Western Riverside County MSHCP
Biological Monitoring Program
Western Pond Turtle (*Clemmys marmorata pallida*) 2022 Survey Protocol

INTRODUCTION

The Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) covers one aquatic reptile, the western pond turtle (*Clemmys marmorata pallida*, synonymous with *Actinemys marmorata pallida*, and *Emys marmorata*), which is a California state species of special concern and the state's only extant native freshwater turtle.

This protocol was adapted from the *USGS Western Pond Turtle (Emys marmorata) Trapping Survey Protocol for the Southcoast Ecoregion* (USGS 2006), which was written with the intent of standardizing pond turtle inventory and monitoring surveys conducted across the ecoregion and is widely used across southern California. Modifications of the USGS (2006) protocol were made to better suit the species-specific objective needs of the MSHCP's Biological Monitoring Program.

Under the MSHCP, species-specific conservation objectives 2 and 5 for this species calls for maintaining occupancy within at least 75% of eight listed Core Areas as measured once every three 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 must also include a 2 km buffer of upland habitat. Additionally, Objective 4 stipulates conservation of over 20 riparian/wetland and overland dispersal areas in the Plan Area (Dudek & Associates 2003).

Goals and Objectives

1. Locate suitable habitat in Core Areas, associated tributaries, and dispersal corridors.
    a. Conduct visual habitat assessments based on U.S. Geological Survey (USGS 2006) protocol.
2. Collect information about species distribution and demographics in the Plan Area.
    a. Determine presence and abundance of pond turtles within at least 75% of eight listed Core Areas.
    b. Monitor known populations and collect data on habitat quality.
3. Assist Management Program efforts.
    a. Trap and remove invasive aquatic species occurring at Core Area survey sites.
4. Assist USGS and other conservation partners with pathogen and population genetic studies.
    a. Collect tissue samples and chytrid swabs from reptile and amphibian species.

METHODS

Survey Design

Core Areas include the water bodies listed in the species objectives with a 2 km buffer as well as the tributaries that supply it. Survey efforts are focused on the main stem of creeks and rivers, but tributaries may be surveyed if: the main water body lacks sufficient suitable habitat; suitable habitat has been identified in a tributary; no turtle of any species has been observed in the main water body; or pond turtles have been observed in any water body, regardless of size or habitat. Additionally, locations not specifically listed in the species objectives may be surveyed to determine the presence/absence of pond turtle populations and potentially compare habitat quality and other habitat parameters to occupied Core Area sites. Once survey sites have been identified, surveys will begin at the most upstream point and continue downstream.

The sampling unit is defined as a 250 m segment of a linear water body (river, stream, creek) and/or isolated lakes or pools. A sampling station is defined as the individual trap within each segment or pool (i.e., sampling unit) and there are two traps at a station (i.e., hoop and minnow traps).

Habitat suitability and water-body configuration determine sampling intensity within each sampling unit. Sampling stations are positioned along the margins of the water body, no more than 2 m from land or suitable habitat (e.g., basking site) and at an average interval of 15 m. If a single turtle is observed, regardless of species, sampling stations may be positioned at shorter intervals if habitat is highly suitable or in shorter stream segments/smaller pools. Sampling stations may also be positioned at greater intervals within a sampling unit if suitable habitat occurs intermittently or if other conditions are unsuitable.

Commercial collapsible hoop traps are used and consist of three or four metal rings measuring 45 and 76 cm (1.5 and 2.5 ft, respectively) in diameter covered by 2.5 or 3.8 cm (1 or 1.5 inch) squared mesh or fish net with a funnel-shaped entrance. These two sizes accommodate the different water levels observed at the survey sites. Perforated cans of sardines packed in oil are suspended inside of the traps and act as attractant for turtles. Hoop traps are an effective and commonly used technique for capturing adult turtles and other freshwater aquatic species, such as fish and amphibians (Mali et al. 2014, Bluett et al. 2011, USGS 2006). Due to the large mesh of these traps, smaller individuals cannot be captured and the data collected from these traps cannot be used for analyzing reproduction or population demographics. Basking traps (traps with floating platforms) may be used to supplement hoop traps and have been shown to be effective for capturing juvenile turtles (Gamble 2006). Minnow traps (small funnel traps) may be set concurrently with hoops traps in a stream segment to aid in detecting small turtles, small fish, crayfish, amphibians, and amphibian larvae.

Survey Site Selection

The Plan requires confirmation of Core Areas every three years. To date the Biological Monitoring Program has opted for three consecutive years of surveys with a break of three

consecutive years. This allows surveys to take place in at least 75% of Core Areas, which cannot reasonably be done in a single year of trapping. Site conditions determine not only sampling design, but where surveys are conducted in a given year.

The Biological Monitoring Program has surveyed for pond turtles in Core and non-core areas almost every year since 2006. Pond turtles have been detected in 7 of 8 Core Areas (Cajalco Creek, San Mateo Creek, Santa Ana River, Murrieta Creek, Santa Rosa Plateau, Temecula Creek, and San Jacinto River) and 5 non-core areas (Santa Margarita River, Warm Springs Creek, Arroyo Seco, RCA property in Murrieta, and Los Alamos Creek). However, a few of these areas seem to have too few individuals to sustain a breeding population. The Chino Creek Core Area has been trapped six times since 2007 yielding only invasive turtles. Although pond turtles were known to exist just north of Chino Creek in a golf course pond, there is little if any appropriate habitat that remains in Chino Creek. The Temecula Creek Core Area has only a few small pools in conservation and one pond turtles have been detected there to date. More aquatic habitat needs to be acquired to meet the needs of the species in this Core Area.

Habitat Assessments

Potential trapping sites are evaluated prior to trapping activities using a visual habitat assessment that is based on variables identified in Madden-Smith et al. (2005, Appendix A). Assessments are conducted with at least 2 surveyors walking along lake or stream banks and within stream channels in an upstream direction. The suitability of each pool or 250 m stream segment is qualitatively ranked according to presence or absence of slow moving water, water depth, quantity of basking sites, aquatic substrate, streamside substrate, and upland habitat. Additionally, the ease of human access, naturalness, and any reptiles and amphibians that are encountered at each potential trapping location are recorded. This information is used to prioritize the segments and pools for future pond turtle survey efforts.

Field Methods

This protocol was adapted from the *USGS Western Pond Turtle (Emys marmorata) Trapping Survey Protocol for the Southcoast Ecoregion* (USGS 2006), which was written with the intent of standardizing pond turtle inventory and monitoring surveys conducted across the ecoregion. Modifications of the USGS (2006) protocol were made in 2008 to better suit the species-specific objective needs of the MSHCP's Biological Monitoring Program (see Document History section).

Turtle Trapping

Sampling stations are selectively placed where vegetative cover, basking sites, and appropriate water depth occur within identified suitable habitat. The number of sampling units per Core Area or dispersal unit, and the number of sampling stations per unit, depends upon the extent of appropriate habitat. Depending on water depth, each sampling station consists of either

a large or small hoop trap baited with a punctured can of sardines. Generally, one standard minnow trap is placed for every ≤10 hoop traps at each site. Basking traps may be used to supplement the hoop and minnow traps.

Each sampling unit is surveyed over a period of four consecutive trap-nights. Traps are installed on Monday morning (Day 0) and checked daily over the next four days (i.e., Tuesday–Friday) to retrieve trapped turtles and other aquatic species (e.g., fish, frogs, invertebrates). The traps are removed on Friday (Day 4). Surveys may be terminated early at a site if water levels drop or traps are stolen or damaged.

Depending on site conditions, some modifications to the trapping methods may be required. Sites with deep water might necessitate a canoe or kayak to distribute and set up traps. At sites where there is a risk of human disturbance, surveyors may need to set up and remove traps daily and to remain on site throughout the day. Field procedures are the same except that activities of Day 0 and Day 4 occur at the start and end of the day with a new Datasheet 2 completed each day. Detailed instructions for completing each datasheet are in Appendix E.

Field Procedure

This section is in chronological order, using a step-by-step procedure of what is done before, during, and after a survey. First, surveyors navigate to the survey site and begin trap preparation on the day of trap set-up (Day 0). Next, set-up, distribution, checking, and removal of traps is described, as well as which data are to be collected and the techniques used to collect them (Days 1-4). Lastly, office tasks to be completed throughout the week and post-survey procedures such as disinfecting and storing equipment are listed. Appendices have been added at the end of this document to provide more detailed information on visual habitat assessments (Appendix A), example of paper datasheets (Appendices B-D), instructions for entering data onto the datasheets (Appendix E), procedures for processing pond turtles and non-native turtles (Appendix F), and the USGS procedure for collecting tissue samplings (Appendix G).

I. Navigating to Survey Sites

The Program Lead provides surveyors with the information needed to navigate to the starting point of each survey location which may include a map or GPS coordinates. Surveys of a series of linked sampling units begin up-stream and proceed down-stream. Special instructions about each site (e.g., contact information, access codes) are also provided before surveyors leave the office. All relevant files and information are stored on the network share drive: (Share\Projects\Herps\Working_folder\CLMA).

II. Trap set-up (Day 0)

Datasheets

Complete Datasheets 1 and 2. A fresh Datasheet 1 (Appendix B) is completed each day, while the original Datasheet 2 (Appendix C) is used each day (Day 0-4) throughout the week to record the times that the sampling stations are checked. Detailed instructions for completing the datasheets are available in Appendix E.

Collect Habitat Data

1. As traps are being deployed the data recorder completes Datasheet 1 with initial survey data (i.e., date, time, observers, segment/pool information).
2. Photograph the survey site from the start point toward the end point. Record photo identification information.
3. Record observations about the site, such as unusual disturbance.
4. Record any aquatic animals observed and life-history information.

Prepare traps

1. Prepare the hoop traps.
    a. Match numbered PVC poles. Poles will fit either a small, medium, or large hoop trap.
    b. Unfold the hoop traps to locate the narrowest sides of the funnel entrance. Place poles on either side of the entrance using the notches at the ends of the poles to secure them onto the last hoop and bending them to stretch out the trap.
    c. Inspect the constructed trap. Check that the numbers on the poles match, mend any tears in the netting, verify that floats are inserted along the top half of the trap, and make sure there is cordage/rope for anchoring the trap.
2. Prepare the minnow traps.
    a. Pair up two halves of the metal traps, ensuring that the two halves fit and there is only one numbered metal tag between each set. Make sure there is rope or string and a flotation device with each trap. Use small empty plastic bottles or pieces of foam as flotation devices.
3. Prepare basking traps (if being used).
    a. Pin the wings on the two sides of the trap so that turtles can easily climb into the trap. Floats are built into this trap, but weights (e.g., mallet or cordage) are necessary to anchor the trap in place.

Distribute and set traps

How traps are distributed may require adjustments based on conditions within each reach or pool (i.e., water depth may require use of a different trap than anticipated). Surveyors must communicate with each other constantly to ensure that traps are well distributed.

1. Determine the appropriate interval to place the traps within the reach or pool. Traps should be set near habitat features likely to be used by pond turtles (possible basking areas, areas with underwater refugia, etc.).

2. Determine how to deliver traps to their stationed area. At some locations, traps can be deposited close to where they will be set, while at other locations surveyors may need to work from one or two points of entry. Surveyors may need to haul traps across the water or use a canoe if the water is deep.
3. Record the start time of the survey on Datasheet 1. "Start time" is defined as the point at which the strategy has been determined and traps are about to be deployed.
4. Place one hoop trap near the access point to the reach/pool. From there, hoop traps are placed approximately every 15 m. Intervals may be adjusted to accommodate suitable habitat and water depth.
    a. Install small hoop traps in shallower water and large hoop traps where water is relatively deeper. Large hoop traps may be used in shallow water if there are not enough small traps to cover the area.
    b. Bait traps by puncturing a can of sardines twice to allow oil to disseminate. Then insert the punctured can into a nylon knee-high (hose) and attach the hose to the netting inside of the trap. The hose should be positioned so that the can is in the water, away from the funnel entrance and toward the back end of the trap.
    c. Securely tie off the back end of the trap and place it in the water. Anchor the trap securely to vegetation, submerged boulders, or the shore with a rope. Tie the rope to the center top of the trap so the trap does not drift or sink. Ensure that the top 1/4 of the trap is raised above the water's surface with floats to allow captured animals to surface for air. The funnel entrance, which is located in the center of the trap, should be at least five cm below the surface. In stream habitats, traps should be set with the opening of the trap facing downstream. This will allow easier access to turtles as they swim upstream following the scent of sardines.
5. Distribute minnow traps.
    a. Place one minnow trap within five meters of the first trap near the point of access to the segment/pool. Then set one minnow trap for every ten turtle traps in the same sampling unit and with the last hoop trap.
    b. Bait minnow traps with a half can of kippers inserted directly into the hose. Knot the end of the hose and place it into the minnow trap with the float. Lock together the two halves of the trap.
    c. Anchor the minnow trap to a hoop trap or to nearby vegetation. Floats should allow the top of the trap to float at least five cm above the water line to ensure trapped animals can surface for air.
6. On Datasheet 2 (under the Day 0 column), record the trap type, trap number, the GPS coordinates of the trap location (in UTM, NAD 83), and the time the trap has been set up and is ready to capture animals.
7. Repeat steps 4-6 until all traps have been set up in the segment or pool.
8. If being used, set basking traps in the larger, deeper openings of pools. They are the last trap to be set up.
    a. Once the trap is in position, it may need to be anchored to prevent it from floating. Attach a mallet to the trap with a rope that is long enough to reach the bottom of

the water body. Bait the trap by placing a can of sardines, punctured twice, into the center cage in the trap. The can of bait does not need to be inserted into hose or attached to the trap.

b. Record the time the basking trap is ready for trapping. More than one basking trap may be set up if the pool is large enough and/or as survey efforts for the week allow.
c. Set a minnow trap near the basking trap (step 5).

Before leaving the site

1. Review datasheets for completeness.
2. At the vehicle, sterilize all equipment that came in contact with an animal or the water source with a 10% bleach solution before leaving the site.

III. Trap Check (Days 1-4)

Traps are checked at 24-hour intervals throughout the week unless site conditions require that traps be set up and removed daily.

Datasheets

Complete a fresh Datasheet 1 for each day and each pool/stream segment or pool visited. Record the time each trap is checked in the appropriate column on Datasheet 2. Complete Datasheet 3 for each animal removed from the traps.

Check traps

1. Navigate to each trap using the GPS coordinates collected during set up (Day 0). If traps are removed nightly, inspect them once at the end of the day when they will be pulled/removed.
2. Lift the trap completely from the water. Inspect for captured animals. Be sure to inspect corners and areas where netting converges or overlaps.
3. Remove animals from trap.
    a. Untie the end opposite the entrance to the funnel.
    b. Remove captured animals. Use care as animals may be aggressive.
    c. If there are several animals place them in a container (e.g., pillowcase, plastic bucket) until they can be processed.
    d. Record the trap number from which the animal was removed.
4. Process animals. Trapped pond turtles are processed on site. All non-native animals can be processed on site or in the warehouse as they are not re-released. Procedures for processing animals are outlined in Appendix F.
    a. Place captured non-native animals in a pillowcase or large plastic container to transport. Mark the animal or the bag with trap identification information.
5. Inspect and repair any tears in the mesh. Use zip ties or string to close tears.
6. Replenish bait if needed or open the can of sardines further.

7. Return the trap to the water with the mouth of the trap pointed downstream. Record the time of the trap check on the datasheet or GPS unit.
8. Inspect minnow and basking traps. Repeat the inspection and re-set procedure.
9. Before leaving the segment or pool, enter the time the survey ended and review datasheets for completeness. Collect all equipment and return to the vehicle.
10. If the next survey station is in a different stream system or watershed, remove debris attached to any equipment and sanitize all equipment that came in contact with an animal or the water source with a 10% bleach solution before leaving the site.

IV. Pull Day (Day 4)

On the final day of trapping, surveyors follow the trap-check procedures of Days 1-3, but remove the traps instead of resetting them. Depending on site conditions, traps may be collapsed at their stations or returned to the point of access and collapsed there. The survey end time on the final day is recorded after surveyors have counted traps to ensure all have been pulled, reviewed all datasheets, and are ready to begin transporting equipment to the vehicle.

V. Office tasks

Field Biologists participating in these surveyors ensure the following tasks are completed throughout the week and at the end of a trapping session.

1. Keep Program Lead informed of conditions and progress.
2. Review all datasheets daily. At the end of Day 0 consolidate trap information onto Datasheet 2 if it was not recorded directly on the form.
3. Clean all trapping equipment
    a. At the warehouse, use a hose and scrub brush to remove any remaining debris from the trapping equipment.
    b. Sanitize all trapping equipment using a 10% bleach solution.
    c. Rinse trapping equipment once more before letting it dry in the sun.
4. Review status of field equipment. Replenish supplies (e.g., bait, knee-high hose, datasheets, batteries), fix/replace faulty equipment, and add equipment that could be useful at a given site.
5. Complete the Incidental Observations Form as needed.
6. Process animals. Procedures for processing animals are outlined in two documents:
    a. Standard Operating Procedure: Processing Aquatic Animals (Appendix F).
    b. Standard Operating Procedure: Collecting Tissue Samples from Amphibians and Reptiles (Appendix G).

    Both documents are also available on the share drive at S:\Projects\Herp\Working_folder\Tissue Samples.

Equipment

Equipment is listed according to its most common application. Field Biologists carry some equipment as part of their regular survey gear (e.g., GPS unit, binoculars). This gear is

indicated below with an asterisk (*). Biologists should coordinate with the Program Lead to ensure all equipment is available during surveys.

Basic equipment:

- Access Permits and gate access codes/keys
- Contact information of the land owner/manager or agency that issued the access permit
- Maps and GPS coordinates of the survey locations
- GPS unit*
- Copy of the protocol
- Data sheets including Incidental Observations of Covered Species
- Clipboard
- Writing utensils*
- Timepiece* (GPS units and many cameras also have clocks)
- Digital camera*
- Binoculars*
- Field guides*

For collecting ambient information:

- Kestrel* (water velocity measurements) ---
- Thermometer*
- pH tester
- DO, Conductivity, Salinity, and TDS probes to set traps
- Hoop traps and poles
- Basking traps with anchors
- Minnow traps
- Buoy balls for turtle traps
- Plastic bottles for minnow traps
- Zip ties
- ~1 m of extra rope
- One can of sardines/fish per hoop/basking trap
- One half of a can of kippers/fish per minnow trap
- Can openers
- Knee-highs or hosiery to suspend bait within trap
- Hip and/or chest waders (optional)
- Life vests (may be required at some sites)
- Canoe/kayak and paddles
- Rubber boots, water shoes, or hiking boots
- Plastic bucket or pillowcase for storing captured animals
- Large containers to hold turtles for transport to warehouse
- Gallon and quart sized re-sealable plastic bags
- Alcohol-proof indelible pens
- Extra batteries* (AA, AAA, D)

- Flagging
- Bleach solution (10%) and bucket/spray bottle
- Safety and first-aid kit*
- Folding chairs to monitor traps during the day
- Old towels

For processing turtles:

- Pesola® spring scales
- New skin
- 1.5 ml tissue vials
- Large slide calipers for measuring animals
- PIT tag reader
- Triangular file for notching shells
- Tissue-sampling kit with:
    a. Scissors or clippers for collecting tissue samples
    b. 50 ml vials for storing tissue samples
    c. Erasable marker for labelling vials
    d. 95% ethanol/alcohol disposable hand-wipes for sanitizing the site of tissue collection on animals

TRAINING

The Program Lead meets with surveyors prior to the field season to review the field protocol, special survey needs, clarify species identification, survey schedule, locations of survey sites, and specific safety concerns. Extensive training is not required as all surveyors have participated in previous turtle surveys and new staff are always paired with experienced biologists. Field Biologists participating in turtle surveys familiarize themselves with relevant aquatic species, mostly non-natives, before the beginning of the survey effort. Correct identification of western pond turtles is the only requirement as all non-native species are removed and processed at the warehouse.

Training on specimen collection (i.e., tissue samples) is hands-on under the supervision of experienced staff (Appendices F and G).

DATA MANAGEMENT

The Taxa Lead reviews survey objectives and ensures datasheets accurately reflect those objectives. The Lead also coordinates with the Data Manager to develop the database forms where data will be entered from the field datasheets. The Taxa Lead provides the Data Manager with information about trap stations (i.e., a code with the segment or pool name, and trap number). This is ideally done during the week the site is being surveyed, but always prior to data entry in order to populate the drop-down lists in the database. The Data Manager ensures that database forms are updated and ready for data entry.

Data entry follows the standard protocol established by the Monitoring Program. Data are entered into the database using a form created for each project. For each datasheet, photos and specimen ID data need to be entered into the corresponding database forms prior to entering the remainder of the data. Because Biologists often participate in multiple surveys at any given time, data entry often occurs between other field responsibilities and as office time allows. One person enters data and a second person verifies the entries independently. Once completed, the Program Lead and Data Manager review the entries and correct errors. The Data Manager verifies/validates the data once all errors had been corrected.

DATA ANALYSIS

Standard data analysis will not occur at this time. The objective requires only confirmation of occurrence and given the low numbers of detections, analysis of detection probability is not possible. Until the number of non-native species is reduced, it is doubtful that we will have sufficient data to be able to analyze detection probabilities or occupancy.

LITERATURE CITED

Bluett, R.D., E.M. Schauber, C.K. Bloomquist, and D.A. Brown. 2011. Sampling assemblages of turtles in central Illinois: a case study of capture efficiency and species coverage. Transactions of the Illinois State Academy of Science. 104:127–136.

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.

Gamble, T. 2006. The relative efficiency of basking and hoop traps for painted turtles (*Chrysemys picta*). Herpetological Review. 37:308–312.

Madden-Smith, M.C, E.L. Ervin, K.P. Meyer, S.A. Hathaway, 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.

Mali, I., D.J. Brown, J.R. Ferrato, M.R.J. Forstner. 2014. Sampling freshwater turtle populations using hoop nets: Testing potential biases. Wildlife Society Bulletin. 38(3):580-585.

Sterrett, S.C., L.L. Smith, S.H. Schweitzer, and J.C. Maerz. 2010. An assessment of two methods for sampling river turtles assemblages. Herpetological Conservation and Biology 5:490–497.

[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. 30 pp.

DOCUMENT HISTORY

2008 – Modifications of the USGS (2006) protocol include using the Sawyer and Keeler- Wolf (1995) vegetation classifications for characterizing the surrounding landscape, collecting water chemistry and water quality data, changing and adding specific characteristics recorded for animal records, eliminating temperature data loggers, and adding a side profile photo of all turtles to assist with identification. Paper datasheets are used in place of personal digital assistants (PDAs) to record data.

2015 – We amended the protocol to include water-quality data that were excluded from our visual habitat assessment protocol (Madden-Smith et al. 2005).

2022 – Protocol was updated with minor changes. We discontinued the PIT tagging of newly captured pond turtles, pond turtles are only processed on site, and removed the snorkel survey protocol.

Appendix A. Pond turtle 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. deep pools (≥ 0.50 m depth)
3. basking sites
4. aquatic refugia
5. streamside refugia
6. upland nesting habitat

Characteristics are 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. The numeric rankings are tallied and habitat ranking are as follows:

0-2 = “Poor”*; 3-4 = “Marginal”; 5-6 = “Good”; 7-8 = “High”

*Sites without water or with < 0.5 m water depth are automatically classified as “Poor”.

Habitat Disturbance

In addition to the qualitative habitat assessment and habitat quality rating, sites are ranked according to the level of human access they receive and their level of naturalness. Pond turtles are usually more abundant where habitat is less disturbed and less human contact occurs due to decreased chance of collection, killing, disturbance, introduction of non-natives, and predation by scavengers. Non-native turtles should be more abundant in more urbanized and/or heavily recreated areas due to the increased likelihood of unwanted pet turtles being released.

Pond turtle habitat assessment datasheet

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")

Total: _____

Poor= 0-2 or water less than 0.5 m deep; **Marginal=** 3-4; **Good=** 5-6; **Hi=** 7-8

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) – the amount of natural or fairly undisturbed wetland habitat. If not able to assess in the field, please leave for Program Lead.

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. Datasheet 1: Daily Monitoring

(Share\Projects\Herps\Working_folder\CLMA\Protocols & Forms\Datasheets)

Station Code: _____ Site Photos:

Date: _____ Obs1: _____ Photographer Initials: _____ JPEG #s: _____

Visit Number: _____ Obs2: _____ Photo Description: _____

Start time: _____ Obs3: _____ Site Notes_____

End time: _____ Obs4: _____ _____

RECORD ONCE (Day 0):

Area of water (m ^{2}) _____ Transparency (circle one): Clear / Opaque Water velocity (m/s) _____ pH _____

Conductivity (mS/cm) _____ TDS (g/L) _____ Salinity (ppt) _____ DO (mg/L) **OR** (%) _____

RECORD DAILY (Days 0-4):

Water temp (°C) _____ Sky condition: _____

0 = clear or few clouds; 1 = partly cloudy or variable; 2 = cloudy or overcast; 3 = fog; 4 = mist or drizzle; 5 = showers or light rain; 6 = heavy rain; 7 = sleet or hail; 8 = snow

NON-TRAPPED AQUATIC SPECIES OBSERVED IN STREAM SEGMENT (Fish, crayfish, amphibians excluding salamanders, garter snakes

Species Code[1]	Observ. Method[2]	Age Class[3]	Sex	# of Indiv.	Disposition[4]	Specimen ID # (Tissue sample)	Notes (nearest trap, coordinates, behavior, etc.)

INCIDENTAL SPECIES

Species Code[1]	Observ. Method[2]	Age Class[3]	Sex	# of Indiv.	Disposition[4]	Specimen ID # (Tissue sample)	Notes (nearest trap, coordinates, behavior, etc.)

[1]**AMME** (Black Bullhead); **CYCA** (Common Carp); **LICA** (Bullfrog); **TRSC** (Red-eared Slider); **AMNA** (Yellow Bullhead); **GAAF** (Gambusia); **MISA** (Largemouth Bass); **XELA** (African Clawed Frog); **APSP** (Spiny Softshell); **LECY** (Green Sunfish); **PRCL** (Crayfish); **CLMA** (Western Pond Turtle); **LEMA** (Blue Sunfish); **THHA** (two-striped garter snake); [2]Audio, Hand, Visual; [3] Adult, Juvenile, Metamorph, LRV1, LRV2, Hatch, Egg Mass, Unknown; [4] Released, Dead, Escaped, Collected, Dispatched

Entered by: _____ Date: _____ Checked by: _____ Date: _____

Appendix C. Datasheet 2: Trap Locations and Survey Times

(Share\Projects\Herps\Working_folder\CLMA\Protocols & Forms\Datasheets)

Pool/Segment: Date (Day 0):

#	Trap Type[1]	Trap #	UTM-E (0_)	UTM-N	Time Set Day 0	Check Time Day 1	Check Time Day 2	Check Time Day 3	Time Pulled Day 4
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									
28									
29									
				Animals captured? (circle one)		(Yes / No)	(Yes / No)	(Yes / No)	(Yes / No)

[1]Large Hoop, Small Hoop, Minnow trap, Basking trap

Entered by: _____ Date: _____ Checked by: _____ Date: _____

Appendix D1. Datasheet 3a: Captured Animals

(Share\Projects\Herps\Working_folder\CLMA\Protocols & Forms\Datasheets)

Pool/Segment Code: Day 0:

TURTLE TRAPPING														
Spp #	Trap Type[1] + Trap # (coordinates for hand captures)	Spp. Code[2]	Age Class[3]	# of Indiv.	Sex	Gravid?	Recap? (Prev. Notched / PIT tagged?)	Carapace Length (mm)	Carapace Width (mm)	Shell Height (mm)	Plastron Length (mm)	Weight (g)	Dispos[4]	Shell damage notes/ Notch patterns from previous recap / Other ID markings
1							Y / N							
2							Y / N							
3							Y / N							
4							Y / N							
5							Y / N							
6							Y / N							
7							Y / N							
8							Y / N							
9														
10							Y / N							
11							Y / N							
12							Y / N							
13							Y / N							
14							Y / N							
15							Y / N							
16							Y / N							
17							Y / N							
18							Y / N							
HAND CAPTURES														
1							Y / N							
2							Y / N							
3							Y / N							

[1] Large Hoop, Small Hoop, Minnow trap, Basking; [2] AMME (Black bullhead), AMNA (Yellow bullhead), APSP (Spiny softshell), CLMA (Western pond turtle), CYCA (Common carp), GAAF (Gambusia), LECY (Green trap sunfish), LEMA (Bluegill sunfish), LICA (Bullfrog), MISA (Largemouth bass), PRCL (crayfish), THHA (Two-striped garter snake), TRSC (Red-eared slider), XELA (African clawed frog) [3] Adult, Juv, Meta, LRV1, LRV2, Hatch, Unknown; [4] Released, Dead, Escaped, Collected, Dispatched

Entered by: _____ Date: _____ Checked by: _____ Date: _____

Appendix D2. Datasheet 3b: Captured Animals

(Share\Projects\Herps\Working_folder\CLMA\Protocols & Forms\Datasheets)

Pool/Segment Code: Day 0:

Spp #	PIT Tag ID #	Tissue ID *(20150123_RHP_XELA_01)*	Photo JPEGs	Photographer's initials	Notes (habitat, behavior, location of hand captures, etc.)
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
HAND CAPTURES					
1					
2					
3					

Entered by: _____ Date: _____ Checked by: _____ Date: _____

Appendix E. Datasheet Instructions

DATASHEET 1: DAILY MONITORING

Complete a new Datasheet 1 each day for each sampling unit (i.e., reach or pool).

1. Station code. Code pertaining to the pool/stream segment, provided by the Program Lead.
2. Date.
3. Visit number. Day 0-4
4. Start time. Use military time (24h) to record the time that traps begin to be deployed. Traps are deployed after surveyors have determined the strategy for trapping and the recorder begins to complete Datasheet 1.
5. End time. Record the time when all survey tasks have been completed and the crew is ready to leave the survey site.
6. Observers. Note the initials of surveyors; also note the names of volunteers or others participating in the survey.
7. Site Notes. Observations about the site, site access, changes in site conditions, etc.
8. On the day of set up only (i.e., Day 0):
    a. Photograph the site. One photo upstream, one photo downstream. Record photographer's initials and photo JPEG number's.
    b. Estimate the area of water to be surveyed. Use the longest and widest points of the reach or pool. Record unique values (i.e., length, width) or the calculated value (i.e., m^2).
    c. Record water quality and water chemistry data.
9. On Days 0-4:
    a. Record water. Collected using a thermometer or Kestrel.
    b. Record sky condition.(0 = clear or few clouds; 1 = partly cloudy or variable; 2 = cloudy or overcast; 3 = fog; 4 = mist or drizzle; 5 = showers or light rain; 6 = heavy rain; 7 = sleet or hail; 8 = snow)
2. Non-trapped aquatic species. Record any aquatic animals observed outside the traps, in the pool/stream segment, or during the survey (see Note):
    a. Species Code.
    b. Observation method. See footnotes at bottom of datasheet.
    c. Age Class if able to determine. See footnotes on datasheet for codes.
    d. Sex if able to determine.
    e. Number of individuals if able to determine.
    f. Disposition. The status of the animal after observed. See codes at the bottom of the datasheet.
    g. Specimen ID number.
    h. Notes: Record location information such as nearest trap number, coordinates, habitat, behavior, or other comments about the observation.

    Note: Covered Species are recorded as incidental observations if they are not part of the survey. For example, aquatic species such as Santa Ana sucker or Arroyo chub observed within the reach would be recorded on Datasheet 1 because, although they are not a target species, we expect to observe them. Other Non-trapped aquatic species includes fish, crayfish, amphibians (excluding salamanders), and garter snakes.
3. Incidental Species. Record non-aquatic Covered Species (i.e., Great Blue Heron or Least Bell's Vireo). Incidental observations will be entered into the database at the same time as the rest of the survey data.
4. Record any species that have yielded a tissue sample or swab.

DATASHEET 2: TRAP LOCATIONS AND SURVEY TIMES

Record the time that traps are set up, checked throughout the week, and removed on the last day. All times are recorded on the same page throughout the week, but only the set and pull times are entered in the database. Pool/stream segment Code and the first day of trapping (i.e., Day 0) are recorded in the upper left corner of the datasheet. Complete a new Datasheet 2 when traps must be pulled at the end of each day (i.e., one Datasheet 2 per day). The following information is completed in the corresponding columns:

1. Trap type - Large hoop-trap, small hoop trap, minnow trap, or basking trap. See footnotes for codes.
2. Trap number -The unique number located on poles of hoop traps or the metal tags attached to the minnow and basking traps.
3. UTM-E - Easting bearing recorded on the GPS unit. In NAD-83 coordinate system.
4. UTM-N - Northing bearing recorded on the GPS unit. In NAD-83 coordinate system.
5. Set time (Day 0) - Time the trap is set and ready to capture animals.
6. Check time (Days 1-3) - Times the traps are checked on the respective dates.
7. Pull time (Day 4) - Time the trap is pulled and no longer available for trapping. Record after checking for captured animals.
8. Animals captures- Indicate at the end of each day, at the bottom of that day's column, whether any animals have been captured (circle Yes / No)

DATASHEET 3: CAPTURED ANIMALS

Surveyors collect data on all animals that are removed from traps. Western pond turtles and other native species are processed on site. Non-natives can be processed on site, but are usually processed in the warehouse as they are not released. Turtles that are captured by hand (not retrieved from a trap) are recorded in the bottom portion of the datasheet.

Datasheet 3a (Appendix D1).
Complete the first five items (columns "Trap Type" through "Sex") and column 13 ("Dispos.") for all animals. The remaining columns on this sheet starting with "Recap?" and all of Datasheet 3b (Appendix D2) applies only to turtles.

1. Trap Type + Trap #. Record coordinates of hand captures in this column under the respective section.
2. Species Code. See common codes in the footnotes.
3. Age Class. See codes in the footnotes.
4. Number of individuals of the species in the trap.
5. Sex. Record male, female, or unknown.
6. Gravid. Indicate yes or no.
7. Recap? Was the animal previously captured- All captured turtles should be scanned with a PIT-tag reader and checked for notches on the carapace or plastron. The reader should be used to scan all around the body cavity, focusing on the areas anterior to the rear legs and scanning both sides of the shell. It may take multiple scans from the reader to detect and read a PIT. Indicate "Y" if previously notched or PIT tag was read.
8. Carapace Length (mm). Taken with calipers along the midline of the carapace.
9. Carapace Width (mm). Taken with calipers on the widest part of the carapace, usually between the eighth and ninth marginal scutes.
10. Shell Height (mm). Taken with calipers between the lowest and the highest points of the turtle's shell.
11. Plastron Length (mm). Taken with calipers along the midline of the plastron
12. Weight (g). Place animal in a pillow case or mesh bag and record weight. Record the weight of the bag to calculate the actual weight of the animal.
13. Disposition. See codes in the footnotes.
14. Shell damage notes / notch patterns from previous recapture/Other ID markings. Datasheet 3b.

15. PIT Tag ID/Specimen #.
16. Tissue ID.
17. Photo JPEG #'s.
18. Initials of photographer.
19. Notes. Record notes on the habitat, behavior, location of hand captures, etc.

Appendix F. Standard Operating Procedure: Processing Aquatic Animals

I. Western Pond Turtle Processing Methods

1. Gender
    - Male, female (gravid?), or unknown
2. Scan turtle for previous PIT tag. Inspect shell for previous notches. Indicate whether this is a recaptured turtle (Y/N)
3. Measurements
    - Using calipers
        i. Carapace length -Taken along the midline of the carapace
        ii. Carapace width- Widest part of the carapace, usually between the eighth and ninth marginal scutes
        iii. Shell height- Taken between the lowest and the highest points of the turtle's shell
        iv. Plastron length - Taken along the midline of the plastron
    - Using Pesola® scale
        i. Weight (g): tare scale first with bag, then place turtle in bag
4. Record shell damage/markings
    - Take notes on shell damage type (i.e. number of dings, scraps, chips and location on shell).
    - Note distinguishing ID characteristics (i.e. scute irregularities etc.) and any notch patterns from previous captures
5. Notch turtle
    - Notch right femoral plastron scute
6. Take tissue sample
    - Label micro-centrifuge tubes (full site name, date, turtle number)
    - Sterilize scissors with alcohol
    - Snip ~3 mm of tail with scissors into 1.5 ml tissue vial
        i. Place drop of tissue adhesive (New Skin) and allow to air dry
    - Place tube in freezer at the warehouse
7. Scan turtle with PIT tag reader. Record PIT tag number and have data recorder read the PIT tag number backwards to tag reader to confirm.
8. Take photos
    - Record number of photos taken. Minimum of 4 (1 face on, 1 above carapace, 1 above plastron, 1 side profile to aid in identification).
        i. In each photo place a ruler and tape with date and turtle number (corresponding to order entered on datasheet)
        ii. Label the photos with date, photographer initials, and photo JPEG number (ex. 20081125_RHP_362).
9. Return turtle to the trap location.

II. Non-Native Turtle Processing Methods

1. Gender
    - Male, female or unknown
2. Take measurements
    - Using calipers
        i. Carapace length
3. Notch turtle (y/n)
    - Notch right femoral plastron
4. Take tissue sample
    - Label micro-centrifuge tubes (full site name, date, turtle number)
    - Sterilize scissors with alcohol
    - Snip ~3 mm of tail with scissors into centrifuge tube
        i. Place drop of tissue adhesive, allow to air dry
        ii. Place tube in freezer at the warehouse
5. Take photos
    - Record number of photos taken. Minimum of 3 (1 face on, 1 above carapace, 1 above plastron).
        i. In each photo place a ruler and tape with date and turtle number (corresponding to order entered into PDA or on datasheet)
        ii. Label the photos with date, photographer initials, and photo JPEG number (ex. 20081125_RHP_362).
6. Transport turtle back to warehouse.

Appendix G. Standard Operating Procedure: Collecting Tissue Samples from Amphibians and Reptiles

USGS Target species: all reptiles and amphibians (amphibians may additionally require a swab sample. Verify with the Program Lead).

1. Gender/Age
    - Male, female or unknown
2. Measurements
    - Using metric ruler
        i. Snout-Vent length (mm)
        ii. Tail length (mm)
    - Using Pesola® scale
        i. Weight (g): tare scale first with sampling bag, then place animal in bag.
3. Take tissue sample (y/n) (Do not take a sample if the animal is too small to safely do so)
        i. Label micro-centrifuge tubes with sample number [date, full board name(site number/board number), 4-letter species code, and individual sequential number (ex. 20091125_MS12-02_EUSK_1)]
    - Sterilize scissors with alcohol.
    - For larger snakes: Take three ventral scale clips from the largest midbody scales. The clip should be ~1 mm by ~3 mm. Try to clip all the way across each scale collecting some of the pigmentation.
    - For small snakes and lizards: Snip ~3 mm of the tail tip with scissors into centrifuge tube.
    - Place drop of tissue adhesive (New Skin) on cut, allow to air dry. Place microcentrifuge tube in designated container in specimen freezer at the warehouse.
4. Take photos (Optional except for mountain kingsnakes and rubber boa)
    - Minimum of 3 (1 dorsal, 1 ventral, 1 close-up of dorsal portion of head).
        i. Place, in each photo, ruler and tape with date and specimen number (corresponding to order entered on datasheet).
        ii. Label the photos with photo number ID [date, photographer initials, and photo file number (ex. 20091125_SLP_362)].
5. Notes - Record unusual morphology

- Take notes on any unusual characteristics of the animal (e.g. coloration, injuries, regrown tail, etc.).

6. Return animal to exact location where found.