006. No incidental take

was anticipated. Subsequent to issuing the biological opinion, the action was changed to include the installation of a section of hybrid-style fence designed to prevent the passage of pedestrians. Because all environmental laws were waived (as permitted by the Real ID Act of 2005) by Secretary of the Department of Homeland Security, CBP never reinitiated consultation with us regarding this change to their proposed action.

20. CBP and USBP 5.2-Mile Primary Fence near Lukeville, Arizona, consultation number 22410-2008-F-0011, issued February 11, 2008. No incidental take was anticipated.
21. SBInet Ajo-1 Tower Project, Ajo Area of Responsibility, USBP Tucson Sector, Arizona, consultation number 22410-F-2009-0089, issued December 10, 2009, with reinitiations issued on March 15, 2010, April 29, 2011, September 16, 2011, and December 15, 2011. We anticipated take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every 5 years thereafter; and one due to direct mortality over the life of the project.
22. Tactical Infrastructure Maintenance and Repair Program (TIMR) along the U.S./Mexico international border in Arizona, consultation number 02EAAZOO-2012-F-0170, issued on November 6, 2012. No incidental take was anticipated.
23. Land Mobile Radio Modernization for Tactical Communications at Buck Peak, Christmas Pass, Granite Mountain (CPNWR), and Cobre along the U.S./Mexico international border in Pima, Santa Cruz, and Yuma counties, Arizona, consultation number 02EAAZOO-2012-F-0200, issued April 23, 2013. No incidental take was anticipated.

Changes made in proposed actions and reinitiated biological opinions from 2001 to the present, plus the findings in other recent opinions, reduced the amount or extent of incidental take anticipated to occur from Federal actions. Significantly, action agencies have worked with us to modify proposed actions and to include significant conservation measures that reduce adverse effects to the pronghorn and its habitat. As described above, the current opinions that anticipate incidental take are 1) the Yuma Sector opinion, in which we anticipated take in the form of harassment that is likely to injure up to one pronghorn in 10 years; 2) the Ajo 1 Tower opinion, in which we anticipated take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every 5 years thereafter; and one due to direct mortality over the life of the project; and 3) the Luke Air Force Base Opinion, in which we anticipated take of one wild Sonoran pronghorn every 10 years, one pen-raised (free ranging) female pronghorn every 10 years, and four pen-raised (free ranging) male pronghorn every 10 years in the form of direct mortality or injury; and one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment. With the exception of likely capture-related deaths during telemetry studies (which were addressed in 10(a)(1)(A) recovery permits), we are unaware of any confirmed incidental take resulting from the Federal actions described here (although a pronghorn may have been strafed near one of the targets on BMGR-East). Additionally, action agencies, as part of their proposed actions, have committed to implementing or providing funding to implement a variety of recovery projects recommended by the Sonoran Pronghorn Recovery Team. For example, these significant commitments have helped the Team to construct pronghorn waters and forage enhancement plots, build a captive breeding pen at Kofa NWR, collar and monitor pronghorn.

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

Historically, livestock grazing, hunting or poaching, and development along the Gila River and Río Sonoyta were all probably important factors in the well-documented Sonoran pronghorn range reduction and apparent population decline that occurred early in the 20th century. Historical accounts and population estimates suggest pronghorn were never abundant in the 20th century, but recently, the estimated size of the wild population in the action area declined from 179 (1992) to 21 (December 2002). Although the proximate cause of the decline during 2002 was drought, human activities limit habitat use options by pronghorn and increase the effects of drought on the population. The U.S. pronghorn population is isolated from other populations in Sonora by a highway and the U.S./Mexico boundary fence, and access to the greenbelts of the Gila River and Río Sonoyta, which likely were important sources of water and forage during drought periods, has been severed. Since 2002, due to improved drought status and implementation of recovery actions, the wild endangered population increased to 159 in 2012. At 159, however, the wild endangered population is still in danger of extirpation due to, among other factors, human-caused impacts, drought, loss of genetic diversity, and predation.

Within its remaining range, the pronghorn is subjected to a variety of human activities that disturb the pronghorn and its habitat, including military training, increasing recreational activities, grazing, significant presence of CBV and subsequent required law enforcement activities. OPCNM (2001) identified 165 human activities in the range of the pronghorn, of which 112 were adverse, 27 were beneficial, 26 had both adverse and beneficial effects, and four had unknown effects. OPCNM (2001) concluded that in regard to the pronghorn, “while many projects have negligible impacts on their own, the sheer number of these actions is likely to have major adverse impacts in aggregate.” MCAS-Yuma (2001) quantified the extent of the current pronghorn range that is affected by select activities and found the following: recreation covers 69.6 percent of the range, military training on North and South TACs covers 9.8 percent, active air-to-air firing range covers 5.8 percent, proposed EOD five-year clearance areas at North and South TACs and Manned Range 1 cover 1.0 percent, and MCAS-Yuma proposed ground support areas and zones cover 0.29 percent.

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

Although major obstacles to recovery remain, since 2002, numerous crucial recovery actions have been implemented in the U.S. endangered range of the species, including 9 emergency waters, three permanent catchments, and five forage enhancement plots, with additional waters planned. The projects help to offset the effects of drought and barriers that prevent movement of pronghorn to greenbelts such as the Gila River and Río Sonoyta. A semi-captive breeding facility, built on CPNWR, currently holds 61 pronghorn. This facility provides pronghorn to augment the existing endangered population and to establish additional U.S. nonessential experimental (10(j)) populations. Additionally, vehicle barriers on the international border on CPNWR and OPCNM are facilitating recovery of pronghorn by reducing the amount of CBV vehicle traffic in pronghorn habitat.

Many developed and nine emergency water sources (six on CPNWR, one on OPCNM, and two on BMGR West) have been constructed in recent years throughout the range of the U.S. endangered population. Additionally, within the past two years, three permanent catchments for Sonoran pronghorn were constructed in the non-wilderness portion of CPNWR (one) and the BMGR East (two). Additionally, one existing water (Sierra Pinta # 3) within the refuge was recently redeveloped resulting in increased storage capacity from 1,800 gallons to over 10,000 gallons. In 2015, one new water for Sonoran pronghorn within the refuge will be constructed (Agua Dulce # 2) and one existing water (Fawn Hills) will be redeveloped to increase storage. Five forage enhancement plots, each consisting of a well, pump, pipelines and irrigation lines, have been developed to irrigate the desert and produce forage for pronghorn.

The current range of the endangered pronghorn in the U.S. is almost entirely comprised of lands under Federal jurisdiction; thus, authorized activities that currently affect the pronghorn in the action area are almost all Federal actions. As explained above, changes made in proposed actions and reinitiated biological opinions from 2001 to the present, plus the findings in other recent opinions, reduced the amount or extent of incidental take anticipated to occur from Federal actions. Significantly, action agencies have worked with us to modify proposed actions and to include significant conservation measures that reduce and offset adverse effects to the pronghorn and its habitat. The current opinions that anticipate incidental take are listed above.

We believe the aggregate effects of limitations or barriers to movement of pronghorn and continuing stressors, including habitat degradation and disturbance within the pronghorn's (endangered) current range resulting from a myriad of human activities, exacerbated by periodic dry seasons or years, are responsible for the precarious status of the Sonoran pronghorn. However, collaborative, multi-agency and multi-party efforts to develop forage enhancement plots and waters, reduce human disturbance of pronghorn and their habitat, combined with the success of the semi-captive breeding facility at CPNWR and the establishment of a second breeding pen and population on Kofa NWR, provide hope that recovery of the Sonoran pronghorn in the U.S. is achievable. Key to achieving recovery in Arizona will be a drastic reduction in human disturbance to pronghorn and their habitat caused by CBV and corresponding enforcement activities.

EFFECTS OF THE ACTION

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

Ending Seasonal Restrictions on Public Access in Sonoran Pronghorn Range

The proposed action, ending seasonal restrictions on public access in Sonoran pronghorn range, may result in a slight increase in human disturbance of Sonoran pronghorn annually from March 15 to July 15. Seasonal restrictions on public access were included as conservation measures in the consultations referenced above to reduce human disturbance (from recreational use) to Sonoran pronghorn during the fawning season, a period of increased physiological stress for the species. This period also corresponds with part of the hot season, a time during which, particularly in drought years, range conditions can be poor, leading to further physiological stress to Sonoran pronghorn. As described above in the status and environmental baseline sections of this biological opinion and the biological opinions referenced above, the Sonoran pronghorn is sensitive to human presence. 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. The effects of disturbance from vehicular use of roads on Sonoran pronghorn were a more significant impact than disturbance from aircraft (helicopter, jet, and fixed wing) (Krausman *et al.* 2001). Wright and deVos (1986) noted that Sonoran pronghorn exhibit “a heightened response to human traffic” as compared to other subspecies of pronghorn. They noted that “once aware of an observer, Sonoran pronghorn are quick to leave the area. One herd was observed 1.5 hours later 11 miles north of the initial observation in October 1984. Other pronghorn have run until out of the observer’s sight when disturbed.” Hughes and Smith (1990) noted that on all but one occasion, Sonoran pronghorn ran from the observer’s vehicle and continued to run until they were out of sight.

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. Human presence may cause Sonoran pronghorn to move from an area, thereby denying pronghorn access to that specific site for what may be crucial ecological functions (e.g. foraging, bedding, seeking thermal shelter, seeking mates, seeking fawning sites, seeking areas of relative safety from predators). Causing pronghorn to move also increases their physiological demands by expending calories and metabolic water. These may be critical stressors in seasonal hot-dry periods and in extended periods of low forage availability. Disturbance may also lead to mortality. Causing a pronghorn to be alarmed or agitated,

or to flee from a disturbance, may also make it vulnerable to predator attack. This is especially true for fawns and females during the fawning season. Krausman *et al.* (2001) found that fawns and their mothers were more sensitive to human disturbance than other life stages of Sonoran pronghorn.

Although seasonal restrictions on recreational use were put in place to decrease human disturbance to Sonoran pronghorn, there are a number of factors why these restrictions are not likely to be needed any longer. Among these is 1) the U.S. Sonoran pronghorn population has significantly increased since the population crash of 2002, 2) recovery actions are being implemented that have helped increase and stabilize the Sonoran pronghorn population in the U.S., and 3) currently, recreational users comprise a small percentage of the overall human use in Sonoran pronghorn range and restricting their use appears to have an inconsequential beneficial effect on Sonoran pronghorn.

Criteria for ending the seasonal restrictions on public use were only include in one of the above-referenced consultation, the CPNWR CCP. Specifically, these criteria were that public access would be restricted until the U.S. subpopulation of Sonoran pronghorn has stabilized (i.e., either it has met the criteria for downlisting described in 2002 Supplement and Amendment to the Final Revised Sonoran Pronghorn Recovery Plan and it has been downlisted or the environmental documents are being processed to finalize the downlisting, or the pronghorn population has remained stable with over 200 individuals for several years. Although the above-mentioned criteria for ending the seasonal restrictions have not been met, the concerted efforts of the Sonoran Pronghorn Recovery Team have resulted in tremendous gains for the species. The semi-captive breeding program produces over 30 fawns annually (10 to 15 of which are released into the endangered population annually), a second pronghorn breeding pen and a wild population were recently established at Kofa National Wildlife Refuge, and an array of forage plots, feed stations, and water catchments and other water sources supplement the natural habitat conditions. All of these actions are working to increase and stabilize the wild population within the U.S. In December 2012, the U.S. pronghorn population was estimated at 159 animals, a rebound from the crash of 2002 when severe drought and other possible stressors nearly extirpated the population. Although more recent survey data do not exist, the endangered Sonoran pronghorn population may already be above 200 (email from Jim Atkinson, CPNWR, March 11, 2014).

If seasonal closures are ended, the additive vehicle traffic from the recreating public is anticipated to be minimal. For example, according to the BLM, public use on the BLM lands in the Ajo area consist mainly of low-speed driving, sightseeing, and flower viewing during daylight hours between March 15 and April 15. On BLM, public use declines to near zero once temperatures increase in about mid-April; while on CPNWR, public use sharply declines in mid-May. Therefore we anticipate negligible adverse effects from human disturbance on pronghorn and pronghorn fawning as a result of ending the seasonal closures.

There may be an increased risk of habitat damage and collision with Sonoran pronghorn from recreational vehicles. However, this risk should be very small, because, as stated above, the additive vehicle traffic from the recreating public is anticipated to be minimal and public vehicular

access in pronghorn habitat is limited to only a few roads, which are currently used predominantly by law enforcement in response to illegal border activities, as well as agencies for administrative purposes. Furthermore, off-road vehicle driving by the public is prohibited and speed limits are in place on CPNWR, OPCNM, BLM, and LAFB lands.

Given the reasons explained above, in 2013, the Sonoran Pronghorn Recovery Team assessed the continued need for the seasonal restriction on public access and concluded it is not required at this time. However, if the Sonoran pronghorn population declines or if otherwise indicated, the Sonoran Pronghorn Recovery Team and/or FWS may reevaluate the need for seasonal restrictions on public access during the fawning season.

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 Act.

Most lands within the action area (current range of the endangered Sonoran pronghorn within Arizona) are managed by Federal agencies; thus, most activities that could potentially affect pronghorn are Federal activities that are subject to section 7 consultation. The effects of these Federal activities are not considered cumulative effects. Relatively small parcels of private and State lands occur within the currently-occupied range of the pronghorn near Ajo and Why, north of the BMGR from Dateland to Highway 85, and from the Mohawk Mountains to Tacna. State inholdings in the BMGR have been acquired by the Department of Defense. Continuing rural and agricultural development, recreation, vehicle use, grazing, and other activities on private and State lands adversely affect pronghorn and their habitat. MCAS-Yuma (2001) reports that 2,884 acres have been converted to agriculture near Sentinel and Tacna. These activities on State and private lands and the effects of these activities are expected to continue into the foreseeable future. Historical habitat and potential recovery areas currently outside of the current range are also expected to be affected by these same activities on lands in and near the action area in the vicinity of Ajo, Why, Yuma, and along the Gila River.

Of most significant concern to pronghorn is the high level of CBV activity in the action area. CBV activity and its effects to pronghorn and pronghorn habitat is described under the “*Human-caused Disturbance*” and “*Habitat Disturbance*” portions of the “Threats” section under “Status of the Species” for Sonoran pronghorn. CBV activity has resulted in route proliferation, off-highway vehicle activity, increased human presence in backcountry areas, discarded trash, abandoned vehicles, cutting of firewood, illegal campfires, and increased chance of wildfire. Habitat degradation and disturbance of pronghorn have resulted from these CBV activities. Although CBV activity levels are still high, the trend in overall CBV apprehensions and drive-throughs has declined in recent years within the action area likely due to increased law enforcement presence, the border fence, and the status of the economy in the U.S. Despite high levels of CBV activity and law enforcement response throughout the action area, pronghorn in the U.S. have managed to increase

since 2002 in part due to releases from the captive breeding pen and the construction of forage plots and waters. However, pronghorn use of areas subject to high levels of CBV and law enforcement activity appear to have declined. We expect CBV activities and their effects on pronghorn to continue for the foreseeable future.

CONCLUSION

After reviewing the current status of the Sonoran pronghorn, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, we reaffirm our biological opinions that the proposed action is not likely to jeopardize the continued existence of the Sonoran pronghorn. No critical habitat has been designated for this species; therefore, none will be affected. Our conclusion is based on the rationale given in our biological opinions referenced above, and our discussion found in the “Effects of the Action” section above.

The conclusions of this biological opinion are based on full implementation of the project as described in the “Description of the Proposed Action” section of this document, as well as the more comprehensive “Description of the Proposed Actions”, including conservation measures, found in the biological opinions referenced above.

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 defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). “Harass” is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR 17.3). “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the 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 amount or extent of take anticipated remains the same as in the original biological opinions referenced above. With the exception of Military Training on the Barry M. Goldwater East (biological opinion number 22410-1996-F-0094-R003), we anticipated the actions would not result in any incidental take of Sonoran pronghorn.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species, initial notification must be made to the FWS's Law Enforcement Office (USFWS OLE, Resident Agent In Charge, 4901 Paseo del Norte NE, Suite D, Albuquerque, New Mexico 87113; telephone: (505) 248-7889) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

Our conservation recommendations remain the same as in the original biological opinions.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the reinitiation requests. 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.

Thank you for your cooperation and assistance throughout this consultation process, as well as your considerable role and leadership in conservation of the Sonoran pronghorn and other important natural resources. Any questions or comments should be directed to Erin Fernandez (520) 670-6150 (x238) or Jean Calhoun (x223). Please refer to the agency appropriate consultation number listed at the beginning of this document in future correspondence concerning this project.

Sincerely,

/s/ Scott Richardson for
Steven L. Spangle
Field Supervisor

cc (hard copy):

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

cc (electronic copy):

James Atkinson, Cabeza Prieta National Wildlife Refuge, Ajo, Arizona
Tim Tibbitts, Organ Pipe Cactus National Monument, Ajo, Arizona
Ron Tipton, Bureau of Land Management, Phoenix, Arizona
Daniel Garcia, 56th Range Management Office, Luke Air Force Base, Gila Bend, AZ
Director, Range Management Department, Marine Corps Air Station, Yuma, AZ
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Regional Supervisor, Arizona Game and Fish Department, Yuma, AZ (Attn: John Hervert)
Raul Vega, Regional Supervisor, Arizona Game and Fish Department, Tucson, AZ

REFERENCES CITED

- Alford, E.J., and J.H. Brock. 2002. Effects of fire on Sonoran Desert plant communities. Page 20 *in* W.L. Halvorson and B.S. Gebow (eds.), Creative Cooperation in Resource Management: Fourth Conference on Research and Management in the Southwestern Deserts, extended abstracts. USGS Sonoran Desert Field Station, University of Arizona, Tucson, AZ.
- Bright, J.L., and J.J. Hervert. 2005. Adult and fawn mortality of Sonoran pronghorn. *Wildlife Society Bulletin* 33:43-50.
- Bright, J.L., J.J. Hervert, L.A. Piest, R.S. Henry, and M. T. Brown. 1999. Sonoran pronghorn 1998 aerial survey summary. Nongame and Endangered Wildlife Program Technical Report No. 152. Arizona Game and Fish Department, Phoenix, AZ.
- Bright, J.L., J.J. Hervert, and M.T. Brown. 2001. Sonoran pronghorn 2000 aerial survey summary. Technical Report No. 180. Arizona Game and Fish Department, Phoenix, AZ.
- Brown, D. E. and R. A. Ockenfels. 2007. Arizona's Pronghorn Antelope, A Conservation Legacy. Arizona Antelope Foundation. 190 pp.
- Brown, D.E., and R.A. Minnich. 1986. Fire and changes in creosote bush scrub of the western Sonoran Desert, California. *American Midland Naturalist* 116(2):411-422.
- Cabeza Prieta National Wildlife Refuge. 2006. Comprehensive Conservation Plan Working Final Cabeza Prieta National Wildlife Refuge Comprehensive Conservation Plan Environmental Impact Statement and Draft Wilderness Stewardship Plan, June 2006. Ajo, Arizona.
- Carr, J.N.. 1974. Complete report-Endangered species investigation. Sonoran pronghorn. Arizona Game and Fish Department, Phoenix, AZ.
- Cherkovich, G.M., and S.K. Tatoyan. 1973. Heart rate (radiotelemetric registration) in macaques and baboons according to dominant-submissive rank in a group. *Folia Primatol* 20:265-273.
- Defenders of Wildlife. 1998. Population viability analysis workshop for the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) in the United States. Defenders of Wildlife unpublished manuscript, Washington, D.C.
- Ehrlich, P.R., and J. Roughgarden. 1987. *The Science of Ecology*. MacMillan Publishing Co., New York, N.Y.
- Geist, V. 1971. A behavioral approach to the management of wild ungulates. *In* E. Duffey and A.S. Watts, eds., *The Scientific Management of Animal and Plant Communities for Conservation*. Symposium of the British Ecological Society No. 11. Blackwell Science Publications, Oxford, U.K.

- Gerstenzang, J. 2006. Bush visits border, urges Senate action. *Los Angeles Times*, May 19, 2006.
- 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.
- Hecht, A. and P.R. Nickerson. 1999. The need for predator management in conservation of some vulnerable species. *Endangered Species Update* 16:114-118.
- Hughes, K.S., and N.S. Smith. 1990. Sonoran pronghorn use of habitat in Southwest Arizona. Report to Cabeza Prieta National Wildlife Refuge, Ajo, AZ.
- Intergovernmental Panel on Climate Change. 2007. Summary for policymakers of the synthesis report of the IPCC fourth assessment report. Draft copy, 16 November 2007.
- Jorgenson, J.T. 1988. Environmental impact of the 1988 winter Olympics on bighorn sheep of Mt. Allan. *Biennial Symposium of the Northern Wild Sheep and Goat Council* 6:121-134.
- Kerley, L. L., J. M. Goodrich, E. N. Smirnov, D. G. Miquelle, H.B. Quigley, and M.G. Hornocker. 2002. Effects of roads and human disturbance on Amur tigers. *Conservation Biology* 16(1):97-108.
- Kindschy, R.R., C. Sundstrom, and J.D. Yoakum 1982. Wildlife habitats in managed rangelands - the Great Basin of southeastern Oregon: pronghorn. General Technical Report PNW-145. U.S. Department of Agriculture, Northwest Forest and Range Experimental Station, Portland, OR.
- Klein, K. 2000. Mass smugglings of immigrants on the increase. March 13, *Desert Sun*, Palm Springs, www.thedesertsun.online.com.
- Krausman, P.R., L.K. Harris, and J. Francine. 2001. Long-term study of the noise effects of military overflights on the Sonoran pronghorn, Barry M. Goldwater Range, Luke Air Force Base, Arizona. U.S. Air Force Contract F41624-98-C-8020-P00003.
- Krausman, P.R., L.K. Harris, C.L. Blasch, K.K.G. Koenen, and J. Francine. 2004. Effects of military operations on behavior and hearing of endangered Sonoran pronghorn. *Wildlife Monographs* 157:1-41.
- Krausman, P.R., L.K. Harris, S.H. Haas, K.K.G. Koenen, P. Devers, D. Bunting, and M. Barb. 2005. Sonoran pronghorn habitat use on landscapes disturbed by military activities. *Wildlife Society Bulletin* 33(1):16-33.

- Landon, D.M., P.R. Krausman, K.K.G. Koenen, and L.K. Harris. Pronghorn use of areas with varying sound pressure levels. *The Southwestern Naturalist* 48(4):725-728.
- Leftwich, T.J., and C.D. Simpson. 1978. The impact of domestic livestock and farming on Texas pronghorn. *Pronghorn Antelope Workshop Proceedings* 8:307-320.
- Luz, G.A., and J.B. Smith. 1976. Reactions of pronghorn antelope to helicopter overflight. *Journal of Acoustical Society of America* 59(6): 1514-1515.
- Milstead, B, and B. Barns. 2002. Life on the border: monitoring the effects of border-crossing and law enforcement on natural resources. W.L. Halvorson and B.S. Gebow, eds., *Meeting resource management information needs: fourth conference on research and resource management in the southwestern deserts, extended abstracts*. USGS Sonoran Desert Field Station, University of Arizona, Tucson: 87-88.
- Moen, A.N., M.A. DellaFera, A.L. Hiller, and B.A. Buxton. 1978. Heart rates of white-tailed deer fawns in response to recorded wolf howls. *Canadian Journal of Zoology* 56:1207-1210.
- Monson, G. 1968. The desert pronghorn. *In Desert Bighorn Council Transactions*. Las Vegas, NV.
- Nelson, F.W. 1925. Status of the pronghorn antelope, 1922-1924. U.S. Department of Agriculture Bulletin No. 1346.
- Officer, J.E. 1993. Kino and agriculture in the Pimeria Alta. *Journal of Arizona History* 34:287-306.
- Organ Pipe Cactus National Monument. 2001. Draft supplemental environmental impact statement, re-analysis of cumulative impacts on the Sonoran pronghorn. Organ Pipe Cactus National Monument, Ajo, AZ.
- Richter-Dyn, N., and N.S. Goel. 1972. On the extinction of a colonizing species. *Theoretical Population Biology* 3:406-433.
- Rowlands, P.G. 2000. Low temperature and other climatic trends at Organ Pipe Cactus National Monument. *In* W.L. Halvorson and B.S. Gebow, eds., *Creative Cooperation in Resource Management, extended abstracts*. U.S. Geological Survey, Western Ecological Research Center, Sonoran Desert Field Station, University of Arizona, Tucson, AZ.
- Rutman, S. 1997. Dirt is not cheap: livestock grazing and a legacy of accelerated soil erosion on Organ Pipe Cactus National Monument, Arizona. *In* J. M. Feller and D. S. Strouse, eds., *Environmental, economic, and legal issues related to rangeland water developments*. The Center for the Study of Law, Science and Technology, Arizona State University, Tempe, AZ.
- Schwalbe, C.R., T.C. Esque, P.J. Anning, and W.L. Halvorson. 2000. Exotic grasses, long-lived species, and managing desert landscapes: a case history at Saguaro National Park. Page 87 *in*

- W.L. Halvorson and B.S. Gebow (eds), *Creative Cooperation in Resource Management: Third Conference on Research and Management in the Southwestern Deserts*, extended abstracts. USGS Sonoran Desert Field Station, University of Arizona, Tucson, AZ.
- Seager, R., M. Ting, T. Held, Y. Kushnir, J. Lu, G. Vecchi, H. Huang, N. Harnik, A. Leetmaa, N. Lau, C. Li, J. Velez, and N. Naik. 2007. Model projections of an imminent transition to a more arid climate in southwestern North America. *Science* 316:1181-1184.
- Sheridan, T.E. 2000. Human ecology of the Sonoran Desert. *In* S.J. Phillips and P.W. Comus, eds., *A natural history of the Sonoran Desert*. Arizona-Sonora Desert Museum Press, Tucson, AZ.
- Thompson, R.D., C.V. Grant, E.W. Pearson, and G.W. Corner. 1968. Cardiac response of starlings to sound: effects of lighting and grouping. *American Journal of Physiology* 214:41-44.
- U.S. Fish and Wildlife Service. 1998. Final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.
- U.S. Fish and Wildlife Service. 2002. Recovery criteria and estimates of time for recovery actions for the Sonoran pronghorn: a supplement and amendment to the final revised Sonoran pronghorn recovery plan. U.S. Fish and Wildlife Service, Albuquerque, NM.
- Weiss, J.L., and J.T. Overpeck. 2005. Is the Sonoran Desert losing its cool? *Global Change Biology* 11:2065-2077.
- Workman, G.D., T.D. Bunch, J.W. Call, F.C. Evans, L.S. Neilson, and E.M. Rawlings. 1992. Sonic boom and other disturbance impacts on pronghorn antelope (*Antilocapra americana*). Report to the U.S. Air Force, Hill Air Force Base, UT.
- Wright, R.L. and J.C. deVos. 1986. Final report on Sonoran pronghorn status in Arizona. Contract No. F0260483MS143, Arizona Game and Fish Department, Phoenix, AZ
- Yoakum, J.D., B.W. O'Gara, and V.W. Howard, Jr. 1996. Pronghorn on western rangelands. *In* P.R. Krausman, ed., *Rangeland wildlife*. The Society for Range Management, Denver, CO.

TABLES AND FIGURES

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

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

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

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

Table 2. Comparison of U.S. Sonoran pronghorn population surveys, 1992-2010.

Date	<u>Pronghorn observed</u>		<u>Population estimates</u>			
	On transect	Total observed	Density estimate using DISTANCE (95 percent CI ^a)	Lincoln-Peterson (95 percent CI)	Sightability model (95 percent CI)	Other estimate
Dec 92	99	121	246 (103-584)	---	179 (145-234)	
Mar 94	100	109	184 (100-334)	---	282 (205-489)	
Dec 96	71	82 (95 ^b)	216 (82-579)	162 (4-324)	130 (114-154)	
Dec 98	74	86 (98 ^b)	---	172 (23-321)	142 (125-167)	
Dec 00	67	69 ^b	N/A	N/A	99 (69-392)	
Dec 02	18	18	N/A	N/A	21 (18-33) ^c	
Dec 04	39	51	N/A	N/A	58	
Dec 06	51	59	N/A	N/A	68 (52-116)	
Dec 08	N/A	N/A	N/A	N/A	N/A	68 ^d
Dec 10	N/A	N/A	N/A	N/A	N/A	85
Dec 12	N/A	N/A	N/A	N/A	N/A	159

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

^b Includes animals missed on survey, but located using radio telemetry.

^c Jill Bright, Arizona Game and Fish Department, pers. comm. 2003

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