

Annual Progress Report:
Implementation of the
Flat-tailed Horned Lizard Rangewide Management Strategy
January 1, 2013 - December 31, 2013

Prepared by the
Flat-tailed Horned Lizard Interagency Coordinating Committee
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EXECUTIVE SUMMARY

The flat-tailed horned lizard is a small horned lizard that inhabits a narrow range within southeastern California, southwestern Arizona, and northwestern Mexico. Much of the species' historic habitat in the United States has been lost due to agricultural and residential development. A Conservation Agreement was signed by several federal and state agencies in 1997 to implement the Flat-tailed Horned Lizard Rangelwide Management Strategy (RMS). The RMS is a long-term plan of action among signatory agencies to ensure persistence of the species. It continues to be implemented by the signatory agencies throughout five Management Areas (MA), a Research Area (RA), and other areas of flat-tailed horned lizard habitat.

Implementation activities during 2013 included regular coordination among the participating agencies through the Management Oversight Group (MOG) and Interagency Coordinating Committee (ICC). Authorized surface impacts have increased recently in Management Areas as a result of solar energy development and military projects. Outreach efforts continued to include the general public and other non-signatories to the CA as active participants in implementing the Strategy. Such groups included the U.S. Border Patrol and several Mexican agencies. Participating agencies conducted population inventories, trend monitoring, and research. However, full population monitoring efforts to quantify critical population indices and detect trends suffer from funding and staffing constraints in California BLM management areas. New lands were acquired within the Yuha and West Mesa Management Areas and the Anza-Borrego Desert State Park Management Area. Continued attempts will be made in 2014 to acquire additional lands in the California Management Areas.

Biologists from the Alto Golfo Preserve in northern Sonora, Mexico, participated in ICC meetings in 2013. They continue to develop a management strategy for FTHL in northern Mexico. They accomplished considerable outreach, education, and coordination during 2013 with various community groups, ejidos (areas of communal land used for agriculture), government agencies, schools, off-road clubs, and ecotourism groups.

The participating agencies believe the RMS as designed and implemented by the signatories of the Conservation Agreement continues to provide an effective management focus to conserve flat-tailed horned lizard habitat throughout its range. The majority of the tasks outlined by the Strategy are being completed on schedule.

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INTRODUCTION

The Flat-tailed Horned Lizard Rangewide Management Strategy

On June 7, 1997, a long-term Conservation Agreement was signed by several federal and state agencies to implement the *Flat-tailed Horned Lizard Rangewide Management Strategy* (RMS). The RMS is a plan of action to conserve the flat-tailed horned lizard (*Phrynosoma mcallii*) (FTHL) in the United States. The FTHL is a small horned lizard that inhabits creosote flats, sand dunes, and mud hills in southeastern California, southwestern Arizona, and northwestern Mexico. Much of the FTHL's historic habitat (possibly as much as 50%) in the United States has been lost due to agricultural and residential development. A revision of the RMS, with minor changes, was completed in 2003.

The following agencies are signatories to the Conservation Agreement:

- U.S. Fish and Wildlife Service (USFWS), Region 8
- USFWS, Region 2
- Bureau of Land Management (BLM), California State Office
- BLM, Arizona State Office
- Bureau of Reclamation (Reclamation), Lower Colorado Region
- Marine Corps Air Station, Yuma (MCAS-Yuma)
- Naval Air Facility, El Centro (NAF El Centro)
- Arizona Game and Fish Department (AGFD)
- California Department of Fish and Wildlife (CDFW) [previously California Department of Fish and Game]
- California Department of Parks and Recreation (CDPR)

The U.S. Customs and Border Patrol (CBP) at times participates as guests in the MOG and the ICC. The CBP elected not to sign the Conservation Agreement, but they continue to work closely with staff at BLM-El Centro.

The Conservation Agreement remains in effect today, and the RMS continues to be implemented by all Conservation Agreement signatory agencies. The RMS requires the ICC to prepare an annual report to monitor plan compliance (Planning Action 9.2.4). This is the 15th annual report and covers the period from January through December 2013.

History Of Proposals To List The FTHL As Threatened

The FTHL has been the subject of considerable activity within the Endangered Species Act and the federal courts. The 2003 Revision of the RMS summarized that activity through early 2003. Later that year, the Tucson Herpetological Society and others filed suit challenging the 2003 withdrawal to list the FTHL as a threatened species. In 2005, the U.S. District Court for the District of Arizona ruled in favor of the plaintiffs and set aside the 2003 withdrawal on the grounds that the withdrawal failed to determine whether the lost historical habitat for the FTHL

is a significant portion of the range for this species and thereby violated the Endangered Species Act. On December 7, 2005, the USFWS published a Federal Register Notice vacating the 2003 withdrawal and restoring proposed status to the FTHL (70 FR 72776). The comment period was reopened on March 2, 2006, for two weeks (71 FR 10631) and on April 21, 2006, for two weeks (71 FR 20637). On June 28, 2006, USFWS published a notice in the Federal Register withdrawing the proposed rule, based on the conclusion that the lost habitat is not a significant portion of the range of the FTHL (71 FR 36745). A lawsuit was filed by Defenders of Wildlife and others on December 11, 2006, in the Arizona District Court challenging the 2003 and 2006 decisions to withdraw the proposed rules to list the FTHL as threatened. The court granted summary judgment in favor of the USFWS. This ruling, however, was appealed to the Court of Appeals for the Ninth Circuit which, on May 18, 2009, reversed the District Court's ruling. The court in this case ruled that the administrative record did not support the USFWS's conclusion that flat-tailed horned lizard populations were stable and viable throughout most of its current range. In November 2009, they ordered the USFWS to reinstate the 1993 proposal to list the species as threatened. The USFWS reinstated the proposal on March 2, 2010 (75 FR 9379) and subsequently solicited public comment and held public meetings. The listing determination was due to be issued in November, 2010, but was postponed by the USFWS because of other priorities. On March 15, 2011, the USFWS once again published a notice in the Federal Register to withdraw the proposed rule, based on the conclusion that threats to the species as identified in the 1993 proposed rule are not as significant as earlier believed, and available data do not indicate the threats to the species and its habitat are likely to endanger the species in the foreseeable future. The withdrawal of the proposed rule also concluded that implementation of the RMS is an important conservation effort that reduces threats in the United States and benefits the FTHL throughout its range (76 FR 14210).

IMPLEMENTATION PROGRESS IN 2013

Progress toward implementation of Planning Actions within the RMS during this period is summarized below.

Planning Action 1. Delineate and designate five FTHL Management Areas and one FTHL Research Area.

The 1997 Conservation Agreement designates five MAs and one RA and precisely described their boundaries. Maps and boundary descriptions are available in the 2003 RMS. All MAs and a portion of the RA were formally adopted within agency environmental and planning documents (see also Planning Action 6) as a result of the actions listed below. All agencies had applied RMS provisions to these areas prior to the formal adoption.

- Yuma Desert MA: In 2007, MCAS-Yuma finalized an Integrated Natural Resource Management Plan (INRMP) that fully incorporates the RMS for its portion of the Yuma Desert MA. In 2004, Reclamation completed a Five-Mile Zone Resource Management Plan that incorporates the RMS for its portion of this MA.

- East Mesa, West Mesa, and Yuha Desert MAs: An Environmental Assessment (EA) proposing an amendment to the California Desert Conservation Area Plan to officially adopt these three MAs received no public protests and was signed on February 1, 2005.
- Borrego Badlands MA: In 2004, the Anza-Borrego Desert State Park's (ABDSP) General Plan was unanimously approved by the California State Parks and Recreation Commission providing long-range guidance and planning to the 600,000 acre park and acknowledging the FTHL RMS. Boundaries for the Borrego Badlands MA within ABDSP have been delineated in the Borrego Badlands and Clark Dry Lake areas.
- Ocotillo Wells RA: In 2003, the BLM portion of the Ocotillo Wells State Vehicular Recreation Area (OWSVRA) RA was designated in an amendment to the Western Colorado Desert Ecosystem Plan. The California State Parks owns a portion of the RA that has not been incorporated into planning documents. The RMS requires no management conservation measures in the RA. However, management for the FTHL falls under guidelines incorporated by California State Parks to evaluate and sustain park resources. Data developed from occupancy surveys for five previous years indicates a stable population of FTHL in the park although demographic studies per ICC protocols have not been conducted. A General Plan Update is in progress for OWSVRA and incorporates new acquisitions subsequent to the original General Plan of 1982. The General Plan for Heber Dunes (HDSVRA) has been completed and adopted by the Off Highway Vehicle (OHV) Commission in December, 2011. It does not include a possible relocation project. HDSVRA will continue to be managed outside the purview of the ICC.
- Coachella Valley: BLM-Palm Springs, along with CDFW, USFWS, and CDPR continues to participate in the Coachella Valley Multiple-Species Habitat Conservation and Natural Communities Conservation Plan (CVMSHCP) that incorporates conservation, monitoring, and management for the FTHL in CVMSHCP conservation areas. The CVMSHCP uses an ecosystem/habitat approach to identify natural communities and sensitive species known or expected to occur in the CVMSHCP area. The CVMSHCP is designed to ensure the long-term viability of sensitive-species populations within the Coachella Valley, including the FTHL.

Planning Action 2. Define and implement management actions necessary to minimize loss or degradation of habitat.

The international boundary pedestrian fence that was completed in 2008 along the entire border of the Yuma Desert appears to have greatly reduced impacts to FTHL habitat in the Yuma MA. Previously those impacts resulted from drug smuggling, illegal immigration, and associated law enforcement activities. Outreach efforts to inform and educate enforcement personnel on FTHL issues continue.

The habitat impacts authorized by managing agencies within the period are shown in Tables 1 and 2. Included in the remainder of this section is a narrative for each participating agency. For reference, the amount of land owned by each agency in the various MAs is shown in Table 3.

BLM-El Centro Field Office

There was one authorization in 2013 in the BLM-El Centro Field Office. CBP was authorized to construct, operate, and maintain the CBP West Desert Roadway in the Yuha Desert MA. Total impact authorized was 7.3 acres. Compensation for the project is 32.5 acres. Compensation will be in the amount of \$20,036.34 and deposited into the Yuha Desert MA account.

BLM-Palm Springs South Coast Field Office

No disturbance was authorized by BLM-Palm Springs.

BLM-Yuma Field Office

No trespass cases were opened in 2012.

MCAS-Yuma

Projects described in the EIS for the Yuma Training Range Complex of 1995 are not subject to the RMS (Planning Action 2.2.1).

NAF El Centro

No disturbance occurred within MAs managed by NAF El Centro.

Anza-Borrego Desert State Park

No disturbance was authorized within the Borrego Badlands MA.

Table 1. Authorized projects with impacts to habitat within Flat-tailed Horned Lizard Management Areas, 1997-present (acres in parenthesis indicate either temporary disturbance or the project was subsequently withdrawn and no impacts occurred).

| Year | Authorizing agency | Project | Acres |
|------------------|---------------------------|--------------------------------------|--------------|
| East Mesa | | | |
| 1998 | NAF-El Centro | Weapons Impact Scoring Set | 1.0 |
| 1999 | BLM-El Centro | Observation wells | 8.77 |
| 2001 | BLM-El Centro | Level 3 Communications | 7.6 |
| 2001 | BLM-El Centro | Granite Construction sand and gravel | 1.0 |
| 2002 | BLM-El Centro | BLM mining (API & Oat Pit) | 82.3 |
| 2002 | BLM-El Centro | BLM geothermal piping | 1.0 |
| 2003 | BLM-El Centro | BLM API sand and gravel and Ormat | 2.8 |
| 2008 | BLM-El Centro | Drop 2 Reservoir | 285 |
| TOTAL | | | 389.47 |

Table 1 continued next page

Table 1 (cont.). Authorized projects with impacts to habitat within Flat-tailed Horned Lizard Management Areas, 1997-present (acres in parenthesis indicate either temporary disturbance or the project was subsequently withdrawn and no impacts occurred).

| Year | Authorizing agency | Project | Acres |
|-------------------------|--------------------|---|--------|
| West Mesa | | | |
| 2001 | BLM-El Centro | Imperial Irrigation District R Line | 31.42 |
| 2001 | BLM-El Centro | Imperial Irrigation District L Line | 75.69 |
| 2004 | NAF-El Centro | NAF cleanup of targets 101 and 103 | 6.0 |
| 2010 | NAF-El Centro | Navy geothermal exploratory test well | 1.76 |
| TOTAL | | | 114.87 |
| Yuha Desert | | | |
| 1998 | BLM-El Centro | Imperial Irrigation District dike (“S” line transmission) | 2.0 |
| 2001 | BLM-El Centro | Caltrans ditching along Hwy. 98 | 16.1 |
| 2001 | BLM-El Centro | Border Patrol blading of staging areas | 14.0 |
| 2001 | BLM-El Centro | Border Patrol maintenance of berms | 2.1 |
| 2002 | BLM-El Centro | Border Patrol cameras | 0.6 |
| 2002 | BLM-El Centro | La Rosita powerline | 53.0 |
| 2004 | BLM-El Centro | Powerpoles to Border Patrol camera | 0.46 |
| 2008 | BLM-El Centro | Powerpoles to Comsite T-line to IID communication | 1.4 |
| 2008 | BLM-El Centro | T-line to IID communication site | 1.4 |
| 2000s | BLM-El Centro | Border Patrol: disturbance to bridges | 3.0 |
| 2009 | BLM-El Centro | Sunrise Powerlink transmission line | 46.41 |
| 2010 | BLM-El Centro | Tessara Imperial Valley Solar transm. line | (92.9) |
| 2011 | BLM-El Centro | C Solar South | 3.12 |
| 2011 | BLM-El Centro | C Solar West | 13.7 |
| 2011 | BLM-El Centro | Centinela | 13.3 |
| 2012 | BLM-El Centro | Campo Verde Solar | 17 |
| 2013 | BLM-El Centro | CBP West Desert Roadway | 7.3 |
| TOTAL | | | 194.89 |
| Borrego Badlands | | | |
| 2011 | ABDSP | Paleoseismic study | 3.73 |
| Yuma Desert | | | |
| 1999 | MCAS-Yuma | Harrier jet crash (temporary disturbance) | (6) |
| 2001 | MCAS-Yuma | Rifle range and runway repair | 2 |
| 2001 | Reclamation | Prison right-of-way and monitoring wells | 1.3 |
| 2002 | Reclamation | Reclamation observation wells | 0.5 |
| 2003 | MCAS-Yuma | Weapons familiarization training | 2 |
| 2004 | MCAS-Yuma | Dust control and ammo supply point | 10.15 |
| 2005 | Reclamation | Border easement | 14 |
| 2010 | MCAS-Yuma | Joint Strike Fighter airfield | 126.7 |
| TOTAL | | | 156.65 |

Bureau of Reclamation-Yuma

No new projects that impacted FTHL habitat were authorized in 2013.

Ocotillo Wells State Vehicular Recreation Area

A high-use trail had a section relocated to reduce maintenance costs. The trail was in a poor location and was constantly being damaged by storms/flooding. 1.06 acres were impacted and bio-monitors were present during construction. The monitors also conducted FTHL surveys prior to work beginning each day. The area where the trail was previously located has been restored and is included in the restoration figure under Planning Action 3

Total Habitat Disturbance from January through December 2013.

BLM-El Centro authorized 7.3 acres in the Yuha Desert MA.

Table 2. Acres of flat-tailed horned lizard habitat authorized for impact by RMS signatories from January to December 2013, and cumulative acres of impacts within the management areas and research area.

| Agency | Within MA | | Outside MA (acres) | Total Acres | Acres Impacted to Date in MAs | |
|--------------------------------|------------------|-------|--------------------|-------------|-------------------------------|-------------------------|
| | MA | Acres | | | Total | Percent ² |
| BLM-El Centro | East Mesa | | | | 388.47 | 0.38 |
| | West Mesa | | | | 107.11 | 0.12 |
| | Yuha Desert | | | | 194.89 | 0.34 |
| NAF-El Centro | East Mesa | | | | 1.0 | 0.01 |
| | West Mesa | | | | 7.76 | 0.02 |
| Anza-Borrego Desert State Park | Borrego Badlands | | | | 3.73 | 0.01 |
| Ocotillo Wells SVRA | 1 | | | | 1 | |
| BLM-Palm Springs | 1 | | | | 1 | |
| MCAS-Yuma | Yuha Desert | | | | 140.85 | 0.12 |
| Reclamation | Yuha Desert | | | | 15.80 | 0.10 |
| BLM-Yuma | 1 | | | | 1 | |
| Total Acres | | | | | 860.61 | 0.18³ |

¹ No land administered within an MA.

² Based on the MA acreage for each agency, including acquisitions (see Table 3).

³ Excluding private lands (see Table 3).

Planning Action 3: Within the MAs, rehabilitate damaged and degraded habitat, including closed routes and other small areas of past intense activity.

BLM-El Centro has been actively implementing the Western Colorado (WECO) route designation plan signed on January 31, 2003. Signage for the Yuha Desert, East Mesa, and West Mesa MAs is complete. BLM rangers and restoration crews make routine checks on signs and replace them as necessary. In addition, BLM-El Centro continues to provide regular outreach by producing and distributing maps of the WECO route of travel designations. Finally, BLM-El Centro continues law enforcement patrol of all MAs under their jurisdiction and makes regular public enforcement and education contacts.

Through a series of multiple-year grants from the California OHV Motor Vehicle Commission, BLM is continuing work on an ambitious restoration program. BLM is contracting either the Student Conservation Association (SCA) or American Conservation Experience (ACE) to engage youth in conducting restoration activities in the Yuha Desert, West Mesa, and East Mesa MAs. Groups of interns improve authorized routes and place dead standing vegetation or cover vehicle tracks from incursions outside the authorized routes of travel. Archaeological surveys are necessary before implementing restoration and are ongoing, concurrent with restoration.

BLM-El Centro completed 22 acres of restoration around the intersection of routes 460 and 463 in the West Mesa MA.

OWSVRA continued the trail rehabilitation project they initiated in 2012. The old section of the trail mentioned under Planning Action 2, 4.64 acres, was rehabilitated with vertical mulching and reseeded/live transplants.

No habitat rehabilitation or restoration efforts were implemented in the Yuma Desert MA in 2013 by either MCAS-Yuma or BOR.

Planning Action 4: Attempt to acquire through exchange, donation, or purchase from willing sellers all private lands within MAs.

The Colorado and Mohave deserts have been targeted as prime locations for utility-scale renewable energy development. Project developers building renewable energy projects in these deserts are required as part of the permitting process to minimize and mitigate their impacts on local species and habitats. The Renewable Energy Action Team (REAT), composed of representatives from the BLM, the USFWS, the California Department of Fish and Wildlife, and the California Energy Commission, was formed to coordinate and expedite the permitting process. The REAT enlisted help from the National Fish and Wildlife Foundation (NFWF) to manage mitigation funds to better coordinate acquisition and management of mitigation lands associated with the large-scale projects. Several of these utility-scale projects could be

constructed within FTHL historical habitat and would likely require compensation in accordance with the RMS. NFWF will manage and administer compensation funds collected for these projects within FTHL habitat. Therefore, land managers will need to coordinate the identification, prioritization, and acquisition of lands in MA's with NFWF staff.

See Table 3 for current and previous acquisitions within MAs.

In-holdings within the Yuma Desert MA were purchased previously and all land remains federally owned.

In Anza-Borrego Desert State Park, possible land acquisitions within FTHL habitat continue in coordination with the Anza-Borrego Foundation (ABF). ABF seeks to acquire private in-holdings within ABDSP including acres within the FTHL MA.

BLM-El Centro continues to use compensation funding for acquisition of private lands in FTHL MAs. They acquired 3 parcels of private land in the Yuha Desert MA. The acquisitions were made by National Fish and Wildlife Foundation and transferred to BLM. The parcels total 180 acres (10 acres, 10 acres, and 160 acres). Compensation funding was from the following projects: Centinela Solar Facility, Campo Verde Solar, Ocotillo Express Wind Facility, Imperial Solar Energy South, and Imperial Solar Energy West.

Seek funds for land acquisitions in MAs

See previous section.

Planning Action 5: Maintain or establish effective habitat corridors between naturally adjacent populations.

The development of the Desert Renewable Energy Conservation Plan (DRECP) has considered and provided provisions to address corridors between FTHL MAs.

No activities or projects have been permitted within the California MAs or Ocotillo Wells RA this year that would prevent or obstruct FTHL movement between adjacent populations in the MAs or RA. Open riding at OWSVRA may be affecting habitat along its border with the Borrego Badlands. Consideration should be made for habitat connection along this border to ensure movement between adjacent populations. Attempts to create Habitat Monitoring System sites on either side of the shared border with ABDSP are still in the process. OWSVRA submitted a project evaluation to ABDSP in 2012 and is awaiting approval to install the monitoring sites (which include pitfall traps for reptile surveys) in CDPR lands.

Table 3. Ownership of lands within Flat-tailed Horned Lizard Management Areas.

| Management Area | Initial acreage (1997) ¹ | | | Acres acquired since 1997 | | | Current acreage |
|-------------------------|-------------------------------------|----------|---------|---------------------------|-------|---------------------|-----------------|
| | Signatory | Non-sig. | Total | Previous | 2013 | Total | |
| East Mesa | | | | | | | |
| BLM | 99,741 | | | | | | 102,990 |
| NAF El Centro | 8,455 | | | | | | 8,455 |
| Private | | 7,339 | | 3,569 | | 3,569 ² | 3,770 |
| TOTAL | 108,196 | 7,339 | 115,535 | | | | 115,535 |
| West Mesa | | | | | | | |
| BLM | 78,787 | | | | | | 86,205 |
| NAF El Centro | 30,605 ³ | | | | 2,560 | 2,560 | 33,165 |
| State | | 2,678 | | | | | 2,678 |
| Private | | 21,784 | | 7,338 | 80 | 9,978 ⁴ | 11,806 |
| TOTAL | 109,392 | 24,462 | 133,854 | | | | 133,854 |
| Yuha Desert | | | | | | | |
| BLM | 57,341 | | | | | | 57,521 |
| Private | | 2,958 | | | 180 | | 2,778 |
| TOTAL | 57,341 | 2,958 | 60,299 | | | | 60,299 |
| Borrego Badlands | | | | | | | |
| State Parks | 38,228 | | | | | | 41,372 |
| Private | | 4,253 | | 2,752 | 392 | 3,144 ⁵ | 1,109 |
| TOTAL | 38,228 | 4,253 | 42,481 | | | | 42,681 |
| Yuma Desert | | | | | | | |
| MCAS | 99,300 | | | | | | 114,800 |
| Reclamation | 16,200 | | | | | | 16,200 |
| State | | 15,500 | | 15,500 | | 15,500 ⁵ | 0 |
| TOTAL | 115,500 | 15,500 | 131,000 | | | | 131,000 |

¹Estimates of initial acreages in 1997 for MAs in California were revised by BLM-EC in 2010.

²Purchased by, and transferred to BLM.

³Estimate of initial acreage in 1997 was revised by NAF El Centro in 2012.

⁴Includes 7,338 acres purchased by, and transferred to BLM and 2,560 purchased by, and transferred to the Navy.

⁵Includes 1,456 acres acquired by the Anza-Borrego Foundation, all but 392 of which have been transferred to California State Parks.

⁶Purchased and administered by MCAS.

Planning Action 6: Coordinate activities and funding among the participating agencies and Mexican agencies.

Management Oversight Group

The MOG is comprised of managers from 12 signatory agency offices. It meets as necessary each year to coordinate implementation of the Conservation Agreement in response to ICC

recommendations. The MOG met on the following dates during 2013:

14 March (MOG/ICC; ABDSP, Borrego Springs)

7 November (BLM-Yuma)

Major items discussed by the MOG during 2013 were analysis of recent monitoring data, land acquisitions, proposals for various development projects, and possible revision of the RMS.

Interagency Coordinating Committee

The ICC is comprised of biologists from 13 signatory agency offices. It meets quarterly to exchange information on research results, develop proposals, and discuss technical and management issues. The ICC is responsible for compiling information for the annual ICC report that outlines accomplishments under the RMS, lists issues regarding management of the MAs and RAs, and details planned actions for the upcoming year. The ICC met on the following dates during 2013:

13 June (AGFD, Yuma)

1 August (BLM-El Centro)

5 December (BLM-El Centro)

Major items the ICC discussed in 2013 included maintaining a centralized database for monitoring data, analyzing recent monitoring data, possible revisions to the RMS, various projects that could impact FTHL habitat (particularly utility-scale solar energy projects), the results of monitoring and research (notably, including research conducted by the University of Arizona (UA) as mitigation for the JSF), updating the research and monitoring list, and training of FTHL monitors.

Coordination with Mexico

Staff of the Alto Golfo de California Biosphere Reserve (AGCBR) continued to participate in the ICC, prepare the final draft of the Mexican Flat-Tailed Horned Lizard Management Strategy (MFTHLMS), perform some incidental monitoring at El Doctor, and other issues of common concern.

Special management areas, equivalent to the MAs in the U.S., need to be identified and managed as such. At present, protection of the species occurs by virtue of the protected land areas in Alto Golfo de California y Delta del Rio Colorado Reserve (AGCBR), and El Pinacate y Gran Desierto de Altar Biosphere Reserve. Additional signage and interpretive materials are needed in support of these areas. In addition, MOG and/or ICC need to meet to focus management and research needs in Mexico and projects to support those needs. Ideally, the meetings should be held in Sonora and include representatives from AGCBR and El Pinacate y Gran Desierto de Altar Biosphere Reserves. The final draft Mexican Rangewide Management Strategy is under development, and was not completed by end of calendar year 2013. We anticipate that it will be completed in 2014. A Spanish version of the RMS for United States populations would be useful.

Conservation Agreement

The 10 agencies that are signatories to the Conservation Agreement to implement the FTHL RMS are listed in the introduction.

Incorporate RMS actions in ecosystem plans

See also Planning Action 1.

In October 2012, the Secretary for the Department of the Interior signed the final Programmatic Environmental Impact Statement (PEIS) for solar energy development that provides a blueprint for utility-scale solar energy permitting in six states, including California and Arizona. The document identifies BLM-administered lands in the six-state study area that may be environmentally suitable for solar energy development and lands that would be excluded from such development. The list of criteria excluding areas from utility-scale solar development include all ACEC's and FTHL MA's. Therefore, if implemented, the solar PEIS should limit utility-scale solar energy development within California and Arizona MA's.

BLM-El Centro continues to implement the Western Colorado Routes of Travel Designation (WECO). BLM-El Centro completed the WECO in January, 2003, which designated routes as open, closed, or limited. WECO specifically incorporates the guidelines of the RMS, and the BLM is managing its land under those guidelines. BLM-El Centro wrote an Environmental Assessment (EA) to amend the California Desert Conservation Area Plan to officially designate the FTHL MAs. The EA was signed on February 1, 2005, thus formally establishing all three MAs in the El Centro area.

Reclamation continues to implement the Five-Mile Zone Resource Management Plan (RMP), adopted March 18, 2004, for withdrawn lands along this zone that parallels the international border. This RMP incorporated the RMS and was further described in the 2004 FTHL Annual Report.

MCAS-Yuma continues to implement the INRMP (see Planning Action 1), which fully incorporates and implements the RMS.

BLM-Palm Springs continues to participate in the CVMSHCP, which ensures the continued existence of the FTHL within designated conservation areas in the Coachella Valley.

Staff from BLM-El Centro, CDFW Region 6, and USFWS Region 8 submitted comments in 2012 on the draft DRECP preliminary conservation strategy map to incorporate areas of potential connectivity between the Yuha and West Mesa MA's consistent with Planning Action 5. Additionally, FTHL MA's have been identified on the preliminary conservation strategy map as

areas with high biological value. This will ensure the management and conservation goals identified in the RMS are incorporated into the DRECP.

NAF El Centro is revising their Integrated Natural Resources Management Plan, which will be finalized in 2014 and will continue to incorporate planning actions from the RMS.

Customs and Border Protection

BLM-El Centro coordinates monthly meetings with 3 BP offices.

Planning Action 7: Promote the goals of the Strategy through law enforcement and public education.

Law Enforcement

BLM-El Centro has continued to increase law enforcement patrols in FTHL habitat in Imperial County, particularly within the East Mesa MA (see description under Planning Action 3 above). Law enforcement officers report that the majority of recreational users in the MAs are now complying with the route designation requirements by staying on approved routes and camping in appropriate areas.

The majority of the Yuma MA that is managed by MCAS-Yuma is closed to the public. Only the southeast portion is open to the public. MCAS-Yuma conducts daily ORV patrols on the BMGR-West.

OWSVRA initiated a multi-disciplinary task force in 2011 to educate and enforce the “trails only” designation east of Poleline Road. This effort continued in 2013, and includes increased interpretive and regulatory signage, public outreach by park interpreters and rangers, and enhanced law enforcement.

Public Information

BLM-El Centro continues to update and distribute the WECO area road map, which encompasses the Yuha Desert, West Mesa, and East Mesa MAs. Furthermore, BLM-El Centro continues public contacts and information dissemination using Park Rangers.

FTHL are addressed by the interpretive department at OWSVRA in their wildlife presentations along with rules and regulations regarding the species.

UA presented a talk on FTHLs at the Joint Meeting of Ichthyologists and Herpetologists in Albuquerque in July 2013.

Planning Action 8: Encourage and support research that will promote the conservation of FTHLs or desert ecosystems and will provide information needed to define and implement necessary management actions effectively.

UA's School of Natural Resources and the Environment continued work under contract with MCAS-Yuma to evaluate the effects of the proposed Joint Strike Fighter project and the effectiveness of proposed mitigation measures. This research project began in 2011 and will continue through 2014. A brief summary for 2013 is included in the Abstracts portion of this report.

Robert Lovich (Navy) and Daniel Leavitt (AGFD) co-authored a presentation at the Joint Meeting of Ichthyologists and Herpetologists in Albuquerque, NM on July 14, 2013. The abstract is included in the Abstracts portion of this report, and a manuscript is in preparation:

With MCAS funding, the United States Geological Survey (USGS) and UA continued a disturbance mapping effort. Five students were hired to map authorized and unauthorized roads and trails from 2008 high resolution (1 ft.) imagery. They have completed their data analysis but the USGS requires an inter-agency peer review before releasing the findings. Their final report will be provided in 2014.

AGFD issued 7 permits for collecting or handling FTHL during 2012. CDFW issued no new scientific collecting permits during 2013; 90 Letters of Concurrence were issued to monitoring trainees.

Bio-monitoring workshop. The ICC again partnered with Southwest Partners in Amphibian and Reptile Conservation (SW PARC) in 2013 to organize and conduct 2 bio-monitor training workshops for the FTHL consisting of about 3-4 hours of field training and 2 hours of classroom debriefing. The high-demand workshops were conducted May 21-23 to train biologists, mostly private consultants, who may work as monitors on projects that impact FTHL. ICC agencies provided staff as experts to assist with the training to certify 88 FTHL monitors who saw up to 14 FTHL per day. This was a worthwhile effort for all who participated in the organization, training, and follow-up. The majority of the feedback in regard to the quality of the workshop was extremely positive. Southwest Partners in Amphibian and Reptile Conservation will continue to manage training sessions in 2014.

OWSVRA continues to provide an award-winning interpretive program that focuses on desert ecology to over 50,000 visitors annually. This program includes education about the FTHL and the need to protect habitat at OWSVRA.

Planning Action 9: Continue Inventory and Monitoring.

Implementation of variations of the current monitoring protocols began in 2002. Techniques were refined over subsequent years, culminating in a FTHL Monitoring Plan that was developed

by the ICC in 2008. This plan described 2 types of standardized monitoring methods. One monitoring method, the occupancy surveys, are large-scale efforts to document the presence (“occupancy”) of FTHL among numerous survey plots broadly distributed within each MA. The purpose is to estimate the proportion of sites occupied, which could be used as a reasonable indicator of population status both in MAs and rangewide. The 2008 plan recommended at least 120 4-ha plots per MA, surveyed simultaneously for one hour by 4 observers working independently. In 2011, this protocol was revised to improve the precision of occupancy estimates and detection probability. The second monitoring method in the plan, demographic surveys, are localized intensive efforts within only a few (usually 2) 9-ha selectively chosen plots within each MA. Plots are surveyed by a team of 4-6 observers for 10 consecutive days. All FTHL GPS locations are recorded, a range of measurements are taken, and FTHL with snout-vent length greater than 55mm are PIT-tagged. Demographic results are intended to provide more-detailed assessments of FTHL abundance, density, survivorship, and recruitment within purportedly higher-quality habitats within each MA. A complete report of monitoring in 2013 appears as Appendix C of this report. Summaries of monitoring results prior to 2007 are given in Table 4. Summaries of 2013 monitoring results from occupancy plots are given in Table 5 and from demographic plots in Table 6.

BLM-El Centro, with funding from NAF El Centro, surveyed single demographic plots in the East Mesa and West Mesa MAs in 2013. OWSVRA surveyed 50 occupancy plots 6 times each during 2013. AGFD, MCAS, and Reclamation completed surveys on 2 demographic plots in the Yuma Desert MA. One plot lies within the Reclamation portion and the other within the BMGR portion. AGFD, MCAS, and Reclamation surveyed 75 occupancy plots 6 times each in the Yuma Desert MA in 2013. ABDSP surveyed 52 occupancy plots 5 times each during 2013 in the Borrego Badlands.

Table 4. Summary of monitoring efforts on Flat-tailed Horned Lizard MAs, with 95% confidence intervals, prior to the adoption of current methods in 2007. Estimates are of the total population in the MA (except where noted) or the probability of occupancy of lizards (L), scat (S), or both (B) on plots in the MA. Population estimates were based on mark-recapture data, except one case where trapping webs were used (TW) in 2003 in the Yuma MA.

| | Yuma Desert | East Mesa | West Mesa | Yuha Basin | OWSVRA | Borrego Badlands |
|------|--|--|--|---------------------------|--------------------------------------|------------------|
| 2002 | - | - | - | 25,514 (12,761-38,970) | - | - |
| 2003 | 16,328 (TW) (8,378-31,794) 25,855 (16,390-43,951) | 42,619 (19,704-67,639) | 10,849 (3,213-23,486) | - | 19,222 (18,870-26,752) | - |
| 2004 | - | - | - | 73,017 (4,837-163,635) | - | - |
| 2005 | 22,120 ¹ (19,962-25,357) | - | 0.06 (0.02-0.14) L 0.48 (0.31-0.79) S | - | 24,345 (14,329-69,922) | - |
| 2006 | - | 0.44 (0.28-0.69) L 0.83 (0.76-0.89) S | - | - | 1.00 (no CI) L 0.56 (0.43-0.72) S | - |

¹ Estimates are only for areas of optimal habitat, approximately 10% of the MA.

Table 5. Number of occupancy plots surveyed in 2013 and percent that were found to be occupied.

| MA | Number of Plots | Occupancy Estimate |
|------------------|------------------------|---------------------------|
| Yuma Desert | 75 | 0.81 |
| Ocotillo Wells | 50 | 0.68 |
| Borrego Badlands | 52 | 0.19 |

Table 6. Summary of flat-tailed horned lizard captures on demographic plots in 2013 (juveniles < 60mm SVL).

| Plot | Location Description | MA | Adults Captured | Juveniles Captured |
|-------------|-----------------------------|-------------|------------------------|---------------------------|
| BMG (=YD1) | BMG Range | Yuma Desert | 5 | 1 |
| BOR (=YD2) | Reclamation 5-Mile Zone | Yuma Desert | 23 | 14 |
| 315 (=EM1) | East of geothermals | East Mesa | 12 | 1 |
| 486 (=YU1) | Pinto Wash | Yuha Basin | ¹ | ¹ |
| 156 (=WM1) | SW of Superstition Mtn | West Mesa | ¹ | ¹ |
| WM2 | On Navy target | West Mesa | Discontinued | |
| WM3 (=NAVY) | | West Mesa | 14 | 0 |
| Squaw Peak | Near Squaw Peak | OWSVRA | Discontinued in 2009 | |
| Mudhills | Mudhill area | OWSVRA | Discontinued in 2009 | |

¹ Not surveyed.

TREASURY REPORT

Table 7. Expenditures and balances for compensation fund accounts through Dec. 2013

| | Yuma MA2 (17.3% INC) | AZ ASH intermediate acquisitions costs ³ (19% INC) | AZ ASH land purchase cost ⁴ (19% INC) | East Mesa MA5 (% INC) | West Mesa MA6 (% INC) | Reclamation Drop 27 | Sunrise Powerlink ⁸ |
|---------------|-------------------------|---|---|--------------------------|--------------------------|---------------------|--------------------------------|
| Carryover | 87,503 | 131,154 | 559,400 | 61,213 | 12,425 | 485,151 | 10,278 |
| | | | | | | | |
| Additions | 51,524 | 4,244 | 41,582 | | | | |
| | | | | | | | |
| Obligations | | | | | | | |
| | | | | | | | |
| TOTALS | 139,027 | 135,399 | 600,983 | 61,213 | 12,425 | 485,151 | 10,278 |

²AZ 320 7122 5701: LVTFA0957010

³AZ 320 7122 5808: LVTFA0958080

⁴AZ 320 7122 6974: LVTFA0969740

⁵CA 670 7122 6712: LVTFB0967120

⁶CA 670 7122 6713: LVTFB0967130

⁷LROBX901700

⁸LVTFB10649L0:

Table 8. Treasurer’s report to the MOG as of November, 2013.

| Yuma MA | | As of 8/31/12 | New Budget Authority | Carry-Over (Field) | Consumable Budget | Commitments | Unliquidated Obligations | Total Expenditures | Total Obligations (Incl. Comm) | Current Available Funds |
|----------------|--------------------|----------------|----------------------|--------------------|-------------------|-------------|--------------------------|--------------------|--------------------------------|-------------------------|
| Funds Center | FA Budget Activity | Funded Program | | \$ | \$ | | | | | \$ |
| LLAZC02000 | L7122 | LVTF5701AZ00 | | 1,308.77 | 1,308.77 | | | | | 1,308.77 |
| LLAZC02000 | L7122 | LVTFA0957010 | | 120,013.32 | 120,013.32 | 0.00 | 20,658.00 | 10,202.57 | 30,860.57 | 89,152.75 |
| Overall Result | | | | | | | | | | 90,461.52 |

| E. Mesa | | | New Budget Authority | Carry-Over (Field) | Consumable Budget | Commitments | Unliquidated Obligations | Total Expenditures | Total Obligations (Incl. Comm) | Current Available Funds |
|--------------|--------------------|----------------|----------------------|--------------------|-------------------|-------------|--------------------------|--------------------|--------------------------------|-------------------------|
| Funds Center | FA Budget Activity | Funded Program | | \$ | \$ | | | | | \$ |
| LLCA000000 | L7122 | LVTFB0967120 | | 61,213.52 | 61,213.52 | | | | | 61,213.52 |

| W. Mesa | | | New Budget Authority | Carry-Over (Field) | Consumable Budget | Commitments | Unliquidated Obligations | Total Expenditures | Total Obligations (Incl. Comm) | Current Available Funds |
|--------------|--------------------|----------------|----------------------|--------------------|-------------------|-------------|--------------------------|--------------------|--------------------------------|-------------------------|
| Funds Center | FA Budget Activity | Funded Program | | \$ | \$ | | | | | \$ |
| LLCA000000 | L7122 | LVTFB0967130 | | 12,425.43 | 12,425.43 | | | | | 12,425.43 |

Table 8 continued on next page.

Table 8 (cont.)

| Yuma Area Service Highway Land Purchase | | | New Budget Authority | Carry-Over (Field) | Consumable Budget | Commitments | Unliquidated Obligations | Total Expenditures | Total Obligations (Incl. Comm) | Current Available Funds |
|---|--------------------|----------------|----------------------|--------------------|-------------------|-------------|--------------------------|--------------------|--------------------------------|-------------------------|
| Funds Center | FA Budget Activity | Funded Program | | \$ | \$ | | \$ | \$ | \$ | \$ |
| LLAZC02000 | L7122 | LVTFA0969740 | | 600,983.12 | 600,983.12 | | 0.00 | 41,582.67 | 41,582.67 | 559,400.45 |

| Yuma Area Service Highway Intermediate | | | New Budget Authority | Carry-Over (Field) | Consumable Budget | Commitments | Unliquidated Obligations | Total Expenditures | Total Obligations (Incl. Comm) | Current Available Funds |
|--|--------------------|----------------|----------------------|--------------------|-------------------|-------------|--------------------------|--------------------|--------------------------------|-------------------------|
| Funds Center | FA Budget Activity | Funded Program | | \$ | \$ | | | \$ | \$ | \$ |
| LLAZC02000 | L7122 | LVTFA0958080 | | 126,225.58 | 126,225.58 | | | -311.67 | -311.67 | 126,537.25 |
| LLCA000000 | L7122 | LVTFA0958080 | | 4,617.36 | 4,617.36 | | | | | 4,617.36 |
| Overall Result | | | | | | | | | | 131,154.61 |

| BOR Drop II | | | New Budget Authority | Carry-Over (Field) | Consumable Budget | Commitments | Unliquidated Obligations | Total Expenditures | Total Obligations (Incl. Comm) | Current Available Funds |
|--------------|--------------------|----------------|----------------------|--------------------|-------------------|-------------|--------------------------|--------------------|--------------------------------|-------------------------|
| Funds Center | FA Budget Activity | Funded Program | | \$ | \$ | | | | | \$ |
| LLCA000000 | L1920 | LRORBX901700 | | 485,151.78 | 485,151.78 | | | | | 485,151.78 |

CONCLUSIONS

Signatory agencies continue close cooperation and careful execution of their respective responsibilities as described in the 2003 updated version of the RMS. The signatory and cooperating agencies continue to implement the RMS throughout the MAs and outside the MAs within FTHL habitat. Regular coordination between the participating agencies continues through the MOG and ICC. The participating agencies believe the FTHL Conservation Agreement and RMS continue to provide an effective management focus for FTHL habitat conservation. During the past year, implementation of the RMS planning actions has positively benefited FTHL conservation. Outreach efforts continue to include the general public, other U.S. agencies (e.g., BP), and Mexican agencies as active participants in RMS implementation. AGCBR and Pinacate Biosphere Reserves are working closely with U.S. agencies on research and conservation efforts to benefit the FTHL in Mexico. Authorized surface impacts have remained low in MAs. However, there is some concern the 1% development cap may be reached, and exceeded, in some MAs due to utility-scale renewable energy development and Navy projects.

The MOG and ICC continue to support the 2004 decision to allow distributing compensation funding among MAs, regardless of source state, since no land is available for purchase in the Yuma MA. This decision continues to focus on purchasing land available in any MA prior to private development. If there is no additional land available for purchase in a MA, the group will continue to use compensation funds for habitat restoration within MAs. Some signatory participants have been successful in securing funding for rehabilitation efforts from non-compensation funds. This supplements the compensation funds in providing management capability for RMS implementation.

Population inventories and the monitoring of trends continue, as well as research in MAs and FTHL habitat areas. This information is useful in developing future management actions and providing direction on how best to implement current projects.

Public outreach and education continues. The informational videos produced in 2006 for the general public and the BP will help in this effort. Public understanding of the FTHL, its habitat needs, and authorized activities in its habitat areas, is necessary to fully implement the RMS.

The 2003 updated version of the FTHL RMS continues to direct participating agencies towards ever more effective management and conservation of FTHL.

RMS IMPLEMENTATION PROGRESS TO DATE (Updated schedule)

The following table displays the priority level, responsible agency, estimated cost, and schedule for completing each Planning Action. The priority levels indicated in the table are assigned the following definitions:

Priority 1: An action that must be taken in the near term to conserve the species and prevent irreversible population declines.

Priority 2: An action that must be taken to prevent significant declines in population or habitat quality.

Priority 3: All other actions necessary to meet the goals and objectives of this RMS.

The following abbreviations and symbols are used in the implementation schedule:

| | | |
|-------------------------------------|-------|--|
| ABDSP | ..... | Anza-Borrego Desert State Park |
| AGFD | ..... | Arizona Game and Fish Department |
| BLM | ..... | Bureau of Land Management |
| Reclamation | ..... | Bureau of Reclamation |
| ICC | ..... | Interagency Coordinating Committee |
| CDFW | ..... | California Department of Fish and Wildlife |
| OWSVRA | ..... | Ocotillo Wells State Vehicular Recreation Area |
| USFWS | ..... | U.S. Fish and Wildlife Service |
| USMC | ..... | U.S. Marine Corps |
| USN | ..... | U.S. Navy |
| <input checked="" type="checkbox"/> | | Task completed since 1997 |
| <input type="checkbox"/> | | Task not completed |
| ⇒, ∪ | ..... | Task ongoing, on schedule |
| ➡, ∪ | ..... | Task ongoing, not on schedule |

| Management Strategy Implementation Schedule, 2008-2012 | | | | | | | | | | | |
|--|----------|---------------|--|--------------------------|--------------------|--------------------|------------------------|---------|---------|---------|---------|
| Status | Priority | Action Number | Planned action | Duration (yrs) | Responsible agency | Total cost (\$000) | Cost estimates (\$000) | | | | |
| | | | | | | | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 |
| | | 1. | Delineate and designate FTHL MAs | | | | | | | | |
| <input checked="" type="checkbox"/> | 1 | 1.1 | Designate Yuma Desert MA | 2 | Reclamation USMC | 1 | 0 | 0 | 0 | 0 | 0 |
| <input checked="" type="checkbox"/> | 1 | 1.2 | Designate East Mesa MA | 2 | BLM USN | 1 | 0 | 0 | 0 | 0 | 0 |
| <input checked="" type="checkbox"/> | 1 | 1.3 | Designate West Mesa MA | 2 | BLM USN | 1 | 0 | 0 | 0 | 0 | 0 |
| <input checked="" type="checkbox"/> | 1 | 1.4 | Designate Yuha Desert MA | 2 | BLM | 1 | 0 | 0 | 0 | 0 | 0 |
| <input checked="" type="checkbox"/> | 1 | 1.5 | Designate Borrego Badlands MA | 2 | ABDSP | 1 | 0 | 0 | 0 | 0 | 0 |
| <input checked="" type="checkbox"/> | 3 | 1.6 | Designate Ocotillo Wells RA | 1 | BLM OWSVRA | 1 | 0 | 0 | 0 | 0 | 0 |
| <input checked="" type="checkbox"/> | 1 | 1.7 | Designate conservation areas in Coachella Valley | 2 | BLM USFWS CDFG | 1 | 0 | 0 | 0 | 0 | 0 |
| | | 2. | Define and implement actions necessary to minimize loss or degradation of habitat | | | | | | | | |
| <input type="checkbox"/> | 1 | 2.1.1 | Apply mitigation measures | <input type="checkbox"/> | ALL | 5 | 1 | 1 | 1 | 1 | 1 |
| <input type="checkbox"/> | 1 | 2.1.2 | Require compensation | <input type="checkbox"/> | ALL | 25 | 5 | 5 | 5 | 5 | 5 |
| <input type="checkbox"/> | 1 | 2.2.1 | Limit discretionary land uses authorizations and rows to 10 acres and 1% total per MA | <input type="checkbox"/> | ALL | 5 | 1 | 1 | 1 | 1 | 1 |
| <input type="checkbox"/> | 1 | 2.2.2 | Do not dispose of lands in MAS | <input type="checkbox"/> | ALL | 0 | 0 | 0 | 0 | 0 | 0 |
| <input type="checkbox"/> | 3 | 2.2.3 | Continue maintenance in existing ROWs | <input type="checkbox"/> | ALL | 0 | 0 | 0 | 0 | 0 | 0 |
| <input type="checkbox"/> | 2 | 2.2.4 | Require fencing along Yuma Desert MA boundary road | <input type="checkbox"/> | ALL | 50 | 0 | 50 | 0 | 0 | 0 |
| <input type="checkbox"/> | 2 | 2.3.1 | Limit surface disturbance from mineral activities in MAS | <input type="checkbox"/> | ALL | 5 | 1 | 1 | 1 | 1 | 1 |
| <input type="checkbox"/> | 2 | 2.4.1 | Reduce new roads to a minimum in MAS | <input type="checkbox"/> | ALL | 5 | 1 | 1 | 1 | 1 | 1 |
| <input type="checkbox"/> | 1 | 2.4.2 | Designate routes "open," "closed", or "limited." Give route signing a priority | <input type="checkbox"/> | BLM USMC BR | 100 | 20 | 20 | 20 | 20 | 20 |
| <input type="checkbox"/> | 1 | 2.4.3 | Reduce route density in MAS | | See 2.4.2 | | | | | | |
| <input type="checkbox"/> | 1 | 2.4.4 | Coordinate with U.S. BP | <input type="checkbox"/> | ALL | 20 | 4 | 4 | 4 | 4 | 4 |
| <input type="checkbox"/> | 3 | 2.5.1 | Allow OHV recreation in RA | <input type="checkbox"/> | OWSVRA | 0 | 0 | 0 | 0 | 0 | 0 |
| <input type="checkbox"/> | 1 | 2.5.2 | No competitive recreational events in MAS | <input type="checkbox"/> | ALL | 0 | 0 | 0 | 0 | 0 | 0 |
| <input type="checkbox"/> | 2 | 2.5.3 | Allow non-motorized recreational activities in MAS, but no new recreational facilities | <input type="checkbox"/> | ALL | 0 | 0 | 0 | 0 | 0 | 0 |
| <input type="checkbox"/> | 2 | 2.5.4 | Limit camping in MAS | <input type="checkbox"/> | BLM USMC | 20 | 4 | 4 | 4 | 4 | 4 |
| <input type="checkbox"/> | 2 | 2.5.5 | No new long-term visitor areas in MAS | <input type="checkbox"/> | ALL | 0 | 0 | 0 | 0 | 0 | 0 |

Management Strategy Implementation Schedule, 2008-2012

| Status | Priority | Action Number | Planned action | Duration (yrs) | Responsible agency | Total cost (\$000) | Cost estimates (\$000) | | | | | |
|--------|----------|---------------|--|----------------|--|--------------------|------------------------|---------|---------|---------|---------|--|
| | | | | | | | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | |
| ⇒ | 3 | 2.6 | Authorize limited use of flora in MAs | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 1 | 2.7 | Allow military maneuvers and encampments only in designated sites in MAS | ∞ | USN USMC | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 3 | 2.8 | Suppress fires in MAS using limited fire suppression methods in MAS | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 1 | 2.9 | Prohibit pesticide treatments in MAS | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 3 | 2.10 | Limit other activities consistent with above | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| | | 3. | Rehabilitate damaged and degraded habitat | | | | | | | | | |
| ⇒ | 2 | 3. | Rehabilitate damaged and degraded habitat in MAs | ∞ | BLM Reclamation ABDSP USMC USN | 500 | 100 | 100 | 100 | 100 | 100 | |
| | | 4. | Bring all lands within MAs into public management | | | | | | | | | |
| ☑ | 3 | 4.1 | Maintain prioritized list of parcels for acquisitions; and respect private rights | 1 | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 3 | 4.2 | Procure funds for land acquisitions in MAs (32,178 acres of private lands acres in California MAs) | ∞ | BLM CDFW ABDSP | 22,525 | 4,505 | 4,505 | 4,505 | 4,505 | 4,505 | |
| ⇒ | 3 | 4.3 | Use compensation funds to acquire key lands in MAs | ∞ | BLM CDFW ABDSP | 20 | 4 | 4 | 4 | 4 | 4 | |
| ⇒ | 3 | 4.4 | Exchange lands opportunistically | ∞ | BLM | 20 | 4 | 4 | 4 | 4 | 4 | |
| | | 5. | Maintain or establish effective habitat corridors between naturally adjacent populations | | | | | | | | | |
| ⇒ | 2 | 5.1 | Limit or mitigate activities in movement corridors | ∞ | ALL | 25 | 5 | 5 | 5 | 5 | 5 | |
| ⇒ | 3 | 5.2 | Coordinate with Mexico and INS | ∞ | ALL | 10 | 2 | 2 | 2 | 2 | 2 | |
| | | 6. | Coordinate activities and funding among the participating agencies and Mexican agencies | | | | | | | | | |
| ☑ | 2 | 6.1.1 | Establish FTHLMOG | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 2 | 6.1.2 | Hold semi-annual ICC meetings | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 | |
| ⇒ | 3 | 6.1.3 | Establish forum for discussions with agencies and individuals in Mexico | ∞ | ALL | 25 | 5 | 5 | 5 | 5 | 5 | |
| ☑ | 1 | 6.2 | Develop Conservation Agreement | 1 | ALL | 0 | | | | | | |
| ☑ | 2 | 6.3.1 | Incorporate actions in Western Colorado Desert ecosystem plan (Note: Other state and local agencies will fill key roles) | - | ALL | 50 | 10 | 10 | 10 | 10 | 10 | |
| ☑ | 2 | 6.3.2 | Incorporate actions in CVMSHCP (Note: Other state and local agencies will fill key roles) | 3 | BLM CDFW USFWS | 0 | 0 | 0 | 0 | 0 | 0 | |

| Management Strategy Implementation Schedule, 2008-2012 | | | | | | | | | | | |
|--|----------|---------------|--|----------------|---|--------------------------|---------------------------|----------------------|-----------------------|----------------------|---------|
| Status | Priority | Action Number | Planned action | Duration (yrs) | Responsible agency | Total cost (\$000) | Cost estimates (\$000) | | | | |
| | | | | | | | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 |
| ⇒ | 2 | 6.3.3 | Incorporate actions in Western Colorado Desert Route Designation | ∞ | BLM | 20 | 4 | 4 | 4 | 4 | 4 |
| ⇒ | 1 | 6.4 | Coordinate with U.S. BP and develop mutual agreements | 2 | BLM Reclamation USMC | 6 | 2 | 2 | 2 | 0 | 0 |
| ⇒ | 2 | 6.4.1 | Encourage use of techniques to minimize BPOHV activity | ∞ | BLM Reclamation USMC | 5 | 1 | 1 | 1 | 1 | 1 |
| ⇒ | 2 | 6.4.2 | Prepare educational briefing for BP agents | 1 | BLM BR | 5 | 1 | 1 | 1 | 1 | 1 |
| | | 7. | Promote the purposes of the RMS through law enforcement and public education | | | | | | | | |
| ⇒ | 1 | 7.1 | Provide adequate law enforcement | ∞ | BLM CDFW AGFD USMC | 750 | 150 | 150 | 150 | 150 | 150 |
| ⇒ | 3 | 7.2 | Provide public information and education | ∞ | ALL | 25 | 5 | 5 | 5 | 5 | 5 |
| | | 8. | Conduct research necessary to define and implement necessary management actions effectively | | | | | | | | |
| ⇒ | 3 | 8.1 | Require permits for research | ∞ | ALL | 5 | 1 | 1 | 1 | 1 | 1 |
| ⇒ | 2 | 8.2 | OWSVRA shall continue to fund research | ∞ | OWSVRA | 200 | 40 | 40 | 40 | 40 | 40 |
| ☑ | 2 | 8.3.1 | Test trapping as a population census technique | 2 | ALL | 0 | 0 | 0 | 0 | 0 | 0 |
| ⇒ | 2 | 8.3.2 | Test direct counting methods | 2 | ALL | | Included in 8.2 and 8.3.1 | | | | |
| ⇒ | 2 | 8.4 | Determine life history and demographic data (sentinel plots) | 5 | BLM MCAS Reclamation OWSVRA ABDSP | 300 150 150 100 | 60 30 30 20 | 60 30 30 20 | 60 30 30 20 | 60 30 30 20 | |
| ⇒ | 2 | 8.5 | Determine effects of conflicting activities | 5 | ALL | 300 | 60 | 60 | 60 | 60 | 60 |
| ⇒ | 3 | 8.6.1 | Determine genetic variation in population | 5 | ALL | 40 | 0 | 20 | 0 | 20 | 0 |
| ⇒ | 3 | 8.6.2 | Determine effects of non-natural barriers | ∞ | ALL | 30 | 5 | 5 | 5 | 5 | 5 |
| ☐ | 3 | 8.6.3 | Determine effects of natural barriers | 5 | ALL | 15 | 3 | 3 | 3 | 3 | 3 |
| ⇒ | 3 | 8.7 | Determine effectiveness of mitigation measures | 5 | ALL | 20 | 4 | 4 | 4 | 4 | 4 |
| | | 9. | Continue inventory and monitoring | | | | | | | | |
| ⇒ | 2 | 9.1 | Continue inventories | ∞ | ALL | 125 | 25 | 25 | 25 | 25 | 25 |
| ⇒ | 2 | 9.2.1 | Monitor implementation | ∞ | ICC | 40 | 8 | 8 | 8 | 8 | 8 |
| ⇒ | 2 | 9.2.2 | Monitor population trends (occupancy plots) | ∞ | BLM MCAS Reclamation OWSVRA ABDSP | 400 180 135 150 | 100 60 45 50 | 50 60 45 50 | 100 60 45 50 | 50 60 45 50 | |
| ⇒ | 1 | 9.2.3 | Document habitat disturbance and loss | ∞ | ALL | 50 | 10 | 10 | 10 | 10 | 10 |

Management Strategy Implementation Schedule, 2008-2012

| Status | Priority | Action Number | Planned action | Duration (yrs) | Responsible agency | Total cost (\$000) | Cost estimates (\$000) | | | | |
|--------|----------|---------------|--|----------------|--------------------|--------------------|------------------------|---------|---------|---------|---------|
| | | | | | | | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 |
| ⇒ | 1 | 923.1 | Conduct aerial reconnaissance and analysis of surface disturbance on the five MAs every five years | ∞ | ALL | 100 | | 100 | | | |
| ⇒ | 2 | 924 | Prepare annual monitoring/implementation report | ∞ | ICC | 20 | 4 | 4 | 4 | 4 | 4 |
| ⇒ | 1 | 925 | Use new inventory, monitoring, and research data in evaluations and proposed changes | ∞ | ALL | 10 | 2 | 2 | 2 | 2 | 2 |

Appendix A: Report Abstracts

Abbate, D. J. and D. J. Leavitt. 2013. Flat-tailed Horned Lizard (*Phrynosoma mcallii*) Demographic Monitoring Within the Yuma Desert Management Area: 2012 Progress Report. Arizona Game and Fish Department, Wildlife Contracts Branch, Phoenix, Arizona. 22 pp.

We captured 18 and 37 FTHL adult individuals within the BR and BMGR survey plots respectively. Of these, 6 were encountered for the first time on the BR plot and marked with PIT tags and 2 (previously detected and toe-clipped as juveniles on the BR plot) were also PIT tagged. We captured and PIT tagged 16 newly identified adults on the BMGR plot and permanently marked 3 other adults with PIT tags that were encountered and toe-clipped during a previous season. Reproduction was at its lowest level since monitoring began in 2008 with only 4 juvenile detections on the BMGR plot and none on the BR plot. Analysis of yearly, summer, and winter precipitation revealed a strong pattern of lizard abundance being associated with winter precipitation. Analysis of 2012 survey results indicate abundance of FTHL decreased since 2010 on both the BR and BMGR sampling plots within the Yuma Desert MA. In contrast to 2011, adults on the BR plot during August 2012 appeared to be in good condition. All adults processed were relatively robust and most appeared to be well nourished.

Goode, M. and M.R. Parker. 2013. Evaluation of the Potential Impacts of the Joint Strike Fighter Program on the Flat-tailed Horned Lizard at MCAS-Yuma, Barry M. Goldwater Range. School of Natural Resources and the Environment, University of Arizona, Tucson, Arizona.

Intensive fieldwork on the Flat-tailed Horned Lizard (*Phrynosoma mcallii*, FTHL) was conducted on the Barry M. Goldwater Range (BMGR), near Yuma, Arizona. This report covers year three of a four-year study funded by Marine Corps Air Station-Yuma (MCAS). The purpose of this study is to evaluate potential impacts of the Joint Strike Fighter (JSF) program, including the construction and operations of the Auxiliary Landing Field (ALF) on the FTHL. As of January 2014, the ALF is fully constructed, but it is not yet operational.

Seventeen previously surveyed 4-ha mark-recapture plots were surveyed 29 times in Project Year 3, resulting in 1009 captures of 515 individuals. All 17 mark-recapture plots were scheduled to be surveyed twice in Project Year 3 (once pre-monsoon and once post-monsoon) to examine seasonal variability in FTHL populations on the BMGR. Heavy monsoon rains and the resulting summer annual growth forced the cancellation of post-monsoon surveys on 5 plots. However, the mark-recapture component of this project was designed with unpredictable weather patterns in mind, which is why a relatively large number of plots were established in Project Years 1 and 2. As with previous years, there was considerable variation in estimates among plots.

A total of 91 FTHLs (43 males and 48 females) were radiotracked in 2013, resulting in 1395 fixes. Of those 91 FTHLs, 51 (27 males, 24 females, 756 fixes) were non-translocated individuals, while 40 (16 males, 24 females, 639 fixes) were individuals that were originally translocated in 2012. Five translocated individuals tracked during the 2012 active season were also tracked throughout their winter dormancy period, and into the 2013 active season. Additionally, four radiotelemetered translocated FTHLs that were lost in 2012 were found and tracked in 2013. Preliminary movement analyses indicate that the movements of translocated lizards may be beginning to resemble those of non-translocated FTHLs.

During the active season, 5164 miles were driven on the Hardball, yielding observations of 461 live reptiles, including 53 FTHLs. Road surveys also resulted in 34 observations of potential mammalian predators and 141 observations of potential avian predators. Though FTHLs were not the most common reptile species observed on the Hardball, they were the most common species found DOR (34% of all DOR observations).

The collaborator that was selected for investigating FTHL vulnerability to noise determined that other commitments precluded him from participating in this project. Dr. Bruce Young, Associate Professor in the Department of Anatomy at the A.T. Still University of Health Sciences, will assume the former collaborator's role in this component of the project. Because the ALF is not yet operational, this complication will not cause any major setbacks for this component of the project.

Leavitt, Daniel J. 2013. Flat-tailed horned lizard (*Phrynosoma mcallii*) monitoring in southeastern California and southwestern Arizona: 2007-2013 analysis update. Unpublished report, Arizona Game and Fish Dept.

See Appendix C.

Lovich, R. and D. Leavitt. 2013. Flat-tailed Horned Lizard (*Phrynosoma mcallii*) Monitoring and Management. Joint Meeting of Ichthyologists and Herpetologists, Albuquerque, NM.

The flat-tailed horned lizard (*Phrynosoma mcallii*; FTHL) has the smallest range of all horned lizards in the United States. Restricted to lower Sonoran desert habitats of the states of California, Arizona, and Baja California, in the United States and Mexico respectively, this species has been the target of research studies and conservation actions for multiple decades. Increasing threats to the long-term survival of this species persist, and challenge the long-term persistence of this species throughout its range. These challenges require rigorous, up-to-date, and accurate status information essential to successful management of FTHL. In order to better understand the abundance and population status for FTHL species across its range, a Rangewide Management Strategy was adopted by major stakeholders for this species in 1997. All of the stakeholders have invested in annual monitoring, which has resulted in a substantial dataset for a single species. Herein, we present a cumulative analysis on the monitoring methods for the Flat-tailed Horned Lizard through time, with recommendations on future monitoring strategies and management actions.

Appendix B: 2014 Annual Work Plan for the Flat-tailed Horned Lizard Interagency Coordinating Committee

1. Delineate and designate flat-tailed horned lizard MAs and a RA.

1.1-1.6. All MAs and the RA have been delineated and officially designated.

1.7. Encourage development of a MA in the Coachella Valley. Signatories decided to support creation of the CVMSHCP in lieu of establishing an MA in the Coachella Valley. BLM-Palm Springs will continue to participate in the implementation of the CVMSHCP.

2. Define and implement management actions necessary to minimize loss or degradation of habitat.

2.1. Mitigate and compensate project impacts through humane and cost-effective measures.

2.1.1. Apply mitigation measures. Appropriate mitigation measures will be enforced for all authorized projects that impact FTHLs or their habitat.

2.1.2. Require compensation for residual impacts. Agencies will continue to require compensation for projects that have residual impacts to FTHL habitat.

2.2. Limit authorizations that would cause surface disturbance in MAs.

2.2.1. Attempt to locate projects outside MAs; limit discretionary land use authorizations and ROWs to 10 acres and 1% total per MA. These limits will be observed.

2.2.2. Federally owned lands in the MAs shall be retained in federal ownership. No disposal of federal lands within MAs will occur.

2.2.3. Maintenance in existing ROWs may continue. No action required.

2.2.4. Require fencing along Yuma Desert MA boundary road. Agencies in Arizona will continue to coordinate with ADOT to ensure that they are committed to maintaining lizard barrier fencing along the Area Service Highway.

2.3. Limit surface disturbance in MAs from minerals actions.

2.3.1. Allow approved minerals actions while applying applicable mitigation and compensation. Applicable mitigation and compensation will continue to be applied.

2.4. Limit vehicle access and route proliferation in MAs. BLM-El Centro will continue to rehabilitate illegal routes and add signage to designated routes.

2.4.1. Reduce new roads to a minimum in MAs. BLM-El Centro: all designated routes within the MAs have been signed.

2.4.2. Designate routes “open,” “closed,” or “limited.” Give route signing a priority. BLM-El Centro completed route designation for the Western

Colorado Desert in January, 2003. All vehicle routes on BLM managed lands in Imperial County were designated as open, closed, or limited. BLM has completed initial signing of all of these routes and is routinely patrolling the area and replacing signs as necessary. BLM is also in the process of restoring closed routes to a natural condition. MCAS-Yuma's INRMP includes a comprehensive effort to sign routes.

- 2.4.3. Reduce route density in MAs.** BLM-El Centro completed route designation for the Western Colorado Desert. All vehicle routes on BLM managed lands in Imperial County were designated as open, closed, or limited. BLM has successfully secured hundreds of thousands of grant dollars to restore closed routes throughout the Western Colorado Desert area, particularly in the FTHL Management Areas. The MCAS-Yuma INRMP includes most of the Yuma Desert MA and calls for closure of redundant routes; routes will be identified for closure within the MA.
- 2.4.4. Coordinate with BP to ensure cooperation and enforcement of vehicle regulations.** ICC members will continue to hold FTHL orientation sessions with BP agents in the El Centro sector to reduce impacts to FTHL habitat along the International Border.
- 2.5. Limit impacts of recreational activities in MAs.** Recreational camping is limited in the Yuha Desert MA to designated camping areas. The MCAS-Yuma INRMP closes the portion of the Yuma Desert MA on the Barry M. Goldwater Range to all forms of recreation.
 - 2.5.1. Allow vehicle-oriented recreation in RA, consistent with relevant state laws.** No action required.
 - 2.5.2. Permit no competitive recreation events in MAs.** Competitive races will not be permitted in MAs.
 - 2.5.3. Allow non-motorized recreational activities in MAs, but limit new recreational facilities.**
 - 2.5.4. Limit camping in MAs.** Recreational camping is limited in the Yuha Desert MA to designated camping areas. The MCAS-Yuma INRMP closes the portion of the Yuma Desert MA on the Barry M. Goldwater Range to camping.
 - 2.5.5. No long-term camping areas shall be developed in MAs.** None will be developed.
- 2.6. Allow limited use of plants in MAs.** No plant sales, commercial collecting, or grazing will be allowed.
- 2.7. Allow military maneuvers and encampments only in designated sites in MAs.** Military training areas in the Yuma Desert MA are fenced or marked to identify their locations and limits so that adjacent areas will not be impacted.
- 2.8. Suppress fires in MAs, BLM lands, and the RA using allowable methods.**

- 2.9. No pesticide treatments shall be applied within MAs.** No pesticide treatments will occur in MAs, except for specifically targeted herbicides. Herbicides are used on tamarisk removal projects, which improve FTHL habitat.
- 2.10. Within MAs, other activities not consistent with the RMS shall not be approved.** None will be approved.
- 3. Rehabilitate damaged and degraded habitat in MAs.** BLM-El Centro will continue restoration and rehabilitation efforts using SCA interns. Efforts will focus on the East Mesa MA. Trail rehabilitation/restoration will continue at OWSVRA.
- 4. Attempt to acquire all private lands within MAs.**
- 4.1 Maintain prioritized list of parcels for acquisitions.** Lists identifying parcels for acquisition will be maintained by the California State Parks, and BLM-El Centro. Ocotillo Wells District, through OHMVRD, will continue to acquire private in-holdings. Colorado Desert District will continue to acquire private in-holdings within ABDSP. The ICC will coordinate with the National Fish and Wildlife Foundation to ensure priority parcels are acquired to offset impacts from utility-scale renewable energy projects.
- 4.2. Seek funding to acquire key parcels in MAs.** Compensation funds will be banked for habitat acquisition. The ICC will coordinate with the National Fish and Wildlife Foundation to ensure funds acquired through utility-scale renewable energy project mitigation is used to acquire identified priority parcels.
- 4.3. Using compensation and other funds, acquire key lands in MAs.** Key lands in MAs will be acquired as opportunities arise. The ICC and MOG will coordinate with the national Fish and Wildlife Foundations to develop a more comprehensive approach regarding the use of funds.
- 4.4. Participate in exchanges to acquire key parcels in MAs.** This will occur as opportunities arise. At the moment, the primary tool for land acquisition is through purchases rather than land exchanges.
- 5. Maintain or establish effective habitat corridors between naturally adjacent populations.**
- 5.6. Limit or mitigate activities in movement corridors.** The ICC will continue to work with state and federal agencies working on renewable energy conservation plans to ensure opportunities for establishing effective FTHL habitat corridors are not lost. OWSVRA will continue to re-work the Habitat Monitoring System (HMS) which is mandated by the State of California to monitor impacts to habitat/wildlife. This has been a lengthy process due to lack of funding and staff. The new HMS is nearing completion but no “set in stone” date is available at this time. Once the data management system is in place OWSVRA will be able to provide monitoring summaries which will

include information on FTHL captured during reptile surveys. Until then, raw data is available at the ICC's request.

5.7. Coordinate with Mexico and INS to ensure movement across the border. Agencies will continue to consult with Department of Homeland Security on border fencing issues.

6. Coordinate activities and funding among the participating agencies and Mexican agencies.

6.1.1. Maintain a FTHL MOG. The MOG will continue to meet as needed to coordinate implementation of the conservation agreement in response to recommendations from the ICC. Meeting minutes will be provided to all MOG and ICC members to facilitate effective coordination.

6.1.2. Hold semi-annual meetings of the ICC. The ICC has met quarterly since the inception of the RMS and will continue to do so to discuss implementation of Planning Actions under the RMS and issues and challenges regarding this implementation. In addition to ICC meetings, subgroups of the ICC may meet on occasion to discuss specific issues.

6.1.3. Develop a forum for discussions with agencies and individuals in Mexico. The ICC will continue to work with Mexico biologists to develop a Mexico Rangewide Management Strategy.

6.2 Develop a conservation agreement. The RMS may be revised as necessary to reflect new information.

6.3.1. Incorporate actions into the Western Colorado Desert Coordinated Management Plan. In 2005, the California Desert Conservation Area Plan was amended to formally adopt the Strategy and the FTHL MAs. This plan will continue to be implemented in 2014.

6.3.2. Incorporate actions into the CVMSHCP. BLM-Palm Springs will continue to participate in the implementation of the CVMSHCP to ensure FTHL populations within the CVMSHCP plan area persist.

6.3.3. Incorporate actions into the Western Colorado Desert Route Designation. See 2.4.2.

6.4. Coordinate with U.S. BP to develop mutual agreements. BP will continue to be invited to MOG meetings. ICC agencies will finalize the production of the BP training and education video and distribute it to BP offices for use in their training programs.

7. Promote the goals of the RMS through law enforcement and public education.

7.1. Provide sufficient law enforcement. MCAS and AGFD will continue to conduct ORV patrols within the Yuma Desert MA and adjacent habitat. BLM-El Centro has aggressively moved ahead to fill vacant law enforcement positions and apply for grants to add additional rangers. El Centro is currently almost fully staffed.

7.2. Provide public information and education about the MAs and RA. All users of BMGR will receive a briefing that includes information on the FTHL, via slides, pictures and/or descriptions. BLM-El Centro will continue to distribute FTHL brochures and maps to land users. Agencies on both sides of the border will continue to distribute the FTHL brochure that was developed by the Centro Intercultural de Estudios de Desiertos y Océanos.

8. Encourage and support research to promote conservation of FTHL and desert ecosystems.

8.1. Require permits for research. AGFD and CDFW will continue to require scientific collecting permits for people who collect or handle FTHL. (New CDFW policy enables monitors who move FTHL as mitigation for projects in California to do so with a Letter of Concurrence from CDFW and not a collecting permit.)

8.2. OWSVRA shall continue to budget for occupancy surveys and conduct monitoring for FTHL as part of the annual Habitat Monitoring Surveys. Depending on funding, planned monitoring (in house) is to complete 50 or more occupancy plots with 6 visits per plot as outlined in the current protocol.

8.3. Continue to refine cost-effective techniques for assessing FTHL abundance.

8.3.1. Test trapping and other techniques used to enumerate FTHLs directly.

8.3.2. Determine effectiveness of relative enumeration techniques and scat counts as an index of relative abundance.

8.4. Determine life history and demographic data. The sentinel plots proposed for each of the MAs will provide this data.

8.5. Determine effects of conflicting activities. The UA will continue to conduct a multi-year survey and monitoring project on FTHL behavior, habitat use and effects of increased road traffic and exposure to noise prior to, during and for three years after JSF Airfield construction. The study focuses on the two primary issues raised in BO, which are the potential impacts of jet noise and airfield proximity on demographics, behavior, and hearing, and the potential effects of increased traffic on roads leading to and in the vicinity of the ALF.

8.6. Determine genetic variation among populations and effects of barriers. The study to evaluate genetic variation across the range of FTHL has been completed.

8.6.1. Determine genetic variation in MAs.

8.6.2. Determine effects of human-created barriers.

8.6.3. Determine effects of natural barriers.

8.7. Determine effectiveness of mitigation measures. The ICC may implement a relocation study to determine whether this measure within the RMS should be revised.

9. Continue Inventory and Monitoring.

9.1. Continue inventories. BLM-El Centro will continue to monitor lizard populations in the MAs using the methods prescribed by the ICC. In the Coachella Valley Preserve, FTHL will continue to be surveyed by the Center for Natural Lands Management, with a focus on lizard-ant-small mammal interactions. The objective is to use a correlation approach as well as an experimental approach (small mammal enclosures with varying resource levels) to determine whether the small mammals restrict the growth of the ant populations and therefore impact FTHL. With funding from Reclamation and/or MCAS, AGFD will conduct 2 demographic plots within the Yuma Desert MA. Funding was not provided to resample the 75 occupancy plots that were established in the Yuma Desert MA in 2011. Demographic plots are proposed in the West Mesa, and Yuha Desert MAs. OWSVRA has a large crew in 2014 so the full extent of occupancy surveys will be attempted using the currently approved RMS protocol and demographic surveys will be initiated. Occupancy surveys are proposed for the Borrego Badlands MA and Yuha Desert MA. Occupancy surveys for the Borrego Badlands will be expanded in order to better comply with ICC recommendations. Certain plots will be put on rotation so that more visits can be achieved on the remaining plots, thus hoping to increase statistical reliability.

9.2. Monitor habitat quality and population trends in the MAs. BLM-El Centro conducts disturbance and vehicle track surveys as time and funding allow. The Student Conservation Crew conducting restoration in the Yuha Desert MA is evaluating the level of disturbance within the MA before, during, and after the restoration.

9.2.1. Monitor implementation of the RMS. The 2013 Work Plan describes how the 2003 RMS will be implemented. At the end of the year, the ICC will report accomplishments and significant deviations.

9.2.2. Monitor population trends. Observations of FTHL during the course of biannual reptile surveys at OWSVRA will be recorded as part of regular monitoring for the Habitat Monitoring Surveys. BLM-El Centro will gather population data using occupancy plots. Colorado Desert District will continue occupancy plots in Borrego Badlands MA.

9.2.3. Document habitat disturbance and loss. All authorized habitat impacts will be reported in the 2012 ICC Annual Report. BLM-El Centro, AGFD, and USFWS will continue to quantify the level of vehicular impacts to FTHL habitat using a step-point method.

9.2.4. Prepare an annual report of monitoring results and implementation progress. An annual report will be produced that summarizes monitoring and RMS implementation during 2012. The report will include a schedule of activities to be accomplished in 2013, budget needs for 2013, and projected budget needs for major projects in 2014 and 2015. The report shall also include a summary of monitoring results and a discussion of the likely causes of any noted declines in population.

9.2.5 New data shall be used in evaluations of the RMS and in assessing proposed changes. New information resulting from ongoing research and monitoring will be used to revise the RMS. MCAS-Yuma will continue their JSF study multi-year survey and monitoring of FTHL behavior, habitat use, and effects of increased road traffic and noise exposure through 2014. It will install traffic counters along County 14 to monitor volume of traffic prior to and after Auxiliary Landing Field construction pre-construction traffic volume data. It will build upon mark-recapture baseline FTHL abundance and demographic data. This will allow documentation in changes in FTHL abundance and demographics due to factors such as seasonal and annual variation, and to obtain long-term data on individual growth and survivorship. It will continue to place new plots in areas of interest, and will re-survey existing plots. It will refine and extend its measurements of distance-from-effect for paved roads, powerlines, and the ASH drift fence. This will permit more accurate estimates of impact severity and allow the study to identify which impacts are most important individually and under what circumstances. It will continue to examine FTHL movement patterns using radiotelemetry. This will provide insight into FTHL natural history, the better we will be able to assess how JSF construction will affect the FTHL population on BMGR. It will continue to refine methodology for radiotelemetry used to evaluate JSF impacts. It will continue to formally monitor FTHL road use and mortality by conducting road surveys. Supplementing these data with traffic volume data will provide insight into how roads are both directly and indirectly affecting FTHLs on the BMGR. Finally, it will also continue to monitor how other species of reptiles, as well as their predators, are using the roads and infrastructure.

Appendix C. Flat-tailed horned lizard (*Phrynosoma mcallii*) monitoring in southeastern California and southwestern Arizona: 2007 – 2013 analysis update



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INTRODUCTION

The Flat-tailed Horned Lizard (FTHL; *Phrynosoma mcallii*) occurs in a very limited range that extends from northern Sonora, Mexico to just north of the Salton Sea, California and enters the southwestern corner of Arizona south of the Gila River confluence with the Colorado River (Figure 1). The FTHL has experienced a significant range reduction (roughly 49 %) due to urban and agricultural development (Rorabaugh and Young, 2009). Multiple actions by partner agencies throughout the range of the FTHL in the U.S.A. and in Mexico have resulted in the implementation of conservation and management strategies (FTHL ICC 1997, 2003, 2008). Five management areas (MAs) and one research area (RA) have been established to protect this species from being listed as federally endangered and to serve as long-term monitoring sites (Figure 1; FTHL ICC 2003).

Periodic population monitoring is conducted throughout the remaining range of the FTHL (FTHL ICC 2008). The objective of this report is to analyze data collected from these monitoring efforts and to provide insight to the FTHL Interagency Coordinating Committee (ICC) in regards to species status and methodological effectiveness. Please refer to the previous analysis reports (USFWS 2010, Frary 2011, Frary and Grandmaison 2012, Leavitt 2013), the FTHL Monitoring Plan (FTHL ICC 2008), and reports from MAs (Abbate et al. 2011, Abbate and Leavitt 2012, Leavitt et al. 2013) for descriptions of FTHL MAs and the RA, as well as field survey effort and analytical methodology.

METHODS

Occupancy

In previous site occupancy analyses the presence of scat was used as a surrogate for FTHL detections. However, it is unclear how a modeling exercise using scat can benefit from these data. Estimates from models that utilize scat often rank higher for both occupancy and detection than those based on individual detections (Frary 2011). This is problematic because the logic for incorporating scat into an occupancy model is not clearly stated in the FTHL Monitoring Plan (FTHL ICC 2008). Currently, there are no methods available for deciphering FTHL scat from the scat of the Desert Horned Lizard (a.k.a. Goode's Horned Lizard; *Phrynosoma platyrhinos*). In addition, reporting from Hodges (1995) that suggests fewer scats present at sites with *P. platyrhinos* versus those with FTHL is correlation and not causation. Hodges (1995) found the same pattern to occur on different soil surfaces, which may have more to do with the differences

in detection of scat than the frequency of defecation between these species. For this report, all analyses of occupancy are conducted on FTHL observations only.

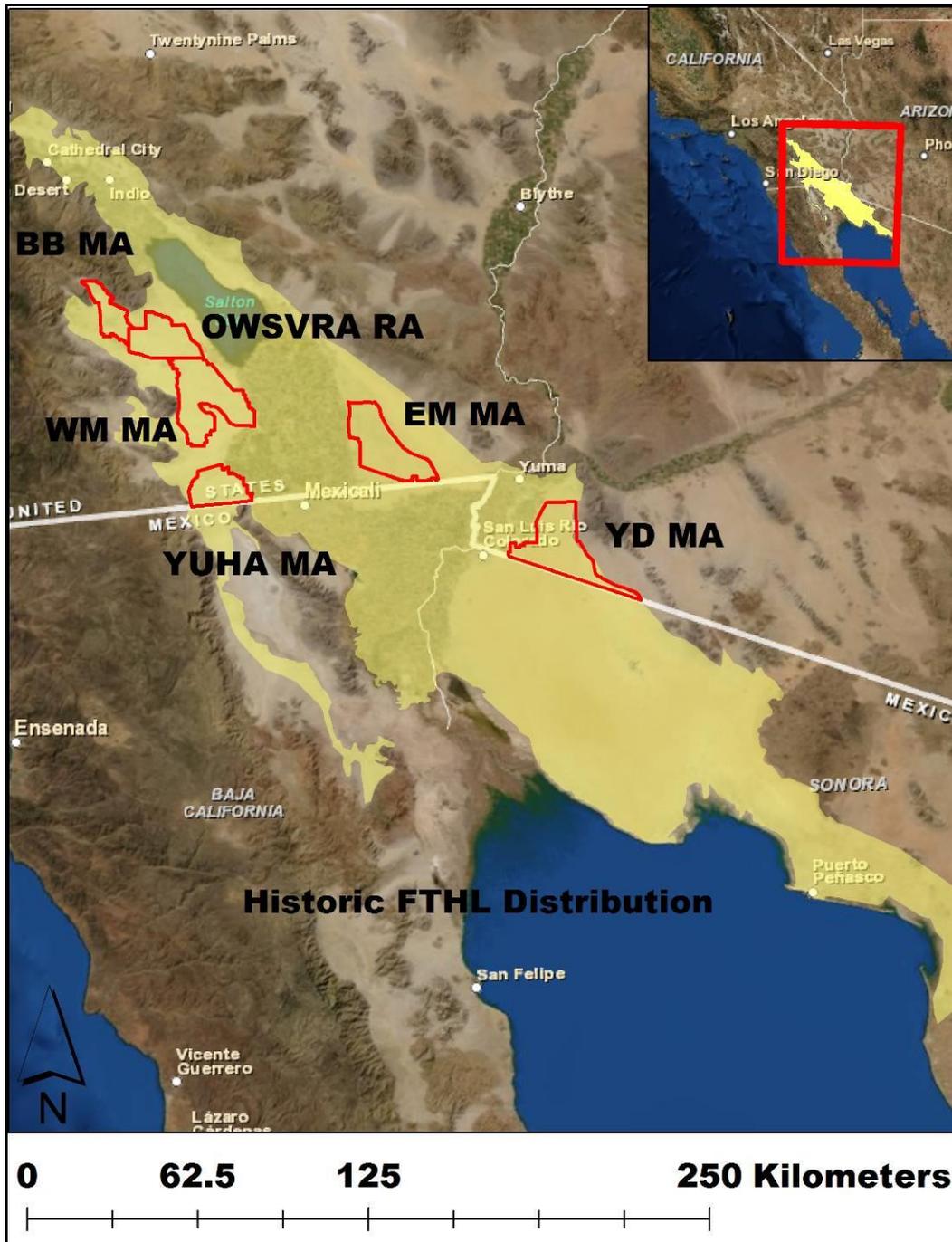


Figure 1. Historic distribution of the Flat-tailed Horned Lizard and current location of five management areas and one research area in southwestern Arizona and southeastern California.

Single-Season Occupancy

Single season patch occupancy models (MacKenzie et al. 2002) were used to estimate detection probability (p) and occupancy probability (ψ) for Borrego Badlands (BB) MA, Ocotillo Wells State Vehicular Recreation Area (OWSVRA) MA, and the Yuma Desert (YD) MA in 2013. Individual single-season analyses were conducted for each MA in program Presence (Hines 2006). Total number of survey passes and plots surveyed varied by MA in 2013 (Table 1). In instances where fewer visits were conducted on a plot than total survey passes expected for each site, missing values were coded as “.” in program Presence. For this analysis, a set of models were considered that allowed p to vary with each survey pass and maintained ψ as constant. All models were ranked according to their Akaike’s Information Criterion (AIC; Akaike 1973) and were corrected for small sample size (AIC_c; Burnham and Anderson 2002). Models with $\Delta\text{AIC}_c \leq 2$ were considered to be well-supported by the data (Burnham and Anderson 2002). To account for model selection uncertainty, parameter estimates were averaged across all candidate models based upon resulting model weights (i.e., parameter estimates from models with higher model weights contributed more strongly to final estimates than models with lower model weights (Burnham and Anderson 2002).

Table 1. Number of surveys conducted for each management area by method for 2013.

| Management Area | Method | |
|---------------------|-------------------------------|---------------------------|
| | Demography Plots ¹ | Occupancy Plots (surveys) |
| Borrego Badlands MA | n/a | 52 (5) |
| East Mesa MA | 1: EM1 | n/a |
| OWSVRA RA | n/a | 50 (6) |
| West Mesa MA | 1: NAVY = WM3 | n/a |
| Yuma Desert MA | 2: YD1 & YD2 | 75 (6) |
| Yuha Desert MA | n/a | n/a |

¹ 1: EM1 = East Mesa plot 1; NAVY = WM3 = West Mesa plot 3; YD1 = Yuma desert plot 1; YD2 = Yuma desert plot 2.

Multiple-Season Occupancy

For MAs where multiple years of occupancy data have been collected (YD, BB, and OWSVRA) I used multi-season methods to estimate p , ψ , colonization (γ) and extinction (ϵ) from 2011-2013. These models assume seasonal closure for ψ and allow for trends to be evaluated and can be used to estimate population growth rates (λ). I compared a variety of models that estimated the seasonal, yearly, and pass specific effects on p and calculated for constant or individual values for ϵ and γ . Multiple-season occupancy analyzes were conducted in program Presence

(Hines 2006) and I selected models that estimated initial ψ , local γ , ε , and p . Missing values for locations and years were coded as “.” and not all MAs were evenly sampled resulting in larger standard error around the parameter estimates. Models and their resulting parameter estimates were treated similarly as described above in the single-season analysis.

Demography

2013 Abundance

Huggins closed capture abundance models (Huggins 1989) were used to estimate abundance (N), capture probability (p), and recapture probability (c) of FTHL in MA plots where demographic surveys were conducted in 2013. These analyses initially included 4 plots: East Mesa MA plot 1, West Mesa MA plot 3 (a.k.a. NAVY), YD MA plot 1, and YD MA plot 2 (Table 1). Due to over-parameterization and low capture rates at YD1 estimates were considerably skewed and these analyses have been omitted. Capture-recapture encounter histories from each survey effort (*i.e.*, MA plot) were included in a single dataset. Abundance was estimated only for adults (≥ 65 mm snout-vent length) due to small numbers of captured juveniles. All models were ranked according to their AIC_c value. Models with $\Delta AIC_c \leq 2$ were considered to be well-supported by the data (Burnham and Anderson 2002). To account for model selection uncertainty, parameter estimates were averaged across all candidate models based upon resulting model weights. Cumulative capture and recapture probabilities, or the probability of capturing or recapturing an individual were calculated once throughout all sampling sessions, assuming that the lizard remained on the plot throughout sampling. Analyses were conducted using program MARK (White and Burnham 1999).

To determine population growth (λ) for the demography plots between years. I calculated the classic λ expression:

$$N_{t+1} = N_t * \lambda$$

where N_t is the population size (abundance above) at time t and N_{t+1} is the population size at time $t + 1$ (Johnson 1996). These estimates were calculated separately for each MA and RA where abundance data were available (Table 1).

Robust-design Pradel models

I used robust-design Pradel models (Pradel 1996) to estimate survival (ϕ), population growth (λ), capture probability (p), recapture probability (c), and abundance (N) for sites with multiple years of marked and recaptured individuals. This model is best described as:

$$N_t \varphi_t = \gamma_{t+1} N_{t+1}$$

where φ_t is the probability of survival for a given time interval and γ_{t+1} is the probability of the individual being alive at preceding occasion. Population growth was determined as above for these models. For φ , λ , and each yearly N per MA, I compared models that alternated these parameters as either constant, by group, over time, and with a time-group interaction. The resulting model set included 2064 different variations. I report on the top models with AICc weights <2 .

The sites used in this analysis were EM plot 1, WM plot 1, YD plot1, and YD plot 2. This analysis was conducted in program MARK (White and Burnham 1999). I selected robust design Pradel models with survival and lambda data type and a Huggins' p and c closure type (Kendall 2012). To fit these models two major corrections were made: each site was 1) assumed to be sampled for ten day periods and 2) assumed to be sampled over a seven year period (2007-2013). I acknowledge that these efforts will artificially lower the estimates of p and c however this is a very effective way to estimate φ and λ with multiple years-worth of data.

RESULTS

Occupancy

Single-Season Occupancy

The models with the most support for BB MA and OWSVRA RA modeled FTHL ψ and p as constant. However, at YD MA the model with the most support held ψ constant and estimated p separately for each survey effort (Table 2). Occupancy estimates were highest at the YD MA (0.81 ± 0.05) and OWSVRA (0.68 ± 0.10) and low at BB MA (0.19 ± 0.08 ; Table 3). Estimates of p were different per MA and these ranged from high at YD MA ($0.56-0.80$) to low at OWSVRA RA (0.25 ± 0.04) and BB MA (0.23 ± 0.09 ; Table 3). Interestingly, there were strong patterns of increased p estimates over time at YD MA.

Multiple-Season Occupancy

The best candidate model for site occupancy for YD MA between 2011 and 2013 estimated γ and ε separately and p per yearly pass (Table 4). The top model of site occupancy at BB MA between 2011 and 2013 estimated γ , ε , and p as constant parameters (Table 5). Finally, the best candidate model for site occupancy at OWSVRA RA between 2011 and 2013 estimated γ and ε as constant parameters and estimated p annually (Table 6). Occupancy estimates were high at

YD MA (0.88 – 0.79; Table 7) and OWSVRA RA (0.91- 0.78; Table 8) and low at BB MA (0.42 – 0.10; Table 9). Both colonization and extinction rates were estimated low at YD MA (Table 7) and OWSVRA RA (Table 8). However, local extinction rates are predicted to be very high at BB MA (Table 9).

Table 2. Candidate set of models used to estimate occupancy (ψ) and detection probability (p) at three Flat-tailed Horned Lizard Management Areas in 2013: Borrego Badlands, Ocotillo Wells State Vehicular Recreation Area, and Yuma Desert.

| Management Area | Model | AIC | Delta AICc | AIC Weights | Model Likelihood | Num. Par |
|------------------|------------------------|--------|------------|-------------|------------------|----------|
| Borrego Badlands | $p(\cdot) \psi(\cdot)$ | 85.55 | 0.00 | 0.93 | 1.00 | 2 |
| | $p(t) \psi(\cdot)$ | 90.79 | 5.24 | 0.07 | 0.07 | 6 |
| OWSVRA | $p(\cdot) \psi(\cdot)$ | 270.34 | 0.00 | 0.96 | 1.00 | 2 |
| | $p(t) \psi(\cdot)$ | 276.88 | 6.54 | 0.04 | 0.04 | 7 |
| Yuma Desert | $p(t) \psi(\cdot)$ | 522.97 | 0.00 | 0.58 | 1.00 | 7 |
| | $p(\cdot) \psi(\cdot)$ | 523.60 | 0.63 | 0.42 | 0.73 | 2 |

Table 3. Occupancy and detection probability estimates for the top models for Borrego Badlands, Ocotillo Wells State Vehicular Recreation Area, and Yuma Desert Management Areas in 2013.

| Management Area | Parameter | Estimate | SE | LCI | UCI |
|-----------------------|-----------|----------|------|------|------|
| Borrego Badlands 2013 | $p1$ | 0.23 | 0.09 | 0.10 | 0.44 |
| | ψ | 0.19 | 0.08 | 0.08 | 0.38 |
| Yuma Desert 2013 | $p1$ | 0.56 | 0.06 | 0.43 | 0.68 |
| | $p2$ | 0.67 | 0.06 | 0.55 | 0.78 |
| | $p3$ | 0.70 | 0.06 | 0.58 | 0.81 |
| | $p4$ | 0.77 | 0.05 | 0.65 | 0.86 |
| | $p5$ | 0.69 | 0.06 | 0.56 | 0.79 |
| | $p6$ | 0.80 | 0.05 | 0.68 | 0.88 |
| | ψ | 0.81 | 0.05 | 0.71 | 0.89 |
| OWSVRA 2013 | p | 0.25 | 0.04 | 0.18 | 0.34 |
| | ψ | 0.68 | 0.10 | 0.47 | 0.84 |

Table 4. Candidate models used to estimate occupancy, detection probability, colonization, and extinction at Yuma Desert Flat-tailed Horned Lizard Management Area from 2011-2013.

| Model | AIC | Δ AIC | AIC | Model | No. Par. | -2LogLike |
|--|---------|--------------|--------|------------|----------|-----------|
| | | | weight | Likelihood | | |
| $\psi_1, Y(t), \varepsilon(t), p(\text{pass})$ | 1562.92 | 0.00 | 0.92 | 1.00 | 11 | 1540.92 |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\text{pass})$ | 1569.23 | 6.31 | 0.04 | 0.04 | 9 | 1551.23 |
| $\psi_1, Y(t), \varepsilon(t), p(t)$ | 1570.22 | 7.30 | 0.02 | 0.03 | 23 | 1524.22 |
| $\psi_1, Y(t), \varepsilon(t), p(\text{year})$ | 1571.90 | 8.98 | 0.01 | 0.01 | 8 | 1555.90 |
| $\psi_1, Y(t), \varepsilon(t), p(\cdot)$ | 1575.47 | 12.55 | 0.00 | 0.00 | 6 | 1563.47 |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(t)$ | 1576.54 | 13.62 | 0.00 | 0.00 | 21 | 1534.54 |

Table 5. Candidate models used to estimate occupancy, detection probability, colonization, and extinction at Borrego Badlands Flat-tailed Horned Lizard Management Area from 2011-2013.

| Model | AIC | Δ AIC | AIC | Model | No. Par. | -2LogLike |
|--|--------|--------------|--------|------------|----------|-----------|
| | | | weight | Likelihood | | |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\cdot)$ | 151.63 | 0.00 | 0.45 | 1.00 | 4 | 143.63 |
| $\psi_1, Y(t), \varepsilon(t), p(\cdot)$ | 152.51 | 0.88 | 0.29 | 0.64 | 6 | 140.51 |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\text{year})$ | 153.34 | 1.71 | 0.19 | 0.43 | 6 | 141.34 |
| $\psi_1, Y(t), \varepsilon(t), p(\text{year})$ | 156.20 | 4.57 | 0.05 | 0.10 | 8 | 140.20 |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\text{pass})$ | 157.72 | 6.09 | 0.02 | 0.05 | 8 | 141.72 |
| $\psi_1, Y(t), \varepsilon(t), p(\text{pass})$ | 159.02 | 7.39 | 0.01 | 0.02 | 10 | 139.02 |

Table 6. Candidate models used to estimate occupancy, detection probability, colonization, and extinction at Ocotillo Wells State Vehicular Recreation Area Flat-tailed Horned Lizard Research Area from 2011-2013.

| Model | AIC | Δ AIC | AIC | Model | No. Par. | -2LogLike |
|--|--------|--------------|--------|------------|----------|-----------|
| | | | weight | Likelihood | | |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\text{year})$ | 930.35 | 0.00 | 0.41 | 1.00 | 6 | 918.35 |
| $\psi_1, Y(t), \varepsilon(t), p(\text{year})$ | 930.92 | 0.57 | 0.31 | 0.75 | 8 | 914.92 |
| $\psi_1, Y(t), \varepsilon(t), p(\cdot)$ | 932.04 | 1.69 | 0.18 | 0.43 | 6 | 920.04 |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\cdot)$ | 933.32 | 2.97 | 0.09 | 0.23 | 4 | 925.32 |
| $\psi_1, Y(t), \varepsilon(t), p(\text{pass})$ | 938.99 | 8.64 | 0.01 | 0.01 | 11 | 916.99 |
| $\psi_1, Y(\cdot), \varepsilon(\cdot), p(\text{pass})$ | 940.30 | 9.95 | 0.00 | 0.01 | 9 | 922.30 |

Table 7. Estimated ψ , \bar{Y} , ε , p , and λ for top model at the Yuma Desert Management Area between 2011 and 2013.

| Year | ψ | \bar{Y} | ε | $p1, p2, p3, p4, p5, p6$ | λ |
|------|-----------------|-----------------|-------------------------|------------------------------------|-----------------|
| 2011 | 0.88 ± 0.04 | -- | -- | 0.53, 0.59, 0.68, 0.66, 0.67, 0.75 | -- |
| | -- | 0.09 ± 0.10 | 0.09 ± 0.04 | -- | 0.89 ± 0.04 |
| 2012 | 0.79 ± 0.05 | -- | -- | 0.53, 0.59, 0.68, 0.66, 0.67, 0.75 | -- |
| | -- | 0.11 ± 0.08 | $0.00 \pm 0.00^\dagger$ | -- | 1.03 ± 0.02 |
| 2013 | 0.81 ± 0.05 | -- | -- | 0.53, 0.59, 0.68, 0.66, 0.67, 0.75 | -- |

† associated β estimate was irregular

Table 8. Estimated ψ , \bar{Y} , ε , p , and λ for top model at the Ocotillo Wells State Vehicular Recreation Area Flat-tailed Horned Lizard Research Area between 2011 and 2013.

| Year | ψ | \bar{Y} | ε | p | λ |
|------|-----------------|-------------------------|-----------------|-----------------|-----------------|
| 2011 | 0.91 ± 0.04 | -- | -- | 0.34 ± 0.02 | -- |
| | -- | $0.00 \pm 0.00^\dagger$ | 0.07 ± 0.07 | -- | 0.92 ± 0.07 |
| 2012 | 0.84 ± 0.07 | -- | -- | 0.23 ± 0.05 | -- |
| | -- | $0.00 \pm 0.00^\dagger$ | 0.07 ± 0.07 | -- | 0.92 ± 0.07 |
| 2013 | 0.78 ± 0.12 | -- | -- | 0.22 ± 0.04 | -- |

† Associated β estimate was irregular

Table 9. Estimated ψ , \bar{Y} , ε , p , and λ for top model at the Borrego Badlands Management Area between 2011 and 2013.

| Year | ψ | \bar{Y} | ε | p | λ |
|------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 2011 | 0.42 ± 0.16 | -- | -- | 0.26 ± 0.08 | -- |
| | -- | 0.01 ± 0.04 | 0.54 ± 0.19 | -- | 0.47 ± 0.16 |
| 2012 | 0.20 ± 0.07 | -- | -- | 0.26 ± 0.08 | -- |
| | -- | 0.01 ± 0.04 | 0.54 ± 0.19 | -- | 0.49 ± 0.16 |
| 2013 | 0.10 ± 0.05 | -- | -- | 0.26 ± 0.08 | -- |

Demography

2013 Abundance

The most well supported model of FTHL abundance using Huggins closed capture method modeled $p = c$ different between locations (YD2: 0.14 ± 0.03 , EM1: 0.07 ± 0.03 , and WM3: 0.31 ± 0.03 ; Table 10). None of the competing models were well supported by the data (*i.e.*, all models had $\Delta AIC_c \geq 2$). Abundance of adult FTHL increased in 2013 on EM1 (Figure 2) and

WM3 plots and were slightly lower on the YD2 plot as compared with previous years (Table 11). Population growth rates spiked between the transitions from 2008 to 2010 and has been fluctuating around stability ($\lambda = 1.0$) since that time (Table 12). East Mesa MA has had the longest going demographic plot thus far (EM1) and this location's FTHL population has shown signs of growth following a steep decline after the 2010 season (Figure 2).

Table 10. Candidate set of models used to estimate abundance, capture probability (p), and recapture probability (c) of FTHLs at three management areas in 2013.

| Model | AICc | Δ AIC | AIC weight | Model Likelihood | No. Par. | Deviance |
|-------------|--------|--------------|------------|------------------|----------|----------|
| $p(g)=c(.)$ | 512.48 | 0.00 | 0.95 | 1.00 | 3 | 449.4 |
| $p(.)c(.)$ | 518.28 | 5.80 | 0.05 | 0.06 | 2 | 457.3 |
| $p(.)=c(.)$ | 535.17 | 22.70 | 0.00 | 0.00 | 1 | 476.2 |

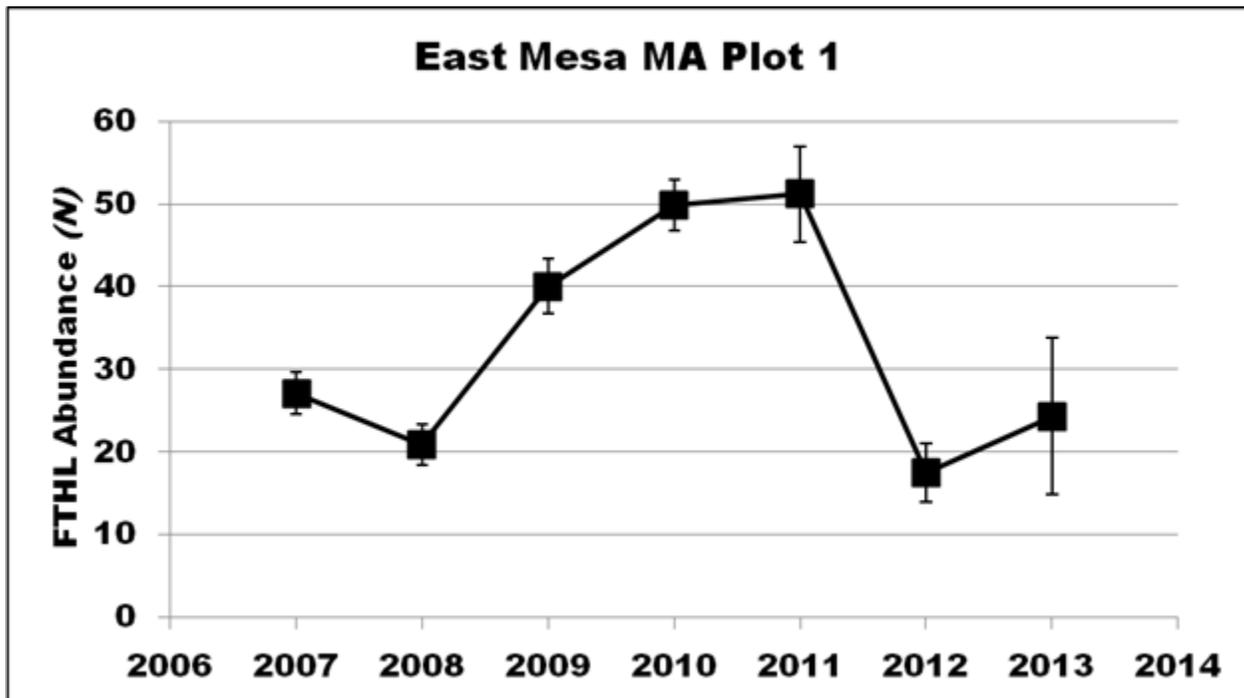


Figure 2. Flat-tailed Horned Lizard abundance and standard error estimates for 9 ha East Mesa plot 1 from 2007 through 2013.

The plots at YD MA (YD1 and YD2) have been visited since 2008, however due to an excess of *Bouteloua aristoides* (Needle Grama) on the YD1 plot in 2013 (Figure 3) very few captures occurred there despite this area being very busy with FTHLs earlier in the year during occupancy

studies (*pers. obs.*). The YD2 plot estimates of N from 2008 to 2013 suggest a spike in growth in 2010 and a continued leveling out until 2013 (Figure 4).



Figure 3. Yuma Desert MA demographic plot 1 on the Barry M. Goldwater Range West photograph depicts the amount of cover created by Needle Grama (*Bouteloua aristoides*).

Table 11. Abundance estimates for FTHL at seven 9-ha demographic survey plots, 2007-2013.

| Plot | Year | N | S.E. | LCL | UCL |
|------|------|------|------|------|------|
| EM1 | 2007 | 27.1 | 2.6 | 22.0 | 32.1 |
| EM1 | 2008 | 20.9 | 2.5 | 16.0 | 25.8 |
| EM1 | 2009 | 40.0 | 3.3 | 33.5 | 46.5 |
| EM1 | 2010 | 49.9 | 3.1 | 43.8 | 56.0 |
| EM1 | 2011 | 51.2 | 5.8 | 39.8 | 62.6 |
| EM1 | 2012 | 17.5 | 3.6 | 14.1 | 31.1 |
| EM1 | 2013 | 24.3 | 9.5 | 15.2 | 58.8 |
| WM1 | 2007 | 10.8 | 2.6 | 5.8 | 15.8 |
| WM1 | 2008 | 5.9 | 1.1 | 3.8 | 8.0 |
| WM1 | 2009 | 16.1 | 2.2 | 11.9 | 20.3 |
| WM1 | 2010 | 18.2 | 2.6 | 13.2 | 23.2 |
| WM1 | 2011 | 48.1 | 5.2 | 38.0 | 58.2 |
| WM1 | 2012 | 20.2 | 4.1 | 16.3 | 35.2 |
| WM1 | 2013 | . | . | . | . |
| WM2 | 2008 | 36.5 | 3.1 | 30.4 | 42.6 |
| WM2‡ | 2009 | 41.2 | 3.4 | 34.6 | 47.8 |

Table 11. Abundance estimates for FTHL at seven 9-ha demographic survey plots, 2007-2013 (continued).

| | | | | | |
|-----|------|------|------|------|-------|
| WM3 | 2010 | 56.3 | 4.6 | 47.2 | 65.4 |
| WM3 | 2011 | . | . | . | . |
| WM3 | 2012 | . | . | . | . |
| WM3 | 2013 | 23.6 | 0.8 | 23.1 | 27.5 |
| YD1 | 2008 | 34.1 | 3.0 | 28.3 | 39.9 |
| YD1 | 2009 | 38.8 | 3.2 | 32.5 | 45.2 |
| YD1 | 2010 | 76.7 | 8.8 | 59.4 | 93.9 |
| YD1 | 2011 | 45.8 | 28.8 | 30.0 | 102.3 |
| YD1 | 2012 | 44.0 | 3.8 | 43.0 | 57.3 |
| YD1 | 2013 | . | . | . | . |
| YD2 | 2008 | 15.3 | 1.8 | 11.7 | 18.8 |
| YD2 | 2009 | 20.0 | 2.1 | 15.8 | 24.2 |
| YD2 | 2010 | 75.9 | 12.7 | 51.1 | 100.8 |
| YD2 | 2011 | 40.4 | 16.7 | 30.0 | 73.2 |
| YD2 | 2012 | 22.0 | 2.7 | 20.0 | 29.0 |
| YD2 | 2013 | 19.2 | 3.2 | 16.1 | 30.7 |
| YU1 | 2007 | 20.0 | 2.1 | 15.8 | 24.2 |
| YU1 | 2008 | 18.8 | 2.0 | 14.8 | 22.8 |
| YU1 | 2009 | 25.9 | 2.5 | 21.0 | 30.8 |
| YU1 | 2010 | 46.4 | 4.2 | 38.2 | 54.6 |
| YU1 | 2011 | 58.5 | 5.8 | 47.1 | 70.0 |
| YU1 | 2012 | 51.1 | 8.9 | 41.9 | 81.9 |
| YU1 | 2013 | . | . | . | . |

Table 12. Population growth (λ) rates for each MA between 2007 and 2013 based on Huggins closed captures abundance estimates.

| | EM1 | WM1 | WM2 | WM3 | YD1 | YD2 | YU1 |
|-----------|------|------|------|-----|------|------|------|
| 2007-2008 | 0.77 | 0.55 | . | . | . | . | 0.94 |
| 2008-2009 | 1.91 | 2.73 | 1.13 | . | 1.14 | 1.31 | 1.38 |
| 2009-2010 | 1.25 | 1.13 | . | . | 1.98 | 3.80 | 1.79 |
| 2010-2011 | 1.03 | 2.64 | . | . | 0.60 | 0.53 | 1.26 |
| 2011-2012 | 0.34 | 0.42 | . | . | 0.96 | 0.54 | 0.87 |
| 2012-2013 | 1.39 | . | . | . | . | 0.87 | . |

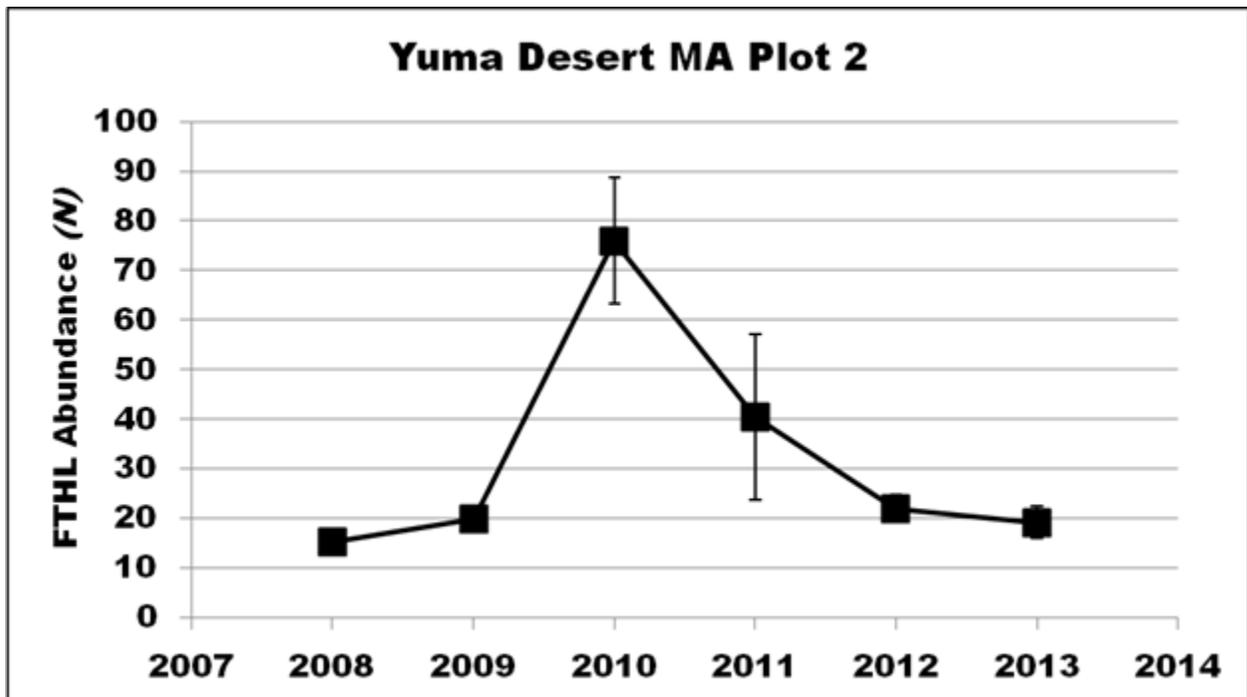


Figure 4. Flat-tailed Horned Lizard abundance (within 9ha plot) and standard error estimates for Yuma Desert plot 2 from 2008 through 2013.

Robust-design Pradel models

Only five of the robust-design Pradel models maintained AIC weights <2 and these models accounted for 58% of all the models compared ($n = 2064$; Table 13). All of these models maintained a group by time interaction for both ϕ and λ estimated site and time specific p and c and differed only in their estimations of N (Table 13). Model-averaged estimates for N , ϕ , and λ suggest a similar patterns in FTHL population dynamics as observed in the Huggins closed captures (Table 14, Figure 5).

Table 13. Candidate models used to estimate survival (ϕ), population growth (λ), capture probability (p), recapture probability (c) and population abundance (N) of FTHLs at four management areas between 2007-2013.

| Model N^\dagger | AICc | AIC weight | Model Likelihood | No. Par. |
|---|--------|------------|------------------|----------|
| 2007(.),2008(.),2009(.),2010(g),2011(.),2012(.),2013(.) | 5823.4 | 0.18 | 1.00 | 62 |
| 2007(.),2008(.),2009(g),2010(g),2011(.),2012(.),2013(.) | 5823.8 | 0.14 | 0.80 | 65 |
| 2007(.),2008(.),2009(.),2010(g),2011(.),2012(.),2013(g) | 5824.3 | 0.11 | 0.62 | 63 |
| 2007(.),2008(.),2009(g),2010(g),2011(.),2012(.),2013(g) | 5824.8 | 0.09 | 0.49 | 66 |
| 2007(g),2008(.),2009(.),2010(g),2011(.),2012(.),2013(.) | 5825.3 | 0.07 | 0.38 | 63 |

\dagger all top models maintained $\phi(t^*g)$, $\lambda(t^*g)$ and g and t effects for p and c .

Table 14. Model-averaged estimates for population size (N), survival (ϕ), and population growth (λ) at four MAs from 2007-2013 from robust-design Pradel models.

| Year | East Mesa 1 | | | West Mesa 1 | | | Yuma Desert 1 | | | Yuma Desert 2 | | |
|------|-------------|--------|-----------|-------------|--------|-----------|---------------|--------|-----------|---------------|--------|-----------|
| | N | ϕ | λ | N | ϕ | λ | N | ϕ | λ | N | ϕ | λ |
| 2007 | 28.17 | -- | -- | 11.00 | -- | -- | . | -- | -- | . | -- | -- |
| | -- | 0.27 | 0.81 | -- | 0.59 | 0.77 | -- | 0.39 | . | -- | 0.57 | . |
| 2008 | 20.74 | -- | -- | 8.49 | -- | -- | 35.02 | -- | -- | 15.64 | -- | -- |
| | -- | 0.70 | 2.46 | -- | 0.48 | 2.35 | -- | 0.33 | 1.33 | -- | 0.71 | 1.66 |
| 2009 | 53.08 | -- | -- | 21.62 | -- | -- | 46.79 | -- | -- | 26.66 | -- | -- |
| | -- | 0.31 | 1.34 | -- | 0.30 | 1.16 | -- | 0.31 | 1.86 | -- | 0.60 | 3.43 |
| 2010 | 73.84 | -- | -- | 24.78 | -- | -- | 88.08 | -- | -- | 84.91 | -- | -- |
| | -- | 0.34 | 1.15 | -- | 0.14 | 1.90 | -- | 0.27 | 0.72 | -- | 0.31 | 0.42 |
| 2011 | 68.00 | -- | -- | 45.73 | -- | -- | 62.94 | -- | -- | 40.67 | -- | -- |
| | -- | 0.34 | 0.54 | -- | 0.04 | 0.61 | -- | 0.33 | 0.60 | -- | 0.33 | 0.59 |
| 2012 | 26.49 | -- | -- | 19.46 | -- | -- | 38.54 | -- | -- | 21.47 | -- | -- |
| | -- | 0.32 | . | -- | 0.23 | . | -- | 0.00 | 0.13 | -- | 0.50 | 1.12 |
| 2013 | . | -- | -- | . | -- | -- | 5.00 | -- | -- | 23.75 | -- | -- |

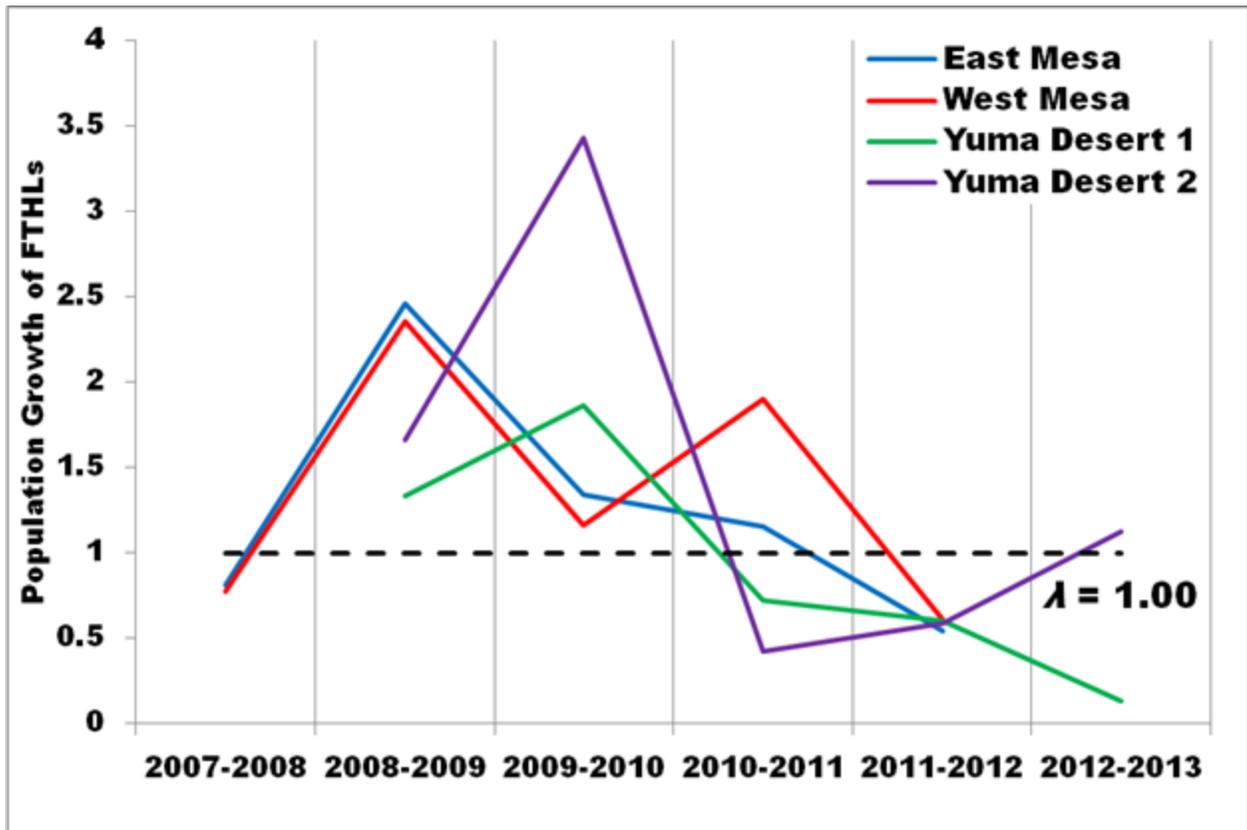


Figure 5. Model-averaged estimates of population growth (λ) for FTHLs at East Mesa, West Mesa, Yuma Desert 1, and Yuma Desert 2 from 2007-2013.

DISCUSSION

In 2013, three MAs conducted demographic monitoring and two MAs and the RA conducted occupancy monitoring of FTHLs (Table 1). Based on the data available it would appear that populations of FTHLs are tracking similar cycles across their range. Additionally, no major reductions in the extent of FTHL range were detected within the MAs or RAs. Recommendations follow the discussion topics below.

Occupancy

Single season estimates of FTHL detection were lower at BB MA and OWSVRA RA than at YD MA in 2013. Further, the trend in detection rates at the YD MA appeared to be steadily increasing detection over the course of the season. This is not unusual and has been observed at this MA and at BB MA in the recent past (Leavitt 2013). It is possible that this is governed either

by surveyors learning how to find FTHL and thus their rates of detection increase or the increase in total number of FTHLs observable increases due to a new crop of juvenile FTHLs. Despite a low FTHL detection rate at OWSVRA RA this location had a relatively higher single season estimate of FTHL probability of occupancy than BB MA. Despite these areas being relatively close to one-another (Figure 1) there are major differences in land management which should be taken into account when postulating these differences.

Multiple-season patch occupancy estimates for FTHL from 2011 to 2013 suggest a stabilizing trend in the FTHL probability of occupancy estimates for BB MA, OWSVRA RA, and YD MA. Indications of a steady decline for BBMA are likely due to irregular sampling at that location, indicating that this trend is an artifact of a poor sampling regime. Estimated rates of FTHL colonization and FTHL extinction were low for OWSVRA RA and YD MA between 2011 and 2013, which suggests that these populations are stable. However, the estimated FTHL extinction probability was high for BB MA. Potential contributors to these differences include but are not limited to uneven sampling within years, low detection, and infrequent revisits between years. These issues occur with the BB MA dataset the most and therefore may be the greatest contribution to inconsistent estimates.

Patch-occupancy study designs allow for long-term trend monitoring if they are consistently used (MacKenzie and Royle 2005). For instance, Zylstra et al. (2010) demonstrate the relationship between sampling frequency and the estimated power to detect a decline in occupancy for Sonoran Desert Tortoises (*Gopherus morafkai*) in southern Arizona. In their example, there is a stark difference for ability to detect decline when sampling frequency between years is lowest (every year). In addition, they demonstrated a higher power to detect change when survey passes are maximized (Zylstra et al. 2010). It stands to reason that if trends in occupancy are the target for monitoring, then regular and standardized visits need to occur.

Demography

The most supported Huggins closed capture model suggested MA specific rates of capture probability and recapture probability. This is similar to the findings from the detection rates from the occupancy analysis but the estimates are much lower. In all cases these surveys took place at a different time of year and are deriving estimates of detection in a different way than the occupancy estimates. However, it should be noted that both WM3 and EM1 were sampled in a different season than in previous years which does not maintain consistency of rates for capture probability across years. Of the three sites where FTHL abundance was estimated all sites appear to be maintaining similar trends since the last population spike. However, the YD1 demographic plot sampling effort in 2013 only detected five individual FTHLs, which was most likely due to the increased vegetative cover (Figure 3). Derived estimates of population growth (Table 12)

were more variable than those estimated from the robust-design Pradel models (Figure 5). This is probably due to the differences in estimate derivation, with the Huggins closed capture models only yearly abundance estimates are used, whereas in the Pradel models other parameters (colonization and extinction) are accounted for.

Slight variations on yearly estimates for FTHL abundance were the only differences between the best robust-design Pradel models of FTHL demographics (Table 13). In all cases the best models maintained a year by MA interaction for survival and population growth. This should be expected, given the independence between sites and the variation in these populations expected between years. Overall population growth for most MAs appears to be fluctuating around a stable growth rate ($\lambda = 1.00$). Survival estimates for these MAs suggest low yearly survival is the norm with FTHLs however, four and five year old lizards are being captured still at YD MA and EM MA plots.

RECOMMENDATIONS

- Efforts should be made to insure occupancy surveys are conducted yearly at the same sites within the designated MA.
- Occupancy surveys should be repeated with at least 6 survey passes per year between the months of May and September.
- Multi-season patch-occupancy models should be fitted with covariates when possible especially those that challenge standing hypothesis regarding FTHL abundance such as rainfall and/or prey-abundance. In addition, covariates that may influence detection rates include, but are not limited to observer bias, vegetative cover, and juvenile abundance.
- Efforts should be made to insure that demographic monitoring is conducted at the same time of year within the same plots in an MA.
- Demographic monitoring needs to take place over the full 10-day period for modeling to work properly without violating major assumptions regarding capture/recapture rates.
- Robust design Pradel models should be fitted with covariates when possible, especially those that evaluate the standing hypotheses regarding what may influence demographic rates of FTHLs (*i.e.* rainfall or prey abundance)

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