

# **Population Biology and Conservation of Western Pond Turtles (*Clemmys marmorata*) in Natural, Managed and Unnatural habitats in the Northern Sacramento River Drainage.**

Tag Engstrom

## ***I. Significance***

The Western Pond Turtle (*Clemmys marmorata*) is listed by state and federal agencies as a species of special concern. Western Pond Turtles depend on wetland habitats such as rivers, streams, sloughs, and marshes from Northern Baja California to Washington. Populations in the southern and northern extremes of the species range have experienced significant declines, and throughout its range the species is threatened by habitat loss, habitat alteration, predation by introduced or human subsidized predators such as domestic dogs and cats, and raccoons, and competition with a larger, more aggressive, introduced turtle species, the red-eared slider (*Trachemys scripta*). Turtles in general are vulnerable to population decline because of their life-history strategy, which depends on very high adult survivorship to counter high mortality in the egg and juvenile stages (Cogdon, 1993). Management plans for the Western Pond Turtle are typically formulated in conjunction with other wetland specialist species such as the Giant Garter Snake and White-Faced Ibis with shared habitat requirements. The effectiveness of these general, wetland species plans could be compromised by lack of specific knowledge of the biology of pond turtles. Western Pond Turtle conservation efforts would benefit from better understanding several aspects of pond turtle biology including: home range size of individual turtles, importance and extent of seasonal migration, upland habitat requirements, interactions with non-native species, and basic demographics of populations including juvenile recruitment, growth, survivorship, age and size at maturity, and reproductive output.

Past research by Dr. Dawn Wilson and her graduate students at California State University, Chico has begun to address each of these questions, and has laid the groundwork for a great deal

of future research. This purpose of this project is to continue collecting the important long-term demographic data that will guide Western Pond Turtle conservation in the future, while addressing short-term questions of direct conservation relevance in the present. This research will involve at least three current CSU Chico Graduate students (Jack Campbell, Gary Lechner, and David Kelly) and several undergraduate students.

This research has been conducted in the CSU's newly constituted Big Chico Creek Ecological Reserve (BCCER), two state managed wildlife refuges (Pine Creek Unit Wildlife Refuge and the Upper Butte Basin Wildlife Refuge) a federal wildlife refuge (Pine Creek Unit of the Sacramento River National Wildlife Refuge), and a municipally managed water treatment facility. These study sites represent the diversity of biological conditions in which these turtles exist today. Spanning from the pristine upper reaches of Big Chico Creek in CSU's Big Chico Creek Ecological Reserve, through the mosaic of agricultural and managed wetland habitats in the Upper Butte Basin Wildlife Refuge to the utterly unnatural conditions in the oxidation ponds at the Chico Municipal water treatment plant. The turtle research in the newly formed BCCER has been important in raising the profile of this exciting new CSU research facility, and enhancing the reputation of the university both among members of the local community and the scientific community. The collaborative efforts between CSU researchers and wildlife managers from city, state and federal agencies continue to enhance the university's reputation for service.

Two striking results to have come from these previous studies: The first is the remarkable contrast in body size between western pond turtles in the Central Valley sites and those in the BCCER. Adult animals in all sites in the valley are 2-3 times larger than in the BCCER. Many important aspects of turtle life history are tied to body size most including age at maturity, and reproductive output. Having a clear understanding of reproductive biology is obviously a key to

appropriate species management, thus quantification of the differences in life history parameters across habitat types will be the major foci our research this year. The second striking result is the presence of large numbers of introduced red-eared sliders at some sites and their complete absence from others. Red-eared sliders are large aggressive turtles and can have negative effects on native turtle populations. For this reason we will also attempt to documentation of the spread of this invasive species and examine its interactions of native species where they co-occur.

The specific objectives of this year's fieldwork is to:

- 1) Continue ongoing mark/recapture studies in all four original study areas. This will improve current population estimates for each site and will provide data on growth, movement, and survivorship of previously marked individuals.
- 2) Expand sampling in three additional areas, two new foothill sites and one new valley site.
  - a. The Butte Creek Ecological Reserve. This foothill site will be included to see if turtles in foothill stream habitats are also small.
  - b. An abandoned livestock pond ~2km from Big Chico Creek in the BCCER. Turtles at this foothill site are presumable from the same genetic stock as the turtles in Big Chico Creek but the habitat has characteristics of lowland habitats.
  - c. Little Chico Creek and the irrigation ditches adjacent to the oxidation ponds. Here we are most interested to see if there is evidence of movement of introduced sliders from the oxidation ponds where they are very abundant, into natural waterways where they may harm native populations of pond turtles and other native aquatic species.
- 3) To collect data on reproductive output in all valley and foothill populations by x-raying all gravid females captured during the course of the research and counting the number of eggs present in a turtle's oviducts

Much of the results of this year's work will be simply the accumulation of data for long term monitoring of populations. The visible short-term products of this research will be include a short publication of the reproductive data for valley and foothill populations. Reproductive data for western pond turtles is almost entirely absent from the literature. This data is of great interest for management and the contrast between foothill and valley populations would be of general interest in the context of life history evolution. A second product of this research will be in the formulation advise on management practices at the Chico water facility to minimize potential for escape of invasive species into natural waterways. These studies will serve as part of David Kelly's Master's work.

***II. Proposed Activites and time line***

	BCCER Creek	BCCER Farm Pond	Oxi Ponds, ditches & LCC	Upper Butte Basin Refuge	Butte Creek Ecol. Reserve	Pine Creek SRNWR
March	Snorkel 1x (tne dlk,199)	Trap once (tne dlk)	Trap 2-3X/wk (dlk, 199)	Trap once (tne, gal)	Trap 1x (tne,199)	
April	Snorkel 1x (tne dlk,199)	Trap once (tne dlk)	Trap 2-3X/wk (dlk, 199)		Trap 1x (tne,199)	Trap once (jac, tne)
May	Snorkel 2x (tne dlk,199)	Trap 2x (tne dlk)	Trap 3-4X/wk (dlk, 199, 154)	Trap once (tne, gal)	Trap 1x (tne,199)	
June	Snorkel 2x (tne dlk,199)	Trap 2x (tne dlk)	Trap 2-3X/wk (dlk, 199)	Trap 2x (tne, gal)	Trap 2x (tne,199)	Trap 2x (jac, tne)
July-Oct	Snorkel 2x (tne dlk,199)	Trap 2x (tne dlk)	Trap 2-3X/wk (dlk, 199)	Trap 2x (tne, gal)	Trap 2x (tne,199)	Trap 2x (jac, tne)

As turtles become active in spring and summer (starting approximately in March) Tag Engstrom (tne), David Kelly (dlk), Jack Campbell (jac), and Gary Lechner (gal), Biology 199 students (199) and Herpetology students (Biol 154) will capture turtles by trapping or snorkeling several times weekly as outlined above. This level of sampling will give an accurate estimate of the

population sizes in new sampling sites, and will give adequate recapture data in re-sampled sites. The most intense and consistent sampling will be done in the BCCER and Chico water treatment oxidation ponds, which are most crucial to the reproductive biology and invasive species studies

### ***III. Additional Benefits***

As noted previously, western pond turtle research at Chico State has already contributed significantly to the enhancement of the university's reputation in the local and scientific communities and with regional wildlife management agencies. By carrying on the work started by Dr. Dawn Wilson, I hope to further advance this favorable of Chico State. This research program has benefited from the Master's thesis work of 3 students and will serve as Master's thesis material for my first master's student during this funding period. In addition to master's level participation, this research program will offer research opportunities in field biology, statistical analysis, laboratory, and veterinary techniques for numerous undergraduate students. The maintenance of two very interesting marked turtle population in the oxidation ponds just 4 miles from the Chico State campus and in the BCCER just 25 miles from campus will provide students in herpetology, ecology, and field biology classes the opportunity to do lab and field exercises using real mark/recapture data from real populations. The turtle research in BCCER has drawn public attention to this new CSU research facility, has played a key role in obtaining funding for the reserve and hopefully will continue to serve as a public relations and funding magnate in the future. I am in my first year as an assistant professor at Chico State University. These projects fit with my overall goals of effective and informed conservation, and I am looking forward to establishing this program as a productive long-term part of my research and teaching program at Chico State. The opportunity for scholarship and mentorship will contribute significantly to my RTP process.

## Qualification

# Curriculum Vitae Tag Engstrom

Assistant Professor of Biology  
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## Education

Ph.D. University of California, Davis June 2003  
Graduate Group in Population Biology  
Major Professor: H. Bradley Shaffer  
Dissertation: Molecular Studies of Phylogenetics, Ecology and Conservation of Turtles  
B.S. – Biology, minor – Chemistry: Eckerd College, St. Petersburg, FL 1994  
Senior Thesis: A survey of the genetic diversity of a population of juvenile loggerhead sea turtles, *Caretta caretta*, in developmental habitat in Caribbean Panama  
Post-Doctoral Experience - Post Doctoral Research Associate, Stony Brook University, Stony Brook NY (February 2003-present) with John J. Wiens.

## Employment –

California State University - Chico Assistant Professor of Biology: August 2003- present

## Grants and Fellowships in the Past 5 years:

Wildlife Conservation Society: Status and distribution of the Euphrates Softshell Turtle in South East Anatolia Turkey (2001) \$7,070 (with Ertan Taskavak)

UC Davis Undergraduate Instruction Improvement Grant: Curation of a Herpetology teaching collection at the University of California, Davis Museum of Zoology (2001) \$8,686 (with Brad Shaffer)

Kramer and Balderston Memorial Fund Fellowship (1999) \$500

Daphne and Ted Pengally Research Award (1999) \$1000

University of California Humanities Research Grant (1998) \$1,500

## **Publications:**

- Tag N. Engstrom** & William P. McCord. 2002. Molecular support for the taxonomic conclusions of McCord and Pritchard (2002) regarding *Chitra*. *Hamadryad* 27(1):57 – 61.
- Tag N. Engstrom**, Peter A. Meylan & Anne B. Meylan. 2002 Origin of Juvenile loggerhead turtles (*Caretta caretta*) in developmental habitat in Caribbean Panamá. *Animal Conservation*. 5(2):125-133.
- Tag N. Engstrom**, H. Bradley Shaffer, & William P. McCord. 2002. Phylogenetic diversity of endangered and critically endangered southeast Asian softshell turtles (Trionychidae: *Chitra*). *Biological Conservation*. 104 (2002) 173–179.
- Mathew K Fujita, **Tag N., Engstrom**, David E. Starkey, H. Bradley Shaffer. Turtle phylogeny: insights from a novel nuclear intron. *Molecular Phylogenetics and Evolution* (*in press*)
- Tag N. Engstrom**, H. Bradley Shaffer, & William P. McCord Multiple datasets, high homoplasy and the phylogeny of softshelled turtles. *Systematic Biology* (*in press*)

## **Manuscripts in prep:**

- Tag N. Engstrom** & Pekka Soini. Mitochondrial DNA diversity and population structure of the yellow-spotted Amazon River Turtle, *Podocnemis unifilis* in the Reserva Nacional Pacaya Samiria, in Amazonian Perú (in prep for *Molecular Ecology*)
- Peter A. Meylan, **Tag N. Engstrom**, Anne B. Meylan, & Jennifer A. Gray. The genetic identity of green turtles, *Chelonia mydas* (Testudines:Cheloniidae) in developmental habitat in Bermuda (in prep for *Molecular Ecology*)
- Tag N. Engstrom** & Ertan Taskavak. Biogeography of aquatic turtles in Southeast Anatolia Turkey: Evidence for post-Pleistocene re-colonization of aquatic habitats in the Tigris and Euphrates Rivers (in prep for *Conservation Genetics*)

## **Invited Seminars:**

- California State University, Chico. March 2003  
Susquehanna University, February 2004  
California State University, Chico February 2004  
Central Connecticut State University, March 2004  
Indiana University of Pennsylvania, April 2004

## **Special Honors and Awards:**

- National Science Foundation pre-doctoral fellowship 1995-1999  
Fullbright Full Grant for study in Australia, 1994-1995  
Eckerd College Class of 1994 Philip Lee Award  
Eckerd College Natural Sciences Collegeum Class of 1994 Award for Academic Excellence  
Barry M. Goldwater Scholar 1993-1994  
Ford Foundation Scholar 1992-1994  
Eckerd College Special Honors Scholarship 1990-1994

### ***Results from Previous Support***

I have not received any previous support from CSU Research Foundation, however various aspects of this research were supported by CSU grants to Dawn Wilson. During the course of this research Dr. Wilson and 3 graduate students captured and marked approximately 800 turtles in four primary study sites. Radio telemetry was used to track 50 animals in the BCCER, Upper Butte Basin Wildlife Refuge and in the Sacramento River National Wildlife Refuge. One of these graduate students (Glen Lubke) has finished his degree and has submitted two papers from this thesis for publication in the Journal of Herpetology. The remaining two graduate students are scheduled to finish their degrees in Spring of this year and are currently preparing their results for publication.

### ***Current or Pending Support***

I have no pending support for this project. Current support for purchase of equipment (turtle traps, calipers and scales etc) for this project was included in the startup package offered by the College of Natural Sciences.

### **Attachments**

No attachments