Western Pond Turtle Workshop: Ecology and Conservation

The Wildlife Society
San Francisco Bay Area Chapter

April 16, 2005

Time	Topic	Presenter	Min
8:00	Check-in Registration		30
8:30	Introduction	Dave Cook	10
	History & Natural History		
8:40	A 40-yr Chelonian Odyssey with the Western Pond Turtle: What the Heck is the Status of Its Populations, Ecology and Conservation?	Bruce Bury	30
9:10	Western Pond Turtles From North to South: What Do We Know?	David Germano	30
9:40	Variation in Shell Morphology of the Western Pond Turtle (*Actinemys marmorata* Baird and Girard) from Three Aquatic Habitats in Northern California	Glen Lubcke	20
10:00	To "Turtle": The Extent of the Historical Terrapin Harvest in California (1863-1931)	Matthew Bettelheim	20
10:20	**Break**		20
	Taxonomy/Evolutionary Relations		
10:50	Evolutionary Relationships and Taxonomy of Emydine Turtles Revisited with an Emphasis on the Biogeography and Paleontology of the Western Pond Turtle (*Emys marmorata*)	Chris Feldman & James Parham	20
11:10	Rangewide Molecular Analysis of the Western Pond Turtle (*Emys Marmorata*): Cryptic Variation, Isolation by Distance, and their Conservation Implications	Phillip Spinks	20
11:30	Preliminary Data on Shape Variation in the Plastron of *Emys marmorata*	Kenneth Angielczyk	20
	Survey Techniques/Regulations		
11:50	Western Pond Turtle: Sampling Techniques, Survey Protocol, Ecology and Conservation Strategy	Bruce Bury *et al.*	20
12:10	**Lunch**		30

Continued, over…

Time	Topic	Presenter	Min
12:40	**Field trip/survey techniques (SSU pond)**	All presenters	70
	Conservation/Management		
1:40	Conservation and Management of Western Pond Turtles - Issues and Needs from a California Department of Fish and Game Perspective	Betsy Bolster	20
2:00	A Long-Term Management Strategy for Western Pond Turtles on a Drinking Water Watershed.	Jeff Alvarez	20
2:20	Western Pond Turtle Population Study at Sunol Regional Wilderness, Alameda County, California.	Pierre Fidenci	20
2:40	Survival of Pond Turtles in Modified Waterways: How Can it Work, and Why Does it Matter?	Brad Shaffer	20
3:00	**Break**		20
3:20	Ecology of Western Pond Turtles in a Small Central California Coastal Watershed	Jerry Smith	20
3:40	Influence of Altered Thermal Regime on Body Size and Age of Maturation on Western Pond Turtles (*Clemmys marmorata*), Trinity County, California.	Don Ashton	20
4:00	Basking Patterns and Thermal Regulatory Behaviors of Western Pond Turtles (*Clemmys Marmorata*) Between Two Thermal Regimes in Dammed and Non-Dammed Forks of the Trinity River, Trinity County, California.	Jamie Bettaso	20
4:20	**End**		

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ALVAREZ, JEFF [azoologist@sbcglobal.net], ***The Wildlife Project***

- **TITLE**: A long-term management strategy for western pond turtles on a drinking water watershed.
- **ABSTRACT**: Construction of the Los Vaqueros Reservoir, in the upper Kellogg Creek watershed, eastern Contra Costa County, was completed in 1998. Prior to completion, a portion of a population of western pond turtles was relocated to stock ponds and constructed wetlands adjacent to the reservoir. Pond turtles were monitored several times a year from 1998 to 2004. Populations that were relocated have maintained or increased numbers over time. During the six years of monitoring, several stock ponds and constructed wetlands were colonized by western pond turtles. Pond turtles in Kellogg Creek, downstream of the reservoir, also appear to stable and show signs of successful reproduction. Appropriate available habitat, and successful monitoring methodology appear to contribute to our understanding of western pond turtle success in the Los Vaqueros Reservoir watershed.

ANGIELCZYK, KENNETH [kangielczyk@calacademy.org], ***California Academy of Sciences***

James Parham, ***Joint Genome Institute, Department of Energy and the Museum of Paleontology, University of California, Berkeley***

TITLE: Evolutionary Relationships and Taxonomy of Emydine Turtles Revisited

- **TITLE**: Preliminary Data on Shape Variation in the Plastron of *Emys marmorata*.
- **ABSTRACT**: We present preliminary results of an ongoing geometric morpohometric study of plastron shape in the western pond turtle *Emys marmorata*. Nineteen landmarks were digitized on photographs of a total of 426 specimens, and all landmarks but two were junctions between or extremal points on the sulci separating the plastral shields. Once the data were archived, we examined three sources of plastral shape variation, ontogeny, sexual dimorphism, and phylogeography. Multivariate regression of partial warps and the uniform component of shape variation on centroid size shows that plastron shape is highly significantly correlated with size. The anterior end of the plastron and bridge tend to be narrower, and the posterior end of the plastron wider, in larger individuals relative to smaller individuals. Sexual dimorphism also is apparent. Males and females display seemingly subtle but highly statistically significant differences in

plastron shape, and both adult sexes also are significantly different from unsexed juveniles in the data set. The anterior and posterior ends of the plastron tend to be relatively shorter and narrower in females relative to males, whereas the bridge is relatively wider and longer in females. To assess whether a phylogeographic signal exists in plastron shape, we binned our specimens into geographically-delimited groups based on the four clades recognized by Spinks and Shaffer in their forthcoming molecular phylogenetic analysis of *E. marmorata* populations. Pairwise comparisons of the four groups shows that each differs significantly in plastron shape, and a canonical variates analysis correctly classifies between 78% and 100% of the specimens in each group. However, our sample of specimens from the Santa Barbara clade currently is very small, and additional sampling in this region will be necessary to confirm that this group is distinct from the other three. Our results, when combined with Spinks and Shaffer's molecular data, have important implications for *E. marmorata* conservation. Given that four genetically and morphologically distinct lineages exist within *E. marmorata*, conservation plans should take phylogeography into account. If this factor is ignored, morphologic and genetic diversity likely will be lost.

ASHTON, DON [dashton@fs.fed.us], ***USDA Forest Service, PSW Redwood Sciences Laboratory***
Jamie Bettaso, ***USFWS, Arcata Office***
Hartwell Welsh, ***USDA Forest Service, PSW Redwood Sciences Laboratory***

- **TITLE**: Influence of Altered Thermal Regime on Body Size and Age of Maturation on Western Pond Turtles (*Clemmys marmorata*), Trinity County, California.
- **ABSTRACT**: Body size and age at maturity are two important life history characteristics of vertebrate species. In pokilothermic species, such as turtles, size and age of maturity are often related to reproductive output by influencing the size and number of ova per clutch, frequency of clutches, and life-time reproductive output. Previous studies show that smaller turtles are more vulnerable to predation and produce smaller clutches so a decrease in body size has potential to reduce survivorship, reproductive output, and viability of offspring. We examined the influence of water temperature on body size and age to maturity on western pond turtles (*Clemmys marmorata*) by analyzing data collected from two separate populations from 1991-1996 and in 2004. We compared dammed and non-dammed forks of the Trinity River, Trinity County, California. The dammed Mainstem Trinity River (MSTR) has a water temperature >10ºC colder than the non-dammed South Fork Trinity River (SFTR). Body size (carapace length and weight) per given age was significantly greater on the non-dammed SFTR compared to MSTR for both sexes. Gravid females were also significantly larger on the non-dammed SFTR and appear to mature at a later age, while they were significantly smaller and appear to mature at an earlier age on the dammed MSTR (SFTR gravid females regression $r^2 = 0.9066$ vs. MSTR gravid females $r^2 = 0.7220$). The unnaturally depressed thermal regime of the dammed MSTR may influence the expression of phenotypic traits resulting in smaller turtles.

BETTASO, JAMIE [Jamie_Bettaso@fws.gov], ***USFWS, Arcata Office***
Don Ashton, ***USDA Forest Service, PSW Redwood Sciences Laboratory***
Hartwell Welsh, ***USDA Forest Service, PSW Redwood Sciences Laboratory***

- **TITLE:** Basking Patterns and Thermal Regulatory Behaviors of Western Pond Turtles (*Clemmys Marmorata*) Between Two Thermal Regimes in Dammed and Non-Dammed Forks of the Trinity River, Trinity County, California.
- **ABSTRACT**: Basking activity of western pond turtles (*Clemmys marmorata*) was studied on two forks of the Trinity River in northern California, the dammed Mainstem Trinity River and the non-dammed South Fork Trinity River. The difference between the thermal regime of these two riverine systems is extreme due to the hypolimnetic release from the Lewiston Dam on the Mainstem Trinity River. Turtles on the Mainstem Trinity River were exposed to summer water temperatures that are >10°C lower than the control population on the South Fork Trinity River. We tested the null hypothesis that there would be no difference in thermal regulatory behavior between the two populations of *C. marmorata*. However, there was a significant difference between the two population's thermal regulatory behavior, with the Mainstem Trinity River population of *C. marmorata* spending more time seeking aquatic thermal refugia and basking than the South Fork Trinity River population (T-value = -3.6094, *P*= 0.005) when compared to the river maximum water temperatures. Individual turtles from the non-dammed South Fork Trinity River tended to bask for shorter periods of time per day and also utilized aquatic basking behaviors compared to the turtles from the Mainstem Trinity River population. The artificially colder thermal regime created by the hypolimnetic releases from the Lewiston Dam may be influencing the turtles thermoregulatory behavior on the Mainstem Trinity River and having these animals seeking alternative aquatic thermal refugia.

BETTELHEIM, MATTHEW [blackfish@nasw.org], ***Sycamore Associates LLC***

- **TITLE**: To "Turtle": The Extent of the Historical Terrapin Harvest in California (1863-1931)
- **ABSTRACT**: The western pond turtle (*Clemmys marmorata*), or terrapin as it was once known, was historically a prominent item in the markets of California at the turn of the twentieth century. And although several scientific and historical journal articles, as well as some popular literature, recount briefly the collection of terrapins for sale in the San Francisco market as an ingredient for soup, little beyond this recycled anecdotal information has been documented or expanded upon in detail. Records, although rare, obscure, or cursory, do exist, however. In many respects, the absence of published data represents a significant hole in the regional historical record surrounding not only the fisheries, but of California. Moreover, these data gaps also highlight our lack of understanding about the current status of a turtle species now facing considerable threats to its existence. Although the western pond turtle could be considered a candidate for listing as an Endangered or Threatened species, state and federal agencies have denied attempts to recognize this status. In urban areas of California, people are far more likely to see introduced, non-native species like the red-eared slider, which are

effectively out-competing the state's native turtle. Biologists throughout the western pond turtle's range recognize that the species is declining, and that certain populations are considered threatened or endangered nonetheless. By digesting what little information remains on the extent and impacts the historical terrapin fisheries exacted on western pond turtle populations ca 1863 to 1931, we may be able to gain a more accurate knowledge of the severity of their decline in numbers.

BOLSTER, BETSY [bbolster@dfg.ca.gov], ***California Department of Fish and Game, Habitat Conservation Planning Branch***

- **TITLE**: Western Pond Turtle Mitigation and Conservation: An Agency Perspective.
- **ABSTRACT**: The California Department of Fish and Game (CDFG) is responsible for conserving native species like pond turtles via commenting on CEQA documents and Timber Harvest Plans, writing streambed alteration agreements, developing and enforcing take regulations, and conducting or sponsoring research and monitoring. Numerous issues and unanswered questions are faced by CDFG biologists, including: what constitutes adequate mitigation for aquatic and upland habitat; is headstarting an appropriate and/or necessary technique; is translocation, either for headstarting, rehabbing, or mitigation, appropriate; what are the population-level impacts of poaching, road kill, removal from wild due to association with housing developments, and nonnative species like red-eared sliders? While some of these issues may be difficult to address, a standardized survey protocol, widespread monitoring efforts, and general consensus on appropriate mitigation and conservation measures are essential to the effective management and long-term conservation of the species.

BURY, BRUCE [buryb@USGS.GOV], ***USGS Forest and Rangeland Ecosystem Science Center***

- **TITLE**: A 40-yr Chelonian Odyssey with the Western Pond Turtle: What the Heck is the Status of Its Populations, Ecology and Conservation?
- **ABSTRACT**: Collectively, we are interested in promotion of knowledge to better understand the ecology, management, and conservation of the Western pond turtle (WPT)—a species of high management concern. Although population declines are severe in the northern and southern ends of its range, I find WPTs widespread and abundant in the core of its range from southern Oregon to northern Calif. Still, its future is not rosy. Management for the species is dicey because we have minimal information on its preferred habitat, nesting areas, juvenile habits, terrestrial habitat use, and long-term monitoring of population trends, especially in modified habitats. Threats to WPTs include: habitat loss and alteration, displacement by invasive species (especially in lowlands), pollution and, increasingly, illegal collection for the pet trade. Although WPTs are long lived (e.g., I have marked adults and recaptured a few 35 yrs later), most individuals in populations rarely survive beyond 25 yrs of age! To improve management and protection of WPTs, I suggest we attempt completion of: field-tested sampling protocols, objective science, rigorous interpretation of ecological patterns, and

effective conservation strategies related to a wide audience of interested agencies and the public.

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Hartwell Welsh, *USDA Forest Service, PSW Redwood Sciences Laboratory*
David Germano, *California State University, Bakersfield, Department of Biology*
…and a Large Cast of Dedicated Contributors

- **TITLE**: Western Pond Turtle: Sampling Techniques, Survey Protocol, Ecology and Conservation Strategy
- **ABSTRACT**: We are glad to report that an interagency team (Federal, State and private) is preparing a 'handbook' on the Western Pond Turtle (WPT). Its goal is to increase and promote better understanding of the ecology, management, and conservation of this species. A synthesis is needed because the WPT has high public visibility and its status is of concern to many government agencies and other parties. We summarize available biological knowledge, interpret ecological patterns, test and describe sampling protocols, develop a conservation assessment and suggest strategies for improved management of the turtle and its associated habitats. We envision the final product as a working document or "toolbox" that a biologist or manager can use range wide yet adapt specific elements (e.g., standardized data sheets and measurements) to local or regional needs. We hope this material will foster effective sampling and promote long-term monitoring of populations with commitment to protection of WPTs in their native habitat. A draft manuscript is completed, and the final product may appear in a year. Cost will be reasonable.

FELDMAN, CHRIS [elgaria@biology.usu.edu*], Utah State University, Department of Biology*
PARHAM, JAMES [parham@socrates.Berkeley.edu], *Joint Genome Institute, Department of Energy and the Museum of Paleontology, University of California, Berkeley*

- **TITLE**: Evolutionary Relationships and Taxonomy of Emydine Turtles Revisited with an Emphasis on the Biogeography and Paleontology of the Western Pond Turtle (*Emys marmorata*)
- **ABSTRACT**: The western pond turtle, *Emys marmorata*, belongs to a small group of New World pond turtles known as the Emydinae. Historically, ideas about theevolutionary relationships of emydine species were based on major differences in shell morphology. Species with a moveable hinge in the plastron were thought to be closely related (genera Terrapene, Emydoidea, Emys), while species with a rigid plastron were lumped into another group (*Clemmys*). Recent molecular genetic research suggests that the evolutionary relationships between taxa, as well as the evolution of shell hinges, is more complex than previously supposed. Here, we review this recent phylogenetic research and its taxonomic implications. We also present an updated emydine phylogeny based on mitochondrial and nuclear DNA. Our data show that hinged and non-hinged species are not always closely related. In particular, the western pond turtle is

much more closely related to Blanding's turtle and the European pond turtle than it is to other non-hinged species. Because taxonomy should reflect evolutionary relationships, we reject the use of the genus *Clemmys* for only those species without and hinge. Thus we recommend that the western pond turtle, Blanding's turtle, and the European pond turtle, be united under the generic name *Emys*. Finally, we highlight important aspects of the biogeographical and paleontological history of *Emys*, with an emphasis on the history and origins of *Emys marmorata* in Western North America.

FIDENCI, PIERRE [pfidenci@garciaandassociates.com], ***Garcia and Associates***

- **TITLE**: Western Pond Turtle Population Study at Sunol Regional Wilderness, Alameda County, California.
- **ABSTRACT**: Western pond turtle (*Actinemys marmorata*) size, structure, density, and distribution were assessed using mark-recapture at Sunol Regional Wilderness, Alameda County, California during spring and summer of 2002 and 2003. Several ponds and a section of Alameda Creek were included in the study sites. More than 140 western pond turtles were marked. Forty two percent were males, 21 percent were females, and the rest were sub-adults, juveniles, and hatchlings. Hatchlings represented for 7 percent. The use of new technique to catch turtles was tested and used. The first results show that most turtles are located in one pond, whereas Alameda Creek and other ponds support smaller populations.

FIDENCI, PIERRE [pfidenci@garciaandassociates.com], ***Garcia and Associates***

- **TITLE**: A New Technique for Capturing Western Pond Turtles (*Actinemys marmorata*) with a Comparison with Traditional Trapping Methods.
- **ABSTRACT:** A new technique to capture western pond turtle was tested and compared with traditional trapping methods at Sunol Regional Wilderness, Alameda County. The four capture methods tested were: funnel traps, basking traps, hand collecting and a new technique, baited wires. The new technique captured more than 20 times the number of turtles captured by the traditional techniques. In the proper habitat, baited wires are very efficient, cheap in cost, and require minimal equipment. Their placement takes very little time. Furthermore, the technique precludes injury to sympatric, threatened or endangered amphibians and reptiles.

GERMANO, DAVID [dgermano@csub.edu], ***California State University, Bakersfield, Department of Biology***

- **TITLE**: Western Pond Turtles From North to South: What Do We Know?
- **ABSTRACT**: The Western (Pacific) Pond Turtle is only one of two native aquatic turtles on the west coast of North America, and the only native aquatic turtle in California and Baja. Despite this singular status, surprisingly little information has been published. Some excellent work has been published in the past decade, but that still amounts to only a fraction of what should be available given the number of biologists studying this species. Much information resides in biologists notebooks or has been put into reports that are not peer-reviewed. This

is not a good situation and I am as guilty of this as others. A focus of my studies (along with Dr. Bruce Bury) has been to compare growth, age to maturity, and population structure of pond turtles along a north south continuum. We also have noted differences among remnant populations that exist in the large Central Valley of California to populations in the foothills and mountains of northern California and Oregon. I present findings that have been collected to date and then vow to publish these data in the not too distant future!

LUBCKE, GLEN [glubcke@mail.csuchico.edu], ***California State University, Chico***

- **TITLE:** Variation in Shell Morphology of the Western Pond Turtle (*Actinemys marmorata* Baird and Girard) from three aquatic habitats in northern California
- **ABSTRACT**: Although the literature for Western Pond Turtles is extensive, comparative studies of life history traits are lacking and the ecological implications of these differences has yet to be considered. In this study, we compare three years of morphometric data on the Western Pond Turtle (*Actinemys marmorata*) from three study sites in northern California that differ in several habitat characteristics. We used maximum carapace length (MCL) as a measure of overall body size and found a significant difference in MCL of Western Pond Turtles among the three sites with site, sex, and site x sex effects significant. Controlling for MCL, Western Pond Turtles in a lotic creek habitat were flatter and narrower than were those in both slough and canal habitats. Although we cannot separate whether morphological differences among populations are attributed to local genetic effects or to the interaction of a genotype and the environment, it is important to note that phenotypic plasticity for body sizes among WPT populations may explain these body size differences. Additionally, we hypothesize that body size differences among sites may be attributable to differences in prey availability and water temperature. An examination of the evolutionary ecology of this species is overdue and our study is a good first start in developing novel research questions.

SHAFFER, BRAD [hbshaffer@ucdavis.edu], ***University of California, Davis, Section of Evolution and Ecology and the Center for Population Biology***
Phillip Spinks, ***University of California, Davis, Section of Evolution and Ecology***
Gregory Pauly, ***University of California, Davis, Section of Evolution and Ecology***
John Crayon, ***USGS, Western Ecological Research Center, and the University of California, Riverside, Department of Biology***

- **TITLE**: Survival of pond turtles in modified waterways: how can it work, and why does it matter?
- **ABSTRACT**: The western pond turtle *Emys* (formerly *Clemmys*) *marmorata* is declining throughout its range, primarily due to loss of habitat via urbanization and conversion to agriculture. Urban waterways present several important challenges to freshwater turtle populations, but they also present an opportunity to maintain declining species in a ubiquitous habitat that has high public visibility. The arboretum waterway on the University of California, Davis campus is an example of an extensively altered urban habitat that supports a relatively large *E. marmorata* population. Over the span of 6 years, we monitored the turtle

population inhabiting the arboretum waterway to determine the demographic health of the population, and the challenges and opportunities that urban environments pose for pond turtles. Since 1993, the naturally existing arboretum pond turtle population had declined by approximately 40% and has shown little natural recruitment as of 2003. During the duration of the study, we also introduced 31 headstarted turtles into the arboretum. Headstarting is the process of raising juveniles in captivity until they have outgrown their period of greatest vulnerability to predators, and then releasing them into the wild. Our headstarting results demonstrate that this contentious strategy is a viable option for adding young turtles to the population, although it does not address the causes of decline. Over the course of our study, we encountered nine species of non-native turtles in the waterway, and these appear to be a serious threat to the native species. As more habitat becomes urbanized, it is increasingly important to understand how freshwater turtles, such as *E. marmorata*, adapt to urban waterways and the impact of non-native turtles on native turtle species. Our strong feeling is that urban waterways can provide habitat for viable populations of freshwater turtles and showcase them to the public, but both the aquatic and terrestrial habitat must be managed according to the biological requirements of individual species.

SMITH, JERRY [smithj@email.sjsu.edu*], San Jose State University, Department of Biological Sciences*
Jae Abel, *San Jose State University, Department of Biological Sciences*
Caroline Davis Chan, *San Jose State University, Department of Biological Sciences*
Donald Crump, *San Jose State University, Department of Biological Sciences*

- **TITLE**: Ecology of Western Pond Turtles in a Small Central California Coastal Watershed
- **ABSTRACT**: Western pond turtles in Waddell Creek watershed primarily used the lagoon and a permanent tule-dominated pond in summer. Within these habitats, and at open-canopied sited upstream, turtles used microhabitats that provided basking sites near underwater escape cover. Turtles basked extensively on most summer days, and turtles switched sites and activity patterns if basking logs were moved. In winter radio-tracked turtles in the pond remained there. Turtles in the stream and lagoon moved to the pond or to upland habitats in response to high stream flows. Preferred upland sites included dense vegetation (buried in soil and leaf litter) and seasonally flooded wetlands. Upland over-wintering turtles were inactive for weeks at a time, but usually moved several times. Females nested in June through August in sunny, sparsely vegetated habitats, including sparse grassland, a horse corral and agricultural fields. Nesting forays were open preceded by exploratory "walkabouts", and several turtles apparently used different nest sites in different years. Nesting turtles often remained upland overnight, but some turtles that had previously explored the site nested within 2 hours. Hatchlings emerged in spring. Rooting by feral pigs and changes in management of the agricultural fields and horse corral may threaten turtle recruitment.

SPINKS, PHILLIP [pqspinks@ucdavis.edu], ***University of California, Davis, Section of Evolution and Ecology***

Brad Shaffer, ***University of California, Davis, Section of Evolution and Ecology and the Center for Population Biology***

- **TITLE**: Rangewide Molecular Analysis of the Western Pond Turtle (*Emys Marmorata*): Cryptic Variation, Isolation by Distance, and their Conservation Implications
- **ABSTRACT**: We analyzed phylogeography and population genetic variation across the range of the western pond turtle (*Emys marmorata*) using rapidly-evolving mitochondrial and nuclear DNA sequence data. Nuclear DNA sequences from two unlinked introns displayed extremely low levels of variation, but phylogenetic analyses based on mtDNA recovered four well supported and geographically coherent clades. These included a large Northern clade composed of populations from Washington south to San Louis Obispo County, California west of the Coast Ranges, a San Joaquin Valley clade from the southern Great Central Valley, a geographically restricted Santa Barbara clade from a limited region in Santa Barbara and Ventura Counties, and a Southern clade that occurs south of the Tehachapis and west of the Transverse Range south to Baja California, Mexico. An analysis of molecular variance (AMOVA) based on regional hydrographic units revealed that populations from the Sacramento Valley north to Washington were virtually invariant, with no evidence of population substructure among river drainage basins. In contrast, *E. marmorata* contains considerable unrecognized variation, particularly in central and southern California and northern Baja California, Mexico. Our AMOVA and phylogenetic results, in conjunction with a growing comparative database for other codistributed aquatic taxa, confirm the occurrence of genetic breaks across the Tehachapi and Transverse ranges bounding the southern end of the Great Central Valley, and point to southern California as a rich source of cryptic genetic variation.

WESTERN POND TURTLE WORKSHOP

2005

ECOLOGY AND CONSERVATION

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ADDITIONAL RESOURCES

1. Field Forms/Survey Forms (see CD)

   - **Field_Form_Bury_5x8Card.pdf**
     Courtesy: Bruce Bury
   - **Field_Form_Bury_CodeSystem.pdf**
     Courtesy: Bruce Bury
   - **Field_Form_Bury_GeneralForm.pdf**
     Courtesy: Bruce Bury
   - **Field_Form_Bury_OregonForm.pdf**
     Courtesy: Bruce Bury
   - **Field_Form_CNDDB.pdf**
     Source: California Department of Fish and Game
   - **Field_Form_Cook.pdf** and **Field_Form_Cook.doc**
     Courtesy: Dave Cook
   - **Field_Form_Holland.pdf**
     Source: Holland 1994

2. Websites

   Frank and Kate Slaven's Western Pond Turtle Website:
   http://www.pondturtle.com/ptmain.html
   Matthew Bettelheim's Western Pond Turtle Website:
   http://www.atlantismagazine.com/bettelheim/pondturtle.html