

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

Western pond turtle (*Clemmys marmorata*)  
Survey Report 2006



April 23, 2007

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**NOTE TO READER:**

This report is an account of survey activities undertaken by the Biological Monitoring Program for the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP). The MSHCP was permitted in June 2004. The Biological 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.

While we have made every effort to accurately represent our data and results, it should be recognized that our database is still under development. 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 Herpetology Program Lead, Natalie Marioni. 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 Western Riverside County Regional Conservation Authority (RCA). For further information on the MSHCP and the RCA, go to [www.wrc-rca.org](http://www.wrc-rca.org).

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## INTRODUCTION

The western pond turtle (*Clemmys marmorata* previously *Emys marmorata*; hereafter “CLMA”) is a California species of special concern with no federal status. More than 90% of aquatic habitat within its historic California distribution has been lost (Brattstrom and Messer 1988; U.S. Fish and Wildlife Service 1992, 1993). The CLMA is California’s only extant, native freshwater turtle species. There are two subspecies of the western pond turtle. In California, the northwestern subspecies (*C. m. marmorata*) occurs north of the American River, while the southwestern subspecies (*C. m. pallida*) occurs from the coast and south of San Francisco (Seelinger 1945; Holland 1994; U.S. Fish and Wildlife Service 1993). The southwestern pond turtle is the subspecies that occurs in the MSHCP Plan Area and is the topic of this report.

Within the MSHCP Plan Area, CLMA is known to inhabit areas in Cole Creek, the Santa Ana River, San Jacinto River and the confluence of Temecula Creek and Murrieta Creek (Dudek & Associates 2003). Specifically, the MSHCP lists the following eight locations as Core Areas for CLMA: Cajalco Creek, San Mateo Creek, Santa Ana River, Chino Creek, Temecula Creek, Murrieta Creek, Santa Rosa Plateau, and San Jacinto River. Species objective 5 for CLMA states:

*... within the MSHCP Conservation Area, maintain continued use at a minimum of 75 percent of the conserved Core Areas as measured once every 3 years.*

In 2006, the Monitoring Program began a study to locate populations of CLMA in the Conservation Area and to test an existing turtle trapping protocol used by the U.S. Geological Survey, Western Ecological Research Center (USGS). Specific goals were as follows:

### Survey Goals

- A) Document CLMA presence within at least 75% of accessible Core Areas, measured once every three years.
- B) Identify new, potential Core Areas at conserved locations within the Plan Area.
- C) Refine the existing CLMA survey protocol to optimize methods for future turtle trapping efforts.
- D) Provide data to land managers to make ecologically sound management decisions regarding the conservation of CLMA and its habitat.

## METHODS

### Protocol Development

The MSHCP Biological Monitoring Program used an existing protocol, *USGS Western Pond Turtle (Emys marmorata) Trapping Survey Protocol for the Southcoast Ecoregion*, written and distributed by the USGS San Diego Field Station (2006 Draft) for surveys of CLMA in 2006. Because the protocol is currently in draft form, it is not included as an attachment to this report. A copy of the protocol can be found in the Monitoring Program office or by contacting

USGS directly. The protocol uses a trapping procedure as a means of detecting all turtle species present. A summary of the survey methods is provided in the sections below.

## **Personnel and Training**

All field crew attended a training session provided by USGS in May 2006 on the use of the turtle trapping protocol and identifying turtle and fish species likely to be encountered in the Conservation Area. Species identification training included slides addressing key distinguishing characteristics between species, plus observing live turtle specimens of CLMA and other similar species. Additionally, both live and preserved fish specimens were reviewed and crew members were trained in PIT tagging of CLMA. The USGS set turtle traps at a nearby pond and checked them with trainees as a mock survey to familiarize surveyors with both field and PDA techniques. Monitoring Program biologists conducting CLMA surveys in 2006 included:

- Natalie Marioni, Herpetology Program Lead (Regional Conservation Authority)
- Karin Cleary-Rose, Monitoring Program Coordinator (USFWS)
- Ricardo Escobar III (California Department of Fish and Game)
- Rosina Gallego (Regional Conservation Authority)
- Christina Greutink (Regional Conservation Authority)
- Conan Guard (Regional Conservation Authority)
- Lesley Hanson (Regional Conservation Authority)
- Jason Hlebakos (Regional Conservation Authority)
- Angela Hyder (Regional Conservation Authority)
- Ryann Loomis (Regional Conservation Authority)
- Adam Malisch (Regional Conservation Authority)
- Valerie Morgan (Regional Conservation Authority)
- Lynn Miller (Regional Conservation Authority)
- Vanessa Rivera del Rio (Regional Conservation Authority)
- Andrea Salzman (Regional Conservation Authority)
- Esperanza Sandoval (Regional Conservation Authority)
- Carol Thompson (Regional Conservation Authority)

## **Study Site Selection**

Within the Conservation Area, turtle trapping sites were chosen based on the criteria that site locations 1) were in a Core Area or other potentially suitable turtle habitat conserved within the Plan Area, 2) contained pools deep enough to place turtle traps and 3) were areas currently not being surveyed for CLMA by other researchers. Preliminary surveys were conducted prior to trapping to determine if the above criteria were met. Sites evaluated for CLMA habitat suitability and trapping potential are listed in Table 1. The Monitoring Program identified 17 locations where potentially suitable habitat for CLMA may occur in the existing Conservation Area. Visual surveys for suitable CLMA habitat were conducted at 14 of those 17 sites (5 Core and 9 non-Core Areas; Table 1). The Santa Rosa Plateau (SRP) Core Area was not surveyed by the Monitoring Program because other researchers (Tommy Owens and Beth Principe) conducted

CLMA projects at pond and stream locations throughout the Santa Rosa Plateau. Habitat in Cajalco Creek at the Lake Matthews Reserve was not surveyed due to access restrictions. Habitat within the Santa Ana River was informally checked during surveys for other species.

## Survey Methods

### *Visual Survey*

Detailed visual survey methods can be found in the *USGS Pond Turtle (Emys marmorata) Visual Survey Protocol for the Southcoast Ecoregion, 2006*. Visual surveys were conducted where we anticipated setting turtle traps. Visual encounter surveys were conducted by at least two surveyors in daylight hours between approximately 0800 hrs and 1700 hrs along lake or stream banks and within stream channels from downstream to upstream areas. Survey time per site varied according to the number of appropriate trapping sites found and the abundance of amphibians detected. All turtles, amphibians and fish trapped, including common species, were identified. Data on habitat characteristics were collected throughout the survey and included: presence and name of exotic plant species, percent overhead canopy, submergent and emergent vegetation, type of upland and riparian vegetation community, percent wet length, percent shallow, medium and deep pools, presence and number of plunge pools, presence and type of aquatic refugia (undercuts, tree roots, woody debris, rock crevices, aquatic submerged vegetation, emergent vegetation, and floating material), presence of basking areas (sunny rocks, open banks, fallen logs, and other), percent of the three most common aquatic substrates (clay, silt, sand, gravel, pebble, cobble, boulder/ bedrock, leaf litter, and fallen logs), and presence and type of any recent disturbance. Specific data collected at the beginning of each surveyed area included: date, observer, time, general weather description, ambient air temperature, average wind speed, presence/absence of water, water temperature, pH, dissolved oxygen (percent and concentration in mg/L), conductivity, wetted depth and stream channel width, water velocity, and number of wetted channel braids. In addition, each time a potential trap site was located, water data were collected, photos were taken, and the UTM coordinates and the number and types of traps that could be set at that pool were recorded.

### *Turtle Trapping*

Our trapping methods are described in detail in the *USGS Western Pond Turtle (Emys marmorata) Trapping Survey Protocol for the Southcoast Ecoregion, 2006*. Trapping locations were chosen based on whether or not suitable habitat was found during a preliminary visual survey of a site. Characteristics used to determine appropriate trap locations within a site include water depth greater than approximately 1.5m (for hoop trap locations) or greater than approximately 0.5m (for box trap locations), sites providing at least some vegetation cover and those containing potential basking sites (logs, rocks, submergent vegetation, etc.). We attempted to choose trap locations as far from public access as possible. Accessibility (by foot or boat) was also a limiting factor when determining where to place traps.

Traps were set in suitable areas within a lake or stream (hereinafter called pools) and numbered in the order in which they were encountered. The number of traps set at a site was dependant upon the overall size of each site. Traps were set on Mondays between 0800 hrs and 1700 hrs and were left open for 4 consecutive nights. Open traps were checked daily. Each trap

was baited with a can of sardines or tuna. The UTM coordinates of each trap were recorded on the day the trap was set, while general weather information and water temperature were recorded each day.

Each site was trapped for 4 consecutive nights except at Lake Skinner and the Santa Margarita River, where the number of suitable pools exceeded the number of traps available. Two, 4 night trapping weeks were conducted at Lake Skinner. Santa Margarita River was trapped for 3 non-consecutive weeks for a total of 12 trap nights. Traps were not set during weekends when there was an increase in the likelihood that the public would encounter the traps. The traps were checked between 0730 hrs and 1600 hrs to retrieve any trapped turtles or other aquatic species (e.g., fish, frogs).

All aquatic species found in a trap were recorded and then released. In some instances, exotic species were removed and dispatched. For all turtles caught, the following data were recorded at the trapping site: sex, carapace length, and weight. The right femoral plastron scute of each turtle was notched, with the exception of turtles captured at Santa Margarita River where a notching scheme was used to uniquely notch each individual according to Holland (1994) (Figure 1). A tissue sample was collected by clipping the last 3mm of the tail and was preserved in alcohol and placed in the freezer upon return to the office. These tail tips were then sent to the USGS office in San Diego where genetic testing will be conducted on them to assess population structure and movement of turtles between sites. At least 3 photos were taken of each turtle (face on, carapace and plastron orientation). Additionally for southwestern pond turtles, shell damage was noted and carapace width and plastron length were recorded. Southwestern pond turtles were scanned to find any previous PIT tags. If a PIT tag was not detected, one was inserted under the skin at the medial ventral fold of the right rear leg (Figure 2). All southwestern pond turtles were then released back into the pool from which they came. Non-native turtles were transported back to the office and given to the California Turtle and Tortoise Club, Orange County Chapter, for adoption as pets. All traps were then re-set in their original pool.

## **Data Analysis**

Raw data are housed in the USGS Pendragon database at the San Diego Field Station and at the Biological Monitoring Program office in Riverside, CA. Due to small sample sizes, data analyses were not conducted on these data.

## **RESULTS**

Potentially suitable habitat for CLMA was found at 11 of 14 sites visually surveyed by the Monitoring Program in 2006 (Table 1). Although no formal visual survey was conducted along the Santa Ana River, a Core Area, general observations made during a habitat assessment for the Santa Ana sucker indicated that water levels were too low to set traps, thus precluding the implementation of our turtle survey methods. Murrieta Creek and Santa Gertrudis Creek were determined unsuitable due to concrete lined waterways and were not trapped.

Of the 11 sites containing potentially suitable habitat, 10 were trapped by the Monitoring Program (2 Core and 8 non-Core Areas). San Mateo Creek Core Area was not trapped in 2006 due to time constraints. A total of 2,574 m of stream habitat from 4 different stream systems were trapped. CLMA were found inhabiting two streams along 30% (1,792 m) of stream habitat surveyed (Tables 2a and 2b, Figure 3). Two and 23 individual CLMA were captured at Los Alamos Creek (Core Area) and Santa Margarita River (non-Core Area), respectively (Table 3). Both individuals caught in Los Alamos Creek were adult males and captured only once. Within the Santa Margarita river the sex ratio was skewed toward males (16:7, Table 4). Only one juvenile turtle was captured during these efforts. This individual was too small to PIT tag. Additionally, 3 other turtles were not PIT tagged due to equipment issues and the PIT tag of 1 turtle did not read properly once inserted into the turtle (Table 4). Three turtles were recaptured once each: 2 adult males and the 1 juvenile. We have not yet received data from the researchers conducting CLMA studies at the Santa Rosa Plateau Ecological Research, although we know that they did find CLMA at the the reserve (Owens 2007).

Exotic turtles were captured at 4 locations, including two different species at San Jacinto Wildlife Area E Ponds where no CLMA were detected (Tables 2a and 3). Seven locations contained exotic fish and 6 locations contained other exotic species (i.e., *Procambarus clarkii*, crayfish). A list of all species captured with respect to location is represented in Table 3.

## DISCUSSION

The 2006 CLMA survey efforts by the Monitoring Program were aimed at identifying potentially suitable habitat and CLMA occupied areas within the Conservation Area. Our efforts found suitable habitat at 14 of 17 areas surveyed. Two of 12 locations trapped resulted in the detection of CLMA. No attempts to calculate detection probabilities were made, therefore we cannot say with confidence that places where CLMA were not detected contain no CLMA.

We believe that the lake habitats trapped this season are not likely to contain CLMA. All three of the lake locations (lakes Perris, Hemet, and Skinner) are man-made and used by the public. Non-native turtles are often released into such public-use water bodies. This was confirmed by the number of different species detected in these lakes. No turtles were captured in Lake Skinner, but we captured 3 different turtle species in Lake Perris and 4 in Lake Hemet. Additionally, 1 and 2 exotic turtle species were detected in Collier Marsh and in the San Jacinto Wildlife Area E Ponds, respectively. In addition to being man-made, Lake Perris was formed by the State Water Project and is supplied by a pipeline from the San Jacinto River, making the movement of turtles from the river to Lake Perris unlikely. Lakes Hemet and Skinner are dammed natural streams. CLMA are extant in the Lake Skinner watershed, while at Lake Hemet there is no specific information on any CLMA occurrences. The maximum elevation limit for CLMA is 2,000m (Dudek and Associates 2003), though they are rare above 1,529m (Holland 1994). All lakes surveyed in 2006 were below 1,500m.

It is important to note that an exotic snapping turtle (*Chelydra serpentina*) was captured at the San Jacinto Wildlife Area. Snapping turtles are the second largest North American freshwater turtle species (Conant and Collins 1998) and will most certainly out-compete the much smaller

CLMA for both food and space. It is not known whether the presence of snapping turtles at this site is the cause for why we did not capture CLMA here. While the E Pond at San Jacinto Wildlife Area does contain suitable CLMA habitat (including ample vegetation cover and basking sites), this pond is man-made and was dug during the construction of the dam for the Lake Perris reservoir. It is not known whether or not there were extant pond turtles in the San Jacinto River drainage at that time and there may not have ever been any opportunity for CLMA to occupy the E pond.

Similarly, we cannot say that the reason we did not detect CLMA at any one site is the presence of other exotic species (turtle, fish or invertebrate) found at those locations. The impact that fish, invertebrates and frogs have on CLMA are not widely studied, but bullfrog (*Rana catesbiana*) adults are known to be opportunistic carnivores, eating any prey item they can, which would include not only the prey items eaten by CLMA, but also CLMA hatchlings. We do know that the presence of exotic turtles creates competition for resources (food, basking areas, space, etc.) that the CLMA would not otherwise face. Given that the most frequently encountered exotic turtle species was the red-eared slider (*T. s. elegans*), a larger species than CLMA, the red-eared slider would most certainly be able to out-compete CLMA for these resources (Spinks et al. 2003). Since most exotic species are introduced by people releasing pets into the wild (Bury and Luckenbach 1976), the risk of transmitting diseases to CLMA is also increased. Even exotic plant species, such as *Tamarix ramosissima*, could impact CLMA by altering nesting habitat and shoreline morphology (Lovich and Meyer 1992).

### **Recommendations for Future Surveys**

It is recommended that the turtle trapping protocol be amended to include detection probabilities and to standardize our trapping methods across sites. In order to standardize our trap methods to compare sites at a later date, we need to establish a set number of traps that will be set per unit area of suitable habitat. This will provide us with a criterion by which we can determine what constitutes an area of suitable habitat (number of basking sites, percent vegetation, water depth, etc.) in quantitative measures. Anecdotal evidence suggests that turtles, especially elusive species like CLMA, might need more time adjusting to additions to their environment (i.e., the traps) before they investigate them and are therefore detected by researchers. There are two ways in which we could address this issue and thus increase the probability that we will detect turtles in the environment. The current protocol is to set traps for four trap-nights and for only one survey week. We could extend both the number of weeks we survey a site as well as the number of nights the traps are set. Another suggestion for handling this issue would be to set baited open traps for the week prior to actually trapping. This would allow turtles to enter in and out of the traps for an acclimation period prior to the actual trap week.

We also suggest that a more comprehensive assessment of upland habitat usage be established. This would involve a more thorough evaluation of the landscape composition to collect parameters such as upland slope and measured distance to suitable nesting locations. Because CLMA do not nest in the aquatic system, it is important for us to assess all their habitat needs. This aspect of turtle surveys would likely be most appropriate once the inventory stage of this project is complete.

Given that access to some existing Core Areas is limited or contains sub-optimal conditions for CLMA, it is recommended that the Santa Margarita Ecological Reserve be added as a Core Area for CLMA. We know that a healthy CLMA population occurs within the reserve along the Santa Margarita River. Therefore it would be appropriate to replace a more highly disturbed or less suitable area on the Core Area list with the Santa Margarita Ecological Reserve.

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U.S. Fish and Wildlife Service. 1993. Endangered and threatened wildlife and plants; notice of a 1-year petition finding on the western pond turtle. Fed. Reg. 58:42717-42718.

**Table 1.** List of locations surveyed for western pond turtle and the type of effort conducted by the Monitoring Program in 2006.

<b>Locations</b>	<b>Core Area</b>	<b>Visual Survey</b>	<b>Turtle Trapping</b>	<b>CLMA Habitat</b>
Chino Creek	Yes	X	X	Yes
Cajalco Creek	Yes	-	-	no access
Murrieta Creek	Yes	X	-	No
San Jacinto River	Yes	X	X	Yes
San Mateo Creek	Yes	X	-	Yes
Santa Ana River <sup>a</sup>	Yes	not formal	-	No
Santa Rosa Plateau <sup>b</sup>	Yes	-	-	Yes
Temecula Creek	Yes	X	-	No
Collier Marsh	No	X	X	Yes
Lake Hemet	No	X	X	Yes
Lake Perris	No	X	X	Yes
Lake Skinner	No	X	X	Yes
Los Alamos Creek*	No	X	X	Yes
Prado Basin	No	X	X	Yes
San Jacinto Wildlife Area**	No	X	X	Yes
Santa Margarita River	No	X	X	Yes
Santa Gertrudis Creek	No	X	-	No

<sup>a</sup>No formal visual survey was conducted along the Santa Ana River, but approx 1,000m were explored during a Santa Ana sucker survey, during which the area was assessed for turtle habitat suitability.

<sup>b</sup>Two other researchers conducted CLMA surveys at the SRP, allowing us not to duplicate efforts there.\*Los Alamos Creek is just off the Santa Rosa Plateau (SRP) and a likely extension of the SRP population.

\*\* The wetlands at the San Jacinto Wildlife Area were surveyed as a spillover location if turtles moved when river levels were low.

**Table 2a.** Survey locations, dates and the number of species detected for all turtle trapping locations in 2006.

Survey Dates	Location	MSHCP Status	Easting	Northing	Total Distance Trapped <sup>a</sup>	Total Trap Hours*	CLMA (total #)	# Non-Native Turtle spp.	# Fish species	# Other Exotic Species
19 - 22 June 2006	Lake Perris		485747	3748068	1,157	672	No	3	2	0
10 -14 July 2006	San Jacinto River	Core	488796	3747649	732	569.4 (189.8)	No	0	0	2
10 -14 July 2006	San Jacinto Wildlife Area, E Ponds		490078	3750732		1429.94 (190.66)	No	2	0	2
17 – 21 July 2006	Lake Hemet		529620	3724556		1094.92 (184.08)	No	4	2	1
31 July - 3 Aug 2006	Chino Creek	Core	439564	3755718	50	215.4 4 (71.48)	No	0	4	4
15 Aug – 22 Sept 2006	Santa Margarita River		481639	3699628	1,788	4807.65 (293.25)	<b>Yes (23)</b>	0	4	1
25 - 28 Sept 2006	Collier Marsh		467365	3728129	280	718.31 (70.82)	No	2	1	0
2 - 6 Oct 2006	Prado Basin		442196	3753352	1172	1150.9 (96)	No	0	1	0
16 Oct – 3 Nov 2006	Lake Skinner		441122	3752849		3821 (193.5)	No	0	7	0
7 - 11 Aug 2006	Los Alamos Canyon (SRP)		469099	3707200	4	378 (94.5)	<b>Yes (2)</b>	0	0	0
<b>Total</b>					<b>5,183 m</b>	<b>14,857.56 (1384) hrs</b>	<b>25</b>			

Location coordinates are in UTM's, Datum = NAD83, Zone 11S

<sup>a</sup>This distance applies to any linear trapping location.

\*First number indicates the total number of turtle trap hours. The parenthetical is the total number of minnow trap hours.

**Table 2b.** Survey locations, dates and the number of species detected for areas where visual surveys were conducted but no trapping efforts have taken place.

Survey Dates	Location	MSHCP Status	Easting	Northing	Length Surveyed (m)	CLMA Habitat	# Turtle Species Observed	# Exotic Species Observed
14 Sep 2006	Murrieta Creek	Core	484564	3708232	1360	N	0	0
Aug 21 – Sep 13 2006	San Mateo Creek	Core	463262	3712333	559	Y	0	4
3 Oct 2006	Temecula Creek	Core	488241	3709852	2540	N	0	1
14 Sep 2006	Santa Gertrudis		484409	3709227	716	N	0	0
<b>Total</b>					<b>5,175 m</b>			

Location coordinates are in UTM's, Datum = NAD83, Zone 11S

**Table 3.** A list of all species encountered during trapping efforts in 2006.

Species	Lake Perris	San Jacinto River	Lake Skinner	Collier Marsh	Prado Basin	Santa Margarita River	San Jacinto Wildlife Area	Lake Hemet	Los Alamos Creek (SRP)	Chino Creek
<b>Fish</b>										
<i>Ameiurus nebulosus</i>										X
<i>Cyprinus carpio</i>						X				
<i>Ictalurus nebulosus</i>	X					X				
<i>Ictalurus punctatus</i>						X				
<i>Micropterus dolomieu</i>			X							
<i>Micropterus salmoides</i>			X		X					X
<i>Morone saxatilis</i>			X							
<i>Lepomis cyanellus</i>			X							
<i>Lepomis macrochirus</i>	X		X	X		X		X		X
<i>Pimephales promelas</i>										X
<i>Pomoxis nigromaculatus</i>			X							
Unknown Fish			X					X		
<b>Frogs</b>										
<i>Rana catesbiana</i>		X					X			X
Ranid species										X
<i>Xenopus laevis</i>										X
<b>Invertebrates</b>										
<i>Procambarus clarkii</i>		X				X		X		X
Unknown invertebrate							X		X	
<b>Turtles</b>										
<i>Chelydra serpentine</i>	X						X			
<i>Chrysemys picta dorsalis</i>								X		
<i>Clemmys marmorata pallida</i> *						X			X	
<i>Graptemys</i> species								X		
<i>Trachemys scripta</i>	X			X			X	X		
<i>Trachemys scripta elegans</i>	X			X				X		
<b>Total Aquatic Species Detected</b>	<b>5</b>	<b>2</b>	<b>7</b>	<b>3</b>	<b>1</b>	<b>6</b>	<b>4</b>	<b>7</b>	<b>2</b>	<b>8</b>

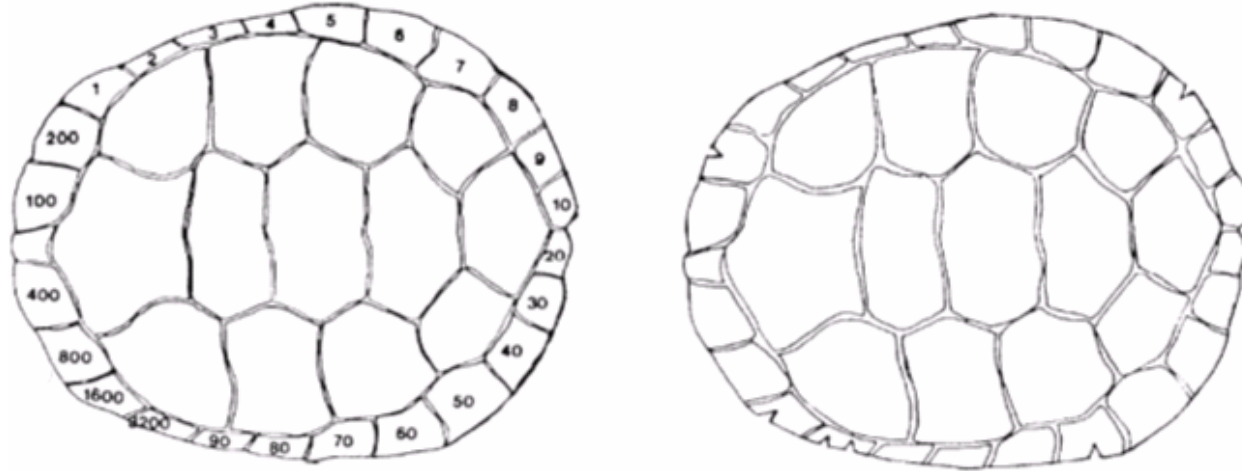
\*Native species are indicated with an asterisk.

**Table 4.** CLMA turtle measurements and PIT tag ID numbers.

Capture Date(s)*	Capture Location	Gender	Life stage	Weight (g)	Carapace Length (mm)	Carapace Width (mm)	Plastron Length (mm)	PIT Tag ID
8/10/2006	Los Alamos Canyon	Male	Adult	304	126.29	103.3	111.95	103103006
8/10/2006	Los Alamos Canyon	Male	Adult	215	117.81	94.97	107.24	103289595
8/16/2006	Santa Margarita River	Male	Adult	349	131.84	106.6	106.86	103108266
8/17/2006 & 8/19/2006	Santa Margarita River	Male	Adult	300	114	88	99	103269359
8/19/2006	Santa Margarita River	Female	Adult	460	140.86	115.14	123.29	103110301
8/29/2006	Santa Margarita River	Male	Adult	352	140	104	116	103028115
8/29/2006	Santa Margarita River	Male	Adult	390	136	118	114	103281110
8/29/2006	Santa Margarita River	Female	Adult	346	135	95	115	103334103
8/29/2006 & 8/31/2006	Santa Margarita River	Male	Adult	405	150	109	117	103117837
8/29/2006	Santa Margarita River	Male	Adult	461	145	125	133	103265800
8/31/2006	Santa Margarita River	Male	Adult	360	137	102	114	103026330
8/31/2006	Santa Margarita River	Female	Adult	370	132	100	117	103297053
8/31/2006	Santa Margarita River	Male	Adult	488	147	118	129	103093054
8/31/2006	Santa Margarita River	Male	Adult	430	141	107	122	103333035
9/1/2006	Santa Margarita River	Male	Adult	370	129.27	101.38	110.73	103354090
9/1/2006 & 9/22/2006	Santa Margarita River	Male	Juvenile	90 / 97	86.96 / 87.03	74.14 / 71.08	76.18 / 76.93	too small
9/19/2006	Santa Margarita River	Female	Adult	430	144.07	111.34	130.82	Not tagged
9/19/2006	Santa Margarita River	Female	Adult	310	126.77	99.65	106.89	Not tagged
9/19/2006	Santa Margarita River	Female	Adult	240	141.84	112.46	123.36	103006514
9/19/2006	Santa Margarita River	Male	Adult	380	136.54	105.3	117.64	103307041
9/19/2006	Santa Margarita River	Male	Adult	505	154.66	116.14	132.83	Not tagged
9/20/2006	Santa Margarita River	Female	Adult	205	110.73	92.25	102.28	103302631
9/21/2006	Santa Margarita River	Male	Adult	330	129.93	108.06	118.27	Tag not reading
9/22/2006	Santa Margarita River	Male	Adult	395	136.23	106.6	115.09	103045626
9/22/2006	Santa Margarita River	Male	Adult	460	136.09	111.74	124.37	103524073

\*When an individual was recaptured, both dates are included.

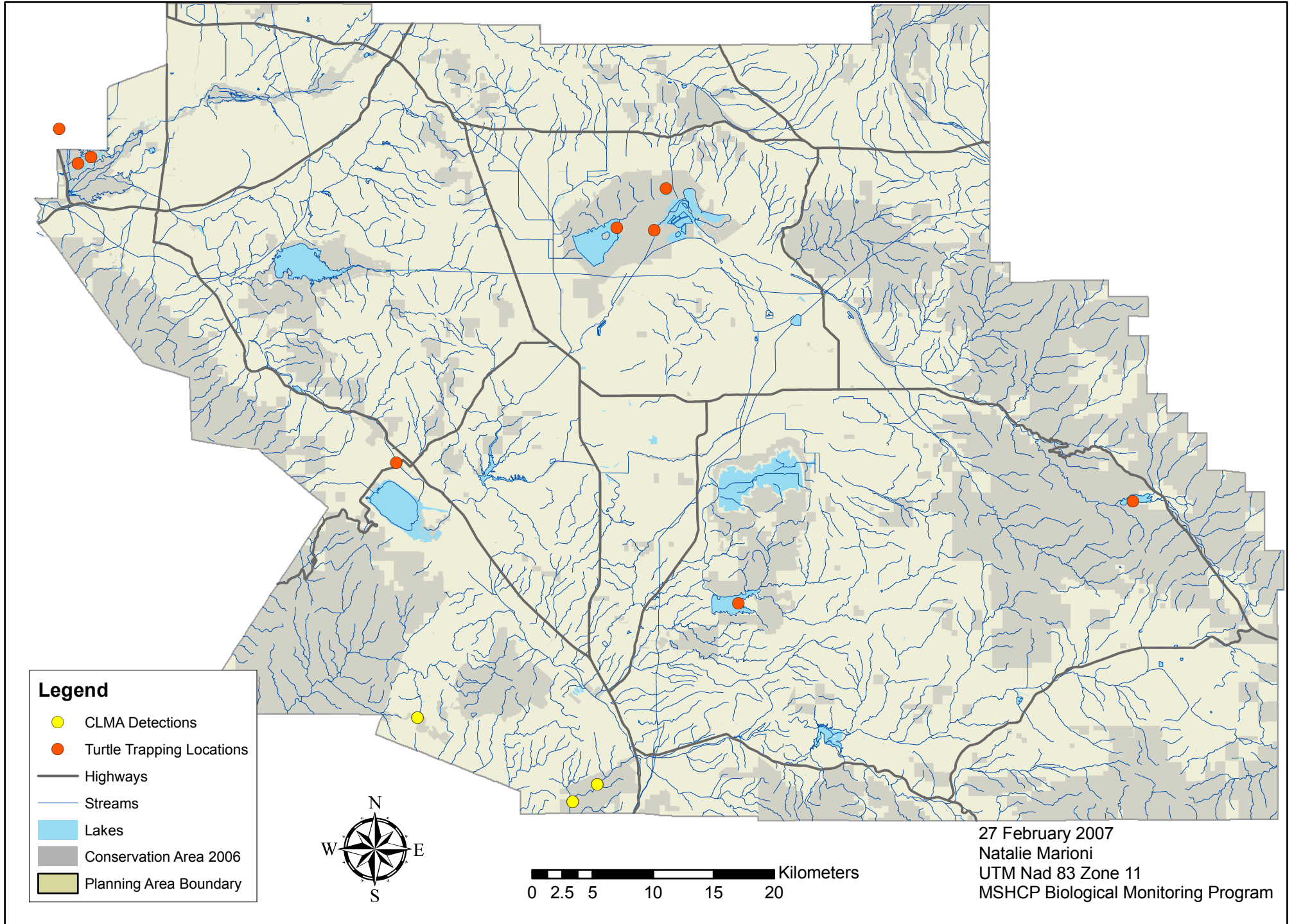
**Figure 1.** Notching scheme reported by Holland (1994) and used at the Santa Margarita River Trap Site. The example carapace on the right represents notch number 8268.



**Figure 2.** Photo demonstrating CLMA PIT tag insertion location. This photo shows a PIT tag being inserted into the medial ventral fold of the rear right leg of a CLMA.



Figure 3: Turtle trapping (orange) and CLMA detection (yellow) locations for 2006 Surveys. CLMA were found within the Santa Margarita and Los Alamos Canyon rivers.



## Appendix A: Visual and turtle trapping datasheets

### Turtle: Visual Survey Form

Date							
Project Code		Start Time		Observer1			
Block		End Time		Observer2			
Site		Site Photo	<table style="display: inline-table; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">Y</td> <td style="width: 20px; text-align: center;">N</td> </tr> </table>	Y	N	Observer3	
Y	N						
Survey Type	<u>visual / trapping</u>	# photos		Observer4			
				Task	<u>observer / recorder / processor</u>		

**Location:**

Start Lat	End Lat
Start Long	End Long
Start Elev	End Elev
Site Length	Site Width

**Weather:**

Temperature	
Condition	<u>clear or few clouds, partly cloudy or variable, cloudy or overcast, fog, mist or drizzle, showers or light rain, heavy rain, sleet or hail, snow, no data</u>
Wind Speed	<u>&lt;1 calm, 2-3 light air movement, 4-7 light breeze, 8-12 gentle breeze, 13-18 moderate breeze, 19-24 fresh breeze, 25-31 strong breeze, 32-38 near gale, &gt;39 gale and above, no data</u>

Water Fields:	Pool #	Pool #	Pool #	Pool #	Pool #	Pool #	Pool #	Pool #	Pool #
Water Present	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N	Y / N		Y / N
Start Latitude									
Start Longitude									
Start Elevation									
End Latitude									
End Elevation									
End Longitude									
Waypoint Name									
Water Temp.									
pH									
Conductivity									
DO % Saturation									
DO mg/L									
Velocity (if stream)									
Photo Time(s)									
Photographer									

Landscape:

Channel width/bankfull (m)	_____			
Flood prone width	_____			
Entrenchment Ratio	_____			
(flood plain width / bankfull width)				
Basking areas present	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> U	<input type="checkbox"/> X
(sunny rocks, banks, etc.)				
Slope %:	_____			

Vegetation:

Upland Community Type	_____
Upland Community	_____
Riparian Community Type	_____
Riparian Community	_____
Dominant Riparian Plant 1	_____
Dominant Riparian Plant 2	_____
Dominant Riparian Plant 3	_____
% Overhead Canopy	0%,1-10%,11-25%,26-50%,51-75%,76-100%
% Submergent Vegetation	0%,1-10%,11-25%,26-50%,51-75%,76-100%
% Emergent Vegetation	0%,1-10%,11-25%,26-50%,51-75%,76-100%

Bank Substrate:

Subst1	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst1	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst2	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst2	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst3	clay, dirt, sand, gravel, cobble, boulder, leaf litter, downfall	% Subst3	0%,1-10%,11-25%,26-50%,51-75%,76-100%

End Water Fields:

Wet Length of Survey	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%			
% shallow pools (<10cm)	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%			
% medium pools (>10cm, < 1m)	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%			
% deep pools (> 1m)	0%, 1-10%, 11-25%, 26-50%, 51-75%, 76-100%			
Plunge pools present	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> U	<input type="checkbox"/> X
Number of Plunge Pools:	1-5, 6-10, 11-20, 21-30, 31-50, 51-100			
Aquatic refugia present	<input type="checkbox"/> Y	<input type="checkbox"/> N	<input type="checkbox"/> U	<input type="checkbox"/> X
Type of Aquatic Refugia:	undercuts, tree roots, woody debris, rock crevices, aquatic submerged veg, emergent veg, floating material			

Dominant Aquatic Substrate:

Subst1	% Subst1	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst2	% Subst2	0%,1-10%,11-25%,26-50%,51-75%,76-100%
Subst3	% Subst3	0%,1-10%,11-25%,26-50%,51-75%,76-100%

Recent Disturbance:

Disturbance Type	Intensity of Disturbance
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy
	Light, Moderate, Heavy

Notes:

\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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Exotic Plants:

Plant Species	Size Class	few plants, scattered small patches, large contiguous stands
Plant Species	Size Class	few plants, scattered small patches, large contiguous stands
Plant Species _____	Size Class	few plants, scattered small patches, large contiguous stands
Plant Species _____	Size Class	few plants, scattered small patches, large contiguous stands
Plant Species	Size Class	few plants, scattered small patches, large contiguous stands

All Animals:

	Observ Method*	Latitude / Longitude (or Trap Number if applicable)	Animal Type	Species Code	Age Class**	Disposition				Photo	# Photos	Photo Time(s)	Location Within Habitat	Animal Behavior
						R	D	E	C					
1						R	D	E	C	Y / N				
2						R	D	E	C	Y / N				
3						R	D	E	C	Y / N				
4						R	D	E	C	Y / N				
5						R	D	E	C	Y / N				
6						R	D	E	C	Y / N				
7						R	D	E	C	Y / N				
8						R	D	E	C	Y / N				
9						R	D	E	C	Y / N				
10						R	D	E	C	Y / N				
11						R	D	E	C	Y / N				
12						R	D	E	C	Y / N				
13						R	D	E	C	Y / N				
14						R	D	E	C	Y / N				
15						R	D	E	C	Y / N				
16						R	D	E	C	Y / N				
17						R	D	E	C	Y / N				
18						R	D	E	C	Y / N				
19						R	D	E	C	Y / N				
20						R	D	E	C	Y / N				

\* audio, hand, trap, or visual

\*\*ADL, JUV, Meta, LRV1, LRV2, Hatch, Egg Mass, or UNK

**Turtle: Trapping Survey Form**

Date \_\_\_\_\_ Survey Name \_\_\_\_\_ TRAP DAY: SET, Day #1  
 Project Code \_\_\_\_\_ Block \_\_\_\_\_  
 Survey Type visual / trapping Site \_\_\_\_\_  
 Start Time \_\_\_\_\_ Site Photo  Y  N  
 End Time \_\_\_\_\_ # photos \_\_\_\_\_

Observer1 _____	Obsv1 Task <u>observer / recorder / processor</u>
Observer2 _____	Obsv2 Task <u>observer / recorder / processor</u>
Observer3 _____	Obsv3 Task <u>observer / recorder / processor</u>
Observer4 _____	Obsv4 Task <u>observer / recorder / processor</u>
Observer5 _____	Obsv5 Task <u>observer / recorder / processor</u>
Observer6 _____	Obsv6 Task <u>observer / recorder / processor</u>

Weather:

Air Temp (°C) _____
Water Temp (°C) _____
Condition <u>clear or few clouds, partly cloudy or variable, cloudy or overcast, fog, mist or drizzle, showers or light rain, heavy rain, sleet or hail, snow, no data</u>
Wind Speed <u>&lt;1 calm, 2-3 light air movement, 4-7 light breeze, 8-12 gentle breeze, 13-18 moderate breeze, 19-24 fresh breeze, 25-31 strong breeze, 32-38 near gale, &gt;39 gale and above, no data</u>

**Other Notes**

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*Western Pond Turtle Survey Report 2006*

Trap Locations:

	Trap Type (or n/a)	Trap Name (or n/a)	Trap Number (or n/a)	Latitude	Longitude	Photo Time	Photographer Initials	Pool #	Time Set	Time Pulled	Elapsed Hours Trap
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											

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All Animals:

1	Observ Method*	Latitude / Longitude (or trap # location)	Animal Type	Species Code	Age Class**	Disposition				Sex				Location w/in habitat	Animal Behavior
						R	D	E	C	M	F	U	X		
1						R	D	E	C	M	F	U	X		
2						R	D	E	C	M	F	U	X		
3						R	D	E	C	M	F	U	X		
4						R	D	E	C	M	F	U	X		
5						R	D	E	C	M	F	U	X		
6						R	D	E	C	M	F	U	X		
7						R	D	E	C	M	F	U	X		
8						R	D	E	C	M	F	U	X		
9						R	D	E	C	M	F	U	X		
10						R	D	E	C	M	F	U	X		
11						R	D	E	C	M	F	U	X		
12						R	D	E	C	M	F	U	X		
13						R	D	E	C	M	F	U	X		
14						R	D	E	C	M	F	U	X		
15							D	E	C	M	F	U			
16						R	D	E	C	M	F	U	X		
17						R	D	E	C	M	F	U	X		
18						R	D	E	C	M	F	U	X		
19						R	D	E	C	M	F	U	X		
20						R	D	E	C	M	F	U	X		
21						R	D	E	C	M	F	U	X		
22						R	D	E	C	M	F	U	X		
23						R	D	E	C	M	F	U	X		
24						R	D	E	C	M	F	U	X		
25						R	D	E	C	M	F	U	X		
26						R	D	E	C	M	F	U	X		
27						R	D	E	C	M	F	U	X		
28						R	D	E	C	M	F	U	X		
29						R	D	E	C	M	F	U	X		
30							D	E	C	M	F	U			

\* audio, hand, trap, or visual

\*\*ADL, JUV, Meta, LRV1, LRV2, Hatch, Egg Mass, or UNK