United States Department of the Interior
Fish and Wildlife Service
Arizona Ecological Services Field Office
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Telephone: (602) 242-0210 Fax: (602) 242-2513

In Reply Refer to:
AESO/SE
22410-1995-F-0114-R006

September 17, 2010

Mr. S. W. Norquist
Marine Corps Installations West
United States Marine Corps
Box 555200
Camp Pendleton, California 92055-5200

RE: West Coast Basing and Operations of the F-35B Joint Strike Fighter and Reinitiation of Formal Section 7 Consultation on Ongoing Activities at the Barry M. Goldwater Range by the Marine Corps Air Station–Yuma, Yuma and Maricopa Counties, Arizona

Dear Mr. Norquist:

This letter is in response to your April 15, 2010, request for initiation of consultation on the West Coast Basing and Operations of the F-35B Joint Strike Fighter (JSF) and associated training activities by the Marine Corps Air Station–Yuma, Yuma County, Arizona (MCAS Yuma). Your request was received by us on April 19, 2010, and was made pursuant to section 7 of the Endangered Species Act of 1973 (ESA) as amended (16 U.S.C. 1531 *et seq.*). Because the proposed project represents a change to the existing action described in the Biological Opinion on Ongoing Activities by the MCAS Yuma in the Arizona portion of the Yuma Training Range Complex (YTRC) on the Barry M. Goldwater Range (BMGR), Yuma and Maricopa counties (02-21-95-F-0114, now 22410-1995-F-0114), as agreed upon, we are addressing your request through reinitiation of this biological and conference opinion. At issue are the impacts to the endangered Sonoran pronghorn (*Antilocapra americana sonoriensis*) and lesser long-nosed bat (*Leptonycteris curasoae yerbabuenae*), as well as the flat-tailed horned lizard (*Phrynosoma mcallii*), a species proposed for listing as threatened under the ESA.

In the Biological Assessment (BA) attached to your April 15, 2010, request, you concluded that the project is not likely to adversely affect the Sonoran pronghorn and the lesser long-nosed bat. However, in your May 27, 2010, electronic mail, you clarified that you were requesting reinitiation of formal consultation on potential project effects to the Sonoran pronghorn and lesser long-nosed bat, both of which were subject to formal consultation in our previous biological opinions on the larger action of ongoing activities by MCAS Yuma on the BMGR.

You additionally clarified you were requesting reinitiation of the conference opinions that addressed project effects to the flat-tailed horned lizard.

Herein, we revise specific sections of biological opinions 22410-1995-F-0114-R005 (dated October 21, 2009) and 02-21-95-F-0114R4 (dated August 6, 2003) for the Sonoran pronghorn and lesser long-nosed bat) and conference opinions 02-21-95-F-10014 (dated April 17, 1996 and 02-21-95-F114R3 (dated December 17, 2002) for the flat-tailed horned lizard) on the Ongoing Activities by MCAS-Yuma in the Arizona portion of the YTRC on the BMGR. Sections not addressed or revised herein remain as presented in the last biological and conference opinions.

CONSULTATION HISTORY

- See Biological Opinions 22410-1995-F-0114-R005 (dated October 21, 2009) and 02-21-95-F-0114R4 (dated August 6, 2003) and Conference Opinion 02-21-95-F-0114R4 (dated April 17, 1996) for consultation history prior to your June 1, 2009 request.

- April 19, 2010: We received your request for initiation of formal consultation.

- May 4, 2010: We met with you to discuss the proposed project.

- May 27, 2010: We received your electronic mail that clarified that you were requesting reinitiation of formal consultation on potential project effects to the Sonoran pronghorn and lesser long-nosed bat, and reinitiation of the conference opinion that addressed effects to the flat-tail horned lizard.

- July 9, 2010: We received the replacement pages for your April 2010, Final BA for the United States Marine Corps F-35B West Coast Basing.

- August 2010: We corresponded via telephone and electronic mail to clarify the description of the proposed action.

- August 31, 2010: By mutual agreement the 135-day consultation timeline was extended.

- September 8, 2010: We sent you the draft biological opinion.

- September 15, 2010: We received your comments on the draft biological opinion.

BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

A complete description of the proposed action is found in your BA and its replacement pages, the Final Environmental Impact Statement, and notes from our August 23, 2010, telephone conversation and electronic mail correspondence. The purpose of this project is to replace legacy aircraft (F/A-18 Hornet and AV-8B Harrier) and integrate the F-35B squadrons into the existing Marine Corps command and organizational structure to efficiently and effectively maintain combat capability and mission readiness. The complete proposed action includes a number of components; however, this consultation will only address the components located in Arizona, including activities associated with MCAS Yuma, Bob Stump Training Range Complex (which includes BMGR West), and the BMGR East (Figure 1). Components occurring in California will be addressed in the biological opinion for the West Coast Basing and Operations of the F-35B Project issued by the Carlsbad Fish and Wildlife Service (FWS) Office.

The proposed action includes the basing and operation of 11 operational squadrons of F-35B aircraft and one Operational Test & Evaluation (OT&E) squadron on the west coast, including MCAS Yuma. As part of an agreement between the United States and the United Kingdom, the west coast OT&E squadron would be comprised of six U.S and two United Kingdom F-35B aircraft. Accompanying these basing actions will be commensurate construction and renovation of facilities and infrastructure at the air station, along with changes in personnel to support the basing of the new aircraft. In addition to the training activities at the existing airfields and ranges, the Marine Corps will construct and operate an Auxiliary Landing Field (ALF) (Figure 2) on the BMGR West. No federally listed species or critical habitat occur at MCAS Yuma (the small facility to the west of BMGR – see Figure 1); therefore, proposed construction and operations activities occurring at MCAS Yuma will not be further considered in this biological opinion.

Core Use and Occasional Use Airspace and Ranges

The F-35B will use the currently available airspace and range assets associated with MCAS Yuma. Existing airspace and ranges proposed for use by the F-35B fall into two categories: 1) core use airspace and ranges, and 2) occasional use airspace and ranges. Airspace defined as core use will receive substantial use by the F-35Bs on a daily basis, while occasional use airspace includes ranges, Military Operations Areas (MOAs), Air Traffic Control Assigned Airspaces (ATCAAs), and Military Training Routes (MTRs). Currently, about 98 percent of operations occur in the core use airspace and ranges. Under the proposed action, use of the core use areas would increase to approximately 99 percent with the remainder of the operations in the occasional use airspace and ranges. Occasional use airspace will receive rare use in any given year. The core use airspace of concern in this biological opinion for Sonoran pronghorn and lesser long-nosed bats includes Restricted Area (R)-2301W (the airspace above BMGR West, the Dome MOA, and the western portion of Cabeza Prieta National Wildlife Refuge [CPNWR]) and R-2301E (the airspace above BMGR East and the CPNWR) (Figures 3 and 4). The core use area above flat-tailed horned lizard habitat is in the western portion of R-2301W. Other core use

airspace to be used by F-35Bs is outside of the current range of the Sonoran pronghorn and lesser-long nosed bat, and therefore will not be further addressed in this opinion. Furthermore, none of the occasional use airspace and range areas overlie the current range of the Sonoran pronghorn, lesser long-nosed bat, and flat-tailed horned lizard; therefore, F-35B activities occurring in these areas will not be further discussed.

Operations Use Levels

The F-35B based out of MCAS Yuma will fly more operations in R-2301W and fewer operations in R-2301E than the legacy aircraft in the existing airspace and ranges (Table 1). The F-35B will continue to participate in the Weapons Tactics Instructor (WTI) course in lieu of legacy aircraft.

With the exception of an increased flight altitude profile and an increase in the use of live ordnance (both discussed below), there will be no changes in WTI operations with the introduction of the F-35B.

Table 1. Baseline and Proposed Annual Airspace and Range Operations[1] by the Marine Corps for Legacy Aircraft (F/A-18 Hornet and AV-8B Harrier) and the F-35B.

	Baseline Operations (F/A-18 Hornet and AV-8B Harrier)[2]			**Proposed F-35B Operations**			**Change in Operations[3]**		
Airspace/Range	**Day**	**Night**	**Total**	**Day**	**Night**	**Total**	**Legacy (F/A-18 Hornet and AV-8B Harrier Operations) Eliminated**	**Post-Basing Training**	**Percent Change[1]**
Bob Stump Training Range Complex									
R-2301W	8,730	179	8,909	10,180	106	10,286	-8,909	10,286	15%
Other Airspace									
R-2301E	3,780	30	3,810	2,826	23	2,849	-3,810	2,849	-25%
Total	12,510	209	12,719	13,006	129	13,135	-12,719	13,135	3%

1 The relationship between sorties and operations is described in the EIS which says, "During a single sortie, an aircraft may fly in several airspace units and produce a number of operations and events. An aircraft could conduct two operations during one sortie, for example, with one operation in BMGR West for ordnance delivery, and one in the Dome MOA for an air-to-air combat engagement event. For these reasons, numbers of operations and events may exceed total sorties, and they are not additive to one another."

2 These numbers are different from those provided in the BA. These numbers reflect only F/A-18 Hornet and AV-8B Harrier baseline operations conducted by the Marine Corps. Baseline numbers provided in the BA included all fixed-wing aircraft operations, including those conducted by the Air Force (communication with Ron Pearce, Marine Corps Air Station, August 23, 2010).

3 Other fixed-wing aircraft, primarily F-5, F-16, and EA-6B, will continue to be used by MCAS-Yuma at levels analyzed in the 2003 biological opinion.

F-35B Altitude Profile

The F-35B's capabilities will allow it to fly at generally higher altitudes than the legacy F/A-18 and AV-8B aircraft. The altitude range for the F-35B in training is 300 feet Above Ground Level (AGL) to 50,000 feet above Mean Sea Level (MSL), with the greatest portion (67 percent)

spent at altitudes above 15,000 feet MSL (Table 2). The F-35B will spend very little time (less than 1 percent) below 5,000 feet AGL.

Table 2. Estimated Altitude Profile for the F-35B.

Altitude Band	Percent Time Used
300 to 5,000 AGL	<1%
5,000 AGL to 10,000 MSL	7%
10,000 MSL to 15,000 MSL	26%
15,000 MSL to 25,000 MSL	48%
25,000 MSL to 50,000 MSL	19%

In R-2301W, the F-35B will conduct 387 operations annually that involve low-altitude flights (flights below 5,000 feet AGL). With the exception of the airfield-type operations at the proposed ALF, all other operations will occur above 5,000 feet AGL. This profile differs from the current legacy aircraft operations in which much more time is spent at lower altitudes. With the elimination of the legacy aircraft, low-altitude flights will decrease by more than 90 percent in R-2301W. On occasion, the F-35B aircraft may fly below 5,000 feet AGL in R-2301E, particularly when operations require use of R-2301W and R-2301E in combination. However, because overall use of R-2301E will decrease by 25 percent and use of low altitudes will decrease by 90 percent, the possible low-altitude flight in R-2301E will represent a negligible component of airspace use.

F-35B Noise Profile for Airspace Operations

Based on the most recent measurements of the F-35A[1], the F-35B model of this aircraft is not anticipated to be noticeably louder (i.e., more than 3 dB greater) than legacy F/A-18 aircraft at 50 feet[2] from the aircraft[3]. Additionally, as addressed above, because the F-35B will typically fly at higher altitudes than legacy aircraft during most airspace operations, there will be an overall decrease in cumulative average daily noise levels at ground level. Occasional low-level F-35B flights, however, may produce more noise per single event than legacy aircraft.

Supersonic Flight

Like the F/A-18 legacy aircraft, the F-35B is capable of supersonic flight, and the Marine Corps intends to continue to fly supersonic operations in authorized airspace within R-2301W. The supersonic area within R-2301W consists of a corridor about 36 miles long and 12 miles wide along the southern edge of the airspace (Figure 4). Currently, legacy F/A-18 aircraft conduct

[1] The A version of the aircraft is the only aircraft available for modeling noise at this time.
[2] The 50 feet distance is the standardized distance for consideration maintenance personnel noise exposure.

[3] JSF Program Office and Lockheed Martin, April 2009. Joint Communications Release, F-35 Acoustics Based on Edwards AFB Acoustics Test, "Edwards Noise Results Briefing 7 April 09.pptx", slide 6.

1,357 supersonic events annually (Table 3), with about 99 percent performed during the environmental day (7:00 a.m. to 10:00 p.m.) and one percent during the night (10:00 p.m. to 7:00 a.m.). In contrast, the F-35Bs will perform a maximum of 7,816 supersonic events annually within R-2301W; this represents an increase of 6,459 annual supersonic events. About 99 percent of supersonic events will continue to be during the day. Lasting an average duration of 2 minutes, these events will be brief and contained within the R-2301W airspace. Other fighter aircraft will continue to fly supersonic at their current rates.

Table 3. Comparison of Current and Proposed Supersonic Events in R-2301W.

Aircraft Type	**Day**	**Night**	**Total**
Baseline			
F/A-18 (legacy)	1,344	13	1,357
Other Fighter Aircraft	1,946	29	1,975
Total	3,290	42	3,332
Proposed			
F-35B	7,738	78	7,816
F/A-18 (legacy)	0	0	0
Other Fighter Aircraft	1,946	29	1,975
Total	9,684	107	9,791
Difference	**+6,394**	**+65**	**+6,459**

The Air Force, primarily using F-16 aircraft, also conducts supersonic operations in R-2301E. Rarely, but on occasion, Marine Corps F/A-18s and F-5s also perform brief supersonic flight activities in this airspace. The F-35Bs replacing the legacy Marine Corps F-/A-18s may also, on occasion, fly supersonic in authorized portions of R-2301E.

Based on the F-35Bs altitude profile, approximately 67 percent of supersonic flights will be performed above 25,000 feet MSL and up to 50,000 feet MSL. In contrast, the legacy F/A-18 aircraft flies supersonic down to 5,000 feet MSL.

Ordnance and Flare Use

F-35B training will involve numerous types of events involving air-to-ground ordnance delivery. Such training will include live and inert ordnance ranging in size from 25 to 2,000 pounds. Inert ordnance contains no explosives, but may contain a small spotting charge (about the size of a shotgun shell) to assist in scoring the event and providing feedback to the pilot. Live ordnance is identical to that used in combat and contains high explosives. Ordnance delivery training will only occur at existing ranges and target areas authorized to permit these activities and accommodate the particular type of ordnance. The F-35B pilots will conduct ordnance delivery training within R-2301W/E. Only inert ordnance will be used at targets within R-2301W with 8,166 anticipated annual ordnance delivery events. Both live and inert ordnance will be used at targets within R-2301E (specifically at North Tactical Range [NTAC] and South Tactical Range

[STAC]) with 1,224 anticipated annual ordnance delivery events (70 percent inert and 30 percent live ordnance).

Pilots use flares as self-protection measures against heat-seeking missiles and similar threats. When ignited, defensive training flares burn for a short period (3.5 to 5 seconds) at approximately 2,000 degrees Fahrenheit (°F). Flares burn out after falling approximately 400 feet. Although the design of the flare cartridges for the F-35B has not been finalized at this time, the Marine Corps anticipates they will function the same as flares used by legacy aircraft. Flare use will occur only in authorized airspace and follow all range regulations, including altitude and fire restrictions. With the F-35Bs flying above 5,000 feet AGL more than 99 percent of the time, flare release will occur well above minimum release altitudes necessary to ensure complete and safe combustion of the flare. Furthermore, the Marine Corps expects to use fewer flares than the legacy aircraft due to the F-35B capabilities.

Transit to and from the Airspace and Ranges

The F-35B will not use specific transit routes or Military Training Routes (MTRs) to access the airspace and ranges from MCAS Yuma. Rather, upon departing the base and its air traffic control system, the pilots will, as with any other aircraft, follow a flight plan directed by the Federal Aviation Administration (FAA) en-route system. Such routings are dictated by air traffic in the area and controlled by the FAA. To maximize available fuel for training, the pilots commonly climb to higher altitudes to transit to a range or airspace unit. On return to the base, the same pattern will apply.

Auxiliary Airfield 2 and Proposed Auxiliary Landing Field

Pilots of both the legacy AV-8Bs and F-35Bs need to perform Field Carrier Landing Practice (FCLP) training as well as other maneuvers at airfields away from their main base. This landing training is essential prior to landing on a Landing Helicopter Assault ship. Currently, the AV-8Bs perform FCLPs at AUX-2 located about nine miles southeast of MCAS Yuma in BMGR West. AUX-2 is a small airfield from the World War II era that has been redeveloped to support AV-8B training activities. However, both the landing surfaces and other components of AUX-2 are inadequate to permit the F-35B to conduct operations, specifically FCLPs. Therefore, use of AUX-2 will decrease with transition from legacy AV-8B aircraft to F-35B aircraft. According to the 2009 MV-22 Biological Assessment, a maximum of 8,521 FLCP operations of the MV-22 will continue at AUX-2 based on an eight-squadron alternative (Table 4). With the elimination of almost 11,000 annual AV-8B FCLPs and other operations, use of AUX-2 will decrease to 9,359 operations per year, mostly by MV-22 and transient helicopters (Table 4). No F-35B operations will occur at AUX-2. To accommodate the F-35B, the Marine Corps will construct an Auxiliary Landing Field (ALF) training facility about four miles to the southeast of AUX-2 (Figure 2). At the proposed ALF, only F-35B operations will occur. F-35B pilots will conduct a total of 10,019 annual operations at the ALF, with 86 percent consisting of FCLPs. Training will occur year round at the ALF. About one to two percent of these new operations will occur during the night (10:00 p.m. to 7:00 a.m.). Combined, the proposed ALF and AUX-2 operations will represent an overall five percent decrease in number of these airfield-type operations in

BMGR West. As airfield-type operations, these activities are not incorporated in total use of the airspace. Within the BMGR, no F-35B take offs or landings will occur outside the ALF.

Table 4. Baseline and Proposed Annual Operations at AUX-2 and ALF.

Aircraft Based/Transient	Baseline AUX-2	Proposed AUX-2	Proposed ALF	Net Change
AV-8B (Based)	10,974	0	0	-10,974
C-130 (Transient)	32	32	0	0
MV-22 (Transient)	8,521[1]	8,521	0	0
Other Rotary Wing (Transient)	806	806	0	0
F-35B (Based and Transient)	0	0	10,019	+10,019
Total	20,333	9,359	10,019	-955

1.From Table V-6 of the 2009 MV-22 Biological Assessment.

F-35B Noise Footprint for Airfield-Type Operations

The footprint for noise above 65 dBA Day-Night Average Sound Level (DNL) from airfield-type operations of the F-35B at the proposed ALF is estimated to be 8,932 acres, an overall 215 percent increase in size of that of the existing AUX-2 facility (Table 5). This includes an exponential increase in area exposed to noise greater than 85 dBA DNL. The location of the proposed noise footprint shifts south and east, with only 105 acres of overlap with the existing 4,149 acres noise footprint. In addition, the maximum noise levels for various flight activities at the proposed ALF will increase in magnitude ranging from 8 to 10 percent of existing maximum noise levels at AUX-2 (Table 6).

Table 5. Comparison of Footprint of Noise above 65 dBA DNL for Airfield-Type Operations on BMGR West between Existing AUX-2 Facility and Proposed ALF[1].

dBA DNL	**Baseline (AUX-2) (Acres)**	**Proposed Action[2] (ALF) (Acres)**	**Increase in Acres**	**Relative Increase**
65-70	1,946	3,047	1,101	157%
70-75	1,596	2,573	977	161%
75-80	362	1,337	975	369%
80-85	151	831	680	550%
85+	94	1,144	1,050	1,217%
Total	4,149	8,932	4,783	215%

[1] Does not include ongoing MV-22 operations at AUX-2 as comparable data for MV-22 were not available.
[2] Using noise modeling of the A version of the F-35.

Table 6. Comparison of Maximum Noise Levels (L_{max}) for Baseline AUX-2 and Proposed ALF[1].

		L_{max}			
Flight Activity	**Altitude (feet AGL)**	**AV-8B at AUX-2**	**F-35B at ALF**	**Increase**	**Percent Increase**
Downwind Leg – FCLP	600	98 dB	106 dB	8 dB	8.2%
Conventional Departure	1,000	103 dB	113 dB	10 dB	9.7%
Short Takeoff	700	107 dB	118 dB	11 dB	10.3%

[1] Does not include MV-22 operations at AUX-2 as comparable data for MV-22 were not available. According to Table V-4 in the 2009 MV-22 Biological Assessment, the MV-22 has an Lmax of 83dBA during arrival measured at a distance of 500 feet abeam of the aircraft.

Construction

The ALF and associated infrastructure including a new access road and utilities will be constructed in three phases between 2012 and 2016. The following facilities will be constructed at the ALF: three simulated landing decks and a 3,000-foot road operation training facility where pilots practice landing on a road, a landing ship office control tower, lighting, VL pads, three flight control towers, aircraft maintenance shelter, refueling apron, and fire and rescue shelter. A paved access road approximately 0.75 mile long will be built to connect the ALF to "the Hardball", which is the primary access road through BMGR West. Parking and a 0.92-acre staging area will be located near the intersection of the Hardball and new access road. Overhead and underground electrical and communication lines will be extended from AUX-2 to new transformers at the ALF. Water will be provided by a new water well and pump house that will include water treatment and storage. According to the 2010 BA, the ALF and associated infrastructure described (e.g., access road and all utilities) will have a construction footprint of 126.7 acres (this includes a building footprint area of 82.7 acres plus an impact area of 44 acres).

Ground Traffic and Transportation

The Hardball provides access to BMGR West from the city of Yuma. It is a single lane, paved road approximately 12 ft wide with a 9-ft wide gravel apron on either side, and an additional 20-ft wide graded dirt area on either side for most of the length of the road from AUX-2 to south of the proposed ALF location. The Hardball extends from East County 19th Street at the BMGR boundary to just north of AUX-2, then turns southeast, for total a distance of approximately 2.72 miles. From AUX-2, the Hardball travels southeast for approximately 4.22 miles to the proposed ALF location. From the proposed ALF location, the road continues southeast, and then east near where it intersects the access road to Cactus West, for a total distance of approximately 3.97 miles. The Hardball continues east from the access road to Cactus West, ultimately terminating east of the Yodaville test range. Vehicle traffic on the Hardball currently includes 884 round

trips for AUX-2 and 2,162 round trips for Cactus West, for a total distance of 51,984 miles of annual travel.

An estimated 1,325 truck trips would occur during construction of the ALF and new 0.75- mile access road, increasing traffic on the Hardball by about 40 percent during the three phases of construction between 2012 and 2016. Once construction is complete, traffic associated with the ALF will include 704 round trips (10,828 miles) annually. Annual traffic to the AUX-2 will decrease by 50 percent and traffic to Cactus West will remain the same. This equates to an overall long-term increase of 16 percent in miles traveled annually on the Hardball to these facilities (Table 7).

Table 7. Ground Traffic and Transportation on the Hardball in BMGR West

		Round Trips			Distance Traveled		
Facility	**Round Trip Distance (Miles)**	**Baseline**	**Proposed**	**Change**	**Baseline**	**Proposed**	**Change**
AUX-2	5.44	884	442	-442	4,809	2,404	-2,405
ALF	15.38	0	704	704	0	10,828	10,828
Cactus West	21.82	2,162	2,162	0	47,175	47175	0
Total		3,046	3,308	262	51,984	60,407	8,423

Conservation Measures

To avoid, minimize, and offset impacts to Sonoran pronghorn, lesser long-nosed bats, and flat-tailed horned lizards, all conservation measures in previous biological opinions will continue to be implemented (for Sonoran pronghorn, see pages 21-28 and for lesser long-nosed bats, see page 28 of the 2003 biological opinion which can be accessed at http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/95114_R4_Marine_Corp_AirStation.pdf; for both species see page 4 of the 2009 biological opinion which can be accessed at http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/950114_R5_MCASMV-22.pdf; for flat-tailed horned lizard see pages 15-19 of the 1996 biological opinion which can be accessed at http://www.fws.gov/southwest/es/arizona/Documents/Biol_Opin/95114_Yuma_Training_Range.pdf). The Marine Corps has agreed to implement conservation measures to avoid and minimize impacts to the flat-tailed horned lizard with respect to construction and subsequent operation of the proposed ALF, and in accordance with the Conservation Agreement and Flat-tailed Horned Lizard Range-wide Management Strategy (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003), as described below:

1) The Marine Corps will conduct a multi-year survey and monitoring effort of flat-tailed horned lizard behavior, habitat use, effects of increased road traffic and exposure to noise within the entire action area prior to initiation of construction, during construction, and 3 years after completion of all construction. The Marine Corps will work with the

Interagency Coordinating Committee (ICC) to complete a study plan by March 15, 2011 so that initial survey work will begin in Spring 2011.

2) Prior to construction, operation, and maintenance of the ALF, a worker education program will be developed and implemented by MCAS. Wallet-sized cards summarizing this information in both English and Spanish will be provided to all construction, operation, and maintenance personnel. The education program will include the following aspects at a minimum:

a. Biology and status of the flat-tailed horned lizard

b. Reporting procedures to be used if a flat-tailed horned lizard is encountered on-site (see Item 3 immediately below); and

c. Importance of exercising care when commuting to and from the project area to reduce mortality of flat-tailed horned lizards on roads.

3) Before construction of the ALF and associated facilities, including the access road, commences, a flat-tailed horned lizard barrier fence may be constructed at the discretion of the Marine Corps, working in concert with the Flat-tailed Horned Lizard Interagency Coordinating Committee and USFWS biologists. Specifications of the barrier fence will be consistent with the RMS. The flat-tailed horned lizard barrier fence shall be periodically inspected with routine maintenance performed, as necessary, to sustain effectiveness as a barrier in excluding access to the construction area by flat-tailed horned lizards. Following the installation of the barrier fence, biological monitor(s) will conduct a thorough search of the construction area in an attempt to capture and relocate flat-tailed horned lizards outside of the barrier fenceline prior to construction activities. Flat-tailed horned lizard removal survey methods will be based on the protocols in the RMS and will be implemented to maximize captures of flat-tailed horned lizards.

4) Biological monitors will be present to oversee adherence to, and implement, conservation actions for the flat-tailed horned lizard. Biological monitors shall be experienced and capable of conducting flat-tailed horned lizard field monitoring, and have sufficient education and field experience to understand flat-tailed horned lizard biology and behavior and to be able to identify flat-tailed horned lizard tracks and scat.

Biological monitors will be present during all surface-disturbing activities in areas from which flat-tailed horned lizards are not excluded. MCAS-Yuma has not yet made a decision as to whether project features will be surrounded by flat-tailed horned lizard barrier fencing or not. If such fencing were to be constructed, lizards within the fenced area may be removed and released outside the fence. If lizard barrier fencing is constructed and flat-tailed horned lizards are removed from the established exclusion zone (see #3), then biological monitors will not need to be present during subsequent construction activities. If barrier fencing is not constructed, then biological monitors will be present during all surface disturbing activities throughout all three phases of

construction to search for and remove flat-tailed horned lizards from the area. The work area would be examined periodically, at least hourly when surface temperatures are between 30° and 50° Celsius (C), for the presence of flat-tailed horned lizards. In addition, all sites likely to trap a lizard (e.g., trenches, holes, deep excavations) would be inspected for the presence of flat-tailed horned lizards each day and prior to backfilling from April through September. Trenches, holes, and excavations will be covered to prevent entrapment of flat-tailed horned lizards.

a. All ground-disturbing activities will be restricted, to the maximum extent possible, to the flat-tailed horned lizard's active period of April through September, when temperatures are between 30° and 50° C to allow for the location and removal of flat-tailed horned lizards from the area of ground disturbance. The outer boundaries of the work area will be flagged and/or marked, workers will be informed to limit ground-disturbing activities to the area within those flagged and/or marked limits, and biological monitors would be present to observe work activities.

b. Existing roads will be used for travel and equipment storage whenever possible, and the number of access roads to the construction sites will be kept to a minimum.

c. Persons that handle flat-tailed horned lizards shall obtain all necessary permits and authorization from Arizona Game and Fish Department before field searches are implemented.

d. Accurate records will be maintained by biological monitors for each relocated flat-tailed horned lizard, including sex; snout-vent length; weight; temperature; location, data, and time of capture and release; a close-up photo of the lizard; and a photo of the habitat where the lizard was first encountered. A Horned Lizard Observation Data Sheet and Project Reporting Form are to be used asas provided in the Flat-tailed Horned Lizard Rangewide Management Strategy (RMS). This information will be included in an annual mitigation report and would also be needed for reports submitted to permitting agencies.

SONORAN PRONGHORN

STATUS OF THE SPECIES

C. Distribution and Abundance

United States

Distribution within BMGR East

Based on the locations of collared Sonoran pronghorn within the U.S. sub-population from 1983-1993, Sonoran pronghorn occurred most frequently in the following areas: Pinta Sands, Growler Valley, Mohawk Valley, San Cristobal Valley, and between the Growler and Little Ajo mountains (Daniel's Arroyo area). All Sonoran pronghorn localities from 1994-2001 were south

of I-8, east of the Copper and Cabeza Prieta mountains, and west of SR 85 (Figure 5; Bright *et al.* 2001). Although Sonoran pronghorn continue using these same general areas, they are using them to different extents. For example, telemetry data from collared Sonoran pronghorn show a declining trend in habitat use near the U.S.-Mexico international border. Between 2006 and 2008, collared Sonoran pronghorn used areas on average approximately ten miles farther north of habitat used between 1994 and 1996 (Figure 5), which could possibly be attributed to illegal border activities and required law enforcement response near the border that may be driving pronghorn north.

Furthermore, Sonoran pronghorn monitors (biologists funded by the USAF to conduct visual surveys for Sonoran pronghorn of the TAC ranges) have reported dramatic increases in Sonoran pronghorn sightings in BMGR East over the last few years. On STAC, Sonoran pronghorn sightings increased 60 percent between 2005 and 2006, 107 percent between 2006 and 2007, and 175 percent between 2007 and 2008, and 17 percent (437 sightings in 2008 versus 511 in 2009) between 2008 and 2009. Sonoran pronghorn sightings also increased on the NTAC from one sighting in 2006 to two in 2007, 38 in 2008, and 266 in 2009. Heavy use of STAC and NTAC by Sonoran pronghorn has continued throughout 2010. It is unclear why Sonoran pronghorn have recently been found more often, and in greater concentrations, on the TACs; some suggestions may include the proximity to the forage enhancement plots and captive breeding pen, the addition of an artificial water source and alfalfa feed station on STAC in 2009, and the increase in illegal border activities and associated law enforcement activity to the south of STAC.

In 2008, four collared pen-raised bucks moved northeast of the recent U.S. Sonoran pronghorn distribution area, travelling through BMGR East's Manned Ranges 2 and 4 and exiting BMGR East to the north. Three of these drowned in an irrigation canal and one traveled on a roundabout route south to Sonora. In February 2009, a lone, recently released pen-raised buck wandered onto Manned Range 2 near the active strafing area. He stayed in the vicinity of target on Manned Range 2 for about one week. An attempt to capture and relocate him with other animals was made by Arizona Game and Fish Department (AGFD); however, it was not successful as the buck died likely due to capture myopathy.

Sonoran pronghorn are occasionally present throughout the San Cristobal Valley and within the Air-to-Air Range, though radio-telemetry data indicates that this area has not frequently been used by 2006.

Semi-captive breeding facility

The breeding program has been very successful and there are currently (as of August 11, 2010) 70 pronghorn (42 adults and 28 fawns) in the enclosure. Since establishing the program, 18 pronghorn, primarily juveniles, yearlings, and two-year olds, have died in the pen due to various causes, including epizootic hemorrhagic disease (1 case was confirmed and disease [epizootic hemorrhagic disease or bluetongue virus] was suspected in the deaths of 12 others), bobcat predation (2), entanglement in the fence (1), and capture operations (2). Sonoran pronghorn have been released from the pen every year since 2006. As of August 2010, a total of 44

individuals, primarily males, have been released, 23 of which are known to still be alive. Currently, more male fawns are surviving in the pen than females; this is thought to be associated with less than optimal nutrition (it has been documented than when females are stressed, they tend to give birth to more males) (personal communication with John Hervert, AGFD, April 13, 2010). As the nutrition of pronghorn in the pen has improved, the female to male ratio has increased, however it still favors males slightly. As females contribute much more significantly to population growth and recovery than males, producing and releasing females is more desirable. Due to sex ratios that favor males and because more females than males need to be kept in the pen to serve as breeding stock, it is anticipated that at least for some time more males than females will continue to be released. If the female to male sex ratio of fawns in the pen increases, more females will likely be released in the future.

The objective is to produce at least 20 fawns each year to be released into the U.S. population, and potentially to establish a second U.S. population, possibly at Kofa National Wildlife Refuge (NWR). Planning for the second herd is underway. Various alternatives are being considered, but a second herd could be established in King Valley of Kofa NWR in less than two years. A captive facility, a forage enhancement plot, and development of waters in King Valley would likely be needed. The population would probably be introduced as an experimental, nonessential population under section 10(j) of the Act. A draft Environmental Assessment and draft 10(j) rule were made available for public review and comment in February 2010. The final documents are expected to be published by the end of this year.

Mexico

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

D. Threats

Barriers that Limit Distribution and Movement

Interstate 8, canals of the Wellton-Mohawk and Palomas Irrigation and Drainage Districts, agriculture, a railroad, and associated fences and human disturbance near the Gila River act as barriers for northward movement of pronghorn. Furthermore, canals have been the cause of four pronghorn deaths in the last two years. Three pen-raised pronghorn drowned in the Palomas Canal in 2008 and one pen-raised pronghorn drowned in the Wellton Canal in 2010.

Disease

A number of deaths (five in the captive breeding pen and two in the wild) in 2010 are suspected to be related to epizootic hemorrhagic disease and bluetongue virus. Samples from some of these individuals have been sent for laboratory testing.

ENVIRONMENTAL BASELINE

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

C. Status of the Sonoran Pronghorn in the Action Area

Drought

The April 2010 long-term drought status report indicated that southwestern Arizona experienced conditions of normal to abnormally dry drought over the 48-month period from March 2006 to March 2010. Range conditions were very dry in the summer and fall of 2009, however, they improved in the winter of 2009/10 due to winter rain events. Currently, conditions vary across the range; some areas are very dry due to lack of rain, while other areas are green due to rain. The August 3, 2010 U.S. Drought Monitor map (http://www.azwater.gov/azdwr/statewideplanning/Drought/DroughtStatus.htm) indicates that southwestern Arizona is experiencing abnormally dry conditions.

Recent Recovery Actions

In March 2009, three temporary, experimental feed and water stations were placed on the STAC on the BMGR East and in May 2010, two new temporary water stations were placed on Organ Pipe Cactus National Monument's (OPCNM).

E. Past and Ongoing Federal Actions in the Action Area

Federal Actions Addressed in Section 7 Consultations

4)[4] Organ Pipe Cactus National Monument General Management Plan

The original biological opinion (consultation number 02-21-89-F-0078), issued June 26, 1997, addressed implementation of OPCNM's General Management Plan (GMP). This opinion was reinitiated six times, resulting in revised biological opinions dated November 16, 2001; April 7, 2003; March 10 and August 23, 2005; March 8, 2007; and December 10, 2009. GMP plan elements included: 1) continuing travel and commerce on SR 85 while enhancing resource protection, 2) seeking designation of OPCNM as the Sonoran Desert National Park, 3) establishment of partnerships, 4) increased wilderness and an interagency wilderness and backcountry management plan, 5) changes in trails, facilities, and primitive camping, and 6) implementation of a Cultural Resources Management Plan. Included were a number of conservation measures to minimize impacts to pronghorn, including "Limiting future

[4] See the 2009 biological opinion for Ongoing Federal Actions #1-3 and 7-10.

development to the area north of the North Puerto Blanco Drive and east of the Senita Basin Road/Baker Mine Trail/Dripping Springs Trail . . ." Effects of the action included human disturbance to pronghorn and habitat due to recreation and management activities. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. In the latest versions of the opinion, no incidental take of pronghorn was anticipated. No incidental take is known to have occurred. The original opinion was the subject of a lawsuit (Defenders of Wildlife, *et al*. v. Bruce Babbitt, *et al*.) and was remanded by the court due to our failure to adequately address the impact of proposed activities on pronghorn. The sixth reinitiation addressed a one-time deviation from the aforementioned conservation measure to allow Department of Homeland Security (DHS) to construct Secure Border Initiative (SBI*net*) towers TCA-AJO-170, 302, and 003 and associated access roads outside the area referenced in the conservation measure. OPCNM issued a Special Use Permit for the construction of these towers on OPCNM lands; however as the lead action agency, DHS consulted on the entire action and incidental take associated with the action was attributed to DHS rather than OPCNM.

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

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

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

The original biological opinion (consultation number 02-21-96-F-0094), issued August 27, 1997, addressed military use of the airspace above and the ground space on BMGR East and CPNWR by Luke Air Force Base. Military activities within the area of overlap with the CPNWR were limited to use of airspace and operation of four Air Combat Maneuvering Instrumentation sites. Military activities occurring within BMGR East included: airspace use, four manned air-to-

ground ranges, three tactical air-to-ground target areas, four auxiliary airfields, Stoval Airfield, and explosive ordnance disposal/burn areas. Primary potential effects of the action included habitat loss due to ground-based activities, harassment and possible mortality of pronghorn at target areas, and disturbance of pronghorn due to military overflights. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. This opinion was reinitiated in 2001, 2003, and 2010, resulting in revised opinions dated November 16, 2001; August 6, 2003; and May 4, 2010. In the 2003 opinion, no incidental take was anticipated; however, in the 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 take of one wild Sonoran pronghorn of either sex, one pen raised (free ranging female) every 10 years, and two pen-raised (free ranging) male pronghorn every 10 years in the form of harassment. The following reasonable and prudent measure was provided: 1) monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring. To date, we are not aware of any take of pronghorn confirmed attributable to Luke Air Force Base use of the ground-surface and airspace on the BMGR. A pronghorn found dead near a target may have been strafed, but it may also have died from other causes (see "Effects of the Proposed Action" in the 2003 opinion for a full discussion of this incident).

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

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

This biological opinion (consultation number 22410-F-2009-0089), issued December 10, 2009, addressed the DHS's implementation of the SBI*net* Ajo-1 Tower Project in the Ajo Station's Area of Responsibility of U.S. Border Patrol (USBP)-Tucson Sector, Arizona. The project included the following components: construction, operation, and maintenance of communication and sensor towers; construction, use, and maintenance of new associated access roads; repair, improvement, use, and maintenance of associated approach roads; USBP operations, including relocating and operating a forward operating base (FOB); and implementation of conservation measures for endangered species. Adverse effects to pronghorn included 1) disturbance of Sonoran pronghorn from noise and lights associated with tower, road, and FOB construction, operation, and maintenance; 2) loss of foraging habitat from tower and road construction; 3) increased risk of collision with project construction and maintenance vehicles; 4) continued degradation of habitat from USBP operations; and 5) disturbance of pronghorn from USBP operations, potential shifts in cross-border violator traffic to important pronghorn areas, better access for the public provided by new or improved roads, and the presence of towers in Sonoran pronghorn habitat. Long-term beneficial effects to Sonoran pronghorn were anticipated if the project results in greater effective control of the border leading to eventual decreased cross-border violator and USBP activity in the project area. Included were a number of best management practices and offsetting measures to avoid, minimize, and offset effects to Sonoran pronghorn resulting from the project, including the contribution of funds to implement Sonoran

pronghorn recovery actions. We determined that the proposed action was not likely to jeopardize the continued existence of the pronghorn. We anticipated incidental take of three Sonoran pronghorn due to harassment within the first year of towers becoming operational and two every five years thereafter; and one due to direct mortality over the life of the project. The following reasonable and prudent measures were stipulated: 1) monitor incidental take resulting from the proposed action and report to the FWS the findings of that monitoring; and 2) minimize harassment of Sonoran pronghorn resulting from the proposed action. To date, we are not aware of any incidental take attributable to the project.

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

Three current biological opinions anticipated incidental take, including 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, the Luke Air Force Base Military Training opinion, and the SBI*net* Ajo-1 Tower Project opinion (see descriptions of anticipated take above). 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.

EFFECTS OF THE PROPOSED ACTION

The biological opinions on Ongoing Activities by the MCAS-Yuma in the Arizona portion of the YTRC on the BMGR, Yuma and Maricopa counties (02-21-95-F-0114, now 22410-1995-F-0114 and its reinitiations) evaluated the effects of routine fixed wing aircraft and other operations on Sonoran pronghorn. Although the use of the F-35B was not specifically evaluated in the biological opinions, the F-35B is intended to replace existing fixed wing aircraft (i.e., F/A-18 Hornet and AV-8B Harrier) that were addressed by those previous opinions. All conservation measures and other requirements within the biological opinions that are applicable to fixed wing aircraft operations will also be applicable to operations of the F-35B.

No construction will occur within the current U.S. Sonoran pronghorn range in association with the proposed action; therefore no effects to Sonoran pronghorn and their habitat are anticipated from project construction or other ground-based activities.

Military Overflights

As described in previous biological opinions, fixed-wing aircraft overflights, particularly low-level flights and those that create sonic booms, may cause disturbance to Sonoran pronghorn (Workman *et al*. 1992). However, habituation by pronghorn, measured in terms of heart rate, to sonic booms, and low-level overflights by F-16 aircraft was observed by Workman *et al.* (1992). Disturbance and flight of ungulates are known to result in a variety of physiological effects that are adverse, including elevated metabolism, lowered body weight, reduced fetus survival, and withdrawal from suitable habitat (Geist 1971, Harlow *et al.* 1987), which may be exacerbated in harsh environments such as those occupied by Sonoran pronghorn.

According to the Marine Corps (personal communication with Ron Pearce, August 2010), currently, a total of 8,909 F/A-18 Hornet and AV-8B Harrier fixed-wing aircraft operations[5] occur annually in airspace R-2301W, and 3,810 occur over R-2301E. Under the proposed action, a total 10,286 F-35B fixed-wing aircraft operations will occur annually in airspace R-2301W (this represents an increase in operations of 15 percent), and 2,849 will occur over R-2301E (this represents a decrease in operations of 25 percent). According to the 2003 biological opinion, of the fixed-wing sorties occurring annually in R-2301W, 18 percent occur between 200 to 1,500 feet AGL and 20 percent occur between 1,500 and 5,000 feet AGL. Under the proposed action, the F-35B will conduct less than one percent (or 387) of its operations below 5,000 feet AGL in R-2301W. This represents a decrease in low-altitude flights (< 5000 feet AGL) by more than 90 percent in R-2301W. All other operations will occur above 5,000 feet AGL, with the greatest portion (67 percent) spent at altitudes above 15,000 feet MSL. As analyzed previously, most flights will continue to occur during the day and will remain fairly evenly distributed among months of the year. Though there will be a 15 percent increase in fixed-wing aircraft use in R-2301W due to the introduction of the F-35B, there will also be a 90 percent decrease in low-altitude (<5000 feet AGL) flights. This change in the proposed action will result in fewer adverse effects to Sonoran pronghorn than previously analyzed. Furthermore, decreases in the numbers of total operations in R-2301E, which overlies much of the current Sonoran pronghorn distribution, coupled with decreases in the number of low-altitude flights, is also anticipated to result in fewer adverse effects to Sonoran pronghorn than previously analyzed.

Measured at the aircraft, the F-35B is louder than legacy aircraft; however, because the F-35B will fly at higher altitudes than legacy aircraft, cumulative average daily noise levels at ground level will decrease. Occasional low-level F-35B flights will produce more noise per single event than legacy aircraft. However, because there will be a 90 percent decrease in low-level flights, overall, cumulative average daily noise at ground will decrease with the introduction of the F-35B. Increased noise of individual low-level flights may cause increased disturbance to Sonoran pronghorn; however, overall, decreases in low-level flights and the higher flight profile of the F-35B are anticipated to result in fewer adverse effects (from noise) to Sonoran pronghorn than previously analyzed.

Supersonic Flight

As analyzed in previous biological opinions, within R-2301W, supersonic flights will only occur within the supersonic flight corridor that overlies only the extreme western-most portion of the

[5] The 2003 biological opinion analyzed sorties instead of operations, the term used in the 2010 BA. The relationship between sorties and operations is described in the EIS which says, "During a single sortie, an aircraft may fly in several airspace units and produce a number of operations and events. An aircraft could conduct two operations during one sortie, for example, with one operation in BMGR West for ordnance delivery, and one in the Dome MOA for an air-to-air combat engagement event. For these reasons, numbers of operations and events may exceed total sorties, and they are not additive to one another." Because there is a difference between sorties and operations, we cannot directly compare the number of fixed-wing sorties analyzed in the 2003 opinion to the number of operations proposed in the 2010 BA; however, to enable comparison, the BA provides F/A-18 Hornet and AV-8B Harrier baseline operation numbers (i.e., the number of A-18 Hornet and AV-8B Harrier operations currently occurring and which, though different metrics were used, were addressed in the 2003 opinion).

current Sonoran pronghorn range. Additionally, supersonic flight may continue to occur in R-2301E as discussed in the 2003 biological opinion. Though the location of supersonic flights will not change, there will be an increase in the number of supersonic flights with the introduction of the F-35B (see Table 3). The increase in supersonic flights over the current distribution of Sonoran pronghorn is anticipated to result in greater adverse effects to Sonoran pronghorn than previously analyzed. That said, we anticipate these effects will mostly be offset because the F-35B aircraft will typically fly supersonic above 25,000 feet MSL (most sonic booms at this altitude would not be audible at ground level) in contrast to the legacy F/A-18 aircraft that flies supersonic down to 5,000 feet MSL.

Ordnance, Flare, and Chaff Delivery; Strafing, and Laser Targeting

Ordnance

There will be no change in the approximate number (8,166 on R-2301W and 1,224 on R-2301E) or location (targets within R-2301W and targets within NTAC and STAC of R-2301E) of anticipated annual ordnance delivery events than previously analyzed in the 2003 biological opinion. Under the previous opinion, only the use of inert ordnance was analyzed; however, under the proposed action, 70 percent of anticipated annual ordnance events will be with inert ordnance and 30 percent will be with live ordnance. Because the use of live ordnance triggers live monitoring and possible target closures (described below), we do not anticipate the increased use of live ordnance will result in greater adverse effects to Sonoran pronghorn than previously analyzed.

This said, however, there may be an increased risk of disturbance, injury, or death to pronghorn from ordnance delivery events as a result of changes to Luke Air Force Base's monitoring and target closure protocol. Luke Air Force Base is working on modifying their operating instructions (OI 13-01, Sonoran Pronghorn Monitoring) for the Sonoran pronghorn monitoring and target closures per biological opinion number 22410-1996-F-0094-R003, dated May 4, 2010, on military training on the BMGR East. As described previously, these instructions are implemented (and will continue to be implemented under the modified OI 13-01) during any high explosive delivery of ordnance, including WTI. Monitoring of NTAC and STAC ranges is triggered by following five events:

1. Live Monitoring: performed on days when live ordnance deliveries are scheduled on that tactical range.

2. Maverick Monitoring: performed on days when live Maverick missile deliveries are scheduled on NTAC range.

3. Required Monitoring: performed on each tactical range on the first fly day of the week (typically Mondays), plus the second fly day of the week if Sonoran pronghorn were detected within the last seven days on that tactical range.

4. Follow-up Monitoring: performed the next fly day after Sonoran pronghorn are detected on a tactical range.

5. EOD Monitoring: performed on days that EOD crews intend to detonate ordnance on a tactical range as part of annual range maintenance activities.

OI 13-01 requires at least two monitors per tactical range during the daylight hours. Monitoring of NTAC and STAC is conducted from vantage points and includes visual observations with the aid of binoculars and spotting scopes, as well as telemetry surveillance to locate collared Sonoran pronghorn. The use of vantage points and telemetry provides landscape-scale coverage of most of the target areas. Monitoring is typically performed at dawn when sighting conditions are optimum and prior to the first mission of the day. Under the previous OI 13-01, if a pronghorn was sighted, no strafing or training ordnance deliveries were made within 3.0 km (1.2 miles) and no live ordnance was delivered within 5.0 km (3.1 miles) of the pronghorn. Under the modified OI 13-01, if a pronghorn is sighted, no strafing will be made within 1.0 km, no training ordnance will be delivered within 0.5 km, and no live ordnance will be delivered within 1.5 km of the pronghorn.

This monitoring has not documented any injury or mortality of pronghorn on the tactical ranges, and it may have prevented such injury or mortality. As described in biological opinion number 22410-1996-F-0094-R003 on military training on the BMGR East, however, there is a chance that pronghorn may not be detected during monitoring sessions. If this were to occur, pronghorn would be at risk of being killed or injured due to ordnance delivery. Furthermore, the target closure protocol is based on the nature of the training activity and previous sighting information and therefore monitoring is not always conducted on every day that inert weapons deliveries occur. As such, in the absence of monitoring, there is an increased risk that pronghorn may wander onto targets and could be killed or injured. These risks have likely increased since 2003 for the following reasons: 1) the wild U.S. Sonoran pronghorn population has grown considerably; and 2) the behavior of the Sonoran pronghorn has changed over the past two years such that they are now concentrating on the STAC and NTAC.

The reduced target closure distances, on the surface, are suggestive of higher risk of death or injury to Sonoran pronghorn due to ordnance delivery. However, based on the weapons zone analysis results (i.e., that inert munitions will fall 99 percent of the time within a radius of 1,640 feet (500 meters) around the specified target; strafe will strike 99 percent of the time within a radius of 3,280 feet (1,000 meters) around the specified target; and live explosive and shrapnel will fall 99 percent of the time within a radius of 4,920 feet (1,500 meters) around the specified target – see biological opinion number 22410-1996-F-0094-R003, dated May 4, 2010). As a result, we anticipate the increase in risk will be small, and may represent a reduction in risk over the situation when the original target closure distances were first implemented (1996) – which was at a time when weapons delivery was less accurate, so the hazard zone around targets was much larger. Because the closure distances will be reduced, pronghorn could occur closer to ordnance delivery activities, which may cause some increased level of disturbance to pronghorn. As a result, pronghorn could exhibit adverse behavioral changes, such as fleeing from the area. This behavior was observed in pronghorn in the captive facility in association with an explosion at HE Hill (personal communication with James Atkinson, CPNWR, April 12, 2010). Based on a study that showed no effects to the hearing ability of mule deer living near high ordnance delivery activities at the East Tactical Range of the BMGR East (personal communication with

John Hervert, AGFD, April 13, 2010), we do not anticipate the hearing of Sonoran pronghorn will be greatly affected. This said, reduced target closure distance associated with the delivery of HE ordnance could result in adverse physiological effects that we do not understand.

Overall, the proposed F-35B ordnance delivery events on NTAC and STAC represent about 2.5 percent of the total ordnance delivery events at these TACs. Therefore, though Sonoran pronghorn are at some risk of disturbance, injury, or death from ordnance delivery events by the Marine Corps, they are at greatest risk from these events conducted by other agencies; which were analyzed in total in our May 4, 2010 biological opinion with the Air Force.

Flares

As described in our 2003 biological opinion, the primary effect of flares continues to be increased incidence of fire. Under the proposed action, the Marine Corps expects to use fewer flares than the legacy aircraft due to the F-35B capabilities. Additionally, the F-35B will fly higher than legacy aircraft; as such, flare release will nearly always occur well above minimum release altitudes necessary to ensure complete and safe combustion of the flare. Consequently, we anticipate the there will be a decreased risk of accidental fire as a result of flare use.

Summary

Based on the information provided and the analysis above, we have determined that, overall, there will be fewer adverse effects to Sonoran pronghorn from the proposed F-35B operations and elimination of legacy aircraft (i.e., F/A-18 Hornet and AV-8B Harrier) than those evaluated for F/A-18 Hornet and AV-8B Harrier aircraft operations in the August 6, 2003 biological opinion.

CUMULATIVE EFFECTS

An additional effect of the activities on private lands not addressed in our October 21, 2009 biological opinion includes the drowning of four Sonoran pronghorn in canals in the last two years. As discussed above, three pen-raised pronghorn drowned in the Palomas Canal in 2008 and one pen-raised pronghorn drowned in the Wellton Canal in 2010.

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 previous 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 August 6, 2003 and October 21, 2010 biological opinions, and the following:

1. Increased fixed-wing aircraft use in R-2301W could disturb Sonoran pronghorn. However, adverse effects to Sonoran pronghorn from F-35B use of R-2031W should be offset because there will be a 90 percent decrease in low-altitude flights.

2. Decreases in the numbers of total operations in R-2301E coupled with decreases in the number of low-altitude flights should reduce the potential for adverse effects to Sonoran pronghorn resulting from these operations.

3. Increased supersonic flights could disturb Sonoran pronghorn. However, adverse effects to Sonoran pronghorn should mostly be offset because the F-35B will typically fly supersonic above 25,000 feet MSL.

4. The risk of disturbance, injury, or death to Sonoran pronghorn from the increased use of live ordnance on NTAC and STAC should be minimized from the monitoring and target closure protocol triggered by the use of live ordnance.

5. Risk of fire caused by flares dropped from aircraft will decline due to reduced numbers of flares used and a higher elevation of flare drops, which provides greater time for the flares to burn out before reaching the ground.

AMOUNT OR EXTENT OF TAKE ANTICIPATED

We do not anticipate the proposed action will result in incidental take of Sonoran pronghorn. Our conclusion is based on the rationale given in our August 6, 2003 and October 21, 2009 biological opinions, and the Effects of the Proposed Action provided in this biological opinion.

LESSER LONG-NOSED BAT

STATUS OF THE SPECIES

C. Status and Threats

Examples of more recent biological opinions that anticipated incidental take for lesser long-nosed bats are summarized below. The 2010 biological opinion that addressed military use of the airspace above and the ground space on BMGR East and CPNWR by Luke Air Force Base included incidental take of up to 10 lesser long-nosed bats every 10 years in the form of direct mortality or injury as a result of collision with aircraft or downward rotor wash from helicopters. The 2009 biological opinion on implementation of the DHS's SBI*net* Ajo-1 Tower Project (including the construction, operation, and maintenance of communication and sensor towers; construction, use, and maintenance of new associated access roads; repair, improvement, use, and maintenance of associated approach roads; USBP operations, including relocating and operating a FOB; and implementation of conservation measures for endangered species) included incidental take of up to 31 lesser long-nosed bats per year in the form of direct mortality or injury as a result of collision with towers; up to all bats in one roost in the form of harassment from the date of the opinion to one year after the towers become operational, or up to all bats in one roost every 5 years thereafter; and an unquantifiable number of bats in the form of harm due to contraction of foraging range caused by avoidance of noise, lights, human activity, and electromagnetic emissions caused by the project. The 2008 biological opinion for implementation of CBP's SBInet Tucson West Project (including the installation, operation, and

maintenance of communication and sensor towers and other associated infrastructure) included incidental take in the form of 10 bats caused by collisions with towers and wind turbine blade-strike mortality for the life (presumed indefinite) of the proposed action. The 2007 biological opinion for the installation of one 600 kilowatt (KW) wind turbine and one 50KW mass megawatts wind machine on Fort Huachuca included incidental take in the form of 10 bats caused by blade-strikes for the life (presumed indefinite) of the proposed action. The 2005 biological opinion for implementation of the Coronado National Forest Land and Resource Management Plan (U.S. Forest Service) included incidental take in the form of harm or harassment. The amount of take for individual bats was not quantified; instead take was to be considered exceeded if simultaneous August counts (at transitory roosts in Arizona, New Mexico, and Sonora) drop below 66,923 lesser long-nosed bats (the lowest number from 2001 – 2004 counts) for a period of two consecutive years as a result of the action. The 2004 biological opinion for the Bureau of Land Management's Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management included incidental take in the form of harassment. The amount of incidental take was quantified in terms of loss of foraging resources, rather than loss of individual bats. The 2003 biological opinion for MCAS–Yuma Activities on the BMGR included incidental take in the form of direct mortality or injury (five bats every 10 years). Because take could not be monitored directly, it was to be considered exceeded if nocturnal low-level helicopter flights in certain areas on the BMGR increased significantly or if the numbers of bats in the Agua Dulce or Bluebird Mine roosts at CPWNR decreased significantly and MCAS-Yuma activities were an important cause of the decline. The 2002 biological opinion for Department of the Army Activities at and near Fort Huachuca, Arizona anticipated incidental take in the form of direct mortality or injury (six bats over the life of the project), harassment (20 bats per year), and harm (10 bats over the life of the project).

ENVIRONMENTAL BASELINE

C. Status of the Lesser Long-Nosed Bat in the Action Area

The highest estimate of lesser long-nosed bats using Bluebird Mine from 2001-2009 bats was 11,624 in 2008. They abandoned the mine however in 2002, 2003, and 2005 due to disturbance from illegal activities. In 2004, the bats returned to the mine after CPNWR staff placed a high steel fence around the mine to prevent disturbance. The bats returned to the mine in 2005, however abandoned the site once again after the fence was damaged, presumably by cross-border violators. The peak estimate of lesser long-nosed bats using Bluebird Mine in 2009 was 4,685. The peak estimate of lesser long-nosed bats using Copper Mountain Mine at OPCNM in 2010 was 41,103. In 2008, the peak estimate was 104,474 lesser long-nosed bats at the Pinacate Cave in the Reserva de la Biósfera Pinacate y Gran Desierto de Altar, Sonora.

The BMGR East represents some of the westernmost locations of the bat's range in the U.S. Lesser long-nosed bats have also recently been recorded on BMGR West in the Copper Mountains. Though lesser long-nosed bats have been recorded foraging on the BMGR (Dalton and Dalton 1994), no lesser long-nosed bat roosts have been documented on the BMGR East despite a number of bat surveys (Dames and Moore 1997, Dalton and Dalton 1994, Cockrum and Petryszyn 1991).

A number of activities occur in the action area that could affect bats. Because of the extent of Federal lands in the action area, with the exception of: 1) cross-border violator activities, 2) non-Federal activities that occur on the TON, and 3) all activities in Mexico, most activities that currently, or have recently, affected the lesser long-nosed bats or their habitat in the Action Area are Federal actions, many of which have undergone formal consultation. For example, our 1997 biological opinion on the OPCNM General Management Plan, found that the proposed action could result in incidental take of bats from recreation, specifically from unauthorized human disturbance to the Copper Mountain maternity roost. Our 2003 biological and conference opinion for the installation of the international boundary vehicle barrier on the OPCNM did not anticipate incidental take, but found that the project would result in the disturbance of 70 acres of potential lesser long-nosed bat foraging habitat, including the destruction of up to 750 to 1000 saguaro and 80 to 100 organ pipe cacti (about 400 to 600 of these were to be salvaged). Our 2006 biological opinion on the USBP's installation of a permanent vehicle barrier (as well as access improvements, construction/improvement of border roads, and associated maintenance and patrol activities) along the border from the western end of the OPCNM barrier to Avenue C just east of San Luis, Arizona, did not anticipate incidental take. It did find, however, that the project would result in the direct disturbance of approximately 207 acres of potential lesser long-nosed bat foraging habitat, including the destruction of up to 50 saguaros and three organ pipe cacti. About 200 saguaros in the project corridor were to be avoided or salvaged. Our 2008 biological opinion on the USBP installation of 5.2 miles of primary (pedestrian) fence (as well as construction of access roads, and all associated maintenance and patrol activities) along the U.S.-Mexico border near Lukeville, did not anticipate incidental take. However, it did find that the project would result in the direct disturbance of approximately 45 acres of potential lesser long-nosed bat foraging habitat, including the removal or salvage of up to 206 saguaros and 295 organ pipe cacti. As mentioned above, in our 2009 biological opinion on implementation of the CBP's SBI*net* Ajo-1 Tower Project, we anticipated incidental take of up to 31 lesser long-nosed bats per year in the form of direct mortality or injury as a result of collision with towers; up to all bats in one roost in the form of harassment from the date of the opinion to one year after the towers become operational, or up to all bats in one roost every five years thereafter; and an unquantifiable number of bats in the form of harm due to contraction of foraging range caused by avoidance of noise, lights, human activity, and electromagnetic emissions caused by the project. Our 2010 biological opinion on Luke Air Force Base's Ongoing Operations and Proposed Enhancements of the BMGR East Project included incidental take of up to 10 lesser long-nosed bats every 10 years in the form of direct mortality or injury as a result of collision with aircraft or downward rotor wash from helicopters.

EFFECTS OF THE PROPOSED ACTION

Military Overflights

The biological opinions on Ongoing Activities by the MCAS-Yuma in the Arizona portion of the YTRC on the BMGR, Yuma and Maricopa counties (02-21-95-F-0114, now 22410-1995-F-0114 and its reinitiations) evaluated the effects of fixed-wing aircraft operations on lesser long-nosed bats. Although the use of the F-35B was not evaluated in the biological opinions, the F-35B is intended to replace existing fixed-wing aircraft (i.e., F/A-18 Hornet and AV-8B Harrier) that

were addressed by the opinions. All conservation measures and other requirements within the biological opinions that are applicable to fixed-wing aircraft operations will be applicable to operation of the F-35B.

No construction will occur within lesser long-nosed bat habitat in association with the proposed action; therefore no effects to lesser long-nosed bats are anticipated from project construction or other ground-based activities.

As described in the previous biological opinions, low-level aircraft overflights have the potential to disturb lesser long-nosed bats. There is likely a much greater chance of adverse effects to lesser long-nosed bats from low-level helicopter flights; however, the noise generated by low-level fixed wing flights may disturb foraging and roosting lesser long-nosed bats. Dalton and Dalton (1993), reported that lesser long-nosed bats at Copper Mountain Roost exposed to low-level (500 feet AGL) military jet flights exhibited no acute responses or significant difference in orienting, but that they did have depressed levels of flights for up to 30 minutes following jet noise.

As described in the "Effects of the Proposed Action" section for Sonoran pronghorn, under the proposed action, the number of fixed-wing operations in R-2301W will increase by 15 percent while the number of fixed-wing operations in R-2301E will decrease by 25 percent. Additionally, the F-35B will conduct less than one percent (or 387) of its operations below 5,000 feet AGL in R-2301W. This represents a decrease in low-altitude flights (< 5000 feet AGL) by more than 90 percent in R-2301W. As analyzed previously in 2003, most flights will continue to occur during the day (only 106 and 23 F-35B operations are expected to occur at night within R-2301W and E, respectively) and will remain fairly evenly distributed among months of the year. The area underlying R-2031W supports very little bat foraging habitat, therefore, bats are not expected to occur in this airspace in significant numbers. That said, potential adverse effects to any lesser long-nosed bats foraging in the area from jet noise will decrease under the proposed action because, though there will be a 15 percent increase in fixed-wing aircraft use in R-2301W, there will also be a 90 percent decrease in low-altitude (<5000 feet AGL) flights. There are no known lesser long-nosed bat roosts in R-2301W and, therefore, no roosting bats are expected to be affected by flights in this airspace. Decreases in the number of total operations in R-2301E, which overlies abundant lesser long-nosed bat foraging habitat and two known bat roosts, coupled with decreases in the number of low-altitude flights, is also anticipated to result in fewer adverse effects to foraging and roosting lesser long-nosed bats than previously analyzed.

Measured at the aircraft, the F-35B is louder than legacy aircraft; however, because the F-35B will fly at higher altitudes than legacy aircraft, cumulative average daily noise levels at ground level will decrease. Occasional low-level F-35B flights will produce more noise per single event than legacy aircraft. However, because there will be a 90 percent decrease in low-level flights, overall, cumulative average daily noise at ground will decrease with the introduction of the F-35B. Increased noise of individual low-level flights may cause increased disturbance to lesser long-nosed bats; however, overall, decreases in low-level flights and the higher flight profile of the F-35B are anticipated to result in fewer adverse effects (from noise) to lesser long-nosed bats than previously analyzed.

Supersonic Flight

The effects of supersonic flights on lesser long-nosed bats were not specifically analyzed in the 2003 biological opinion. As described in the "Effects of the Proposed Action" section for Sonoran pronghorn, under the proposed action, the location of supersonic flights will not change, though there will be an increase in the number of supersonic flights with the introduction of the F-35B (see Table 3). The increase in supersonic flights over lesser long-nosed bat foraging or roosting habitat could result in greater adverse effects to bats from noise disturbance; however, we anticipate these effects will mostly be offset because the F-35B aircraft will typically fly supersonic above 25,000 feet MSL in contrast to the legacy F/A-18 aircraft that flies supersonic down to 5,000 feet MSL.

Ordnance and Flares

Ordnance

As explained in the 2003 biological opinion, the only use of the TACs, including ordnance delivery, by MCAS-Yuma is during WTI; the spring WTI occurs before most bats arrive in southwestern Arizona, and the fall WTI occurs after they leave. Thus, ordnance delivery, including the increased use of live ordnance, at the TACs by MCAS-Yuma is unlikely to directly affect foraging lesser long-nosed bats. Effects to lesser long-nosed bat foraging habitat, addressed in the 2003 biological opinion, are not anticipated to change under the proposed action.

Flares

The effects of flares on lesser long-nosed bats were not specifically analyzed in the 2003 biological opinion. However, as described in the "Effects of the Proposed Action" section for Sonoran pronghorn, the primary effect of flares is increased incidence of fire. Under the proposed action, the Marine Corps expects to use fewer flares than the legacy aircraft due to the F-35B capabilities. Additionally, the F-35B will fly higher than legacy aircraft; as such, flare release will nearly always occur well above minimum release altitudes necessary to ensure complete and safe combustion of the flare. Consequently, we anticipate that there will be a decreased risk of accidental fire (that could consume lesser long-nosed bat forage habitat) as a result of flare use.

Summary

Based on the information provided and the analysis above, we have determined that, overall, there will be fewer adverse effects to lesser long-nosed bats from the proposed F-35B operations and elimination of legacy aircraft (i.e., F/A-18 Hornet and AV-8B Harrier) than those evaluated for F/A-18 Hornet and AV-8B Harrier aircraft operations in the August 6, 2003 biological opinion.

CUMULATIVE EFFECTS

This section remains the same as in our October 21, 2009 biological opinion.

CONCLUSION

After reviewing the current status of the lesser long-nosed bat, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, we reaffirm our previous biological opinions that the proposed action is not likely to jeopardize the continued existence of the lesser long-nosed bat. No critical habitat has been designated for this species; therefore, none will be affected. Our conclusion is based on the rationale given in our August 6, 2003 and October 21, 2009 biological opinions and the following:

1. Increased fixed-wing aircraft use in R-2301W could disturb foraging lesser long-nosed bats. However, adverse effects to bats from F-35B use of R-2031W should be offset because there will be a 90 percent decrease in low-altitude flights.

2. Decreases in the numbers of total operations in R-2301E coupled with decreases in the number of low-altitude flights should reduce the potential for adverse effects to foraging and roosting lesser long-nosed bats resulting from these operations.

3. Increased supersonic flights could disturb lesser long-nosed bats. However, adverse effects to bats should mostly be offset because the F-35B will typically fly supersonic above 25,000 feet MSL.

4. Risk of fire caused by flares dropped from aircraft will decline due to reduced numbers of flares used and a higher elevation of flare drops, which provides greater time for the flares to burn out before reaching the ground.

INCIDENTAL TAKE STATEMENT

The incidental take statement, including the **Amount or Extent of Take Anticipated**, **Effect of the Take, Reasonable and Prudent Measure**, and **Term and Condition**, remain the same as in our August 6, 2003 biological opinion.

Disposition of Dead or Injured Listed Species

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

FLAT-TAILED HORNED LIZARD

STATUS OF THE SPECIES

The flat-tailed horned lizard was initially proposed as a threatened species under the Act in 1993 (58 FR 62624). Since that time, it has been withdrawn from listing consideration three times (62 FR 37853, 68 FR 331, 71 FR 36745) and reinstated three times (66 FR 66384, 70 FR 72776, 75 FR 9377), the last of which occurred on March 2, 2010, thus the species is currently proposed for listing under the Act. A more detailed account of our previous Federal actions for flat-tailed horned lizard can be found in the March 2, 2010, Federal Register notice (75 FR 9377). The flat-tailed horned lizard is listed by the Mexican government as a threatened species in Mexico.

Rangewide Management Strategy

In June of 1997, seven Federal and State agencies signed a Flat-Tailed Horned Lizard Conservation Agreement to implement a Flat-tailed Horned Lizard RMS. The purpose of the RMS is to provide a framework for conserving and managing sufficient habitat to maintain several viable populations of the flat-tailed horned lizard throughout the U.S. range of the species. The RMS was developed over a three- year period by the flat-tailed horned lizard working group composed of conservation biologists and herpetologists familiar with the flat-tailed horned lizard. The RMS was considerably updated and revised in 2003 (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). The strategy's format was that of a Fish and Wildlife Service recovery plan, and also included standard mitigation and compensation formulas and survey protocols that all signatory agencies would use, and suggested techniques for restoration of degraded flat-tailed horned lizard habitat (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003).

The purpose of the RMS is to maintain viable self-sustaining populations of flat-tailed horned lizards in five management areas (MAs) in the U.S., including the Yuma Desert MA in Yuma County, Arizona; and the East Mesa, West Mesa, Yuha Desert, and Borrego Badlands MAs in Imperial and eastern San Diego counties, California. The RMS also called for managing areas in the Coachella Valley, Riverside County, California, that are capable of maintaining self-sustaining populations of lizards. These MAs range in size from 42,400 to 136,100 acres, total 485,200 acres, and represent roughly 40 percent of flat-tailed horned lizard habitat remaining in the United States (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). Also established was a research area at the Ocotillo Wells State Recreational Vehicle Area in California where the effects of human activities and other studies of the lizard would be supported. Key planning actions in the RMS included establishing the MAs and, within MAs, limiting cumulative new disturbance to one percent of each MA, limiting vehicle use to designated routes only, reducing route densities, acquisition of inholdings, law enforcement and public education, rehabilitation of degraded habitats, no competitive recreational events, no long-term camping, and no use of pesticides. The planning actions also included research needed to promote conservation of the lizard and its habitat, inventory and monitoring of horned lizard populations and habitats, and maintenance of habitat corridors between MAs. A technical team

(the ICC) and a management team (the Management Oversight Group [MOG]), modeled after similar groups for the desert tortoise, coordinate and track implementation of the strategy.

The ICC compiles an annual report that tracks implementation of the RMS. Compliance with the strategy has been very good, thus far; particularly in regard to establishing MAs, regulating recreation and pesticide use, mitigation and compensation of project impacts, conducting research, monitoring of habitat conditions, and acquiring inholdings. Between 1997 and 2009, signatory lands within MAs increased from 333,100 acres to 453,712 acres, largely through purchase of lands with compensation and mitigation funds (Flat-tailed Horned Lizard Interagency Coordinating Committee Annual Report 2009). As of December 2009, a total of 332 acres (0.07 percent) of flat-tailed horned lizard habitat within the MAs have been authorized for impact by RMS signatories (Flat-tailed Horned Lizard Interagency Coordinating Committee Annual Report 2009). Monitoring of populations in the MAs has begun, but as yet there are not enough data to determine long-term trends. Plans are in place or in preparation to fully implement the strategy, and the ICC and MOG meet regularly. The ICC and MOG are also working with Pronatura, a Mexican non-governmental organization, the Reserva de la Biósfera Alto Golfo de California y Delta del Río Colorado (Alto Golfo Reserve), and the Reserva de la Biósfera Pinacate y Gran Desierto de Altar (Pinacate Reserve) to develop a conservation strategy and monitoring program for the flat-tailed horned lizard in Mexico. The MOG allocated funds to assist with this binational effort.

B. Life History and Habitat

The flat-tailed horned lizard is a small, cryptically colored, phrynosomatid lizard. Flat-tailed horned lizards are oviparous (egg-laying), early maturing, and may produce multiple clutches within a breeding season (Howard 1974). Flat-tailed horned lizards produce relatively small egg clutches (N = 31; mean clutch size = 4.7; range = 3 to 7; Howard 1974), compared to most other horned lizards (Pianka and Parker 1975). The first cohort hatches in July to August (Muth and Fisher 1992; Young and Young 2000) in years of adequate rainfall. Approximately 50 mm of rainfall in the previous September to May period is enough to cause the first cohort to appear in July or August (Grant 2005). Generally a second cohort then appears in the fall (Muth and Fisher 1992). In drier years, only one cohort is produced that emerges in the fall (e.g. Setser 2004, Muth and Fisher 1992). Hatchlings from the first cohort may reach sexual maturity after their first winter season, whereas hatchlings born later may require an additional growing season to mature (Howard 1974, Young and Young 2000). Flat-tailed horned lizards can live up to at least six years in the wild (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003), and up to nine years in captivity (Baur 1986). In the Yuma Desert, few lizards have been found to live longer than four years (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003).

Flat-tailed horned lizards generally lie close to the ground and remain motionless when approached (Wone 1995); however, individuals may also bury themselves in loose sand if it is available (Norris 1949), and more rarely they may flee (Young and Young 2000). Their propensity to remain motionless and bury themselves in the sand, along with their cryptic coloration and flattened body, make them very difficult to find in the field (Foreman 1997, Grant

and Doherty 2007). During the summer, flat-tailed horned lizards escape extreme surface temperatures by retreating to burrows (Rorabaugh 1994, Young and Young 2000). Burrows are usually constructed by the lizards themselves and may be used once or many times.

Based on studies of their daily movements, flat-tailed horned lizards are very active and have large home ranges compared to other sympatric lizard species of similar size (Miller 1999; Wone and Beauchamp 2003). Large variation in home range size was noted among individuals and between years (Miller 1999; Young and Young 2000); this variation may depend on gender and precipitation. However, flat-tailed horned lizards may not maintain distinct home ranges, but instead shift their area of use through time, thereby increasing the home range estimate with each additional location (Miller 1999). Mean home range size for flat-tailed horned lizards has been estimated between 0.56 ha (1.4 ac) and 10.3 ha (25.5 ac) (Muth and Fisher 1992; Miller 1999; Young and Young 2000; Setser 2004).

Adult flat-tailed horned lizards are reported to be obligatory hibernators (Mayhew 1965), although individuals have been noted on the surface during January and February (Wone and Beauchamp 2003). Hibernation may begin as early as October and end as late as March (Muth and Fisher 1992). Individual lizards may hibernate for many months, or as short as one week (Muth and Fisher 1992, Grant 2005), or not at all (Wone and Beauchamp 2003). The date at which flat-tailed horned lizards enter hibernation in the fall depends on the size and weight of the lizard. Larger, heavier lizards begin hibernation sooner (Grant 2005, Grant and Doherty 2006). Hibernation burrows are constructed by the lizards themselves rather than using burrows constructed by other animals. Flat-tailed horned lizards hibernate within 3.9 in of the surface (Muth and Fisher 1992). Mayhew (1965) found that the majority of lizards hibernated within 5 cm (2.0 in) of the surface. The greatest depth recorded was 7.9 in below the surface. Grant (2005) found the median depth of hibernating lizards (N = 31) to be 2.0 in to the center of the dorsum. While most adults apparently hibernate during winter months, some juveniles may remain active (Muth and Fisher 1992, Grant 2005).

The flat-tailed horned lizard lives in some of the hottest and most barren examples of the Sonoran Desert. It is most commonly found below about 755 ft in sandy flats and valleys in a creosote bush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) plant association (Turner *et al*. 1980, Muth and Fisher 1992, Foreman 1997, Rorabaugh and Young 2009). Turner *et al*. (1980) stated the best habitats are generally low-relief areas with surface soils of fine packed sand or pavement, overlain with loose, fine sand. The species is not abundant in large unstable dunes (Turner *et al.* 1980, Rorabaugh and Young 2009). On the upper edges of its range, where this species is sympatric with Goode's and Desert Horned Lizards, soils are typically coarser and vegetation communities can be richer, with occasional trees and ocotillos (Rorabaugh and Young 2009). Flat-tailed horned lizards can also be found in badland habitats in California and Sonora. Within a creosote plant community in West Mesa, California, Muth and Fisher (1992) found that flat-tailed horned lizards preferred sandy substrates with white bursage and Emory dalea (*Psorothamnus emoryi*), and avoided creosote and *Tiquilia plicata*. In Arizona, Rorabaugh *et al*. (1987) found flat-tailed horned lizard abundance correlated with big galleta grass (*Hilaria rigida*) and sandy substrates, but suggested that the presence of sandy substrates

were more important than that of big galleta grass. Beauchamp *et al.* (1998) described flat-tailed horned lizards occupying mud hills and gravelly flats.

The flat-tailed horned lizard, like most horned lizard species, is an ant-foraging specialist (Pianka and Parker 1975, Sherbrooke and Schwenk 2008). Greater than 95 percent of the diet by prey item of flat-tailed horned lizards consists of ants of the genera *Messor*, *Pogonomyrmex*, *Conomyrma*, and *Myrmecocystus* (Turner and Medica 1982, Pianka and Parker 1975, Young and Young 2000). *Messor pergandei* and *Pogonomyrmex* spp. are harvester ants that collect seeds of plants for food. Harvester ants are much larger than *Conomyrma* and *Myrmecocystus* and hence are probably more important prey sources.

C. Distribution and Abundance

The flat-tailed horned lizard has the most restricted range of any species of horned lizard in the United States (Stebbins 2003). The species is endemic to the Sonoran Desert in southwestern Arizona, southeastern California, and northeastern Baja California, and northwestern Sonora, Mexico (Turner and Medica 1982). The revised RMS estimated the historical range of the flat-tailed horned lizard to include 2,606,468 acres in the United States and 3,577,179 acres in Mexico (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). The current range for the flat-tailed horned lizard was estimated by eliminating areas from the historical range now converted to agriculture, urban areas and other anthropogenic disturbances. The current range in the United States was estimated to be 1,199,343 acres, and 2,763,198 acres in Mexico. Thus.Subsequently, approximately 46 and 77 percent of historical flat-tailed horned lizard habitat remained in the United States and Mexico, respectively, as of 2003 (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). The current distribution of the flat-tailed horned lizard is not contiguous across its range.

United States

In Arizona, the range of this species is approximately bounded by the Gila River on the north, urban and agricultural development at Yuma, the Foothills, and along the Colorado River on the west, and to the east by bajadas and relatively coarse, alluvial, granitic soils immediately west of the Gila and Butler mountains (Rorabaugh *et al.* 1987, Hodges 1995). In this area, most records for the species are from areas of fine, often windblown, silica sand dominated by sparse stands of white bursage (*Ambrosia dumosa*), creosote (*Larrea tridentata*), and galleta grass (*Hilaria rigida*) (Rorabaugh *et al.* 1987, Hodges 1995). The species shows a preference for and may be more abundant on sandy substrates as compared to desert pavement or hardpan surfaces (Muth and Fisher 1992, Rorabaugh *et al.* 1987), and in Arizona is most often found in areas of silica sand, rather than granitic sands and gravels (Hodges 1995). Piest and Knowles (2006) estimated 221,214 ac of habitat existed historically in Arizona, of which 62,246 ac (28 percent) have been lost primarily to agricultural and urban development.

In California, the remaining strongholds for the species are in East Mesa (west of the Algodones Dunes), West Mesa (west of El Centro and north of I8), Yuha Basin (southwest of El Centro and south of I8), and in the northeastern portions of Anza Borrego Desert State Park. Additional

populations occur in extreme eastern San Diego County, elsewhere in Imperial County, and in remnant desert scrub in the Coachella Valley, Riverside County.

Mexico

The species occurs in Baja California Norte outside of agricultural and urbanized areas from about 40 miles south of Laguna Salada north to the international boundary and also in remaining desert scrub in extreme northeastern Baja (Grismer 2002, Rodriguez 2002, Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). In Sonora, the flat-tailed horned lizard occurs in the Gran Desierto and Pinacate region from San Luis Rio Colorado south and east to the Gulf of California and Bahia San Jorge (Rodriguez 2002, Rorabaugh 2008). Approximately 60 percent of the species' range in Mexico is located within two areas afforded some protection by the Mexican government: the 1.7 million acre Pinacate Reserve), and the 2.3 million acre Alto Golfo Reserve, both of which are managed by La Comisión Nacional de Áreas Naturales Protegidas (CONANP) (Rorabaugh 2010). The Pinacate Reserve is an area administered by the Mexican government with use restrictions similar to those in a national park in the United States. The Pinacate area is primarily a volcanic zone within which flat-tailed horned lizard habitat is probably limited to the sandy perimeters of Volcan Pinacate and the dunes and sandy flats of the Gran Desierto. The Alto Golfo Reserve includes flat-tailed horned lizard habitat in the vicinity of the Colorado River Delta and southeastward to Bahia Adair.

A study to investigate the distribution of flat-tailed horned lizards in Sonora and Baja was initiated in 2000, and surveys were conducted across the species' range from 2000-2002. Significant range extensions were documented during this study (Rodriguez 2002). There are no recent estimates of habitat loss in Mexico. Johnson and Spicer (1985) estimated that in 1981, approximately 59 percent of the species range occurred in Mexico, with the majority of the range in Mexico occurring in the state of Sonora. Johnson and Spicer (1985) estimated 14 percent of habitat in Sonora was threatened by urban, agricultural or recreational use, and habitat degradation in 1981. According to Rorabaugh (2010), Johnson and Spicer's estimate of occupied habitat in Sonora was conservative, likely resulting in an overestimate of the percentage of the lizard's habitat considered threatened. In Baja California, considerable habitat loss has occurred in the Mexicali Valley, where urban and agricultural development extends from Mexicali to the Colorado River (Johnson and Spicer 1985, Foreman 1997).

Population Trends

From 1979 to 2001, population trends of flat-tailed horned lizards in the United States were monitored using scat counts and lizards observed along transects with year to year variation in methods of transect selection, numbers and experience of observers, numbers of repetitions, and lengths and shapes of transects (Wright 2002). Methodologies that rely on scat counts to assess the relative abundance of flat-tailed horned lizards are confounded by several potential limitations (Wright 2002). The use of scat counts does not account for variations in lizard activity, misidentification of scat from other species, variability in scat production due to fluctuating food resources, weather conditions that affect scat production or longevity in the field, observer differences, and small sample sizes (Muth and Fisher 1992, Rorabaugh 1994).

Consequently, scat abundance may not be closely correlated with lizard abundance under varying conditions (Rorabaugh 1994, Beauchamp *et al*. 1998). In addition, resulting data have not incorporated detection probabilities of lizards (Thompson *et al*. 1998). Because flat-tailed horned lizards are very difficult to find in the field due to their cryptic coloration and behavioral characteristics, incorporating the probability of detecting them into survey results is very important.

The Flat-tailed Horned Lizard RMS was revised in 2003 and capture-mark-recapture (CMR) methodology was adopted as the standard for abundance and trend monitoring (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). Presence/absence surveys in the framework of occupancy estimation (Mackenzie *et al.* 2003) were adopted for distribution monitoring (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). A new monitoring plan using CMR and occupancy was adopted and is meant to form the basis of future flat-tailed horned lizard monitoring (Flat-tailed Horned Lizard Interagency Coordinating Committee 2008). Initial survey results for MAs in the United States are presented below, but it is still too early to draw conclusions about trends in these populations. We have no population estimates for the species in Mexico.

California

The Bureau of Land Management (BLM) recently estimated the population size on three MAs by using CMR. Grant (2005) analyzed the BLM flat-tailed horned lizard mark-recapture data from four summer monitoring surveys of three MAs: the Yuha Basin MA in 2002, the East Mesa MA in 2003, the West Mesa MA in 2003, and the Yuha Basin MA again in 2004. The East Mesa MA was estimated to have 42,619 (95 percent confidence interval [CI] = 19,704 to 67,639) adult lizards (over 65 mm snout-to-vent length) in 2003 and the Yuha Basin MA in 2002 was estimated to have 25,514 adult lizards (95 percent CI = 12,761 to 38,970). The West Mesa MA was estimated to have 10,849 adult lizards (95 percent CI = 3,213 to 23,486). The Yuha Basin in 2004 was estimated to have 73,017 adult lizards (95 percent CI = 4,837 to 163,635). The West Mesa MA survey and the Yuha Basin MA survey of 2004 were based on sparse data, hence the large confidence intervals. No trend can be inferred from the two years of data in the Yuha Basin MA because of the size and overlap of confidence intervals.

Hollenbeck (2004) surveyed the Ocotillo Wells Research Area in 2003. The Ocotillo Wells Research Area is the Ocotillo Wells SVRA, an area open to off-highway vehicle (OHV) recreation. He estimated 19,222 lizards (95 percent CI = 18,870 to 26,752) in 2003. A similar survey completed in 2005 (Eric Hollenbeck, pers. comm.) estimated 24,345 adult lizards (95 percent CI = 14,328 – 69,922) and 37,085 young-of-the-year (95 percent CI = 22,165 – 74,811).

Arizona

Rorabaugh (1994) and Hodges (1995) were the first biologists to try to estimate flat-tailed horned lizard densities based on direct counts of individuals in Arizona. Hodges visited 30 9.9-acre sites spaced evenly across suspected flat-tailed horned lizard range, individually marked each flat-tailed horned lizard found and, based on the total number of individuals, estimated a

density of 0.16 lizards/acre. This should be considered a crude estimate since it couldn't account for flat-tailed horned lizard movement on or off plots during the lengthy time between visits. In 1996, 1997, and 1998, Young and Young (2000) estimated 0.6, 0.6, and 2.1 lizards/acre, respectively, based on total captures in open plots in areas they considered to be high density habitat. They estimated that 19,760 acres within the BMGR portion of the Yuma Desert MA were comprised of such habitat and supported high-densities of flat-tailed horned lizard. Assuming a conservative density estimate of 0.6 lizards/acre in high-density habitat and 0.2 lizards/acre for the remaining 79,040 acres of flat-tailed horned lizard habitat in BMGR, they estimated a population of 28,000 in 1996 within BMGR, which comprises about 88 percent of the Yuma Desert MA. Again, estimates based on repeated visits of open plots over a long period of time should be interpreted with caution.

Young *et al.* (2004) used an occupancy protocol, similar to that subsequently used by the flat-tailed horned lizard ICC, on 9.9-acre plots randomly located within the Yuma Desert MA in 2003. Estimates from this protocol are much more reliable than previous estimates because of the shorter survey duration and the ability to use occupancy modeling to calculate and apply detection rates. Estimates from their study (as revised by Tyler Grant) were 0.2 lizards/acre (95 percent CI = 0.125-0.328) and 25,855 total lizards (95 percent CI = 16,390 – 43,951) for the Yuma Desert MA. For comparison, they estimated densities the same year using pitfall buckets in a trapping web analysis. Their estimates from that technique were 0.125 lizards/acre (95 percent CI = 0.064-0.243) and 16,328 total lizards (95 percent CI = 8,378 – 31,794). In 2005, Young and Royle (2006) estimated 1.7 lizards/acre (95 percent CI = 1.5-1.9) based on capture-recapture analysis of two 29.7-acre plots in high-quality habitat. They estimated an overall population of 22,120 lizards (95 percent CI = 19,962-25,357) for the 10 percent of the MA they considered to be high-quality habitat.

Beginning in 2008, AGFD conducted intensive mark/recapture surveys on two 22.2-acre "demographic" plots in the Yuma Desert MA on BMGR and lands administered by Bureau of Reclamation (BR) using protocols developed by the ICC (Grant 2008). These plots were located within the 10 percent of habitat that Young and Royle (2006) considered to be high-quality. They estimated densities of 1.07 adult lizards/acre (95 percent CI = 0.86 – 1.35) in 2008, and 1.29 adult lizards/acre (95 percent CI = 0.91 –1.66) (Arizona Game and Fish Department 2010). Estimated overall adult flat-tailed horned lizard abundance in high-quality habitat in the Yuma Desert MA was 14,350 (95 percent CI = 11,437-18,019) and 17,264 (12,139-22,120) in 2008 and 2009, respectively (Arizona Game and Fish Department 2010). Results of these monitoring surveys are roughly comparable and are suggestive of a stable population within core habitat areas of the Yuma Desert MA.

D. Threats

Rangewide threats to the flat-tailed horned lizard include widespread habitat loss, fragmentation, and degradation due to past and current human activities such as agricultural and urban development, renewable energy development, OHV use by recreationists, illegal immigrant and smuggler traffic across the international border and associated law enforcement, introduction of non-native plants, sand and gravel mining, cattle grazing in Sonora, military activities, pesticide

use, and climate change (U.S. Fish and Wildlife Service 1993, Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). Several aspects of flat-tailed horned lizard ecology and behavior contribute to the species' sensitivity to habitat loss and degradation. Among these are the following: 1) relatively low clutch size may limit the ability of flat-tailed horned lizard populations to recover from declines; 2) flat-tailed horned lizards often freeze in response to danger, which makes them susceptible to mortality on roads and in other areas of activity; 3) flat-tailed horned lizards are found in valleys and flats where the majority of residential, agricultural, and energy development typically occurs; 4) flat-tailed horned lizards are susceptible to a variety of predators, many of which occur at elevated levels near agriculture or urban areas; and 5) flat-tailed horned lizards inhabit the most arid portions of the Sonoran Desert, in which drought is likely an important factor in population dynamics, which may be exacerbated by accelerated climate change.

Urban and Agricultural Development

Urban and agricultural development is responsible for extensive loss of flat-tailed horned lizard habitat. In the mid-20th century, large areas of flat-tailed horned lizard habitat in the Coachella, Imperial, Mexicali, and San Luis valleys were converted to agriculture using irrigation water from the Colorado River. Agricultural development in flat-tailed horned lizard habitat continues today in some of these areas, albeit at a smaller scale, using pumped groundwater for irrigation. A growing threat in these areas is the subsequent conversion of agricultural land to urban development. Because urban development uses less water than agriculture, urban development then spreads to adjacent previously undeveloped lands without exhausting the limited water supply. Past and current conversion of desert lands to agriculture and urban areas not only destroys habitat, but also fragments remaining habitat.

Infrastructure, such as roads, utility right-of-ways, and canals that support agricultural and urban areas continue to contribute to habitat loss and fragmentation. In the U.S., the All American Canal, Colorado River, East Highline Canal, New Coachella Canal, and Salton Sea are barriers to movement of flat-tailed horned lizards. Major roads such as U.S. Interstates 8 and 10, the Area Service Highway in Arizona, Mexico Highways 2 and 5 are barriers to movement of flat-tailed horned lizards. Recently completed highways in Sonora from San Luis Río Colorado to roughly El Doctor, and from El Golfo de Santa Clara to Puerto Peñasco also eliminated habitat and provide new access to the Gran Desierto. Due to road mortality, there will likely be a "dead zone" along the new highways, in which densities of reptiles are much reduced and some species may be absent (Boarman *et al.* 1992, Rosen and Lowe 1994). Grant *et al.* (2001) found 87 percent fewer flat-tailed horned lizards within 0.45 mi of Highway 98 in California than in areas farther from the road. Young and Young (2005) found that lizard populations can be significantly reduced for at least 1,475 feet from urban or agricultural development, likely due to predation.

Renewable Energy Development

Renewable energy development is a growing threat to the flat-tailed horned lizard in recent years. Numerous energy developments have recently been constructed or are proposed for

construction within flat-tailed horned lizard habitat in the United States and Mexico. In California, companies have applied for permits for wind and solar energy development projects on 41,416 acres of BLM lands within the current distribution of the flat-tailed horned lizard. This includes 348 acres within the Yuha MA. In addition, companies have applied for permits that are immediately adjacent to the boundaries of the East Mesa MA, West Mesa MA, Yuha MA, and Octillo Wells SVRA for a total of 17 of 253 miles or 7 percent of the total boundary of these four areas. There are other proposed solar developments of unknown size on private and State Trust Lands in California and Arizona, as well as one in Mexicali. There are proposed geothermal energy projects proposed in flat-tailed horned lizard habitat in the Imperial Valley and Baja California Norte. Energy developments can result in surface disturbance that modifies flat-tailed horned lizard habitat, making the area no longer suitable for flat-tailed horned lizard.

Off Highway Vehicles

OHV use by recreationists occurs at varying intensities throughout most remaining areas supporting flat-tailed horned lizard habitat. Use guidelines within all of the flat-tailed horned lizard MAs recognized in the RMS allow for OHV use on existing or designated routes. Four areas open to unrestricted OHV use in California are within the range of the flat-tailed horned lizard: Plaster City Open Area, Superstition Hills Open Area, Imperial Sand Dunes Recreation Area; and Ocotillo Wells SVRA. Together, the four Open Areas comprise approximately 247,100 acres which is 25 percent of the approximately 988,400 acres of habitat remaining in California. Illegal OHV recreation is difficult to quantify, but occurs to some degree in many areas inside the MAs. In Arizona, OHV activity occurs in flat-tailed horned lizard habitat near the city of Yuma, but no OHV activity is allowed in the Yuma Desert MA, and that portion of the Barry M. Goldwater Range (BMGR) that is part of the MA, including the Yuma Dunes, is closed to public entry. A recently completed highway from Peñasco to El Golfo de Santa Clara is bringing additional visitors, their OHVs, and associated recreational impacts to remote portions of the Gran Desierto in Sonora.

Another form of off-road vehicle activity within flat-tailed horned lizard habitat in Arizona and California includes illegal border crossings and associated law enforcement patrol and pursuit as described below under “Border Activities”.

The effects of off-road vehicle activity include habitat degradation and direct mortality of lizards. While some research has demonstrated flat-tailed horned lizard fatalities associated with vehicle use (Muth and Fisher 1992), level of vehicle activity at which populations of lizards decline is unclear. Wright and Grant (2003) suggest this threshold is nine percent coverage by vehicle tracks, but their analysis is complicated by other factors that may affect populations. Grant (2005) found that hibernating flat-tailed horned lizards suffer low levels of mortality due to OHVs, but quantification of direct effects of OHVs on active (non-hibernating) lizards has yet to be undertaken. OHVs also degrade habitat by damaging or destroying native plants that provide cover and produce seeds, which are the main food for the harvester ants *Messor pergandei* and *Pogonomyrmex* spp., compacting soils, and destroying cryptobiotic crusts (Webb 1983, Belnap 2002). In the Plaster City Open area, Lathrop (1983) demonstrated a 39 percent reduction in mean density of perennial plants from 1953, before OHVs were commonly used, to 1972. In the

Algodones Dunes, Imperial County, California, Luckenbach and Bury (1983) documented declines in plants, arthropods, mammals, and lizards in areas with relatively low levels of OHV use. In heavily used areas, virtually no plants or animals existed.

Border Activities

Despite recent reported reductions in illegal border activities, flat-tailed horned lizard habitat along the entire U.S.-Mexico border in Arizona and California is threatened by these activities and law enforcement response (Milstead and Barnes 2002, Kralovec 2006, Segee and Neeley 2006, Cordova and de la Parra 2007). In Yuma and Imperial counties, Customs and Border Protection (CBP) is highly active in patrolling the international border (see Sonoran pronghorn threats in the August 21, 2009 biological opinion). In 2006, CBP initiated fence construction in all flat-terrain and lowland areas for the entire California-Mexico border and portions along the Arizona–Mexico border. Several types of fencing (i.e., pedestrian and vehicular) have been constructed by CBP within flat-tailed horned lizard habitat. In the long term, the fences may reduce impacts to flat-tailed horned lizard habitat within the Yuma and Yuha management areas resulting from drug smuggling, illegal immigration, and associated law enforcement actions.

Invasion of Non-native Plants

A growing threat to the flat-tailed horned lizard is invasion of non-native plants, particularly winter annuals. Mediterranean grass (*Schismus arabicus* and *S. barbatus*) is widespread and often abundant, and was first recorded in Arizona in the 1920s and ‘30s (Felger 1990). Sahara mustard (*Brassica tournefortii*), a more recent introduction (Felger 2000), is often common in sandy flats and dunes. This species covered the Mohawk Dunes and surrounding areas during the wet winter of 2004-2005, and appears to be increasing in the Yuma area. Also during the winter of 2004-2005, salad rocket (*Eruca vesicaria*) was the dominant vegetation in a swath along Interstate 8 from Gila Bend to west of Sentinel (~53 km), and was also prominent near Sonoyta. Additional non-native plants, such as Russian thistle (*Salsola tragus*), the perennial buffelgrass (*Pennisetum ciliare*), and many others are common locally, particularly in disturbed areas with relatively fertile soils (Brooks 1999, Wilson *et al.* 2002).

Invasion of non-native plants may increase fire frequency and may alter the prey base of the flat-tailed horned lizard. Historically, fire occurred only very rarely in Sonoran desertscrub (Schmid and Rogers 1988). Many Sonoran Desert plants are poorly adapted to fire and are readily killed. Desertscrub communities that burn, especially if they burn repeatedly, may take decades or centuries to recover (Schmid and Rogers 1988, Schwalbe *et al.* 2000, Narog and Wilson 2003). After a fire, invasive plants are the primary colonizers, which encourages fire even more (Brooks 2002). In the early 1990s, a fire burned 3,500 acres of horned lizard habitat in East Mesa, California, and most of the creosote was killed. It is now dominated by relatively thick exotic plants. In the spring of 2005, after the previous winter’s luxurious growth of annual plants dried out, fires scorched at least 25,500 ha (63,010 ac) on BMGR and 2,025 ha (5,000 ac) on CPNWR (Rorabaugh 2010). Invasive exotic plants also pose a threat to the flat-tailed horned lizard because they are found in areas with a high percentage of bare ground. Stem densities of invasive plant species can become dense enough to impede the movement of flat-tailed horned

lizards. Thick herbage is difficult for them to move through because of their wide bodies (Newbold 2005), perhaps making them more susceptible to predators. Additionally, thick exotic plants shrink their field of view, making it more difficult to find prey. Exotic plant seeds may not be the ideal food resource for the ants that flat-tailed horned lizards prey on. The extent of invasive plant coverage in flat-tailed horned lizard habitat throughout their range has not been measured, but is likely increasing.

Pesticide Use

Aerial insecticide applications in flat-tailed horned lizard habitat to control an agricultural pest may have reduced ant populations in some areas of California; ants are the primary prey of the flat-tailed horned lizard (Turner and Medica 1982, Bolster and Nicol 1989, U.S. Fish and Wildlife Service 1993). Pesticides used in agriculture are known to kill individual surface-foraging harvester ants, though colonies seem to recover quickly from a single treatment (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003). The chronic effects of pesticide drift are unknown and difficult to quantify. Foreman (1997) stated that the effects of applying a broad-spectrum insecticide to desert scrub communities over many years are potentially many and complex. Pesticide/herbicide drift from croplands also has the potential to adversely affect plant communities adjacent to agricultural areas. Although some pesticide drift is likely leaving agricultural areas and entering adjacent desert lands, the magnitude and effects of this drift have not been measured. Aerial spraying on BLM lands has been discontinued (Foreman 1997).

Military Activities

The Departments of the Navy and Air Force administer lands in Arizona and California that include habitat for the flat-tailed horned lizard. Ground-based activities, such as those of troops and vehicles at ground-support areas, along with air-based ordnance delivery could disturb flat-tailed horned lizards and modify habitat; and vehicles, ordnance, live fire, and shrapnel could potentially strike and kill or injure a flat-tailed horned lizard. High level noise from military flying operations including take-off and lands and FCLPs at AUX-2 may alter behavior and reduce survivorship of the flat-tailed horned lizard. The impact of low-flying, very loud aircraft on flat-tailed horned lizards has not been studied. A study by Brattstrom and Bondello (1983) evaluated responses of a lizard species to high level noise exposure. The Mojave fringe-toed lizard, *Uma scoparia*, experienced short-term hearing loss when exposed to dune buggy noise at 95 dBA for a cumulative exposure time of 500 seconds. However, the Mojave fringe-toed lizard has external ear openings, whereas the flat-tailed horned lizard does not, suggesting the flat-tailed horned lizard may be less sensitive to noise. Despite these effects, much of the BMGR is off limits to the public, and only 2.5 percent of lands in the BMGR have been subjected to moderate to high severity military activities; another 7.5 percent have been affected to a lesser degree (U.S. Departments of the Navy, Air Force, and Interior 2006).

Climate Change

Changes in weather patterns associated with global climate change, particularly the timing and amount of rainfall in the Sonoran Desert, are a potential threat to the flat-tailed horned lizard. Mean annual temperatures rose 1.8-3.6 ^{0}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). Additionally, models developed to assess extinction risk to lizards due to climate change suggest that Phrynosomatid lizards are susceptible to increased risk of extinction because of intolerance to an increase in environmental temperatures (Sinervo *et al*. 2010). Therefore, the effects associated with global climate change may adversely affect the flat-tailed horned lizard throughout its range, but the magnitude of this threat is unknown at this time.

Some of these threats have been reduced since the development and implementation of the RMS and we anticipate a further reduction of threats with continued implementation of the RMS. A more detailed analysis of these threats can be found in the RMS (Flat-tailed Horned Lizard Interagency Coordinating Committee 2003), which is hereby incorporated by reference.

ENVIRONMENTAL BASELINE

A. Action Area

The action area specific to the flat-tailed horned lizards includes the ALF and associated facilities proposed on BMGR West (Figure 1). The action area includes the corridor of the access road and adjacent areas where horned lizard populations may be affected by decline due to road mortality, the approximately 127 acre construction footprint of ALF and associated facilities, and an 8,932-acre noise exposure footprint above 65 dB Day-Night Average Sound Level (DNL) surrounding the ALF, where flat-tailed horned lizards populations may be affected by decline due to road mortality, fragmentation, and physiological and behavioral impacts from noise (see Effects of the Action).

C. Status of the Flat-tailed Horned Lizard in the Action Area

The proposed action area for the ALF occurs within the flat-tailed horned lizard Yuma Desert MA comprised of approximately 130,804 acres in the Yuma Desert, of which 115,419 acres (or 88 percent) are within BMGR. The Yuma Desert MA is within the largest geographically distinct area of the flat-tailed horned lizard habitat within the range of the species, including

approximately 2,652,741 acres of the current distribution of the species in the Yuma Desert in Arizona south into Sonora Mexico. However, very little is known about the status of the species in this geographic area outside of the Yuma Desert MA. To date, impacts to flat-tailed horned lizard habitat with the Yuma Desert MA managed by signatories of the RMS are below the one percent cap instituted in 1997. Impacts on the BMGR portion of the Desert Yuma BA since 1997 include removal of 60 acres of habitat: 10 acres from MCAS actions and 50 acres from CBP actions. Significant habitat for the flat-tailed horned lizard still exists in the BMGR portion of the Yuma Desert MA, and this habitat remains the least disturbed of the Arizona portion of the lizard's range.

As stated in the Status of the Species, Young and Young (2000) estimated that 19,760 acres within the BMGR portion of the Yuma Desert MA were high quality habitat with high-densities of flat-tailed horned lizards (0.6 lizards/acre), and 79,040 acres were lower quality habitat (0.2 lizards/acre). With these densities, they estimated a population of 28,000 lizards on the BMGR. Of the two demographic plots established by AGFD in 2008, the BMGR survey plot is less than two miles south of the proposed ALF construction footprint. Estimates of flat-tailed horned lizard densities within the high-quality habitat portion of the MA on BMGR were 1.49 adult lizards/acre (95 percent CI = 1.17-1.86) in 2008 and 1.68 lizards/hectare (95 percent CI = 1.21-2.12) in 2009 (Arizona Game and Fish Department 2010). Estimates of abundance of flat-tailed horned lizards on the BMGR plot was almost twice that of the BR plot for both years. The Navy contracted San Diego Natural History Museum herpetologists to conduct surveys of the flat-tailed horned lizard on a demographic plot in the vicinity of the proposed ALF footprint in June 2010. The results of these surveys were not available to the FWS to incorporate into this conference opinion. Between 1994 and 2007, 85 flat-tailed horned lizards flat-tailed horned lizards were documented within 33 feet of the centerline of the access road from the AUX-2 site southeast to the approximate location of the proposed turn-off for the ALF. An additional 388 flat-tailed horned lizards were found in the proposed construction and noise footprint of the ALF, although this area was not surveyed as extensively as the paved road (all of these locations are within 0.45 mile of a paved or unpaved road). These records are found in our files in Tucson, Rorabaugh *et al.* (1987), Hodges (1997), Rorabaugh (1994), Young and Young (2000).

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

Illegal activities along the border in the Yuma area have increased dramatically over the last decade, and much of the habitat along the border has been impacted by off-road-vehicle activity. During surveys in 2002, Rorabaugh *et al.* (2002) found that vehicle tracks covered 2.86 and 3.36 percent of the surface area on BMGR and Bureau of Reclamation portions of the Yuma Desert MA, respectively. This was relatively low compared to BLM California MAs, which ranged from 4.8-11.4 percent coverage with vehicle tracks (Wright 2002). Fifteen of the 16 transects on BMGR were resampled in 2006; percent cover by vehicle tracks increased only slightly to 2.9 percent on the BMGR and 4.4 percent on the Bureau of Reclamation lands (Fernandez *et al.* 2006). The 16 transects were revisited again in 2007, when percent cover by vehicle tracks declined to 1.4 percent on the BMGR and 2.9 percent on the Bureau of Reclamation lands (Allen and Rorabaugh 2007). However, differences in vehicle track coverage among years (2002, 2006, and 2007) were not significant (Allen and Rorabaugh 2007). The lack of difference among years

was surprising, because during that period there were dramatic changes in apprehensions and law enforcement response. From 2005 to 2006 the number of agents in the Border Patrol's Yuma Sector reportedly doubled to about 700, and arrests in the Sector were up 13 percent from October 2005 to May 2006, as compared to the previous year, which was a record year in regard to arrests (Billeaud 2006). However, by the end of 2007, a pedestrian fence had been constructed along the border from San Luis to the Tinajas Alta Mountains, virtually halting illegal drive-throughs and curtailing pedestrian traffic across the border in the range of the flat-tailed horned lizard in Arizona. In the Yuma Sector of the Border Patrol, apprehensions declined 68 percent in fiscal year 2007 as compared to 2006 (U.S. Customs and Border Protection 2009a), and in 2008 apprehensions dropped another 78 percent (U.S. Customs and Border Protection 2009b).

On State and private lands in the northern Yuma Desert, habitat continues to be developed for agriculture. The habitat north of the BMGR in the Foothills area is rapidly being lost to housing developments.

E. Past and Ongoing Federal Actions in the Action Area

In the Yuma Desert outside of BMGR, numerous proposed or ongoing activities threaten the habitat of the flat-tailed horned lizard. Federal actions that have affected the species in the Yuma Desert outside of BMGR over the last two decades include the following: Bureau of Reclamation's construction of a desalinization sludge disposal facility as part of their Colorado River Salinity Control Project, located approximately one mile north of the intersection of County 23rd and Avenue B; an Arizona State Medium Security Prison State Prison on the southeastern corner of County 23rd and Avenue B, paving of County 23rd and Avenue B, construction of the Area Service Highway, border patrol operations, construction of a hybrid vehicle/pedestrian fence on the U.S./Mexico border, development of a Yuma County Administrative Center, construction of a new port of entry, construction of a landfill along county 23rd east of its intersection with Avenue D, and rights-of way and improvements for roads and utilities. The City of Yuma has a waste water sludge disposal facility in T11S, R23W, SE1/4 section 5, immediately north of the proposed ROW along County 23rd. The waste water site was apparently graded at some time in the past, but the vegetation is recovering. A landfill has been proposed along County 23rd east of its intersection with Avenue D.

Federal Actions Addressed in Section 7 Consultations

On the BMGR, activities that adversely affect the species are as follows:

The original biological opinion for Marine Corps Air Station-Yuma in the Arizona Portion of the Yuma Training Range Complex (consultation number 02-21-95-F-0114), was issued on April 17, 1996. That opinion was reinitiated, and revised opinions were issued November 16, 2001, December 17, 2002, August 6, 2003, and October 21, 2009. Due to the listing status of the flat-tailed horned lizard, effects to the species were addressed only in the original opinion and the reinitiated opinion issued on December 17, 2002. These opinions addressed all proposed and authorized actions on the BMGR by MCAS-Yuma (see Sonoran pronghorn Environmental

Baseline for details). Operation of vehicles and equipment on and off-road, as well as non-vehicular activity such as troop maneuvers, establishment of camps, EOD disposal, ordnance delivery, use of the rifle range, and construction at AUX-2 were determined to adversely affect flat-tailed horned lizards in the 1996 and 2002 opinions. MCAS-Yuma proposed measures to reduce the direct and indirect impacts of the proposed action, including measures to reduce or eliminate take of flat-tailed horned lizards and to minimize destruction and degradation of habitat. We determined that the proposed action was not likely to jeopardize the continued existence of the flat-tailed horned lizard. We anticipated incidental take of 23 flat-tailed horned lizards per year in the form of direct mortality, 10 flat-tailed horned lizards in the form of harm resulting from habitat loss or degradation, and an undetermined number of flat-tailed horned lizards in the form of harassment resulting from moving animals out of harm's way. Biologists conducting surveys in the project area in 2003, 2004, 2007, and 2009 reported finding 11 dead flat-tailed horned lizards on paved access roads or the AUX-2 airfield (Arizona Game and Fish Department flat-tailed horned lizard Database).

Federal Actions For Which Consultation Was Not Conducted For the Species

Due to the listing status of the flat-tailed horned lizard at the time each of the following opinions was issued, effects to this species were not addressed.

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

This biological opinion (consultation number 02-21-96-F-0334), issued September 5, 2000, addressed all USBP activities along the United States/Mexico border in Yuma County from the Colorado River to about the area of Pinta Sands at the southern end of the Sierra Pinta Mountains (see Sonoran pronghorn Environmental Baseline for details). Off-road vehicle use by USBP has caused mortality of flat-tailed horned lizards and destruction of habitat. This includes use of target run in lines on BMGR as vehicle routes. This action was not mitigated through the RMS.

2) Area Service Highway

This biological opinion (consultation number 02-21-95-F-0479) issued July 24, 2003, addressed construction of the 23-mile long Areas Service Highway (ASH) along the western and northern boundaries of the Yuma Desert Management Area from a new port of entry at Avenue E on the international border to Araby Road at Interstate 8, including a portion of the northwestern corner of BMGR West. The consultation did not address the flat-tailed horned lizard, but mitigation and compensation were negotiated with Arizona Department of Transportation and Federal Highways Administration per the RMS. Construction of the ASH was completed in 2009. The ASH effectively isolated parcels of flat-tailed horned lizard habitat west and north of the ASH right-of-way from the MA, resulting in the loss of approximately 4,277 acres of habitat from construction and fragmentation. This included 623 acres of habitat within the highway right-of-way on lands under jurisdiction of RMS signatories (289 acres are within BMGR West and 334 acres are on Reclamation lands) (Arizona Department of Transportation 2005). The portion of the ASH on the BMGR West was constructed through relatively undisturbed flat-tailed horned lizard habitat. The RMS allowed for the Yuma Desert MA boundary to be adjusted to the east

and south side of the ASH right-of-way, so that the ASH defines the MA boundary for a distance of approximately 15 miles. This resulted in isolation of 1,894 acres of habitat on BMGR West. Mitigation and compensation measures for effects to the species were implemented in accordance with the RMS and are outlined in the final Environmental Assessment for the project (Arizona Department of Transportation 2005). Two of these measures included installing lizard barrier fence along 19 miles of the ASH right-of-way where it borders the Yuma Desert MA, as well as providing funds necessary to purchase replacement of lost habitat. The project impacted habitat and caused a loss of about 2.7 percent of current habitat in Arizona; however, the highway and its right-of-way fence now serve as a defensible barrier against OHV and other intrusions into the Yuma Desert MA.

3) MCAS-Yuma Integrated Natural Resources Management Plan for the Barry M. Goldwater Range, Arizona

This biological opinion (consultation number 02-21-05-F-0492), issued on August 25, 2005, addressed implementation of the MCAS-Yuma Integrated Natural Resources Management Plan (INRMP) for BMGR (see Sonoran pronghorn Environmental Baseline for details). Although the biological opinion did not address these effects to the flat-tailed horned lizard, the INRMP fully incorporates implementation of the RMS.

4) Permanent Vehicle Barrier Project on the Barry M. Goldwater Range and Cabeza Prieta National Wildlife Refuge, Arizona

This biological opinion (consultation number 22410-2006-F-0113), issued on September 15, 2006 , addressed the CBP - Office of the Border Patrol's installation of a permanent vehicle barrier along sections of the border from the western end of the OPCNM barrier to Avenue C just east of San Luis, Arizona (see Sonoran pronghorn Environmental Baseline for details)). After issuance of the biological opinion, the project was revised to include a hybrid vehicle/pedestrian fence from Avenue C to the Tinajas Altas Mountains. The project was legislatively exempted from compliance with the Act. Construction of the hybrid barrier, which was a mesh fence attached to a vehicle barrier, was completed in 2008 and removed 74.6 acres of flat-tailed horned lizard habitat including 62.4 acres within the Yuma Desert MA, of which 50.4 acres were on the BMGR. Following ICC recommendations, CBP added slots to the fence that were intended to allow passage of flat-tailed horned lizards. Drifting sand buried some of these slots while others have become stranded high above the sand surface, making many of them inaccessible to flat-tailed horned lizards. However, Rorabaugh (2010) reported erosion under the hybrid barrier and other species of lizards apparently passing under the fence in burrows, so the fence may be somewhat porous to small animals such as the flat-tailed horned lizard, at least in sections. Nonetheless, the hybrid barrier plus the border road and Mexico Highway 2, likely create a barrier between the Arizona and Sonora populations of the species to some degree. This CBP action was not mitigated through the RMS.

5) West Coast Basing of the MV-22 and Reinitiation of Formal Section7 Consultation on Ongoing Activities at the Barry M. Goldwater Range by the Marine Corps Air Station–Yuma

The October 21, 2009 biological opinion for reinitiation of ongoing activities at the BMGR by MCAS-Yuma (consultation number 02-21-95-F-0114) did not address effects to the flat-tailed horned lizard and included actions that changed the baseline for the species within the action area. This opinion addressed effects of up to 10 MV-22 squadrons conducting training and readiness operations at BMGR-West. With the implementation of this action, MV-22 crews use AUX-2 and the surrounding area for flight training at night with night-vision goggles. Airfield-type operations at AUX-2 changed from 572 CH-46 operations to 8,521 MV-22 operations, for a net increase of 7,949 FCLP operations. Air-to-air and air-to-ground operations at Cactus West and Yodaville (previously Moving Sands target) will increase from 31 CH-46 operations to 3,580 operations, for a net increase of 3,549 operations. It is unknown what portion of these operations will occur at the Cactus West target, which is in flat-tailed horned lizard habitat, and Yodaville, which is outside flat-tailed horned lizard habitat. Increased use of roads, runways, and targets associated with the MV-22 operations will have greater effects to the flat-tailed horned lizard than previously analyzed and will increase likelihood of mortality and injury of flat-tailed horned lizards resulting from these activities.

F. Summary of Activities Affecting Flat-tailed Horned Lizards in the Action Area

As of 1997, approximately 31.1 percent of the historical habitat in Arizona had been converted to other land uses, with agriculture (17.5 percent) and urban development (11.1 percent) accounting for most of the habitat conversions (Piest and Knowles 2006). Flat-tailed horned lizards have been affected not only by direct habitat loss, but by edge effects near human disturbance. Despite activities mentioned above, significant habitat for the flat-tailed horned lizard still exists in the BMGR portion of the Yuma Desert MA, and this habitat remains the least disturbed of the Arizona portion of the lizard's range.

EFFECTS OF THE PROPOSED ACTION

The biological opinions on Ongoing Activities by the MCAS-Yuma in the Arizona portion of the YTRC on the BMGR, Yuma and Maricopa counties (02-21-95-F-0114, now 22410-1995-F-0114 and the 2002 reinitiation) evaluated the effects of airfield-type and other operations on flat-tailed horned lizards. Although the use of the F-35B was not specifically evaluated in the biological opinions, the F-35B is intended to replace existing fixed wing aircraft (i.e., F/A-18 Hornet and AV-8B Harrier) that were addressed by those previous opinions. All conservation measures and other requirements within the biological opinions that are applicable to airfield-type and other operations will also be applicable to operations of the F-35B.

Ordnance and Flare Use

Ordnance

Yodaville and Cactus West target complexes continue to be the only air-to-ground weapons ranges at which actual ordnance delivery occurs within BMGR West. The number of anticipated ordnance delivery at these targets will not change with the current proposed action. However, subsequent to the 1996 conference opinion that addressed effects to the flat-tailed horned lizard,

the number of anticipated ordnance deliveries at these targets has increased by 3,580 air-to-air and air-to-ground firing operations of the MV-22, according to the 2009 Biological Assessment for the MV-22. As stated in the 1996 opinion, lizards on the Cactus West target complex could be killed during grading of the target, access and maintenance of the target, EOD clearances, and delivery of ordnance during air-to-ground operations. Yodaville is outside the range of the flat-tailed horned lizard, but lizards occur along established vehicle access routes to Yodaville and could be killed by military personnel travelling to access the Yodaville target complex for maintenance and EOD clearance. The likelihood of these effects to flat-tailed horned lizards has increased with the increase in operations at both target complexes.

Flares

The effect of flares continues to be increased incidence of fire in flat-tailed horned lizard habitat. Under the proposed action, the Marine Corps expects to use fewer flares than the legacy aircraft due to the F-35B capabilities. Additionally, the F-35B will fly higher than legacy aircraft; as such, flare release will nearly always occur well above minimum release altitudes necessary to ensure complete and safe combustion of the flare. Furthermore, fuel loads are rarely if ever high enough in the Yuma Desert to carry a fire. Consequently, we anticipate almost no chance that a wildfire will result from flare use.

Auxiliary Airfield 2 and Proposed Auxiliary Landing Field

Construction, Operation and Maintenance of ALF Facilities

Construction, operation, and maintenance of ALF Facilities will occur entirely within the Yuma Desert MA for the flat-tailed horned lizard. According to the 2010 BA, construction of the proposed ALF, creation of an access road to connect the ALF to the Hardball (existing access paved road), and extension and creation of associated utilities would permanently remove 82.7 acres of relatively undisturbed flat-tailed horned lizard habitat on the BMGR. This represents 0.07 percent of the total MCAS-Yuma administered lands within the Yuma Desert MA (115,130 acres). An additional 44 acres of flat-tailed horned lizard habitat will be disturbed as a result of construction and equipment/materials storage and staging areas. For the purpose of this consultation, habitat disturbance from staging and storage areas may recover over a period of decades after project construction is completed in 2016. Recovery of staging and storage areas would be more rapid if the area is not cleared and shrubs are crushed rather than excavated; however, plants may not survive during the long period of construction proposed from 2012 through 2016.

Flat-tailed horned lizards are known to occur in the project areas and would be subject to mortality or injury during all the three phases of construction. Animals could be crushed by vehicles or equipment while in their underground, shallow burrows, or while on the surface. Flat-tailed horned lizards often freeze, rather than flee, when approached. Thus, they are especially susceptible to crushing by vehicles or equipment. Although we do not know the quality of habitat within the project footprint, we assume the amount of high quality habitat ranges from 20 to 100 percent (Young and Young 2000, Arizona Game and Fish Department

2010). We also assume that the density of flat-tailed horned lizards in high quality habitat is between 0.6 lizards/acre (Young and Young 2000) and 1.6 lizards/acre (Arizona Game and Fish Department 2010), and density in low quality habitat is 0.2 (Young and Young 2000). Following these assumptions, approximately 66 to 203 flat-tailed horned lizards may currently occupy the 126.7 acres that would be lost or disturbed as a result of the project. These animals would either be killed during construction or would move or be moved off the site. Several of the conservation measures included in the proposed action will reduce the likelihood of these effects occurring, including having biological monitors onsite during construction activities to move flat-tailed horned lizards out of harm's way, minimizing ground-disturbing activities to a flagged area, implementing a worker education program to increase awareness of the presence of the species, and possibly constructing a permanent lizard-proof barrier fence. However, if a permanent exclusion fence is not constructed around the ALF facilities, the ALF is also expected to act as a population sink, in that flat-tailed horned lizards will be killed by vehicles, jet exhaust, and possibly noise. Populations in adjacent undisturbed habitat will likely be depleted as animals wandering in from those areas are killed.

The Hardball goes through approximately 20 miles of flat-tailed horned lizard habitat, beginning from the ASH near the northwestern corner of the BMGR to its intersection with South Foothills Boulevard on the eastern boundary of the Yuma Desert MA. Vehicle miles traveled in flat-tailed horned lizard habitat will increase by 16 percent (see Table 7) due to additional travel of military personnel on the Hardball and new access road to the ALF facility, and is expected to result in additional, ongoing mortality and injury to lizards. Roads can act as mortality sinks for small animals (Boarman *et al.* 1992, Rosen and Lowe 1994). Over a four-year period, mortality along a 27.4-mile section of Route 85 in southern Arizona, Rosen and Lowe (1994) recorded mortality of snakes equivalent to the estimated snake population in a 1.93 mi^2 area. They also found this to be equivalent to eliminating all snakes within 213 feet of the road. Desert tortoise populations are depleted up to a mile or more on either side of roads for which average daily traffic is greater than 180 vehicles (Nicholson 1978a&b). Grant *et al.* (2001) found 87 percent fewer flat-tailed Horned Lizards within 0.45 mile of Highway 98 in California than in areas farther from the road. Periodic maintenance of roadways and runways could also result in occasional mortality or injury of horned lizards. During resurfacing of roadways, lizards and other small animals may become entrapped in drying asphalt or on oiled surfaces. Re-grading of road shoulders could result in crushing of animals in burrows or on the surface.

Analysis suggests that flat-tailed horned lizard population viability is particularly sensitive to mortality (Flat-tailed Horned Lizard Conservation Team 1996). Thus, the ongoing mortality of flat-tailed horned lizards expected along the access road to the ALF and within the ALF facility could affect horned lizard populations for significant distances from these facilities.

Airfield-Type Operations at AUX-2 and ALF

All airfield-type operations at the ALF and associated noise exposure described in the proposed action will occur within the flat-tailed horned lizard habitat in the Yuma Desert MA. The number of proposed airfield-type operations at AUX-2 and the proposed ALF will decrease by 8 percent from the baseline presented in the 2010 BA (11,812 to 10, 857 operations, see Table 4).

The MV-22 will include a maximum of 8,521 annual FCLP operations and will replace CH-46 operations, for a net increase of 7,949 rotary-wing operations, at AUX-2 after legacy fixed wing aircraft are phased out. Therefore, the number of all proposed airfield-type operations within flat-tailed horned lizard habitat (e.g. both facilities) will increase by 64 percent from the 1996 baseline previously evaluated for this species (11,812 to 19,318 operations), which did not include the projected MV-22 operations. Aircraft landings and takeoffs at both AUX-2 and the proposed ALF may result in mortality of flat-tailed horned lizards that are burned by jet exhaust from ongoing operations of the MV-22 and proposed operations of the F-35B.

The exposure area and noise levels described in the proposed action will also increase significantly from baseline operations. The total area of flat-tailed horned lizard habitat within estimated contours for noise levels 65 dBA DNL or greater from fixed-wing legacy aircraft will increase by 215 percent (see Table 5). The amount of habitat within the contour depicting the highest noise levels (greater than 85 dBA DNL) will increase exponentially by 1,217 percent. Since the location of the 8,932- acre noise footprint from airfield-type operations at proposed ALF overlaps with only 105 acres of the existing noise footprint, it is likely that flat-tailed horned lizards previously not exposed to noise levels greater than 65 dBA DNL will be exposed to these noise levels under the proposed action. In addition, flat-tailed horned lizards will be exposed to maximum noise levels 8-10 percent higher than they have been exposed to in the action area in the past (see Table 6). Although the MV-22 will continue to operate at AUX-2 after legacy fixed wing aircraft are phased out, the size and magnitude of the noise footprint for ongoing FCLP operations of the MV-22 are unknown. As stated in the 1996 biological opinion, aircraft noise could result in hearing loss and altered behavior of the flat-tailed horned lizard. Although the specific effects from noise on the flat-tailed horned lizard have not been investigated,the lizard's behavior could potentially be altered and or survivorship could be reduced (see 1996 biological opinion). However, the flat-tailed horned lizard has continued to persist under ongoing levels of noise exposure, suggesting tolerable effects of current noise levels. MCAS-Yuma has committed to investigate effects to flat-tailed horned lizard due to increased noise from the proposed and ongoing actions. If effects are documented different than are anticipated here, this issue may need to be revisited.

Summary

Based on the information provided and the analysis above, we have determined that, overall, there will be more adverse effects to flat-tailed horned lizards from the proposed F-35B operations, elimination of legacy aircraft (i.e., F/A-18 Hornet and AV-8B Harrier), and ongoing operations of the MV-22 Osprey than those evaluated for F/A-18 Hornet and AV-8B Harrier aircraft operations in the April 17, 1996 conference opinion. The construction of the ALF will permanently remove 82.7 acres and have long-term (decades) adverse effects on 44 acres of flat-tailed horned lizard habitat in the Yuma Desert MA. Increased traffic on the existing paved access road and new access to the ALF will increase the number of flat-tailed horned lizards killed or injured by road kill. Population sinks may occur or worsen along these roads as well as at the ALF itself, with effects to flat-tailed horned lizard populations in adjacent, undisturbed habitats. Although the specific effects from noise on the flat-tailed horned lizard have not been

investigated, the lizard's behavior could potentially be altered and/or survivorship could be reduced.

CUMULATIVE EFFECTS

Of most significant recent concern to flat-tailed horned lizard in the action area is the high level of CBV activity. CBV activity and its effects to flat-tailed horned lizards and their habitat is described under the "*Border Activities*" portions of the "Threats" section under "Status of the Species" for flat-tailed horned lizard and "Past and Ongoing Non-Federal Actions in the Action Area". CBV activity has resulted in route proliferation, off-highway vehicle activity, increased human presence in backcountry areas, discarded trash, abandoned vehicles, and illegal campfires. Habitat degradation and disturbance of flat-tailed horned lizards have resulted from these CBV activities. Though CBV activity has been high in recent years, it has declined recently, likely due to increased law enforcement presence, the border fence, and the status of the economy in the U.S. In particular, the number of drive-throughs in the action area has decreased significantly since construction of the border fence. This decrease has resulted in a consequent decrease in human disturbance to flat-tailed horned lizards and their habitat.

CONCLUSION

After reviewing the current status of the flat-tailed horned lizard, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, we reaffirm our previous conference opinions that the proposed action is not likely to jeopardize the continued existence of the flat-tailed horned lizard. No critical habitat has been designated for this species; therefore, none will be affected. Our conclusion is based on the rationale given in our April 17, 1996 and December 17, 2002 conference opinions, and the following:

1. The acreage of flat-tailed horned lizard habitat anticipated to be lost or degraded is small (127 acres) compared to the size of the Yuma Desert MA (115,130 acres). The Yuma Desert MA is one of 5 MAs, which in total are 485,000 acres.

2. Ongoing mortality of flat-tailed horned lizards expected along the access road to the ALF and within the ALF facility could affect horned lizard populations for significant distances from these facilities. However, these effects will be reduced if MCAS-Yuma decides to build lizard barrier fencing around project facilities.

3. Increased noise levels could adversely affect the hearing and behavior of flat-tailed horned lizards. However, the flat-tailed horned lizard has continued to persist under current levels of noise exposure and MCAS-Yuma will investigate effects to flat-tailed horned lizard of increased noise from the proposed and ongoing actions.

4. Risk of wildfire caused by flares dropped from aircraft is negligible. This is primarily because the F-35B will fly higher than legacy aircraft and flares will have a higher likelihood of burning out before they reach the ground. Furthermore, fuels in flat-tailed horned lizard habitat are rarely if ever great enough to carry a wildfire.

5. MCAS-Yuma has been a key partner in the conservation of the flat-tailed horned lizard and will continue to participate as a signatory to the flat-tailed horned lizard RMS.

6. Conservation measures included in the 1996 Biological Opinion and the proposed action will help reduce disturbance to and the risk of injury or death of flat-tailed horned lizards from project-related activities.

7. Conservation measures included in the proposed action (i.e., implementing and providing funding to implement priority conservation actions for the species) will help offset adverse effects to lizards that could result from implementation of the project.

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.

The prohibitions against taking in section 9 of the Act do not apply to proposed species, such as the flat-tailed horned lizard. By incorporation of the conservation measures, impacts of the proposed action will be decreased.

AMOUNT OR EXTENT OF TAKE

This conference opinion anticipates the following forms of take would occur as a result of the proposed action, including ongoing operations as described in the 1996 conference opinion:

1) All flat-tailed horned lizards (up to 203) inhabiting the action area, including the 126.77-acre proposed ALF site which includes the new access road to the proposed ALF site. Take is anticipated in the form of direct mortality or injury, including crushing or injury as a result of construction activities, and in the form of harm resulting from loss or degradation of habitat. If MCAS-Yuma decides not to build the lizard barrier fencing,

additional flat-tailed horned lizards that imigrate into the ALF from adjacent areas will be subject to incidental take from these same causal factors.

2) Thirty flat-tailed horned lizards per year in the form of direct mortality or injury resulting from crushing during operations of vehicles and equipment on and off-road, or crushing or burning during airfield operations of aircraft. This is an increase from twenty flat-tailed horned lizards per year anticipated in the 1996 conference opinion.

3) Five flat-tailed horned lizards per year in the form of direct mortality or injury associated with non-vehicular aspects of troop maneuvers, establishment of camps, EOD disposal, ordnance delivery, use of the rife range, cargo pallet delivery and recovery at the parachute drop zone, and other non-vehicular activities described in this biological opinion and the 1996 biological opinion in "DESCRIPTION OF THE PROPOSED ACTION". This is an increase from three flat-tailed horned lizards per year anticipated in the 1996 conference opinion

4) Undeterminable numbers of flat-tailed horned lizards per year through harassment associated with aircraft noise, and movement of horned lizards out of harm's way during construction and other activities.

If this conference opinion is adopted as a biological opinion, we will only authorize forms of take (see above) that are incidental to activities as described in the Description of the Proposed Action. If adopted as a biological opinion, take will be authorized for the West Coast Basing and Operations of the F-35B Joint Strike Fighter and ongoing operations at BMGR West by MCAS-Yuma, so long as the proposed action is carried out as described herein.

EFFECT OF THE TAKE

In this conference opinion, the FWS determines that this level of anticipated take is not likely to result in jeopardy to the species for the reasons stated in the Conclusions section.

REASONABLE AND PRUDENT MEASURES

Reasonable and Prudent Measures remain the same as in the 1996 conference opinion.

TERMS AND CONDITIONS

Terms and Conditions remain the same as in the 1996 conference opinion.

Disposition of Dead or Injured Listed Species

Upon locating a dead, injured, or sick listed species initial notification must be made to the FWS's Law Enforcement Office, 2450 W. Broadway Rd, Suite 113, Mesa, Arizona, 85202, telephone: 480/967-7900) within three working days of its finding. Written notification must be made within five calendar days and include the date, time, and location of the animal, a photograph if possible, and any other pertinent information. The notification shall be sent to the

Law Enforcement Office with a copy to this office. Care must be taken in handling sick or injured animals to ensure effective treatment and care, and in handling dead specimens to preserve the biological material in the best possible state.

CONSERVATION RECOMMENDATIONS

We continue to recommend implementing the conservation measures in our August 6, 2003 biological opinion and 1996 conference opinion.

REINITIATION NOTICE

This concludes formal consultation on the West Coast Basing and Operations of the F-35B Joint Strike Fighter outlined in your reinitiation request. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

Thank you for your cooperation and assistance throughout this consultation process. Any questions or comments should be directed to Erin Fernandez (520) 670-6150 (x238) or Jim Rorabaugh (520) 670-6150 (x230).

Sincerely,

/ s / Jim Rorabaugh for
Steven L. Spangle
Field Supervisor

cc (hard copy):
Field Supervisor, Fish and Wildlife Service, Phoenix, AZ (2)
Assistant Field Supervisor, Fish and Wildlife Service, Tucson, AZ
Field Supervisor, Fish and Wildlife Service, Carlsbad, CA (Attn: Jonathan Snyder)

cc (electronic copy):
Refuge Manager, Cabeza Prieta National Wildlife Refuge, Ajo, AZ
Director, 56th Range Management Office, Luke Air Force Base, Gila Bend, AZ
Director, Range Management Department, Marine Corps Air Station, Yuma, AZ
Chief, Habitat Branch, Arizona Game and Fish Department, Phoenix, AZ
Regional Supervisor, Arizona Game and Fish Department, Yuma, AZ

LITERATURE CITED

Allen, T., and J. Rorabaugh. 2007. Human disturbance in the Flat-tailed Horned Lizard Yuma Desert Management Area. Marine Corps Air Station, Yuma, AZ.

Arizona Department of Transportation. 2005. Final environmental assessment for Yuma Areas Service Highway, Yuma County, Arizona. Federal Project No. HPP-900-A(022)

Arizona Game and Fish Department. 2010. Flat-tailed horned lizard demographic monitoring within the Yuma Desert management Area, Arizona. 2009 Progress Report. 11 pp.

Baur, B.E. 1986. Longevity of horned lizards of the genus *Phrynosoma*. Bulletin Maryland Herpetological Society 22:149-151.

Beauchamp, B., B. Wone, S. Bros, and M. Kutilek. 1998. Habitat use of the flat-tailed horned lizard (*Phrynosoma mcallii*) in a disturbed environment. Journal of Herpetology 32:210-216.

Belnap J. 2002. Impacts of off-road vehicles on nitrogen cycles in biological soil crusts: resistance in different U.S. deserts. Journal of Arid Environments 52(2):155-165.

Boarman, W.I., M. Sazaki, and W.B. Jennings. 1997. The effects of roads, barrier fences, and culverts on desert tortoise populations in California, USA. Proceedings: Pp. 54–58 *in* Conservation, Restoration, and Management of Tortoises and Turtles—An International Conference. New York Turtle and Tortoise Society.

Bolster, B. and K. Nicol. 1989. The status of the flat-tailed horned lizard (*Phrynosoma mcallii*) in California. California Department of Fish and Game, Sacramento.

Brattstrom, B.H. and M.C. Bondello. 1983. Effects of off-road vehicle noise on desert vertebrates. In R.H. Webb and H.G Wilshire, editors. Environmental effects of Off- Road Vehicles: Impacts and Management in Arid Regions. Springer-Verlag. New York, New York, USA.

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.

Brooks, M.L. 1999. Habitat invisibility and dominance by alien annual plants in the western Mojave Desert. Biological Invasions 1:325-337.

Brooks, M.L., and T.C. Esque. 2002. Alien plants and fire in desert tortoise (*Gopherus agassizii*) habitat of the Mojave and Colorado Deserts. Chelonian Conservation and Biology 4: 330–340.

Cockrum, E.L., and Y. Petryszyn. 1991. The lesser long-nosed bat. Leptonycteris: An endangered species in the Southwest? Texas Tech Univ., Occas. Pap. Mus., Number 142.

Brooks, M.L. 1999. Habitat invisibility and dominance by alien annual plants in the western Mojave Desert. Biological Invasions 1:325-337.

Brooks, M.L., and T.C. Esque. 2002. Alien plants and fire in desert tortoise (*Gopherus agassizii*) habitat of the Mojave and Colorado Deserts. Chelonian Conservation and Biology 4: 330–340.

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

Dames and Moore. 1997. Bat Surveys at Mine Sites on the Barry M. Goldwater Range. Dames and Moore Job No. 01016-610-050. Final Report to Natural Resources Program, Luke Air Force Base, AZ.

Felger, R.S. 1990. Non-native plants of Organ Pipe Cactus National Monument. University of Arizona, Cooperative National Park Resource Studies Unit, Technical Report 31:1-93.

Felger, R.S. 2000. Flora of the Gran Desierto and Río Colorado of northwestern Mexico. University of Arizona Press, Tucson.

Flat-tailed Horned Lizard Interagency Coordinating Committee. 2003. Flat-tailed horned lizard rangewide management strategy, 2003 revision. 78 pp. plus appendices.

Flat-tailed Horned Lizard Interagency Coordinating Committee. 2008. Flat-tailed Horned Lizard Monitoring Plan. 38 pp.

Foreman, L.D. (Ed.). 1997. Flat-tailed horned lizard rangewide management strategy. Report of the Working Group of the Flat-tailed Horned Lizard Interagency Coordinating Committee.

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.

Grant, T.J. 2005. Flat-tailed horned lizards (*Phrynosoma mcallii*): Population size estimation, effects of off-highway vehicles, and natural history. Thesis. Fall 2005. Colorado State University, Fort Collins, CO.

Grant, T.J., and P.F. Doherty, Jr. 2006. *Phrynosoma mcallii* (Flat-tailed Horned Lizard): Hibernation. Herpetological Review 37:346-347.

Grant, T.J., and P.F. Doherty Jr. 2007. Monitoring the flat-tailed horned lizard with methods incorporating detection probability. The Journal of Wildlife Management 71: 1050–1056.

Grismer, L.L. 2002. Amphibians and reptiles of Baja California, including its Pacific Islands and the Islands of the Sea of Cortéz. University of California Press, Berkeley.

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.

Hodges, W. 1995. *Phrynosoma mcallii* occurrence in Arizona. Unpublished report. Arizona Game and Fish. August 31, 1995. 18 pp. + tables and figures.

Hollenbeck, E. 2004. Ocotillo Wells district 2003 flat-tailed horned lizard (*Phrynosoma mcallii*) mark/recapture report. California Department of Parks and Recreation, Ocotillo Wells District.

Howard, C.W. 1974. Comparative reproductive ecology of horned lizards (Genus *Phrynosoma*) in southwestern United States and northern Mexico. J. Ariz. Acad. of Sciences 9:108-116.

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

Johnson, T.B., and R.B. Spicer. 1985. *Phrynosoma mcallii* (Hallowell 1852) Flat-tailed horned lizard. Contract Report No. 14-16-002-81-224 to US Fish and Wildlife Service, Albuquerque, N.M.

Kralovec, M.L. 2006. Past, present, and future management of border related impacts on Organ Pipe Cactus National Monument resources. In Programs and Abstracts: Borders, Boundaries, and Time Scales, Sixth Conference on Research and Resource Management in the Southwestern Deserts, Tucson, AZ, pp. 41

Lathrop, E.W. 1983. The effect of vehicle use on desert vegetation. Pp. 153–166 *in* R.H. Webb and H.G. Wilshire (eds.). Environmental effects of off-road vehicles. Springer-Verlag, New York, NY.

Luckenbach, R.A., and R.B. Bury. 1983. Effects of Off-Road Vehicles on the Biota of the Algodones Dunes, Imperial County, California. Journal of Applied Ecology 20: 265–286.

MacKenzie, D.I., J.D. Nichols, G.B. Lachman, S. Droege, J.A. Royle, and C.A. Langtimm. 2003. Estimating site occupancy rates when detection probabilities are less than one. Ecology 83:2248-2255.

Mayhew, W.W. 1965. Hibernation in the horned lizard, *Phrynosoma mcallii*. Comp. Biochem. Physiol. V16:103-119.

Miller, P. A. 1999. Home range (?) of the flat-tailed horned lizard *Phrynosoma mcallii*. MS Thesis. Utah State University, Logan, Utah.

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

Muth, A., and M. Fisher. 1992. Development of baseline data and procedures for monitoring populations of the flat-tailed horned lizard, *Phrynosoma mcallii*. Contr. Rept. No. FG9268 to Calif. Dept. of Fish and Game, Sacramento, Calif.

Narog, M.G., and R.C. Wilson. 2003. Delayed mortality: saguaro cacti are still dying 10 years after wildfire!, P2.9, Second International Wildland Fire Ecology and Fire Management Congress and Fifth Symposium On Fire And Forest Meteorology, American Meteorological Society, Boston, Massachusetts.

Newbold, T. A. S. 2005. Desert horned lizard (*Phrynosoma platyrhinos*) locomotor performance: The influence of cheatgrass (Bromus tectorum).

Nicholson, L., 1978. The effects of roads on desert tortoise populations. In: Proceedings of the 1978 Desert Tortoise Council Symposium, 127–129.

Norris, K.S. 1949. Observations on the habits of the horned lizard *Phrynosoma m'callii*. Copeia 1949:176-180.

Parker, W.S., and E.R. Pianka, E.R. 1975. Ecology of horned lizards: A review with special reference to *Phrynosoma platyrhinos*. Copeia 1975(1):141-162.

Piest, L., and B. Knowles. 2006. An analysis of the status and land ownership of flat-tailed horned lizard habitat in Arizona: 2006 update. April 2006. Unpublished report, Arizona Game and Fish Department, Yuma, AZ. 4 pp.

Rodriguez, R. 2002. Evaluation of status, distribution and develop of education/interpretation materials of the flat tailed horned lizard, *Phrynosoma mcallii* (Hallowell) in Mexico. Unpublished report. Contract – 00PG340230. Centro Intercultural de Estudios de Desiertos y Océanos, A.C. In colaboration with Reserva de la Biosfera Alto Golfo de California y Delta del Río Colorado, Baja California-Sonora Reserva de la Biosfera "El Pinacate y Gran Desierto de Altar, Sonora Comisión Nacional de Áreas Naturales Protegidas (CONANP).

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

Rorabaugh, J.C. 2010. Conservation of amphibians and reptiles in northwestern Sonora and southwestern Arizona. Pp. 181–204 *in* W. Halvorson, C. Schwalbe, and C. van Riper III. Southwestern desert resources. The University of Arizona Press, Tucson, AZ.

Rorabaugh, J.C. 1994. An analysis of scat counts as a survey method for the flat-tailed horned lizard (*Phrynosoma mcallii*). U.S. Fish and Wildlife Service, Phoenix, AZ

Rorabaugh, J.C., and K.V. Young. 2009. Flat-tailed horned lizard, *Phrynosoma mcallii* (Hallowell, 1852). Pp. 182–185 *in* L.L.C. Jones and R.E. Lovich (eds.). Lizards of the American Southwest, a photographic field guide. Rio Nuevo Publishers, Tucson, AZ.

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

Rorabaugh, J.C., S. Vissman, and B.L. Morrill. 2000. A multi-agency conservation agreement for the flat-tailed horned lizard, *Phrynosoma mcallii*, in the Sonoran Desert of southwestern Arizona and southeastern California. Pages 75-76 *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.

Rodriguez, R. 2002. Evaluation of the status, distribution, and development of education/interpretation materials of the flat-tailed horned lizard, *Phrynosoma mcallii* (Hallowell) in Mexico. Contract - 00PG340230. Centro Intercultural de Estudios de Desiertos y Océano, A.C. Puerto Peñasco, Sonora, Mexico. 34 p + appendices.

Rosen, P.C., and C.H. Lowe. 1994. Highway mortality of snakes in the Sonoran Desert of southern Arizona. Biological Conservation 68(1994):143-148.

Schmid, M.K., and G.F. Rogers. 1988. Trends in fire occurrence in the Arizona upland subdivision of Sonoran Desert, 1955-1983. The Southwestern Naturalist 33:437-444.

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. In Creative cooperation in resource management: third conference on research and

management in the Southwestern deserts, extended abstracts, edited by W.L. Halvorson and B.S. Gebow, pp. 87. USGS Sonoran Desert Field Station, University of Arizona, Tucson.

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

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

Setser, K. 2004. Natural history, demography, and home range characteristics of a southern California population of *Phrynosoma mcallii* inhabiting atypical habitat. Thesis. Utah State University, Logan, UT.

Sherbrooke, W.C., and K. Schwenk. 2008. Horned Lizards (*Phrynosoma*) Incapacitate Dangerous Ant Prey With Mucus. Journal of experimental zoology 309A: 447–459.

Sinervo, B., F. Méndez-de-la-Cruz, D.B. Miles, B. Heulin, E. Bastiaans, M. Villagrán-Santa Cruz, R. Lara-Resendiz, N. Martínez-Méndez, M.L. Calderón-Espinosa, R.N. Meza-Lázaro, and others. 2010. Erosion of lizard diversity by climate change and altered thermal niches. Science 328: 894–899.

Stebbins, R.C. 2003. Western reptiles and amphibians, third edition. Houghton Mifflin Company, New York, NY

Thompson, W.L., G.C. White, and C. Gowan. 1998. Monitoring Vertebrate Populations. Academic Press, San Diego, California 365pp.

Turner, F.B., and P.A. Medica. 1982. The distribution and abundance of the flat-tailed horned lizard (*Phrynosoma mcallii*). Copeia 1982(4):815-823.

Turner, F.B., J.C. Rorabaugh, E.C. Nelson, and M.C. Jorgensen. 1980. A survey of the occurrence and abundance of the flat-tailed horned lizard (*Phrynosoma mcallii*) in California. Report to the Bureau of Land Management, Riverside, CA.

U.S. Customs and Border Protection. 2008a. Environmental Stewardship Plan for the construction, operation, and maintenance of tactical infrastructure, U.S. Border Patrol El Centro Sector, California. May 2008.

U.S. Customs and Border Protection. 2008b. Environmental Stewardship Plan for the construction, operation, and maintenance of tactical infrastructure, U.S. Border Patrol Yuma Sector, Arizona and California. May 2008.

U.S. Departments of the Navy, Air Force, and Interior. 2006. Final environmental impact statement for the Barry M. Goldwater Range Integrated Natural Resources Management Plan, Vol. 1. Marine Corps Air Station-Yuma and Luke Air Force Base, Arizona. 616 p.

U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants: proposed rule to list the flat-tailed horned lizard as threatened. Federal Register V58(227):62624-62629.

Webb, R.H. 1983. Compaction of desert soils by off-road vehicles. Pp. 51–79 *in* R.H. Webb and H.G. Wilshire (eds.). Environmental effects of off-road vehicles. Springer-Verlag, New York, NY.

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

Wilson, M.F., L. Leigh, and R.S. Felger. 2002. Invasive exotic plants in the Sonoran Desert. In Invasive exotic species in the Sonoran region, edited by B. Tellman, pp. 81-90. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson, AZ. 424 p.

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

Wilson, M.F., L. Leigh, and R.S. Felger. 2002. Invasive exotic plants in the Sonoran Desert. In Invasive exotic species in the Sonoran region, edited by B. Tellman, pp. 81-90. University of Arizona Press and the Arizona-Sonora Desert Museum, Tucson, AZ. 424 p.

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**,** G. 2002. Flat-tailed horned lizard monitoring report. Bureau of Land Management, Unpublished report. 55pp.

Wright, G., and T. Grant. 2003. Flat-tailed horned lizard (*Phrynosoma mcallii*) monitoring report. Bureau of Land Management. April 2003.

Young, K.V., and A.T. Young. 2000. Final report: scientific study of the flat-tailed horned lizard, *Phrynosoma mcallii*. U.S. Dept. of Navy Contracts N68711-95-LT-C0032, N68711-95-LT-C0035. Http://bioweb.usu.edu/flattailweb.

Young, K.V., A.T. Young, and H. Spitzer. 2004. Comparison of three monitoring techniques for flat-tailed horned lizards: trapping web, mark-recapture, and presence-absence. Final report to Arizona Game and Fish Department, Yuma. 29 pp.

Young, K.V., and A.T. Young. 2005. Indirect Effects of Development on the Flat-tailed Horned Lizard. February 2005. Final report submitted to Arizona Game and Fish Department, Yuma.

Young, K.V., E.D. Brodie Jr., E.D. Brodie III. 2004. How the horned lizard got its horns. Science 304: 65.

Young, K.V., and J.A. Royle. 2006. Abundance and site occupancy of flat-tailed horned lizard (*Phrynosoma mcallii*) populations in Arizona and California. Final Report Submitted to: U.S. Bureau of Reclamation, U.S. Navy, and Arizona Game and Fish Department, October 2006.

FIGURES

Figure 1. Marine Corps F-35B Basing Locations and Core Use Airspace and Ranges in Arizona.

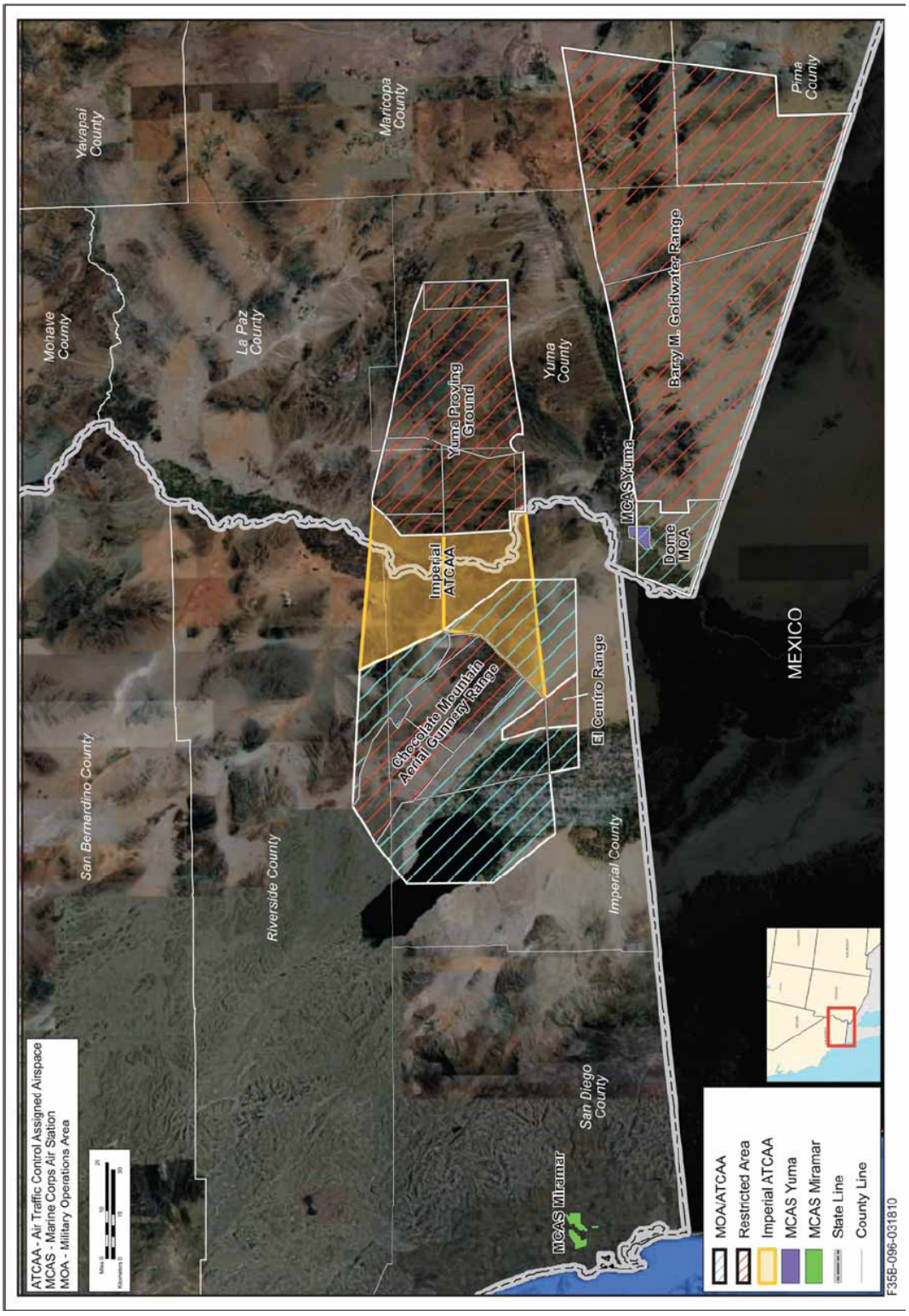

Figure 2. Auxiliary Airfield 2 and Proposed Auxiliary Landing Field.

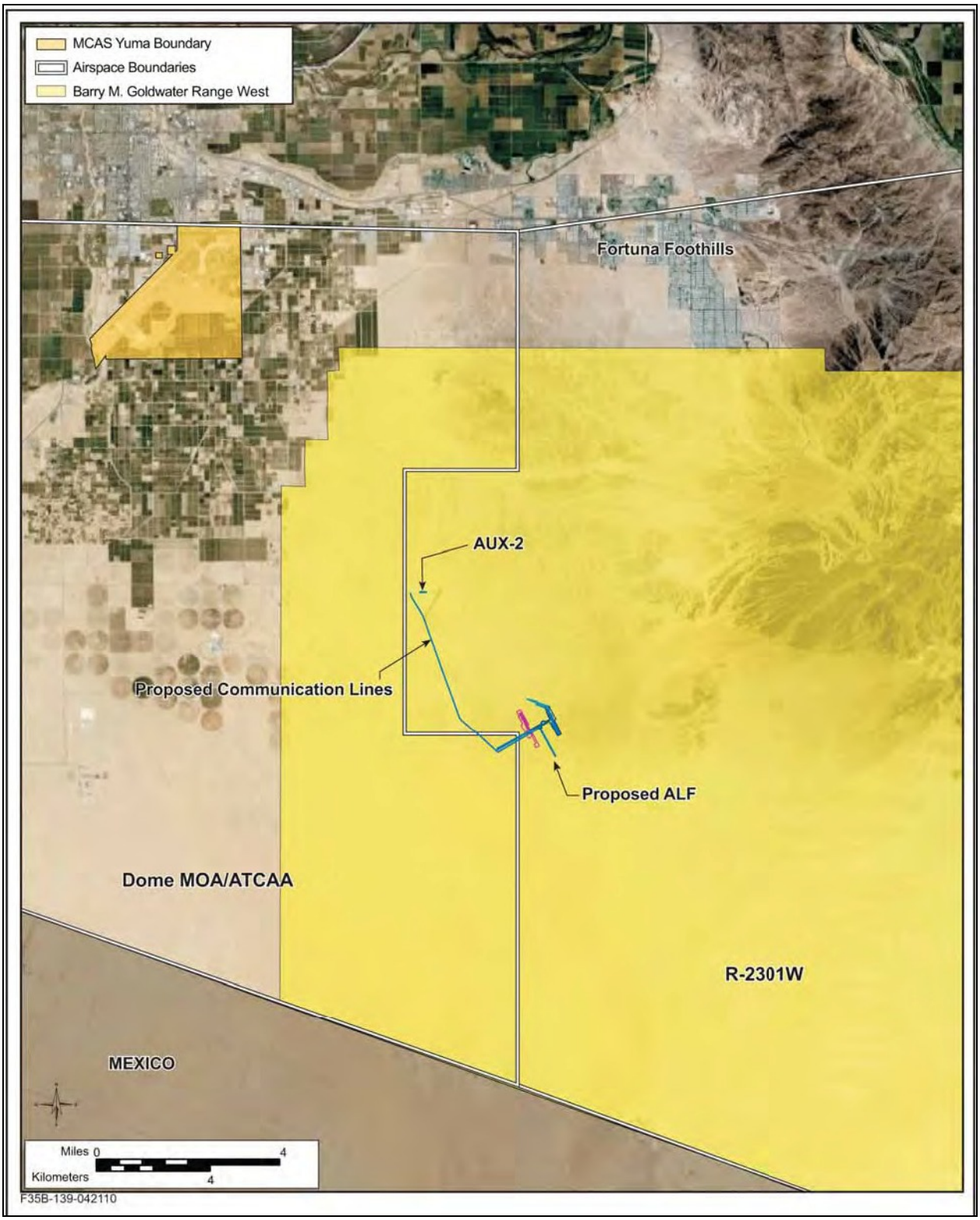

Figure 3. R-2301 W and supersonic cooridor in R-2301W.

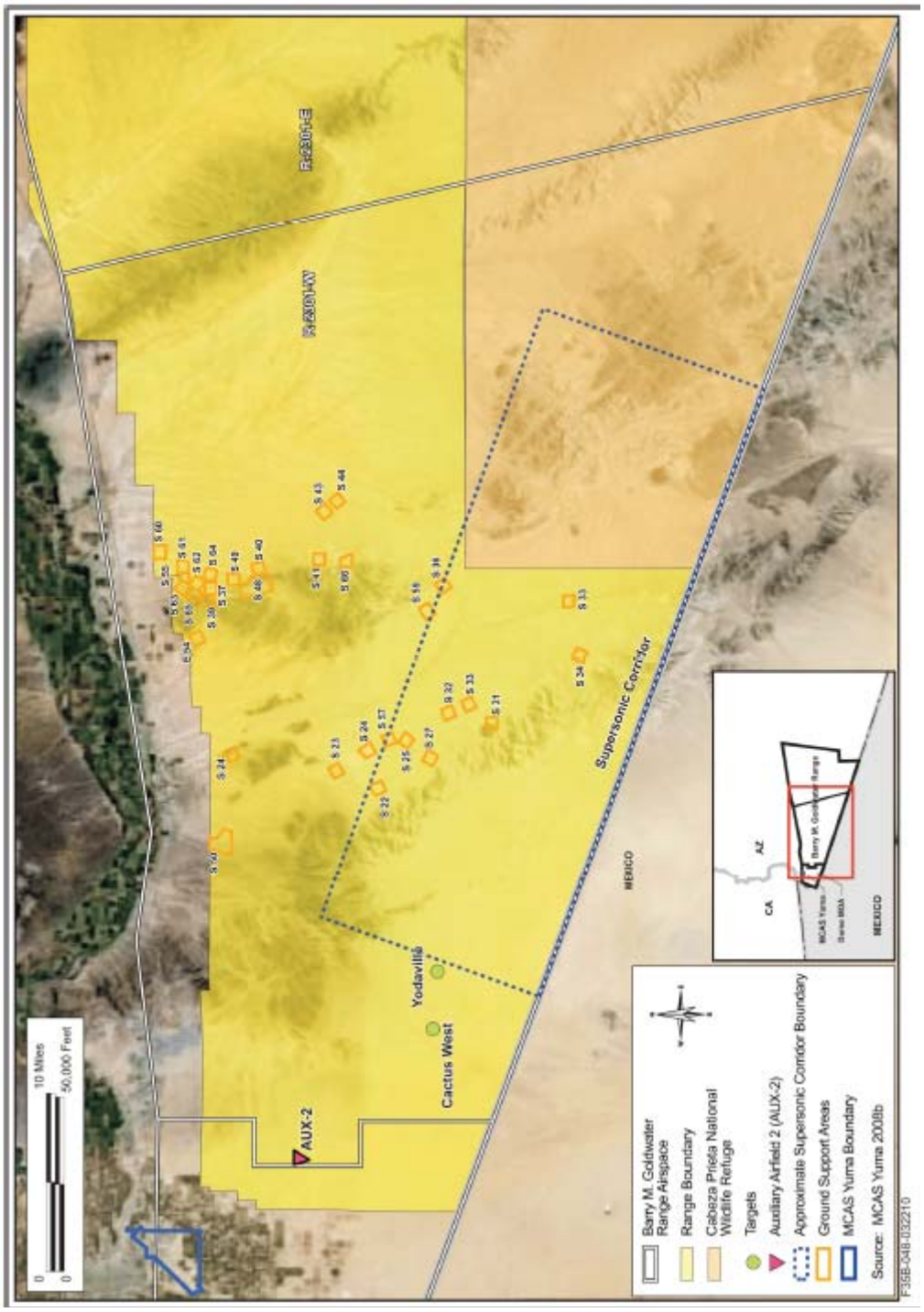

Figure 4. R-2301E.

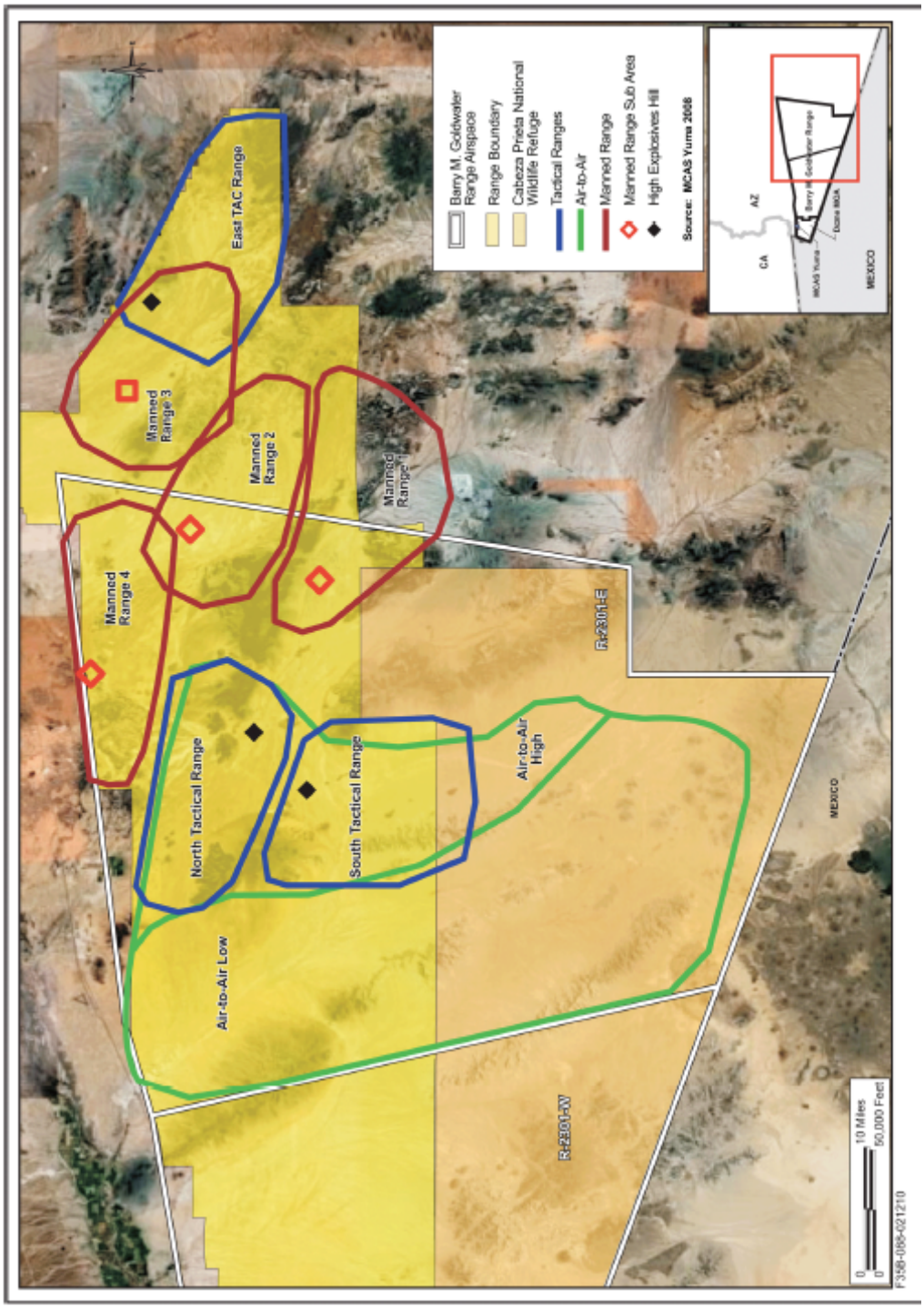

Figure 5. Sonoran pronghorn distribution in the United States: Records from 1994-2008.