Western Riverside County
Multiple Species Habitat Conservation Plan (MSHCP)
Biological Monitoring Program

Southwestern Pond Turtle
(*Actinemys marmorata pallida*)
Survey Report 2009

23 April 2010

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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 Game 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.

MSHCP reserve assembly is ongoing and it is expected to take 20 or more years to assemble 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 would like to 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 2009 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 preparer of this report was the 2009, Herpetofauna 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. Further information on the MSHCP and the RCA can be found at www.wrc-rca.org.

Contact Information:

Executive Director
Western Riverside County
Regional Conservation Authority
4080 Lemon Street, 12th Floor
P.O. Box 1667
Riverside, CA 92502-1667
Ph: (951) 955-9700

Western Riverside County MSHCP
Monitoring Program Administrator
c/o Adam Malisch
4500 Glenwood Drive, Bldg. C
Riverside, CA 92501
Ph: (951) 782-4238

INTRODUCTION

The southwestern pond turtle (*Actinemys marmorata pallida*) is a California species of special concern and is the state's only native freshwater turtle. There are 2 subspecies of *Actinemys marmorata* that occur in California: the northwestern subspecies (*A. m. marmorata*) ranges north of the American River, and the southwestern subspecies (*A. m. pallida*) is distributed from the San Francisco area south across the Western Riverside County MSHCP Plan Area and into Baja California (Seelinger 1945, USFWS 1992, Holland 1994). The southwestern pond turtle prefers permanent water bodies with emergent vegetation and basking areas (Lemm 2006). The species has been known to occur in the Plan Area across portions of Cole Creek, Santa Ana River, San Jacinto River, and the confluence of Temecula Creek and Murrieta Creek (Dudek & Associates 2003).

Species Objectives 2 and 5 for pond turtle call for maintaining occupancy within at least 75% of 8 Core Areas as measured once every 3 years (Dudek & Associates 2003). Core Areas for this species are: Cajalco Creek, San Mateo Creek, Santa Ana River, Chino Creek, Temecula Creek, Murrieta Creek, Santa Rosa Plateau, and San Jacinto River east of I-215. These Core Areas include a 2 km buffer of upland habitat surrounding the river system. We also trapped the San Jacinto River at Railroad Canyon Lake, which is listed in Objective 4 as dispersal habitat for pond turtle.

We began surveying in 2006 for populations of pond turtle across Core Areas and other suitable areas in the Plan Area. We used visual and trapping protocols developed and tested in San Diego County by the Western Ecological Research Center, U.S. Geological Survey (USGS). We successfully detected the species during surveys in 2006 and continued to survey using the USGS protocol in 2007, paying specific attention to the timing and quantity of pond turtle detections.

Our 2009 efforts focused on locating suitable habitat, documenting presence, and determining abundance of pond turtle at Core Areas where we have not yet detected them [Santa Ana River and Chino Creek (including Mill Creek and other tributaries) Core Areas]. We also addressed a portion of Species Objective 4 by surveying where the San Jacinto River flows through Railroad Canyon Lake. Specifically, our goals and objectives in 2009 were as follows:

Goals and Objectives

1. Locate suitable habitat in Core Areas and dispersal units not surveyed in recent years.
    a. Conduct visual habitat assessments based on USGS protocol.
2. Collect information about species distribution and demographics in the Plan Area.
    a. Determine presence and measure relative abundance at surveyed Core Areas.
    b. Mark animals with Passive Integrative Transponder (PIT) tags.
3. Work in collaboration with USGS on an ongoing population study of reptiles in southern California.
    a. Retrieve tissue samples from USGS target species for genetic analysis.

METHODS

Protocol Development

We surveyed potential trapping sites using a visual habitat assessment protocol (Appendix A) developed by former Herpetology Program Lead Natalie Marioni, which was based on the *USGS Pond Turtle (*Emys marmorata*) Visual Survey Protocol for the Southcoast Ecoregion*. We used the *USGS Western Pond Turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion* when surveying for pond turtle in 2009 (USGS 2006). The protocol details a trapping procedure to detect all turtle species present in a given area. This protocol was amended by the current Herpetology Program Lead, Robert Packard, to include water quality data and landscape characteristics that were excluded from our visual habitat assessment protocol.

Personnel and Training

Field personnel working with the Monitoring Program herpetology crew in 2006 attended a USGS-led training in May 2006 that covered protocol implementation and the identification of turtle species that occur in the Plan Area. Individuals that attended the USGS sessions then trained 2009 field personnel in protocol procedure and species identification. The Herpetology Program Lead also attended a southwestern pond turtle conference in the Santa Monica Mountains in spring of 2009 to learn new techniques for trapping pond turtle and refine protocol methods.

Biological Monitoring Program training for pond turtle surveys included an in-office presentation of key characteristics used to distinguish local species, and examination of live specimens. Additionally, crew members were trained to insert Passive Integrated Transponder tags (PIT tags) and collect tissue samples using live specimens of locally-captured non-native species or in the field with trapped pond turtle. Monitoring Program biologists that conducted pond turtle surveys in 2009 were:

- Robert Packard, Herpetology Program Lead (Biological Monitoring Program)
- Adam Malisch (Biological Monitoring Program)
- Ariana Malone (Biological Monitoring Program)
- Ashley Ragsdale (Biological Monitoring Program)
- Bill Kronland (Biological Monitoring Program)
- Conan Guard (Biological Monitoring Program)
- Elizabeth Dionne (Biological Monitoring Program)
- Esperanza Sandoval (Biological Monitoring Program)
- Jonathan Reinig (Biological Monitoring Program)
- Karyn Lee-Drennen (Biological Monitoring Program)
- Liliana Santilli (Biological Monitoring Program)
- Lynn Miller (Biological Monitoring Program)
- Masanori Abe (Biological Monitoring Program)
- Misty Gray (Biological Monitoring Program)
- Nicholas Peterson (Biological Monitoring Program)
- Nydia Celis (Biological Monitoring Program)

Survey Design

We targeted the Chino Creek and Santa Ana River Core Areas, and dispersal habitat at Railroad Canyon Lake with pond-turtle surveys in 2009 (Figure 1). The Chino Creek area included all tributaries of Chino Creek, including Mill Creek, and the 2 km buffer, which encompassed the settling ponds in the Prado Basin. We selected trap locations within targeted Cores and dispersal units based on presence of suitable habitat, as determined by visual assessments conducted along streams and lake shorelines from 8 – 25 June. Habitat was considered suitable if there was slow moving water over 0.5 m deep, and had a marginal ranking or better according to the parameters in Appendix A (basking sites, aquatic refugia, streamside refugia, upland nesting sites).

We selectively placed traps where vegetative cover (e.g., trees, shrubs, cattails), basking sites (e.g., logs, rocks, emergent vegetation), and appropriate water depth (≥ 0.75 m for large hoop traps, ≥ 0.45 m for small hoop traps) occurred within identified suitable habitat. We also attempted to avoid vandalism and theft of traps by placing them away from public access. Alternatively, we opened traps in the morning, monitored them throughout the day, and pulled them in the early evening if they could not be located away from public view. We otherwise left traps open all night, and checked them each morning.

The number of trap sites per Core Area or dispersal unit, and the number of trap locations per site was dependent upon the extent of appropriate habitat (Table 1). We did not find suitable habitat at Murrieta Creek based on the absence of water at the time we conducted visual assessments. Each trap location consisted of either a large- or small-hoop trap, depending on water depth, baited with a punctured tin of sardines. We also monitored fish and crayfish populations by placing 1 standard minnow trap for every 10 hoop traps at each site, or 1 for every trap site with < 10 hoop traps.

Table 1. Number of trap sites (*n*) per area at surveyed Core Areas and Dispersal Units.

Site	Trapping Area	*n*	Description (# of traps per site)
Core Area			
Santa Ana River	Norco	2	Oxbow pools (9 and 11)
Chino Creek	Chino Creek	14	Creeks and tributaries (4 to 24)
	Mill Creek	6	Creek (9 to 15)
	Prado Pools	5	Settling ponds (2 to 7)
	Goldberry Pools	2	Settling ponds (5 and 25)
Murrieta Creek	-	-	No suitable habitat present on conserved lands.
Dispersal Unit			
Railroad Canyon	Canyon Lake	8	Lake and ponds (1 to 9)

We surveyed each trap site over a single effort that consisted of 3 consecutive trap nights. We installed traps on the Monday of each effort, checked them in the mornings on the next 3 days (e.g., Tuesday to Thursday), and pulled them on each Thursday. We pulled traps at Railroad Canyon Lake each night at approximately 1800 h, after checking them for turtles, due to the threat of human disturbance, and reset them each morning at

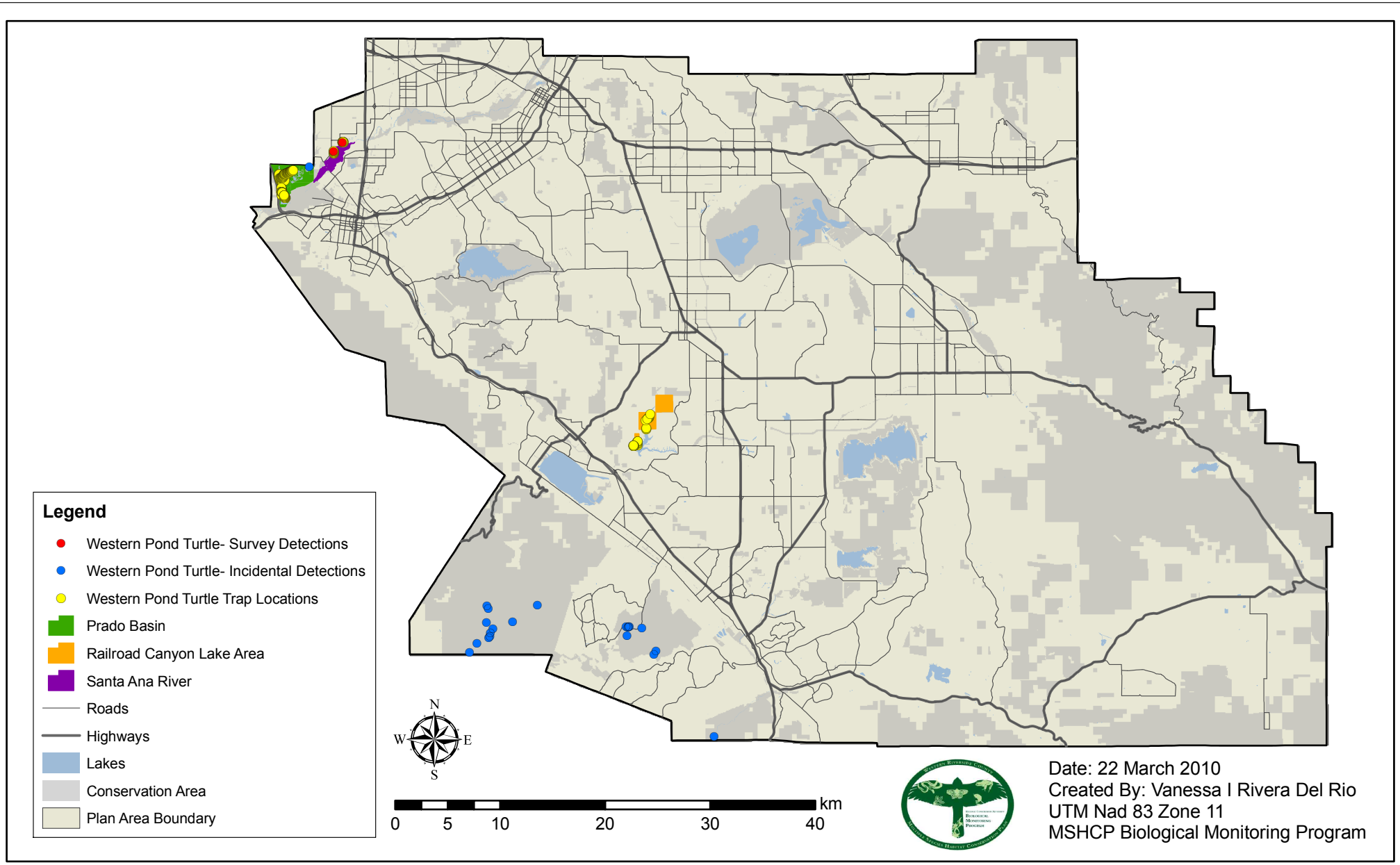

Figure 1. Western pond turtle trapping locations and detections in 2009.

0700 h. We did not keep traps in place for 4 nights, as recommended by 2007 survey results, because of state-mandated Friday furlough days. Trap surveys were conducted from 2 June to 15 October

Field Methods

We conducted visual habitat assessments with at least 2 surveyors walking along lake or stream banks and within stream channels in a downstream-to-upstream direction. We qualitatively ranked the suitability of each pool or 250-m stream segment according to presence or absence of slow moving water, water depth, quantity of basking sites (none, few, or many), aquatic and streamside substrate, and upland habitat. We also recorded the ease of human access (low, medium, or high), naturalness (natural, modified natural, or artificial), and identified all amphibians that were encountered at each potential trapping location (USGS 2006).

We trapped sites determined to have appropriate habitat according to *USGS Western Pond Turtle (*Emys marmorata*) Trapping Survey Protocol for the Southcoast Ecoregion* (USGS 2006). We recorded UTM coordinates of each trap on the day it was set, and uniquely numbered trap locations in the order in which they were selected. We collected the following data before setting traps at each pool or stream segment: date, observer, time, general weather description, temperature in shade at 1 m above ground, average wind speed, water temperature, pH, dissolved oxygen (concentration and percent), conductivity, water width, water velocity, and area of water. We also took upstream photos at the start of each segment and noted the presence and abundance of exotic plant species. For non-covered animal species, we recorded a species record at the first encounter of each life stage (i.e., tadpole, juvenile, adult) within a pool or stream segment for animals outside of traps. For all Covered Species a record was made for each individual and a waypoint was taken.

We baited each trap with a punctured can of sardines and checked them daily after the first day (i.e., Monday) between 0730 h and 1600 h to retrieve trapped turtles and other aquatic species (e.g., fish, frogs, invertebrates). We first recorded general weather information [ambient air temperature (C), sky condition (USGS sky code), and wind speed (km/hr) and water temperature (C)] at each pool before checking traps. We then recorded trap site, sex, carapace length (mm), carapace width (mm), plastron length (mm), and weight (g) for each captured turtle. We also notched the right femoral scute of the plastron of all turtles except softshells, and collected tissue samples for each turtle by clipping the last 3 mm of the tail, or a small strip of skin from the feet of softshells. Softshell turtles were not marked due to the delicate nature of the soft shell, and the fact that they are non-target species. We preserved tissue samples in alcohol and stored them in a freezer at the Biological Monitoring Program office before delivering them to the USGS office in San Diego. USGS uses the tissue samples in a larger genetic study to assess population structure and movement of turtles between sites. We took at least 4 photos of each pond turtle (face-on, carapace, side of carapace, and plastron orientations) and noted shell damage. We also marked all adult pond turtles with a subcutaneous Passive Integrated Transponder (PIT) tag (American Veterinary Identification Devices, Inc.) inserted at the medial ventral fold of the right rear leg (Figure 2) after scanning individuals with a PIT tag reader to ensure that they had not already been tagged. We

then returned all southwestern pond turtles to the pool from which they came. Processing times ranged from 5 to 10 min per animal depending on the presence/absence of PIT tags and marking scheme used.

We recorded species information and then released all native invertebrates, fishes, and amphibians found in each trap without taking additional measurements. All exotic turtles were collected and given to the California Turtle and Tortoise Club for adoption. Exotic animals were either released on-site or destroyed, according to each surveyor's personal preference. We then re-set traps after each check and removed the traps on the fourth trapping day.

Figure 2. PIT tag being inserted into the medial ventral fold of the right rear leg of a southwestern pond turtle. Notch mark used for identifying a recaptured animal is also visible on the right femoral plastron scute.

Data Analysis

Quantitative analysis of data collected in 2009 was not possible due to small sample sizes. We present here only summary statistics. We also transferred all data collected prior to 2009 and stored at the USGS office to the Biological Monitoring Program database. Personal Digital Assistants (PDA) used to collect the data were not reconfigured in time to use them during 2009 surveys, so all data were taken with paper data forms. Forms are stored at the Biological Monitoring Program Office in Riverside, CA.

RESULTS

We only captured pond turtle (n = 2) at the oxbow pools along the Santa Ana River in Norco, and did not detect the species in the San Jacinto River at Railroad Canyon Lake, Chino Creek, the settling ponds near Chino Creek, or at Mill Creek in Prado Basin.

We did not trap San Mateo Canyon in the Cleveland National Forest due to trapping prohibitions, but did observe pond turtle (n = 11) here during stream surveys in 2009. We also did not trap at the Santa Rosa Plateau because the San Diego Zoo Department of Herpetology (Thomas Owens) was surveying the reserve in 2008, but we did detect 8 individuals during stream surveys in Cole Canyon. We also incidentally recorded an individual at the Santa Margarita River while checking artificial cover there. Orange County Water District staff (*Bonnie Nash, personal communication*) found a pond turtle near the Santa Ana River in Prado Basin, adding to our detections in that Core.

Exotic turtles were captured in 4 of 5 areas trapped (Figure 3). In the oxbow pools along the Santa Ana River we captured spiny softshells (*Apalone spinifera*) and red-eared sliders (*Trachemys scripta*). We captured sliders on the San Jacinto River at Railroad Canyon Lake. We captured softshells and sliders in Chino Creek and its tributaries in the Prado Basin. One slider was seen but not captured in the settling ponds next to Chino Creek. No turtles were seen or captured in Mill Creek. All drainages trapped had a variety of exotic fish, including fathead minnow (*Pimephales promelas*), common carp (*Cyprinus carpio*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), inland silversides (*Menidia beryllina*), western mosquitofish (*Gambusia affinis*), bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), largemouth bass (*Micropterus salmoides)*, and smallmouth bass (*M. dolomieu)* (Appendix B). No native fish were found in any drainage trapped. The invasive red swamp crayfish (*Procambarus clarkia*) was also found in most drainages trapped (Appendix B).

We turned over all exotic turtles captured to the California Turtle and Tortoise Club (Orange County, California) to be relocated or adopted out.

DISCUSSION

We focused 2009 survey efforts on documenting presence of pond turtle in Core Areas where we have not yet recorded the species. We were successful in detecting pond turtle in the Santa Ana Rive Core, but not at Chino Creek. Moreover, we did not find suitable habitat on conserved lands at Murrieta Creek, though we acknowledge that this is a variable condition dependent upon annual precipitation, and lack of suitable habitat in 2009 does not preclude suitable habitat existing at a future point in time

We have surveyed all 8 pond turtle Core Areas visually for appropriate habitat from 2006-2009, and performed trapping surveys in 5 Core Areas. We have detected the species in 4 of 8 (50%) Cores, as well as in one dispersal area (i.e., Santa Margarita River). We need to document pond turtle at 2 additional Core Areas to meet Species Objective 5, which requires occupancy of at least 75% (6 of 8) of Core Areas as measured every 3 years (Table 2). Temecula and Murietta Creeks have little if any

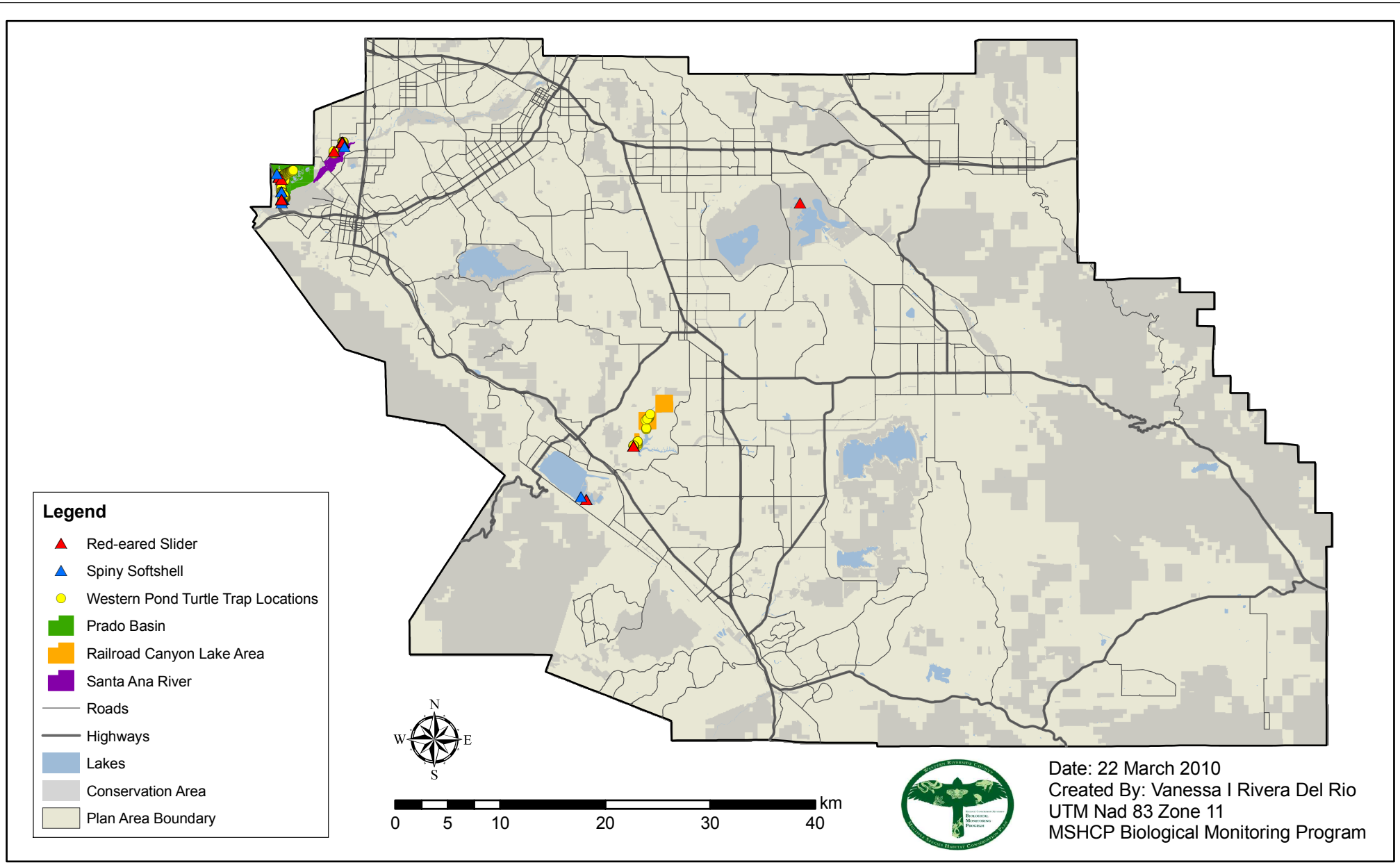

Figure 3. Invasive turtle detections in 2009.

appropriate habitat, and Chino Creek and the San Jacinto River have been highly impacted by human activities. Still, a robust population is known to occur along Chino Creek just north of the Plan Area in San Bernardino County, and much suitable habitat exists within 2 km of the San Jacinto River as it pass through the SJWA. It seems plausible that pond turtle should occur at these Core Areas, and trapping efforts should continue here.

Table 2. Summary of pond turtle survey efforts (V = visual, T = trapping, I = incidental) and years we detected the species from 2006 – 2009.

Site	Trapping Site	2006	2007	2008	2009	Detected[a]
Core Areas						
Chino Creek	Chino Creek	V, T	V	-	V, T	-
	Mill Creek	-	-	-	V, T	-
	Settling Ponds	-	-	-	V, T	-
	Goldberry Ponds	-	-	-	V, T	-
Murrieta Creek[b]	Murrieta Creek	V	-	V	V	-
Cajalco Creek	Cajalco Creek	-	-	T	V	2008
San Jacinto River	San Jacinto River	-	-	V, T	-	-
	San Jacinto Wildlife Area	-	-	V, T	-	-
San Mateo Canyon	San Mateo Canyon	V	V	-	I	2007, 2009
Santa Ana River	Norco Pools	-	-	-	V, T	2009
Santa Rosa Plateau	Santa Rosa Plateau	V	V	-	I	2006, 2008, 2009
Temecula Creek	Temecula Creek	V	-	T	-	-
Non-core areas						
Chino Hills State Park[c]	Lower Aliso Canyo	-	T	-	-	2007
Dispersal Habitat						
Railroad Canyon Lake	Canyon Lake	-	-	-	V, T	-
Santa Margarita River	Santa Margarita River	-	V, T	-	I	2007, 2009

[a] Represents detections from visual and trapping surveys combined.

[b] No suitable habitat found on conserved lands.

[c] Not in the Plan Area, but trapped for protocol testing

Lack of pond turtle in the Chino Creek Core Area may be due to the presence of red-eared sliders (*T. scripta*) and spiny softshell turtles (*Apalone spinifera*). These exotic species may pose a threat to native species through competition for food and basking and nesting sites, along with the introduction of exotic diseases (Spinks et al. 2003). We did detect a few exotic turtles in the San Jacinto River at Railroad Canyon Lake, but seemingly not enough to deter pond turtle. Absence of the species here may be a result of being highly impacted by human activity (e.g., boats, trash, development) and water level fluctuations. Hydrology may also explain the lack of pond turtle in the main channel of the San Jacinto River east of I-215, which has been highly modified over the past 100 years.

Recommendations for Future Surveys

We will continue to survey all accessible Core Areas and attempt to identify other potential turtle habitat during the inventory stage of our program. We will trap the Core Areas of San Jacinto River, Murrieta Creek and Temecula Creek in 2010 pending access permissions. We will also search for more areas along the San Jacinto River that may be suitable for trapping. An undocumented capture of a pond turtle was reported by the staff at the San Jacinto Wildlife Area in 2009 along the San Jacinto River. Access issues at the settling ponds next to Chino Creek prevented us from completing our surveys there, and we will attempt to address these issues in 2010. It would also be beneficial to regularly trap sites over an entire year to determine seasonal effects on turtle activity and detectability.

We recommend the turtle trapping protocol be amended to include population estimates once the inventory stage of surveys is complete and the pond turtle populations throughout Western Riverside County have been identified. While this is outside of the scope of the pond turtle species objectives, population estimates would enable reserve managers to monitor the status of populations over time and could potentially provide valuable information regarding population responses to management actions.

We also suggest that a more comprehensive assessment of upland habitat usage be established to facilitate appropriate management. This would involve a more thorough evaluation of the landscape composition, such as collecting parameters of upland slope and distance to suitable nesting locations. Pond turtles are known to travel extensive distances in search of suitable nesting habitat and it has been reported that pond turtle in particular have traveled as far as 1.9 km streamside and 100 m into upland habitat (Rathbun et al. 1992). Telemetry studies could also be employed to determine specific upland habitat usage by nesting female turtles within the Conservation Area. Because pond turtle do not nest in the aquatic system itself, it is important to assess all of their habitat requirements. This aspect of turtle surveying would likely be most appropriate once the inventory stage of this project is complete.

Also, we highly recommend that the Santa Margarita Ecological Reserve be added as a Core Area for pond turtle given that access to some existing Core Areas is limited while others are heavily disturbed. Based on previous efforts, we know that a pond turtle population occurs within the reserve along the Santa Margarita River. Therefore, it would be appropriate to replace a more highly disturbed or unsuitable area on the Core Area list with the Santa Margarita Ecological Reserve.

LITERATURE CITED

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.

Holland DC. 1994. The western pond turtle: habitat and history. Final Report. DOD/BP-62137-1. Bonneville Power Administration, and Oregon Dept. of Fish and Wildlife, Wildlife Diversity Program, Portland, OR.

Lemm JM. 2006. Field Guide to Amphibians and Reptiles of the San Diego Region. Berkeley (CA): University of California Press.

Rathbun GB, Siepel N, Holland D. 1992. Nesting behavior and movements of western pond turtles, *Actinemys marmorata*. The Southwestern Naturalist 37(3):319-324.

Seelinger LM. 1945. Variation in the Pacific mud turtle. Copeia 1945:150-159.

Spinks Q, Pauly GB, Crayon JJ, Shaffer HB. 2003. Survival of the Western Pond Turtle (*Emys marmorata*) in an urban California Environment. Biological Conservation 113(2): 257-267.

[USFWS] U.S. Fish and Wildlife Service. 1992. Endangered and threatened wildlife and plants; 90-day finding and commencement of status reviews for a petition to list the western pond turtle and California red-legged frog. Fed. Reg. 57:45761-45762.

[USGS] U.S. Geological Survey. 2006. USGS western pond turtle (Emys marmorata) trapping survey protocol for the southcoast ecoregion. U. S. Geological Survey protocol. San Diego, CA.

Appendix A. Western Riverside County MSHCP Monitoring Program pond turtle Protocol Amendment for Habitat Assessment

The information provided here is an amendment created by the MSHCP Monitoring Program to the USGS Western Pond Turtle Protocol. This amendment was created in order to have more statistically sound and quantifiable data regarding pond turtle trapping locations and trapping effort. The information provided here was supplied by USGS from the following document:

Madden-Smith, M. C., E. L. Ervin, K. P. Meyer, S. A. Hathaway, and R. N. Fisher. 2005. Distribution and Status of the Arroyo Toad (*Bufo californicus*) and Western Pond Turtle (*Emys marmorata*) in the San Diego MSCP and Surrounding Areas. U. S. Geological Survey final report prepared for County of San Diego and California Department of Fish and Game. San Diego, CA. 183 pp.

Habitat Quality

Pond turtle habitat is defined as having the following 6 characteristics.

1. slow moving water
2. ≥ 0.50 m of pooling water
3. basking sites
4. aquatic refugia
5. streamside refugia
6. upland nesting habitat

Characteristics #s 3-6 will then each be ranked as either 0 ("none"), 1 ("few") or 2 ("many") for a particular stream reach or 250 m shoreline of pond habitat. The shoreline of ponds less than 250 m will be measured to determine how much shoreline there is and will then be classified as one site. The numeric rankings are then tallied, giving a number between 0-8. Habitat quality is based off of this tally in the following way: poor (0 – 2), marginal (3 – 4), good (5 – 6), or high (7 – 8). Sites with no water or < 0.05 m deep will be considered poor.

Habitat Disturbance

In addition to the general habitat characteristics that were collected during the habitat assessment conducted in this study, more detailed data should be collected and should include: more precise measurements of percent of canopy cover and pool size (possibly using digital orthophotographs), pool depth, substrate types (both wetland and upland), and percent of basking site coverage.

Block (stream/ pond): _____ **DATE**: _____
Site (reach/ pool #): _____

Observer(s) Initials: _____

Habitat Quality

slow moving water circle one: no yes___

≥ 0.50 m of pooling water circle one: no yes___

basking sites circle one: 0 ("none") 1 ("few") 2 ("many")

aquatic refugia circle one: 0 ("none") 1 ("few") 2 ("many")

streamside refugia* circle one: 0 ("none") 1 ("few") 2 ("many")

upland nesting habitat* circle one: 0 ("none") 1 ("few") 2 ("many")

Level of Human Access (circle one)

Low (remote sites or sites with restricted or limited access)

Medium (sites with restricted or limited access, but with a moderate frequency of trespassing (e.g., private reservoirs), or sites with only limited restrictions on access & have only moderate use (e.g., parks imbedded in low density housing, parks in a developing area with only moderate use at this time))

High (sites with few access restrictions, usually designated recreational areas (e.g., fishing/boating areas)

Level of Naturalness (circle one) – If not able to assess in the field, please leave for Natalie.

Natural: (Sites with 10% or less modification of the natural habitat (e.g., mostly natural river or stream channel)

Modified Natural: (sites with greater than 10% artificial modification of the natural habitat (e.g., dammed or channelized river or stream))

Artificial: (sites that were completely artificial and occur outside of a natural channel or wetland (e.g., artificial ponds in a park setting, agricultural ponds))

NOTES:_____

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Appendix B: Invasive Animal Species Captured at Each Site Surveyed.

Site	Species	Scientific Name	Site	Species	Scientific Name
Chino Creek	Spiny Softshell	*Apalone spinifera*	Prado Ponds	Mosquitofish	*Gambusia affinis*
	Red-eared Slider	*Trachemys scripta*		Fathead Minnow	*Pimephales promelas*
	Mosquitofish	*Gambusia affinis*		Bullfrog	*Lithobates catesbeiana*
	Green Sunfish	*Lepomis cyanellus*		Red swamp crayfish	*Procambarus clarkii*
	Common Carp	*Cyprinus carpio*			
	Smallmouth Bass	*Micropterus dolomieu*	Goldberry Ponds	Sunfish sp.	*Lepomis sp.*
	Largemouth Bass	*Micropterus salmonoides*		Red swamp crayfish	*Procambarus clarkii*
	Black Bullhead	*Ameiurus melas*		Mosquitofish	*Gambusia affinis*
	Yellow Bullhead	*Ameiurus natalas*		Bullfrog	*Lithobates catesbeiana*
	Bullfrog	*Lithobates catesbeiana*			
	Red swamp crayfish	*Procambarus clarkii*	Norco Pools	Common Carp	*Cyprinus carpio*
	Inland Silversides	*Menidia beryllina*		Sunfish sp.	*Lepomis sp.*
				Largemouth Bass	*Micropterus salmonoides*
Mill Creek	Black Bullhead	*Ameiurus melas*		Bullfrog	*Lithobates catesbeiana*
	Bullhead	*Ameiurus natalas*		Red swamp crayfish	*Procambarus clarkii*
	Common Carp	*Cyprinus carpio*			
	Green Sunfish	*Lepomis cyanellus*	Railroad Canyon Lake	Largemouth Bass	*Micropterus salmonoides*
	Bullfrog	*Lithobates catesbeiana*		Bullhead sp.	*Ameiurus sp.*
	Mosquitofish	*Gambusia affinis*		Green Sunfish	*Lepomis cyanellus*
	Bluegill Sunfish	*Lepomis macrochirus*		Bullfrog	*Lithobates catesbeiana*
	Red swamp crayfish	*Procambarus clarkii*			
			Railroad Canyon Ponds	Sunfish sp.	*Lepomis sp.*
Chino Creek Tributary 1	Common Carp	*Cyprinus carpio*		Largemouth Bass	*Micropterus salmonoides*
	Largemouth Bass	*Micropterus salmonoides*		Bullfrog	*Lithobates catesbeiana*
	Sunfish sp.	*Lepomis sp.*			
Chino Creek Tributary 2	Common Carp	*Cyprinus carpio*			
	Black Bullhead	*Ameiurus melas*			
	Sunfish sp.	*Lepomis sp.*			
	Mosquitofish	*Gambusia affinis*			