

**Western Riverside County  
Multiple Species Habitat Conservation Plan  
Biological Monitoring Program**

**2016-2017 Terrestrial Reptile Survey Report**



Patch-nosed snake (*Salvadora hexalepis*)

**1 October 2018**

## TABLE OF CONTENTS

INTRODUCTION .....	1
GOALS AND OBJECTIVES .....	1
METHODS .....	1
PROTOCOL DEVELOPMENT .....	1
STUDY SITE SELECTION .....	2
SURVEY METHODS .....	2
TRAINING.....	2
DATA ANALYSIS .....	2
RESULTS .....	2
SAN DIEGO BANDED GECKO ( <i>COLEONYX VARIEGATUS ABBOTTI</i> ; COVA) .....	3
BLAINVILLE’S HORNED LIZARD ( <i>PHRYNOSOMA BLAINVILLII</i> ; PHCO) .....	5
GRANITE SPINY LIZARD ( <i>SCELOPORUS ORCUTTI</i> ; SCOT).....	5
SOUTHERN SAGEBRUSH LIZARD ( <i>SCELOPORUS VANDENBURGIANUS</i> ; SCGR) .....	5
BELDING’S ORANGE-THROATED WHIPTAIL ( <i>ASPIDOSCELIS HYPERTHRUS BELDINGI</i> ; ASHY).....	5
COASTAL WESTERN WHIPTAIL ( <i>ASPIDOSCELIS TIGRIS STEJNEGERI</i> ; ASTI) .....	5
GRANITE NIGHT LIZARD ( <i>XANTUSIA HENSHAWI</i> ; XAHE).....	11
NORTHERN RED DIAMOND RATTLESNAKE ( <i>CROTALUS RUBER RUBER</i> ; CRRU).....	11
DISCUSSION .....	11
RECOMMENDATIONS.....	14
ACKNOWLEDGEMENTS.....	15
LITERATURE CITED .....	15

## LIST OF TABLES

<b>Table 1.</b> Terrestrial reptile detections for target species by Core Area in 2016-2017 .....	3
---	---

## LIST OF FIGURES

<b>Figure 1.</b> San Diego banded gecko ( <i>Coleonyx variegatus abbotti</i> ; COVA) detections 2016-2017. ....	4
<b>Figure 2.</b> Blainville's horned lizard ( <i>Phrynosoma blainvillii</i> ; PHCO) detections 2016-2017.....	6
<b>Figure 3.</b> Granite spiny lizard ( <i>Sceloporus orcutti</i> ; SCOT) detections 2016-2017. ....	7

<b>Figure 4.</b> Southern sagebrush lizard ( <i>Sceloporus vandenburgianus</i> ; SCGR) detections 2016-2017. ....	8
<b>Figure 5.</b> Belding's orange-throated whiptail ( <i>Aspidoscelis hyperthrus beldingi</i> ; ASHY) detections 2016-2017. ....	9
<b>Figure 6.</b> Coastal western whiptail ( <i>Aspidoscelis tigris stejnegeri</i> ; ASTI) detections 2016-2017. ....	10
<b>Figure 7.</b> Granite night lizard ( <i>Xantusia henshawi</i> ; XAHE) detections 2016-2017. ....	12
<b>Figure 8.</b> Red diamond rattlesnake ( <i>Crotalus ruber ruber</i> ; CRRU) detections 2016-2017. ....	13

## **NOTE TO READER:**

This report is an account of survey activities conducted by the Biological Monitoring Program for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June 2004. Reserve assembly is ongoing and is expected to take 20 or more years to complete. The Conservation Area includes lands acquired under the terms of the MSHCP and other lands that have conservation value in the Plan Area (called public or quasi-public lands in the MSHCP). In this report, the term “Conservation Area” refers to these lands as they were understood by the Monitoring Program at the time the surveys were conducted.

The Monitoring Program monitors the status and distribution of the 146 species covered by the MSHCP within the Conservation Area to provide information to Permittees, land managers, the public, and the Wildlife Agencies [i.e., the California Department of Fish and Wildlife (CDFW, formerly California Department of Fish and Game) and the U.S. Fish and Wildlife Service]. Monitoring Program activities are guided by defined conservation objectives for each Covered Species, other information needs identified in MSHCP Section 5.3 or elsewhere in the document, and the information needs of the Permittees. A list of the lands where data collection activities were conducted in 2017 is included in Section 7.0 of the Western Riverside County Regional Conservation Authority (RCA) Annual Report to the Wildlife Agencies.

The primary author of this report was the 2017 Herpetology Taxa Lead, Robert Packard. This report should be cited as:

Biological Monitoring Program. 2018. Western Riverside County MSHCP Biological Monitoring Program 2016-2017 Terrestrial Reptile Survey Report. Prepared for the Western Riverside County Multiple Species Habitat Conservation Plan. Riverside, CA. Available online: <http://wrc-rca.org/about-rca/monitoring/monitoring-surveys/>.

While we have made every effort to accurately represent our data and results, it should be recognized that data management and analysis are ongoing activities. Any reader wishing to make further use of the information or data provided in this report should contact the Monitoring Program to ensure that they have access to the best available or most current data.

Please contact the Monitoring Program Administrator with questions about the information provided in this report. Questions about the MSHCP should be directed to the Executive Director of the RCA. Further information on the MSHCP and the RCA can be found at [www.wrc-rca.org](http://www.wrc-rca.org).

## **Contact Information:**

Executive Director  
Western Riverside County  
Regional Conservation Authority  
Riverside Centre Building  
3403 10th Street, Suite 320  
Riverside, CA 92501  
Ph: (951) 955-9700

Monitoring Program Administrator  
Western Riverside County MSHCP  
Biological Monitoring Program  
4500 Glenwood Drive, Bldg. C  
Riverside, CA 92501  
Ph: (951) 248-2552



## INTRODUCTION

Terrestrial reptile survey efforts from 2016-2017 focused on the following eight reptile species covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP): San Diego banded gecko (*Coleonyx variegatus abbotti*; COVA), Blainville's horned lizard (*Phrynosoma blainvillii*; PHCO), southern sagebrush lizard (*Sceloporus vandenburgianus*; SCGR), granite spiny lizard (*Sceloporus orcutti*; SCOT), Belding's orange-throated whiptail (*Aspidocelus hyperythrus beldingi*; ASHY), coastal western whiptail (*Aspidocelus tigris stejnegeri*; ASTI), granite night lizard (*Xantusia henshawi*; XAHE), and the northern red diamond rattlesnake (*Crotalus ruber ruber*; CRRU). The default objective for these species requires that the Biological Monitoring Program document the continued use of at least 75% of the Core Areas listed in the MSHCP at least once every eight years (Dudek & Associates 2003). The MSHCP identifies 16 Core Areas which each include at least one of these species: Agua Tibia Mountains, Anza Valley, the Badlands, Banning Bench, Lake Mathews/Estelle Mountain/Lee Lake, Lake Skinner/Diamond Valley Lake, Paloma Valley/Hogbacks, Potrero Area of Critical Environmental Concern, San Jacinto Foothills, San Jacinto Mountains, San Jacinto Wildlife Area (SJWA)/Lake Perris, Santa Ana Mountains, Santa Ana River, Santa Rosa Mountains, Santa Rosa Plateau, and Vail Lake/Aguanga/Wilson Valley (Dudek & Associates 2003).

The U.S. Geological Survey (USGS) is collecting tissue samples from reptile and amphibian species as part of ongoing population genetics studies in southern California. Monitoring Program biologists collected and processed tissue samples during terrestrial reptile surveys in support of that research.

### Goals and Objectives

1. Document the presence of target species within as many species-specific Core Areas and potentially occupied areas as possible.
  - a. Conduct visual encounter area-constrained surveys within suitable habitat in Core Areas.
2. Collect information about species distribution and demographics in the Plan Area.
  - a. Determine presence in surveyed Core Areas.
3. Collaborate with USGS on their ongoing population genetics study of reptiles and amphibians in southern California.
  - a. Collect tissue samples of USGS target species for genetic analysis.

## METHODS

### Protocol Development

The search methods developed by the Biological Monitoring Program for diurnal terrestrial reptile surveys were modified in 2008 from visual encounter survey methods detailed in Crump and Scott (1994). The grid-based area-constrained surveys we implemented in 2008 added a systematic component to the visual encounter methods (Biological Monitoring Program 2009).

## **Study Site Selection**

The Conservation Area has been divided into a grid of 250 m × 250 m sampling stations. We searched all appropriate and accessible habitats for target species at sampling stations within designated Core Areas.

## **Survey Methods**

To allow surveyors to utilize their expertise regarding target species habitat use and to maximize efficiency, we did not survey sampling stations along a pre-determined path or in a time-constrained manner.

At least two surveyors simultaneously conducted visual encounter surveys for terrestrial reptiles within sampling stations between May and October in 2016, and May and July in 2017. Surveys were conducted between 0749 h and 1618 h. We recorded site information (general area, plot #, start time, habitat) at the beginning of each survey and recorded ambient weather conditions at the beginning and end of each survey. We attempted to identify all reptile species observed and recorded observations for each individual of any Covered Species encountered. For non-covered species, we recorded the species and noted the number of individuals seen within each grid. As part of the USGS Western Ecological Research Center's on-going genetic studies, we collected tissue samples of reptile and amphibian species we encountered. For a more complete description of survey methods, see the *Western Riverside County MSHCP Biological Monitoring Program Terrestrial Reptile 2017 Survey Protocol*, available from the Biological Monitoring Program.

## **Training**

Prior to survey efforts, surveyors and volunteers attended a training session where they were trained by the Herpetology Taxa Lead on the terrestrial reptile survey protocol, reptile identification (including a discussion of key distinguishing characteristics between species), and tissue sampling techniques. Study materials included in-house photographic guides, published field guides and live local species.

## **Data Analysis**

Data analysis consisted of mapping observations of target species in a geographic information system (ESRI 2009) and assessing their distribution with respect to the species' Core Areas. All survey data are stored in the Biological Monitoring Program's central database. Paper data sheets and survey maps are retained in the program office in Riverside, CA.

## **RESULTS**

We conducted diurnal terrestrial reptile surveys across 147 sampling stations on 63 days from 31 March to 28 October 2016 and 24 March to 12 July 2017. We visited 14 of the 16 Core Areas (Table 1), concentrating on those areas where we have not detected Covered Species in the current eight-year reporting period. Due to species objective needs we did not conduct focused surveys in the Paloma Valley/Hogbacks or Santa Rosa Plateau Core areas.

**Table 1.** Terrestrial reptile detections for target species by Core Area in 2016-2017. Core Areas denoted by shading. A detection during a focused survey is denoted by an “X”. Incidental observations are indicated by an “I”.

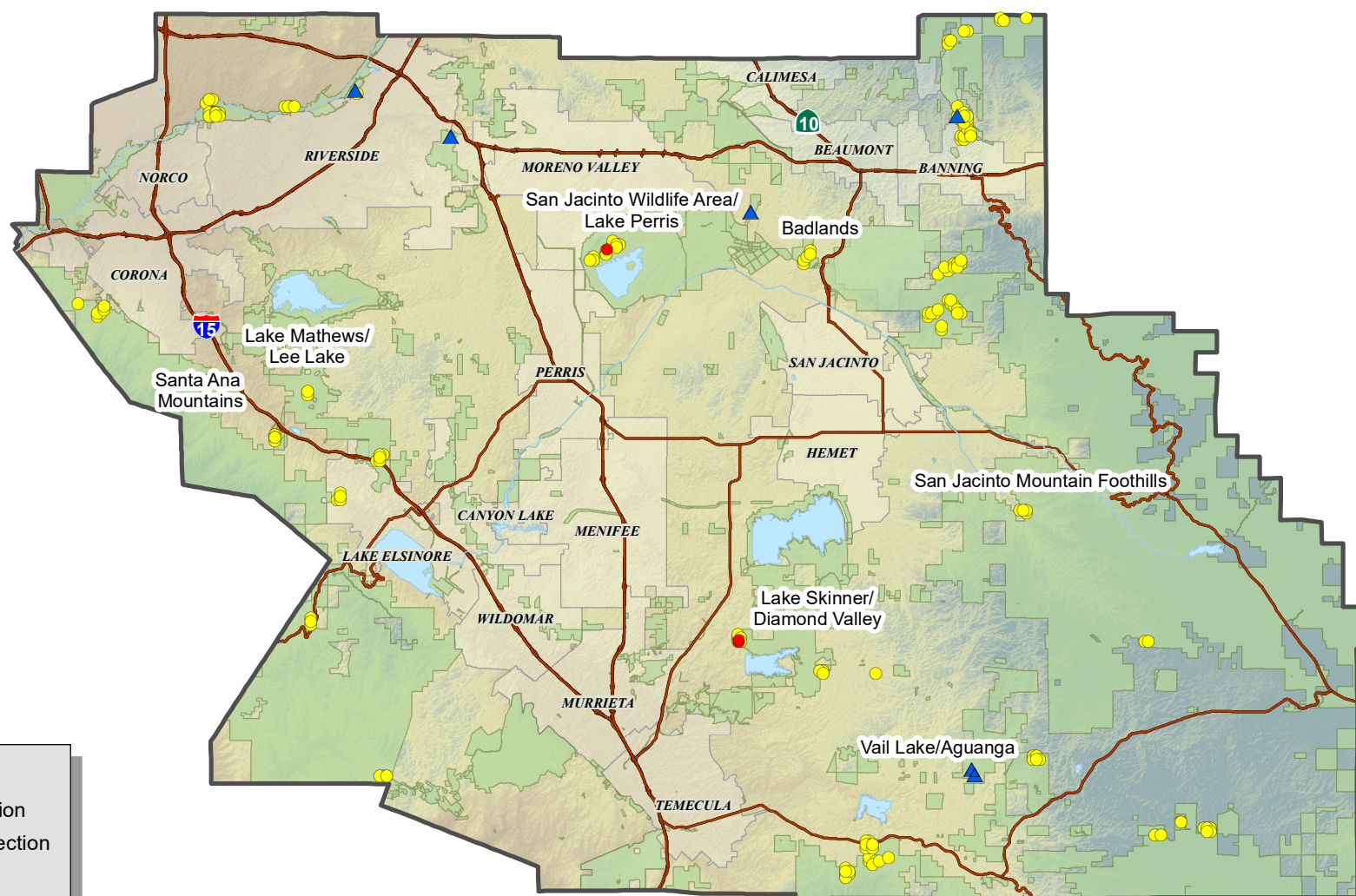
Core Areas	ASHY	ASTI	COVA	CRRU	PHCO	SCGR	SCOT	XAHE
Agua Tibia Mountains	X	X			X		X	
Anza Valley		I			X		X	X
Badlands	X	I	I				X	I
Banning Bench		X	I			X		
Lake Mathews/Estelle	I	I		I			X	
Lake Skinner/Diamond	X	X	X	X	I		X	
Paloma Valley/Hogbacks	I	I		I	I		I	
Potrero Valley/Soboba		X			I		X	X
San Jacinto Foothills		I					I	
San Jacinto Mountains		I		I	I	I	I	I
SJWA/Lake Perris	X		X	X			X	X
Santa Ana Mountains	I	X		X	X		X	
Santa Ana River	X	X	I		I		X	
Santa Rosa Mountains		I						
Santa Rosa Plateau		I					I	
Vail Lake/Aguanga	I	X	I	I	I		X	X

Survey time per sampling station varied from 30 to 93 min (mean = 62 min), depending on habitat conditions and the presence and abundance of Covered Species. A few sampling stations were located at the boundaries of the Conservation Area and were smaller than 250 m × 250 m, so only a portion of those stations were surveyed.

We detected a total of 469 individuals representing 20 reptile and two amphibian species, including all eight targeted Covered Species. We collected tissue samples from 29 individuals of 12 species of reptiles and amphibians. Samples were processed according to USGS protocol, and then shipped to the local office in San Diego.

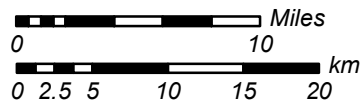
#### **San Diego banded gecko (*Coleonyx variegatus abbotti*; COVA)**

San Diego banded gecko was detected three times during terrestrial reptile surveys in 2016-2017, in two Core Areas: Lake Skinner/Diamond Valley and San Jacinto Wildlife Area/Lake Perris (Table 1, Fig. 1). There were seven incidental detections, three of which occurred in the Vail Lake/Aguanga Core Area and one in the Badlands Core Area. These detections total 57.1% of Core Areas. Three incidental detections were in non-core areas: Banning Bench, Santa Ana River, and Sycamore Canyon.



### Legend

- COVA Survey Detection
- ▲ COVA Incidental Detection
- Survey Station
- Highways
- Water Bodies
- Existing Conservation Land
- Cities



Date: 24 September 2018  
 UTM Nad 83 Zone 11  
 Contact: Robert Packard  
 MSHCP Biological Monitoring Program

**Figure 1.** San Diego banded gecko (*Coleonyx variegatus abbotti*; COVA) detections 2016-2017. Survey detections include data from partnering organizations.

**Blainville's horned lizard (*Phrynosoma blainvillii*; PHCO)**

Blainville's horned lizard, formerly coast horned lizard (*P. coronatum*), was detected seven times during focused surveys in three of its 13 Core Areas (Agua Tibia Mountains, Anza Valley, Santa Ana Mountains) and one non-core area (Magee Hills east of Lake Skinner) (Table 1, Fig. 2). It was incidentally detected in five Core Areas: Lake Skinner/Diamond Valley, Paloma Valley/Hogbacks, Potrero Valley, Santa Ana River, and Vail Lake/Aguanga for a combined total of 61.5% of the Core Areas. It was incidentally detected in five non-core areas: Desert Transition, San Jacinto Mountains, Bautista Canyon, Sedco Hills, and Temecula.

**Granite spiny lizard (*Sceloporus orcutti*; SCOT)**

Granite spiny lizard was detected in 11 of its 12 Core Areas (91.7%) (Table 1, Fig. 3). It was also detected incidentally in most areas of western Riverside County where granite outcrops are present. This species is common in this distinct habitat. The only Core Area where it was not found was the Banning Bench, which has no granite outcrops.

**Southern sagebrush lizard (*Sceloporus vandenburgianus*; SCGR)**

Southern sagebrush lizard was targeted in one non-core area (Banning Bench) where three individuals were found at elevations between 1993 and 2047 m (6538 and 6715 ft) (Table 1, Fig. 4). Incidental detections were used to confirm presence in the San Jacinto Mountains, where this species is common above elevations of 1500 m (4921 ft). We did not survey the Santa Rosa Mountains Core Area, as it does not contain appropriate habitat, and it was not detected during previous surveys in this Core Area.

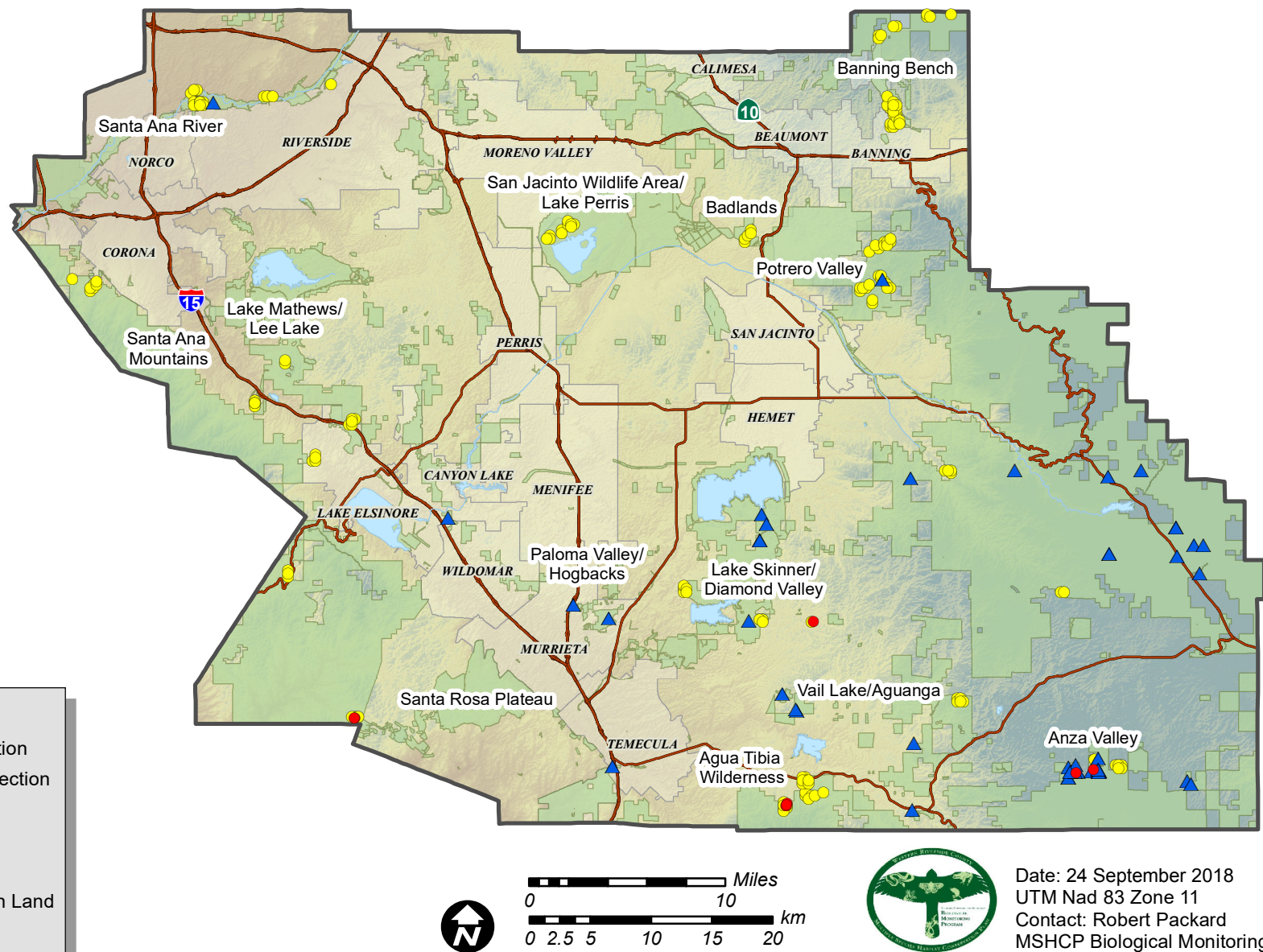
**Belding's orange-throated whiptail (*Aspidoscelis hyperthrus beldingi*; ASHY)**

Belding's orange-throated whiptail was detected in three Core Areas: SJWA/Lake Perris, Lake Skinner/Diamond Valley, and the Badlands (Table 1, Fig. 5). It was incidentally detected in two additional Core Areas: Lake Mathews/Lee Lake and Vail Lake/Aguanga, for a total of 55.6% of Core Areas. It was also detected during surveys in the Agua Tibia Mountains and near the Santa Ana River, which are not Core Areas for this species. It was incidentally detected in numerous lowland areas in western Riverside County.

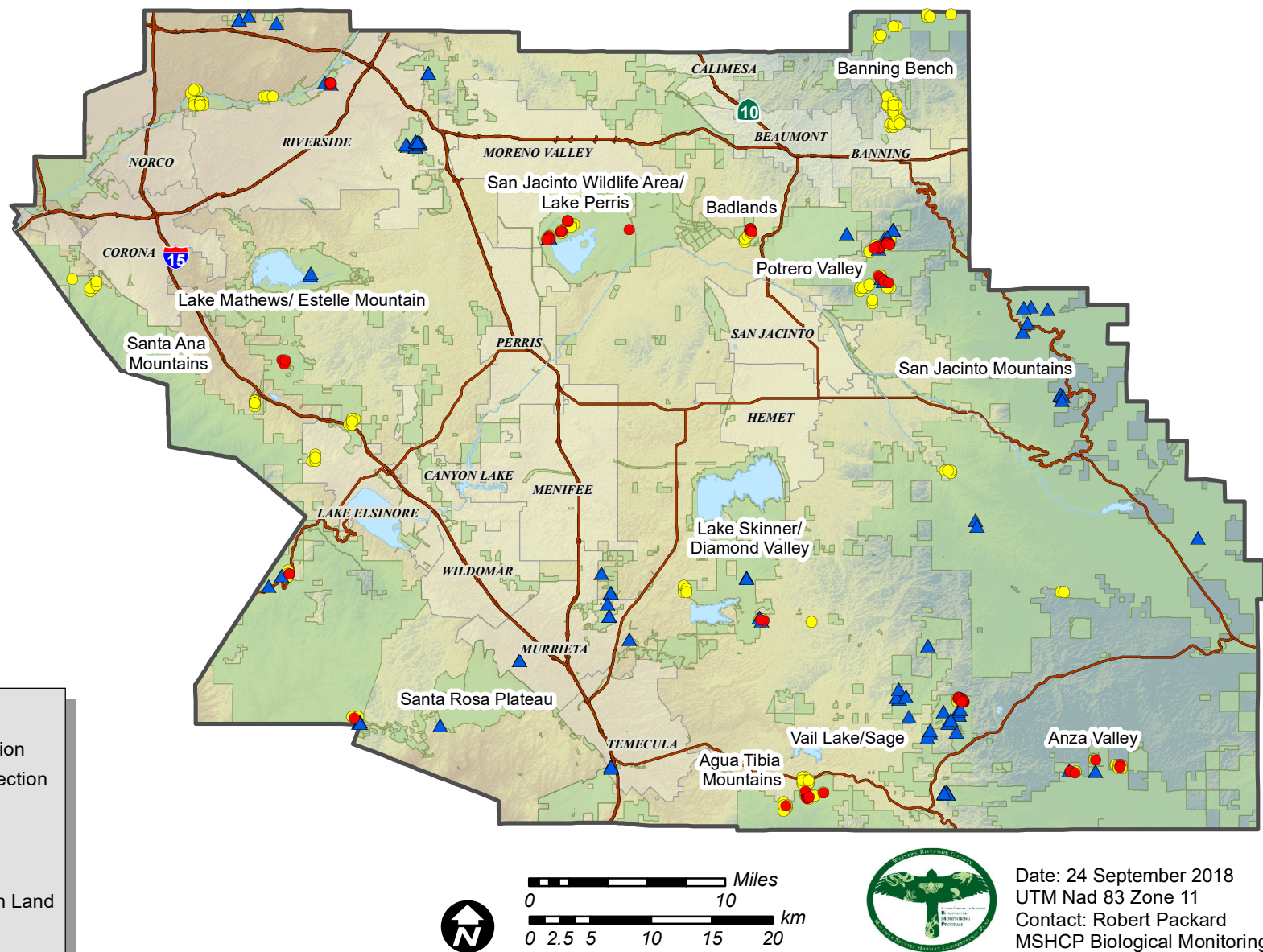
**Coastal western whiptail (*Aspidoscelis tigris stejnegeri*; ASTI)**

Coastal western whiptail was detected in six Core Areas: Agua Tibia Wilderness, Banning Bench, Lake Skinner/Diamond Valley, Potrero Valley, Santa Ana River, and Vail Lake/Aguanga (Table 1, Fig. 6). It was incidentally detected in five other Core Areas: Anza Valley, Badlands, Lake Mathews/Lee Lake, Paloma Valley/Hogbacks, and Santa Rosa Plateau, for a total of 12 of 13 Core Areas (92.3%). It was also detected incidentally throughout western Riverside County, in a variety of habitats, from 200 m to 1881 m in elevation (194 to 6172 ft).



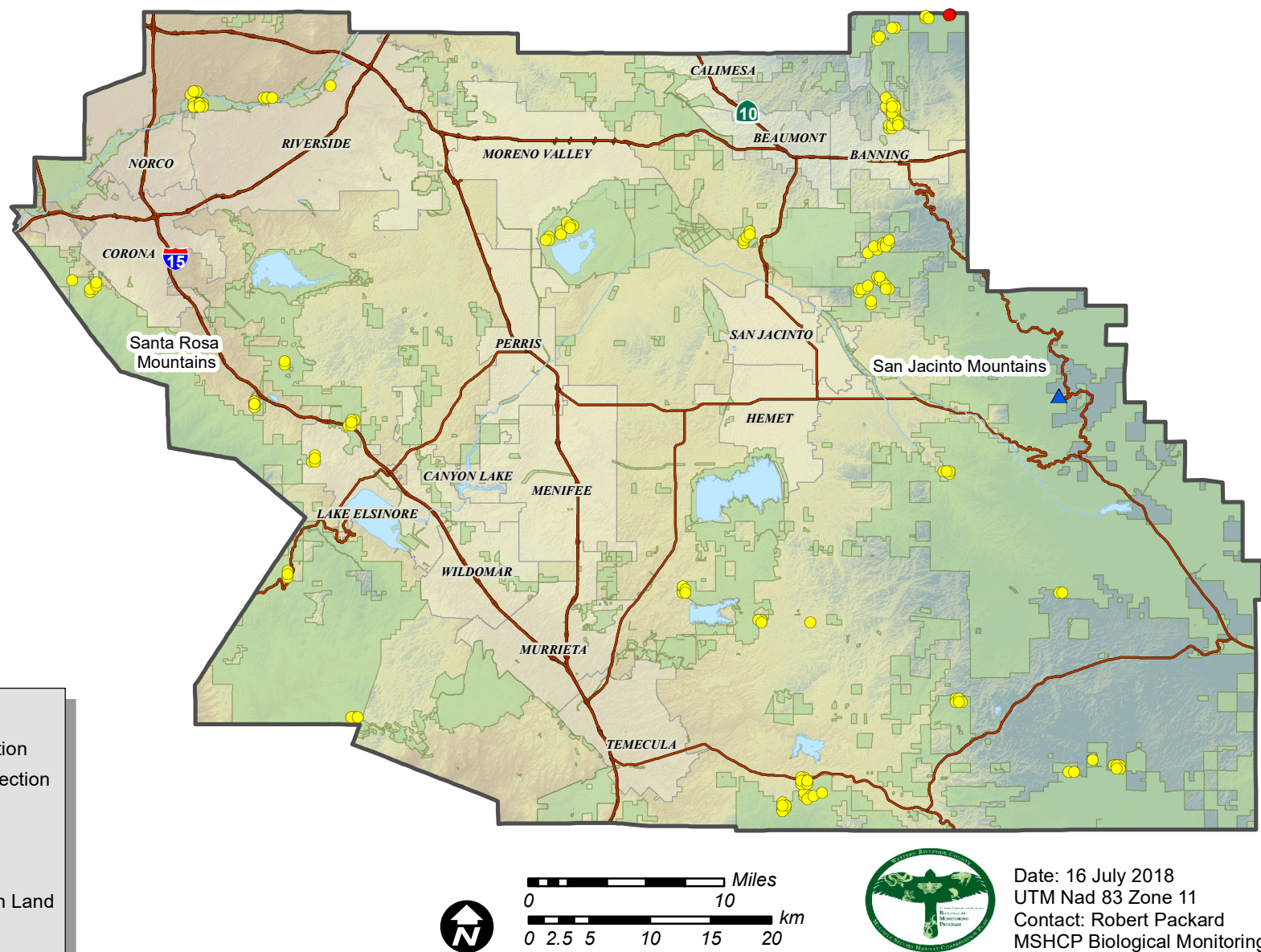


**Figure 2.** Blainville's horned lizard (*Phrynosoma blainvillii*; PHCO) detections 2016-2017. Survey detections include data from partnering organizations.



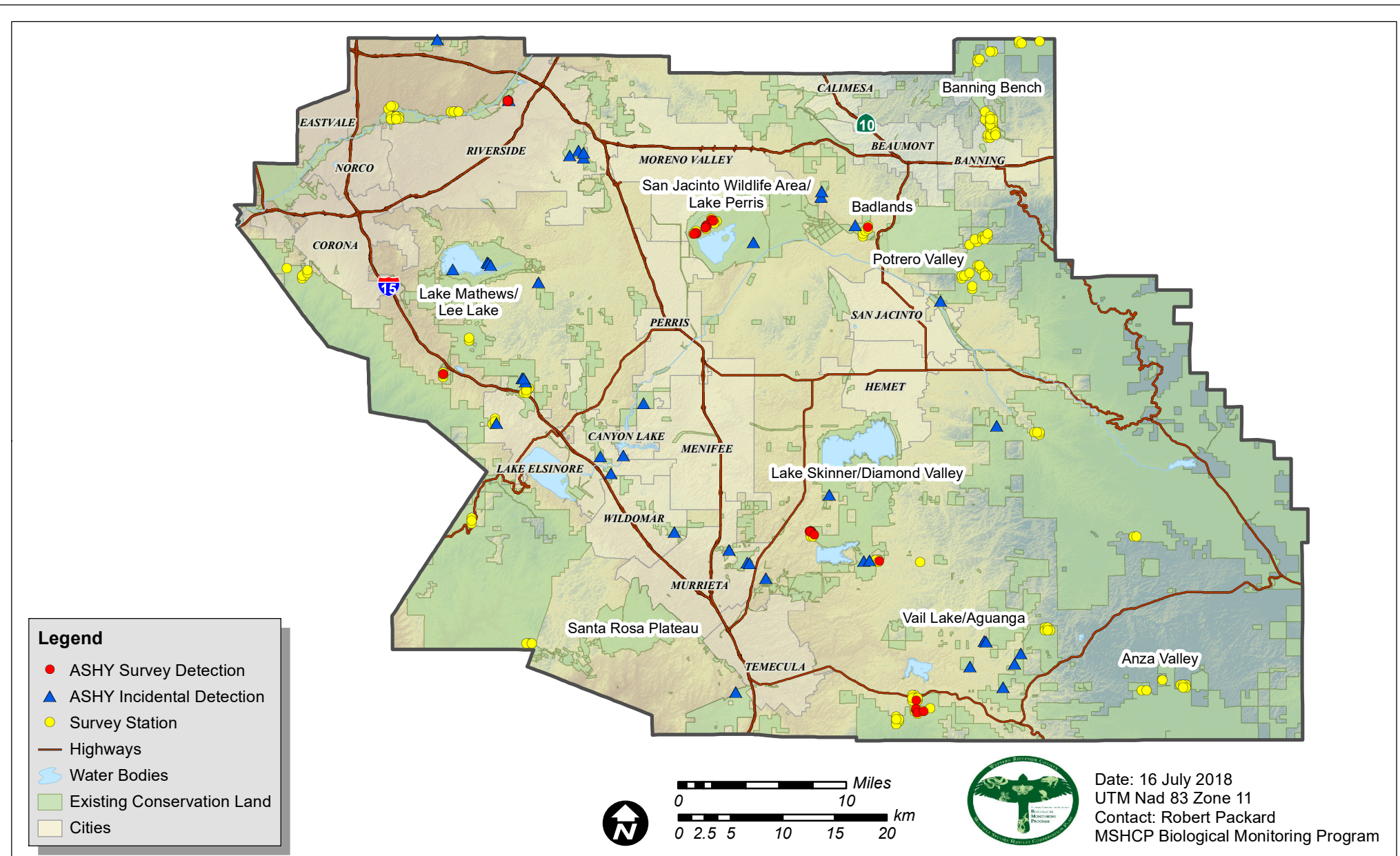
**Figure 3.** Granite spiny lizard (*Sceloporus orcutti*; SCOT) detections 2016-2017. Survey detections include data from partnering organizations.





**Figure 4.** Southern sagebrush lizard (*Sceloporus vandenburgianus*; SCGR) detections 2016-2017. Survey detections include data from partnering organizations.





**Figure 5.** Belding's orange-throated whiptail (*Aspidoscelis hyperthrus beldingi*; ASHY) detections 2016-2017. Survey detections include data from partnering organizations.



### **Granite night lizard (*Xantusia henshawi*; XAHE)**

Granite night lizards were detected during surveys in four Core Areas: Anza Valley, Potrero Valley, San Jacinto Wildlife Area/Lake Perris, and Vail Lake/Sage/Wilson Valley (Table 1, Fig. 7). They were incidentally detected in two additional Core Areas: Badlands and San Jacinto Mountains, which totals six of nine Core Areas (66.7%). They were not detected incidentally or otherwise in any other areas.

### **Northern red diamond rattlesnake (*Crotalus ruber ruber*; CRRU)**

Red diamond rattlesnakes were detected on surveys in three Core Areas: Santa Ana Mountains, Lake Skinner/Diamond Valley Lake, and San Jacinto Wildlife Area/Lake Perris (Table 1, Fig. 8). They were incidentally detected in three additional Core Areas: Lake Mathews/Estelle Mountain, San Jacinto Mountains, and Vail Lake/Sage. These detections total six of 12 Core Areas (50%). This species was also detected incidentally in two non-core areas: Sedco Hills and Paloma Valley/Hogbacks.

## **DISCUSSION**

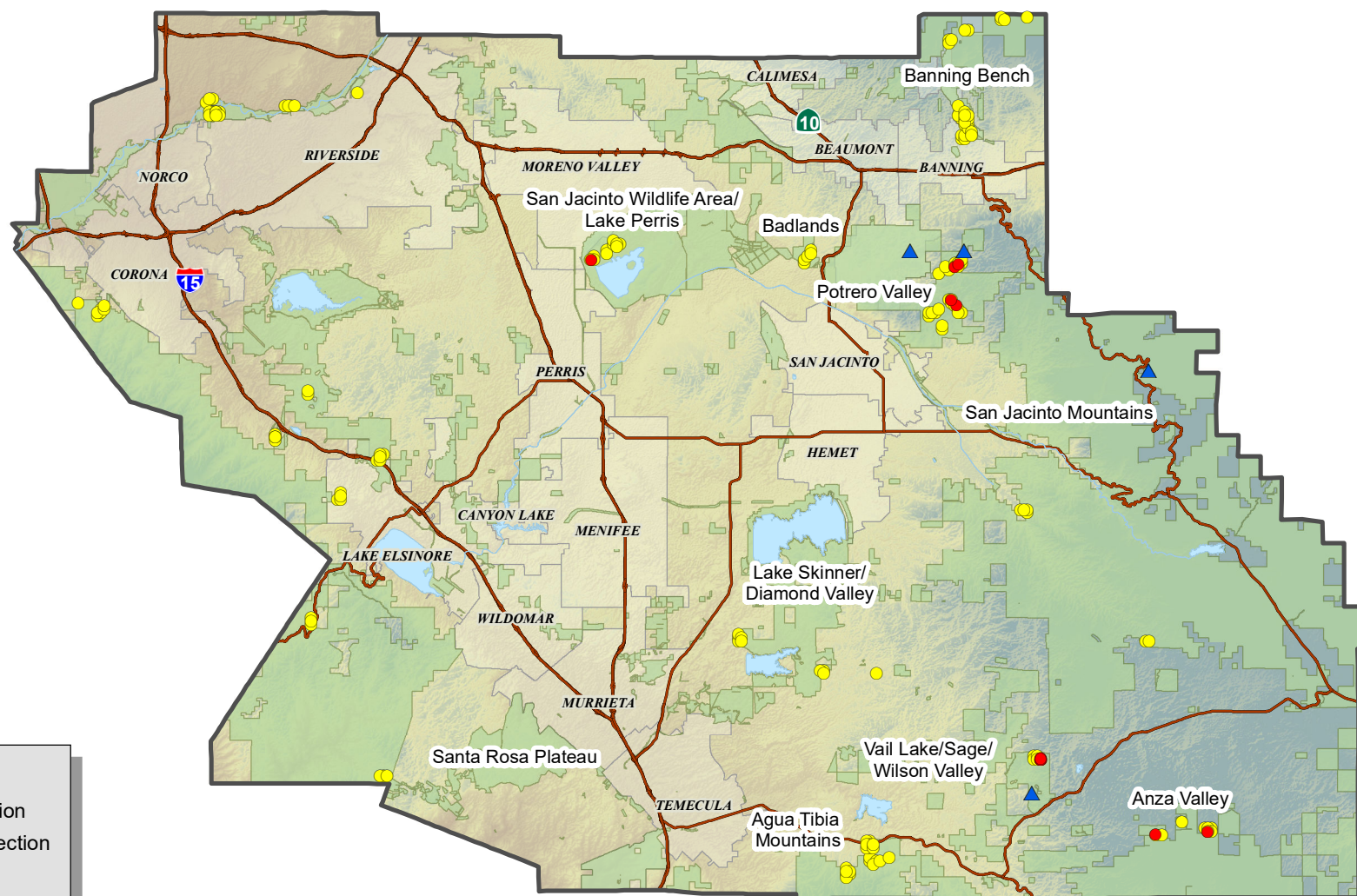
During the current eight-year reporting period (2009-2017), the species objectives were met for coastal western whiptail, Blainville's horned lizard, granite spiny lizard, granite night lizard, and red diamond rattlesnake. During this period San Diego banded gecko was found in five of seven Core Areas (71.4%), southern sagebrush lizard in one of two Core Areas (50%), and Belding's orange-throated whiptail in six of nine Core Areas (66.7%).

All target species were detected during surveys in 2016-2017 (Table 1). Many non-target reptile and amphibian species were also detected during these surveys, including western toad (*Anaxyrus boreas*), Baja California treefrog (*Pseudacris hypochondriaca*), southern alligator lizard (*Elgaria multicarinata*), side-blotched lizard (*Uta stansburiana*), western skink (*Plestiodon skiltonianus*), desert rosy boa (*Lichanura orcutti*), western yellow-bellied racer (*Coluber constrictor mormon*), coachwhip (*Coluber flagellum*), striped racer (*Coluber lateralis*), gopher snake (*Pituophis catenifer*), peninsular lyre snake (*Trimorphodon lyrophanes*), southern pacific rattlesnake (*Crotalus oreganus helleri*), speckled rattlesnake (*Crotalus pyrrhus*), and two-striped garter snake (*Thamnophis hammondi*).

Visual encounter surveys are a simple technique for searching for animals that spend the majority of their time on the surface of the ground. Because the targeted species objectives only require documentation of the presence of a given species within a Core Area, these surveys did not employ more complex designs such as time-constrained sampling (Crump and Scott 1994) or repeat visits to the same sites in an occupancy framework (MacKenzie et al 2006).

Incidental detections comprise a large percentage of the detections used to confirm species presence in Core Areas. These detections show the importance of having well-trained surveyors that remain vigilant about looking for and documenting non-target Covered Species during any field effort.





### Legend

- XAHE Survey Detection
- ▲ XAHE Incidental Detection
- Survey Station
- Highways
- Water Bodies
- Existing Conservation Land
- Cities

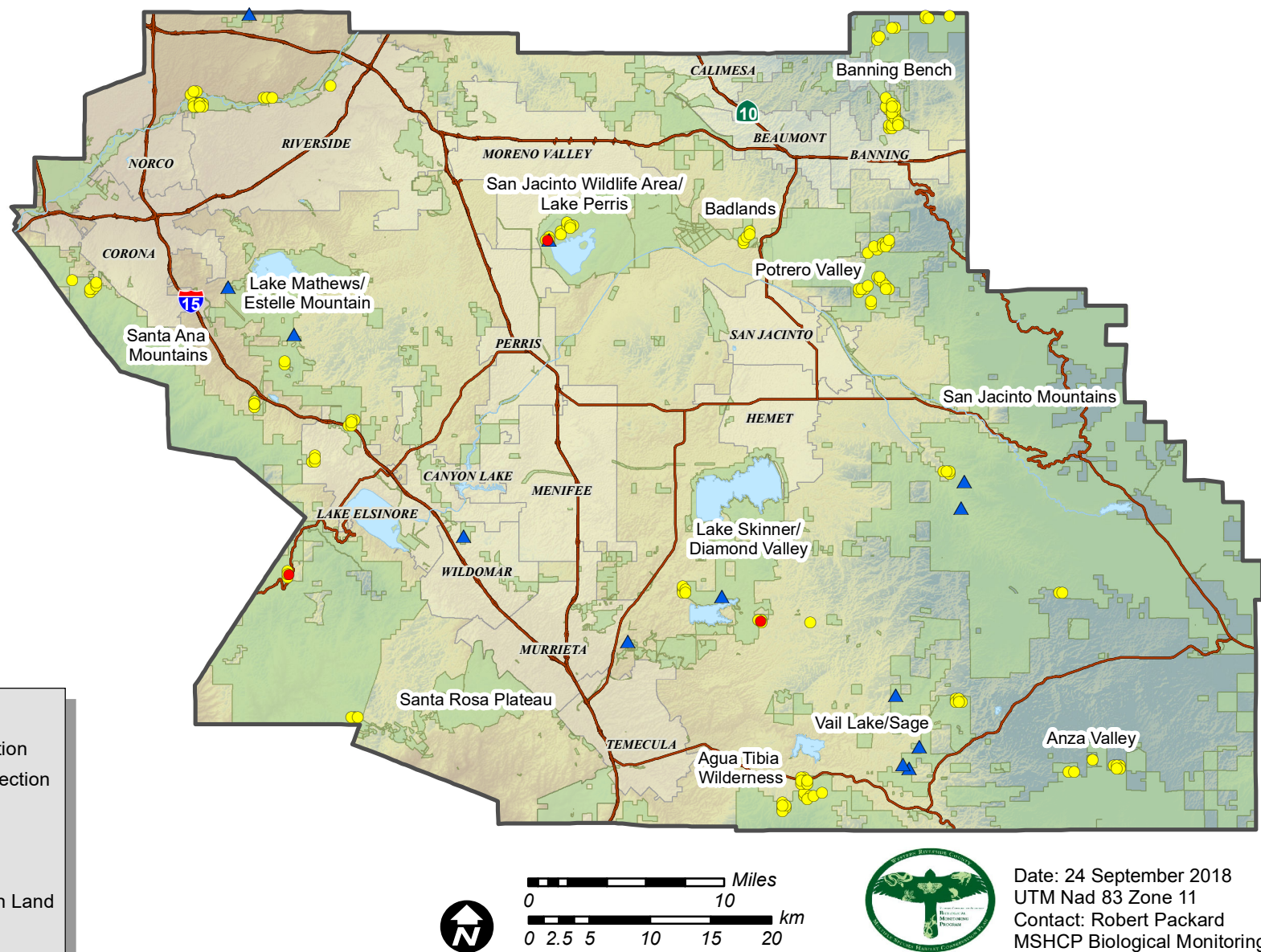


0 10 Miles  
0 2.5 5 10 15 20 km



Date: 24 September 2018  
UTM Nad 83 Zone 11  
Contact: Robert Packard  
MSHCP Biological Monitoring Program

**Figure 7.** Granite night lizard (*Xantusia henshawi*; XAHE) detections 2016-2017. Survey detections include data from partnering organizations.



**Figure 8.** Red diamond rattlesnake (*Crotalus ruber ruber*; CRRU) detections 2016-2017. Survey detections include data from partnering organizations.

## **Recommendations**

### *Future Surveys*

If time and personnel allow, intensive and repeated surveys should be done to estimate range occupancies and detection probabilities of target species using methods described in MacKenzie et al. (2006). Surveys should also be done in suitable habitat in non-core areas to better delineate the distribution of target species across the Conservation Area and determine if any of these areas would be suitable replacements for Core Areas that have little appropriate habitat. We should continue testing other methods for detecting these species that do not involve undue disturbance of natural habitat. We have placed artificial cover in suitable habitat with mixed results (Biological Monitoring Program 2012). This method should be considered as an option again if long-term placement is possible. Another option is to conduct nocturnal surveys during the summer months, when high daytime temperatures induce reptiles to forage at night.

San Diego banded gecko will need to be surveyed with methods alternative to simple diurnal visual detections surveys. This species has been particularly difficult to detect in the Plan Area as it is small, slow-moving, nocturnal, and secretive. We have developed several different protocols to attempt to locate this species, with minimal success, including nocturnal reptile searches, artificial cover surveys, nocturnal transect surveys, and nocturnal driving surveys. All of these initial surveys focused on their supposed preferred habitat, granite outcrops (Stebbins and McGinnis 2012; Thomson 2016). However, subsequent to these surveys, we have had incidental detections in western Riverside County that have not occurred in or near this habitat. This should be taken into account when planning future survey efforts for this species. Snake traps and small pitfall traps positioned along drift fencing could be utilized to target this species in the future.

Red diamond rattlesnakes are not uncommon in the lowlands and foothills of the Plan Area, but can be difficult to detect. This is another species that could be targeted using snake traps positioned along drift fencing.

### *Core Area Definitions and Species Objectives*

Core Area names should be standardized to avoid confusion. As it stands, a few Core Areas with the same numerical designation (e.g., Core 2) have more than one general name as referenced in the Species Objectives depending on the species. For example Core 7 is called Vail Lake/Sage, Vail Lake/Aguanga, or Vail Lake/Sage/Wilson Valley, depending on what species the author is referencing. The Core Area Potrero Valley is defined as the northwest portion of Core K (San Jacinto Mountains). This corner of Core K does not actually contain the Potrero Valley, which is in Core 3, the Badlands. This area should be renamed something more appropriate, such as Potrero ACEC, Soboba, or Mount Edge.

Blainville's horned lizard is relatively common in appropriate habitat. The Banning Bench does not contain appropriate habitat, and should be removed as a Core Area. The San Jacinto Wildlife Area/Lake Perris contains appropriate habitat, but the heavy human usage in this Core Area seems to have had an impact on the species. We have not found it in this Core Area despite extensive surveying in 2008 and 2017. These



Core Areas could be replaced with the San Jacinto Mountains (Core K) and Bautista Canyon (Core 4) Core Areas, where this species is relatively common.

Granite spiny lizard is restricted to granite outcrops which are abundant in the Plan Area. The Banning Bench should be removed as a Core Area, as it has no granite outcrops. This Core Area could be replaced with the Paloma Valley/Hogbacks Core Area (Core 2), or the Lakeview Mountains (NCH-5), both of which contain suitable habitat.

Southern sagebrush lizard is restricted to areas above 1500 m (4921 ft) in the Plan Area. The Santa Rosa Mountains Core Area has very limited area at this elevation, and the species has not been found there despite many surveys. This Core Area should be removed and replaced with the Banning Bench Core Area (Core I). The northern end of the Banning Bench has good habitat for this species above 1500 m, and we have detected it during surveys in this area.

Belding's orange-throated whiptail is relatively common in the lowlands of the Plan Area up to about 610 m (2000 ft). We have not found it in the Anza Valley, Banning Bench, Potrero Valley, or Santa Rosa Plateau Core Areas. These could be replaced with the Agua Tibia Mountains (Core M) and/or Santa Margarita River (Core G) Core Areas, where the species is common to abundant.

Granite night lizard is restricted to granite outcrops. Its range is much more restricted than granite spiny lizard, however, for reasons unknown. It is common to abundant in occupied areas. The Banning Bench has no granite outcrops, so this Core Area should be removed. The Lake Skinner/Diamond Valley Core Area has areas of seemingly excellent habitat, but surveys have not detected the species here. The Lakeview Mountains have excellent habitat, and we have detected the species here. This would be a good candidate to replace the Banning Bench as a Core Area.

## **ACKNOWLEDGEMENTS**

We thank the land managers in the MSHCP Plan Area, who in the interest of conservation and stewardship facilitate Monitoring Program activities on the lands for which they are responsible. Funding for the Biological Monitoring Program is provided by the Western Riverside Regional Conservation Authority and the California Department of Fish and Wildlife. Program staff who conducted surveys during 2016 and 2017 were: Masanori Abe, Jessica Burton, Tara Graham, Cristina Juran, Robert Packard (Herpetology Program Lead), Michelle Mariscal, Lynn Miller, Karen Riesz, Esperanza Sandoval, and Ana Sawyer. Volunteers who assisted with survey efforts include Deborah De LaTorre, Rachel Guinea, and James Voss.

## **LITERATURE CITED**

Biological Monitoring Program. 2009. Western Riverside County MSHCP Biological Monitoring Program Diurnal Reptile Survey Report, 2008. Report prepared for the Western Riverside County Multiple Species Habitat Conservation Plan. Riverside, CA. Available online: <http://www.wrc-rca.org/library.asp>.

- Biological Monitoring Program. 2012. Western Riverside County MSHCP Biological Monitoring Program Artificial Cover Survey Report, 2011. Report prepared for the Western Riverside County Multiple Species Habitat Conservation Plan. Riverside, CA. Available online: <http://www.wrc-rca.org/library.asp>.
- Crump ML, Scott NJ Jr. 1994. Visual encounter surveys. p 84-91 In: Heyer WR, Donnelly MA, McDiarmid RW, Hayek LAC, Foster MS, editors. Measuring and monitoring biological diversity: standard methods for amphibians. Washington, D.C.: Smithsonian.
- Dudek & Associates. 2003. Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). Final MSHCP, Volumes I and II. Prepared for County of Riverside Transportation and Lands Management Agency. Prepared by Dudek & Associates, Inc. Approved June 17, 2003.
- MacKenzie D, Nichols J, Royle JA, Pollock KH, Bailey LL, Hines JE. 2006. Occupancy estimation and modeling. San Diego (CA): Elsevier-Academic.
- Stebbins RC, McGinnis SN 2012 Field Guide to Amphibians and Reptiles of California, California Natural History Guides, University of California Press.
- Thomson RC, Wright AN, Schaffer HB 2016. California Amphibian and Reptile Species of Special Concern. California Department of Fish and Wildlife, University of California Press.