Western Riverside County
Multiple Species Habitat Conservation Plan
Biological Monitoring Program

2012 Terrestrial Reptile Survey Report

Patch-nosed snake (*Salvadora hexalepis*)

15 May 2013

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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. The Monitoring Program monitors the distribution and status of the 146 Covered Species 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 and the U.S. Fish and Wildlife Service). Monitoring Program activities are guided by the MSHCP species objectives for each Covered Species, the information needs identified in MSHCP Section 5.3 or elsewhere in the document, and the information needs of the Permittees.

Reserve assembly of the MSHCP is ongoing and it is expected to take 20 or more years to construct the final Conservation Area. The Conservation Area includes lands acquired for conservation 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 the Conservation Area as understood by the Monitoring Program at the time the surveys were planned and conducted.

We thank and acknowledge 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. A list of the lands where data collection activities were conducted in 2012 is included in Section 7.0 of the Western Riverside County Regional Conservation Authority (RCA) Annual Report to the Wildlife Agencies. Partnering organizations and individuals contributing data to our projects are acknowledged in the text of appropriate reports.

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.

The primary author of this report was the 2012 Herpetology Program Lead, Robert Packard. If there are any questions about the information provided in this report, please contact the Monitoring Program Administrator. If you have questions about the MSHCP, please contact the Executive Director of the RCA. For further information on the MSHCP and the RCA, go to www.wrc-rca.org.

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INTRODUCTION

Terrestrial reptile survey efforts in 2012 focused on two reptile species covered by the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP): the San Diego mountain kingsnake (*Lampropeltis zonata pulchra;* kingsnake) and the northern red diamond rattlesnake (*Crotalus ruber ruber;* red diamond rattlesnake). 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 lists three Core Areas for the San Diego mountain kingsnake: the Santa Ana Mountains, Agua Tibia Mountains and Desert Transition Bioregions. For the red diamond rattlesnake, the MSHCP identifies 12 Core Areas: Santa Ana Mountains, Agua Tibia Mountains, San Jacinto Mountains, Santa Rosa Plateau, Lake Skinner-Diamond Valley Lake, Lake Mathews-Estelle Mountain, San Jacinto Wildlife Area-Lake Perris, the Badlands, Potrero ACEC (identified as the northwestern portion of Core K), Banning Bench, Sage/Vail Lake, and Anza Valley (Dudek & Associates 2003).

In 2012 we surveyed two Core Areas for the kingsnake: the Agua Tibia Mountains and Desert Transition Bioregions, and four Core Areas for the rattlesnake: the Agua Tibia Mountains, Banning Bench, Anza Valley, and Potrero ACEC. Note that although Anza Valley and Iron Springs both occur within the Desert Transition Bioregion, we distinguished between the two, rather than combining them into a single locale, because Iron Springs lies outside the Anza Valley and is therefore not a Core Area for the red-diamond rattlesnake.

The Core Areas we surveyed for the two primary target species are also listed as Core Areas for one or more other Covered Species. Consequently, we hoped to observe, in appropriate habitat, Belding's orange-throated whiptail *(Cnemidophorus hyperythrus beldingi*), coastal western whiptail (*Cnemidophorus tigris multiscutatus*), granite spiny lizard (*Sceloporus orcutti*), granite night lizard (*Xantusia henshawi*), San Diego horned lizard (*Phrynosoma coronatum blainvillei*), San Diego banded gecko (*Coleonyx variegatus abbotti*), southern sagebrush lizard (*Sceloporus graciosus vandenburgianus*) and western spadefoot (*Scaphiophus hammondi*). We have met the species objectives for the first five species but have yet to meet objectives for San Diego banded gecko and western spadefoot. Objectives for southern sagebrush lizard likely can not be met as written (Biological Monitoring Program 2009).

The U.S. Geological Survey (USGS) is collecting tissue sample data from reptile and amphibian species as part of an ongoing population genetics study in southern California. Monitoring Program biologists collected, processed, and delivered tissue samples to the local USGS office in San Diego in support of this project.

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 and area-constrained surveys within suitable habitat in Core Areas.

2. Collect information about species distribution and demographics in the Plan Area.
   a. Determine presence and abundance at surveyed Core Areas.

3. Collaborate with USGS on their ongoing population study of reptiles and amphibians in southern California.
   a. Collect and deliver tissue samples of USGS target species for genetic analysis.

METHODS

Protocol Development

We initially used simple visual encounter surveys, which require at least two surveyors to meander within Core Areas searching appropriate habitat for target species. Unlike Crump and Scott (1994), we did not collect ambient weather information, record non-covered species, or constrain the duration of the survey period. We conducted these surveys from 8 February to 31 May, and as we had not detected either target species we decided to intensify our efforts by using more focused searches within a grid system, which we had first implemented in 2008 (Appendix A) (Crump and Scott 1994; Biological Monitoring Program 2008).

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

Survey Methods

For the grid-based surveys we divided the Conservation Area into 250 m x 250 m sampling stations and conducted surveys within these squares in designated Core Areas (Fig. 1). At least two surveyors simultaneously conducted visual encounter surveys for terrestrial reptiles within sampling stations between approximately 0800 h and 1500 h (Crump and Scott 1994). All appropriate habitats were searched for target species within sampling stations. To allow surveyors to use expertise regarding target species habitat use and maximize efficiency, sampling stations were not surveyed with a pre-determined path or in a time-constrained manner.

We recorded site information at the beginning of each survey and recorded ambient weather conditions at the beginning and end of each survey (Appendix B). 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 observations at the first encounter of each life stage (i.e., juvenile, adult) and noted the number of individuals seen within each plot.

Due to staff conducting surveys for other taxa and Covered Species in the spring and summer of 2012, terrestrial reptile surveys were conducted from February to May and from September to November in 2012.

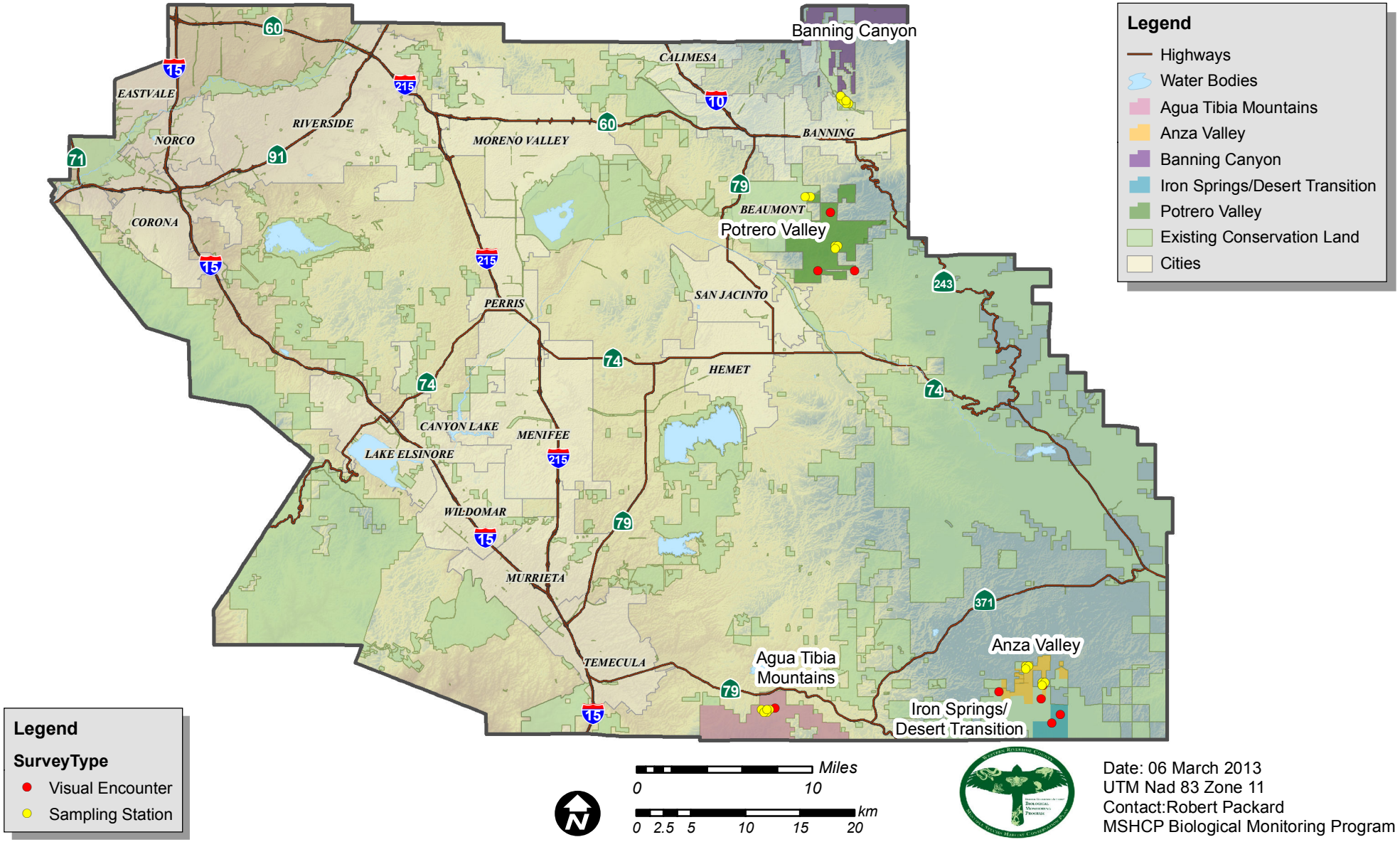

Figure 1. Terrestrial reptile survey locations in 2012.

Personnel and Training

Biological Monitoring Program biologists are funded either by the Regional Conservation Authority (RCA) or the California Department of Fish and Wildlife (CDFW), formerly the California Department of Fish and Game. Surveyors were trained by the Herpetology Program Lead on survey techniques as well as species identification. Study materials included in-house photographic guides and published field guides. The following personnel conducted terrestrial reptile surveys in 2012:

- Robert Packard, Herpetology Program Lead (Biological Monitoring Program)
- Ashley Ragsdale (Biological Monitoring Program)
- Esperanza Sandoval (Biological Monitoring Program)
- Jonathan Reinig (Biological Monitoring Program)
- Joseph Sherrock (Biological Monitoring Program)
- Lynn Miller (Biological Monitoring Program)
- Maricela Paramo (Biological Monitoring Program)
- Masanori Abe (Biological Monitoring Program)
- Michele Felix (Biological Monitoring Program)
- Tara Graham (Biological Monitoring Program)
- Mia Roberts (Volunteer)
- Patrick Temple (Volunteer)

Data Analysis

Data analysis consisted of mapping observations of target species in a geographic information system 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 in five Core Areas in 2012, concentrating on San Diego mountain kingsnake and red diamond rattlesnake (Fig. 1). We initially implemented a standard visual encounter survey approach with the Project Lead designating general survey areas to surveyors. Because of lack of detections, we chose to implement a grid-based survey during the second round of surveys in the fall.

We conducted directed visual encounter surveys on 21 days from February to May in four Core Areas (Table 1). We did not survey the Banning Bench Core Area during this period, as it is marginal habitat and the temperatures in this area are not often high enough to allow surveying.

We surveyed 23 sampling stations in four Core Areas from September to November 2012 (Table 1). For this round we did not survey Iron Springs but surveyed Anza Valley instead as it is also in the Desert Transition and a Core Area for both target

Table 1.Survey effort for target species by Core Area and survey method in 2012. Target species for each Core Area denoted by an "X".

Core Areas	San Diego Mountain Kingsnake	Northern Red Diamond Rattlesnake	No. of Visual Encounter Surveys	No. of Sampling Stations Surveyed
Agua Tibia Mountains	X	X	4	4
Anza Valley		X	2	6
Banning Bench		X	0	7
Potrero ACEC		X	11	6
Iron Springs	X		4	0

species. 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 small number of sampling stations located at the boundaries of the Conservation Area were smaller than 250 m x 250 m so we surveyed only those portions that were in conservation.

We detected a total of 53 individuals representing eight reptile and four amphibian species, including five Covered Species, during terrestrial reptile surveys in 2012 (Table 2). Covered terrestrial reptile species observed included: Belding's orange-throated whiptail, coastal western whiptail, granite spiny lizard, granite night lizard, and San Diego horned lizard. Neither of the two primary target species was detected. During terrestrial reptile surveys 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.

DISCUSSION

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 initial 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).

Neither target species was detected during terrestrial reptile surveys in 2012. Northern red diamond rattlesnakes are not particularly rare or secretive, but can be difficult to detect intentionally at a given site. Red diamond rattlesnakes have been detected in nine Core Areas listed in the MSHCP. However, the records are a combination of incidental observations, snake skins, and nocturnal survey detections. Snake skins can be used to confirm the presence of species with recognizable skins such as red diamond rattlesnake. These observations show the importance of having well-trained crew members that remain vigilant about looking for and documenting non-target Covered Species during any field effort. San Diego mountain kingsnake are infrequently observed due to a secretive life history strategy and use of steep, densely vegetated

Table 2. Reptiles and amphibians detected in Core Areas surveyed in 2012. Covered Species in **bold**.

Species	Agua Tibia	Anza Valley	Banning Bench	Iron Springs	Potrero ACEC
Western toad (*Anaxyrus boreas*)	X				X
Arboreal salamander (*Aneides lugubris*)	X				
Garden slender salamander (*Batrachoseps major*)	X				
Large-blotched ensatina (*Ensatina klauberi*)		X			
Southern alligator lizard (*Elgaria multicarinata*)					X
San Diego horned lizard (*Phyrnosoma coronatum*)	X	X		X	X
Western fence lizard (*Sceloporus occidentalis*)	X	X	X	X	X
Granite spiny lizard (*S. orcutti*)	X	X		X	X
Side-blotched lizard (*Uta stansburiana*)	X	X	X	X	X
Gilbert's skink (*Plestiodon gilberti*)		X			X
Orange-throated whiptail (*Cnemidophorus hyperthrus*)					X
Coastal whiptail (*C. tigris*)					X
Granite night lizard (*Xantusia henshawi*)					X
Desert rosy boa (*Lichanura orcutti*)					X
Common kingsnake (*Lampropeltis getula*)	X				X
Coachwhip (*Masticophis flagellum*)			X		
Striped racer (*M. lateralis*)	X	X		X	X
Gopher snake (*Pituophis catenifer*)		X	X		
Patch-nosed snake (*Salvadora hexalepis*)					X
Southern Pacific rattlesnake (*Crotalus helleri*)					X
Speckled rattlesnake *(C. mitchellii*)					X
Two-striped garter snake (*Thamnophis hammondii*)	X				

habitat that is difficult for surveyors to access. The species is most typically observed under rocks, in rock crevices, or under vegetation (Dudek & Associates 2003).

As a result of surveys in 2012 we have met the species objective for granite night lizard with detections at Potrero ACEC, where we also added new detections for orange-throated and coastal whiptails (Table 2).

Recommendations

Surveys should continue in Core Areas and non-core areas for covered reptile species. 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 describe 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 also explore 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 should be considered as an option again if long-term placement is possible. Another option is to conduct nocturnal summer surveys, when high daytime temperatures force reptiles to forage at night.

Both target species, especially kingsnakes, are at risk from collectors. We recommend that red diamond rattlesnake and both subspecies of mountain kingsnake be placed on the list of California Department of Fish and Wildlife species that are prohibited from being collected.

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Appendix A. 2012 Western Riverside County MSHCP Biological Monitoring Program Field Methods for Diurnal Terrestrial Reptile Surveys

Goals: To document the presence of covered terrestrial reptiles within as many species-specific Core Areas and potential habitats as possible in the MSHCP Conservation Area.

Determine the sampling stations that are inside both the access and Core Areas you wish to survey, and find or print a map. Download all corner points to your GPS unit.

Surveys will be conducted when the temperature is at least 25 °C starting at least one hour after sunrise, with no precipitation. Surveys should be done by two people for every complete 250m x 250m station. Incomplete stations, or those with little appropriate habitat, may be done by one person.

When at the location, navigate to a corner point of the sampling station you wish to survey. Determine the best way to navigate through the station, staying in appropriate habitat. Fill out the datasheet completely, including sky code, average and maximum wind speeds.(km/hr), and temperature (°C). Also record date, location, sampling station number, start time, and observers' initials.

To start the survey, walk slowly and carefully through appropriate habitat, scanning all basking sites, including trees and large bushes, with binoculars. Look into any dark cracks or crevices using a flashlight or mirror to reflect light into these openings. Rock crevices especially should be checked thoroughly. Be careful not to expose yourself to any rattlesnakes that might be lurking inside. Try to leave all natural cover undisturbed, but any unnatural cover or trash should be flipped over to find animals. Be very careful not to leave any part of your body exposed as you are looking under cover to protect yourself from rattlesnakes, scorpions, spiders, etc. Snake gaiters are also highly recommended while conducting these surveys. Any reptile skins found should be carefully removed and put into a plastic sampling bag to be brought back to the office for identification. Take a GPS waypoint for every Covered Species location or unknown skin.

All reptiles and amphibians will be recorded, even if not positively identified. You will also need to record the number observed, location, sex, and age for every age class. For non-covered species, record the number seen in the sampling station for every age class, but for all of the other information, record only that which pertains to the FIRST individual seen in the station. For Covered Species enter each individual as a separate record and record the GPS coordinates. If more than one Covered Species is in the same small area you can use the same coordinates for all, but a separate entry must be made for each animal.

Take a photograph of any unusual specimens and put them on the network share at Common\Projects\Data_Photos\Terrestrial Herps\2012. Label the photos with the date,

the observer, and the jpg number. For example a San Diego horned lizard photographed on 15 June 2012 by Masa Abe with the jpg number 456 would be 20120615_MXA_456.jpg.

When the survey is complete, record the end time, temperature, and wind speed again.

Equipment: Close-focus binoculars, Kestrel, GPS unit, camera, extra batteries, snakestick, flashlight, handheld mirror, datasheets, list of species codes, field guides, sampling bags, snake gaiters (optional), and all personal gear, including food and water.

Appendix B. 2012 Western Riverside County MSHCP Biological Monitoring Program Diurnal Terrestrial Reptile Survey Data Sheet

Terrestrial Reptiles and Amphibians 250m² Grid Count Data Sheet

Area		Observers			START	END
Grid #		Date		Wind (max)		km/hr
Start Time		Habitat[1]		Wind (avg)		km/hr
End Time		Sky[2]		Temp		°C

[1]Habitat: CSS=Coastal Sage Scrub, CH=Chaparral, R=Rock outcrop, O=Oak, CO=Coniferous forest, G=Grassland, R=Riparian, DT=Desert Transition, O=Other (specify)
[2]Sky: 0=clear or few clouds, 1=partly cloudy, 2=mostly cloudy, 3=fog or smoke, 4=light drizzle, 5=constant snow, 6=constant rain

Location Notes: _____

Species Code[3]	UTM_E	UTM_N	Sex (M, F, U)	Age[4]	#	Photo ID	Tissue ID	Notes

[3] For covered species, enter one separate record for each individual
[4]Age: A=Adult, J=Juvenile, L=Larva, M=Metamorph

Appendix B. Continued.

Frog	ANBO	*Anaxyrus boreas*	Western Toad
Frog	ANSP	*Anaxyrus* sp.	Unknown *Anaxyrus* Species
Frog	HYCA	*Pseudacris cadaverina*	California Chorus Frog
Frog	HYRE	*Pseudacris hypochondriaca*	Baja California Chorus Frog
Frog	HYSP	*Pseudacris spp.*	Unknown Chorus Frog
Frog	LICA	*Lichanura catesbeiana*	Bullfrog
Frog	RANA	*Rana* sp.	Rana species
Frog	SCHA	*Scaphiopus hammondii*	Western Spadefoot
Lizard	CNHY	*Cnemidophorus hyperythrus*	Orange-Throated Whiptail
Lizard	CNTI	*Cnemidophorus tigris*	Western Whiptail
Lizard	ELMU	*Elgaria multicarinata*	Southern Alligator Lizard
Lizard	PLGI	*Plestiodon gilberti*	Gilbert's Skink
Lizard	PLSK	*Plestiodon skiltonianus*	Western Skink
Lizard	PLSP	*Plestiodon spp*	Skink
Lizard	PHCO	*Phrynosoma coronatum*	Coast Horned Lizard
Lizard	SCGR	*Sceloporus graciosus*	Sagebrush Lizard
Lizard	SCOC	*Sceloporus occidentalis*	Western Fence Lizard
Lizard	SCOR	*Sceloporus orcutti*	Granite Spiny Lizard
Lizard	UNLI		Unknown lizard
Lizard	UTST	*Uta stansburiana*	Side-Blotched Lizard
Lizard	XAHE	*Xantusia henshawi*	Granite Night Lizard
Lizard	COVA	*Coleonyx variegatus*	San Diego Banded Gecko
Salamander	TATO	*Taricha torosa*	California Newt
Snake	CHBO	*Charina bottae*	Rubber Boa
Snake	COMO	*Coluber mormon*	Western Racer
Snake	CRMI	*Crotalus mitchellii*	Speckled Rattlesnake
Snake	CRRU	*Crotalus ruber*	Red Diamond Rattlesnake
Snake	CRHE	*Crotalus helleri*	Western Rattlesnake
Snake	DIPU	*Diadophis punctatus*	Ringneck Snake
Snake	SAHE	*Salvadora hexalepis*	Western Patchnose snake
Snake	LAGE	*Lampropeltis getula*	Common Kingsnake
Snake	LAZOPA	*Lampropeltis zonata parvirubra*	San Bernardino Mt. Kingsnake
Snake	LAZOPU	*Lampropeltis zonata pulchra*	San Diego Mountain Kingsnake
Snake	LITR	*Lichanura orcutti*	Desert Rosy Boa
Snake	MAFL	*Masticophis flagellum*	Red Coachwhip
Snake	MALA	*Masticophis lateralis*	California Whipsnake
Snake	PIME	*Pituophis catenifer*	Gopher Snake
Snake	RHLE	*Rhinocheilus lecontei*	Long-Nosed Snake
Snake	TRLY	*Trimorphodon lyrophanes*	Peninsular Lyre Snake
Snake	THHA	*Thamnophis hammondii*	Two-Striped Garter Snake
Snake	UNSN		Unknown snake