

**Ecology of the Western Chicken Turtle (*Dierochelys reticularia miaria*) in the Arkansas Valley:
Development of Survey and Monitoring Protocols for a Rare and Secretive Species.**

Summary: Arkansas currently has no information on the population status, distribution and abundance of Western Chicken Turtles (*Dierochelys reticularia miaria*) in the state. Thus, development of a comprehensive conservation and management plan is not currently possible. The goal of this study is to determine the ecology of Western Chicken Turtles in central Arkansas. By 2009, I will develop survey protocols that will include appropriate survey seasons and techniques ultimately permitting distribution and abundance surveys to be conducted accurately across the state and throughout the species range.

Project Leader: Dr. Stephen Dinkelacker
Assistant Professor
University of Central Arkansas

Email: dinkelac@uca.edu

Mailing Address: Department of Biology, LSC 122
University of Central Arkansas
Conway, AR 72035

Phone: 501-450-3319
Fax: 501-450-5914

**Total Amount of
Money Requested:** \$23,386

**Amount/ Source of
Matching/ In-Kind:** \$15,260 Cash Matching (University of Central Arkansas)
\$13,520 In-Kind (University of Central Arkansas)

Explanatory Text

This research project will directly address the needs of a species of greatest conservation need, as well as lead to on-the-ground conservation. Because of its scarcity and poorly understood biology and ecology, the Western Chicken Turtle (*Dierochelys reticularia miaria*) has been designated as an S3 species (i.e., rare to uncommon) with fewer than 25 locality records in Arkansas. At this time, development of a conservation and management plan is inconceivable due to a lack of baseline ecological data. This information is critical for the development of suitable conservation strategies and to define appropriate distribution and abundance survey protocols for this rare species.

This project will be conducted in the Arkansas Valley, specifically Faulkner County. Virtually nothing is known about the Western Chicken Turtle (*D. r. miaria*) in Arkansas, except that they occur in the state. In fact, little is known about the ecology of the 3 chicken turtle subspecies. Only 2 studies have examined the ecology of chicken turtles since 1969, and those were conducted on the eastern subspecies (*D. r. reticularia*) in Virginia and South Carolina. Most accounts of chicken turtles that appear in general herpetological surveys and reference books lack or provide insufficient ecological data.

The limited ecological and biological data that are available for chicken turtles suggest they use a variety of habitats, including terrestrial habitats during their annual cycle. Chicken turtles may have bimodal nesting seasons, with the first season occurring in early spring and the second in late summer/early fall. Preliminary data from a local population suggests that female Western Chicken Turtles are gravid in mid-June, potentially using terrestrial habitats for most of the year, and occupying seasonal wetlands during late spring and early summer. Survey protocols for Western Chicken Turtles do not exist. In addition, a potentially limited activity season, low population densities, and specific habitat requirements may make to detection and determination of abundance very difficult for this species. In other words, Arkansas currently has no indication of the population status, distribution, or abundance of this species within the state.

Because chicken turtles potentially occupy small, seasonal wetlands, there is the possibility that chicken turtles exist in metapopulations. In other words, individuals may move between small wetlands (e.g., small populations) on a seasonal or potentially yearly basis. Because these seasonal wetlands are subject to environmental fluctuations, as well as anthropogenic impacts, a chicken turtle population may be dependant upon the ability to colonize new and re-colonize old wetlands.

Goals

The principal goal of this study is to determine and document population structure and size, reproductive ecology, and seasonal habitat selection of Western Chicken Turtles in central Arkansas. By 2009, I propose to elucidate these variables and develop appropriate survey protocols including appropriate survey seasons and techniques, which will allow for distribution and abundance surveys to be conducted accurately across the state and throughout the species range. I will use aquatic and terrestrial drift fences, radio telemetry techniques, activity monitoring techniques, and veterinary techniques to accomplish these goals.

Methods

Study Site

A privately-owned, seasonal wetland on the Cadron Creek floodplain, located near Springhill, AR will serve as the main study site. Preliminary data indicate a suitable population inhabits this site and utilizes the adjacent creek. In addition, we will actively search within the Cadron Creek basin for additional populations.

Population Characteristics, Habitat Selection and Reproductive Ecology

Turtles will be captured using a combination of aquatic and terrestrial drift fencing in order to capture migrating and nesting turtles. Turtles will be individually marked, weighed, sexed, and measured for

morphometrics such as carapace and plastron length. Standard characteristics such as population size, sex ratio, density, adult/juvenile ratio, and biomass will be calculated. Growth rates will be calculated whenever possible.

The advantage of using terrestrial and aquatic drift fences is that we will be able to determine the seasonal activity of Western Chicken Turtles (i.e., when they become aquatic and when they become terrestrial). Thus, we will determine the appropriate time of year to survey for the species within a given habitat type (i.e., terrestrial versus aquatic). Radio-transmitters will be attached to several (10) female and male turtles to determine patterns of seasonal movement and habitat utilization. Turtles will be located every three (3) days following transmitter attachment. At each turtle location, and at subsequent random locations, we will measure appropriate habitat variables. The variables measured will depend upon the habitat the turtle is utilizing (i.e., aquatic versus terrestrial).

Captured females will be periodically subjected to ultrasound screening during the spring, summer, and fall to determine reproductive status. Gravid females will be followed to their nesting sites using radio telemetry.

Measurable Products/ Outcomes

The measurable outcomes of the project include increasing our knowledge of a rare species in Arkansas as well as the development of an appropriate survey protocol. Because the Western Chicken Turtle is different than other aquatic turtles, it may require specialized survey techniques in order to accurately determine its presence/absence and abundance. Second, this project will provide a foundation for other states to examine their own chicken turtle populations. Arkansas will have the first protocol designed to survey for the presence of this species based on scientific information rather than speculation.

Existing Resources:

This project takes advantage of current resources available only through the University of Central Arkansas. Currently, we have access to a privately-owned site where chicken turtles have been caught in high numbers. In fact, we currently have the largest data set on the subspecies. In addition, we have most of the equipment, as well as the qualified personnel needed to conduct the study. Finally, I have the time to personally oversee and conduct the study.

Monitoring Methodology:

The Arkansas Wildlife Action Plan seeks short-term and long-term performance measures, which are designed to help make management decisions. Although there are no standardized monitoring methods for reptiles in general, for turtles, one of the main monitoring methods will no doubt be yearly trapping in order to follow population dynamics. Coupled with initial surveys and studies to establish population abundance and distribution, the AGFC would be able to tie impacts and short term measures back into adaptive management strategies.

The major problem with the Western Chicken Turtle is that traditional trapping efforts do not always work for this species. Additionally, this species may have a very restricted active season similar to spring-breeding frogs. That is the main purpose of this study: to establish monitoring methodology for the Western Chicken Turtle in Arkansas and across the species range. Since this species is extremely cryptic, secretive, and potentially occupies seasonal habitats such as ephemeral ponds; the short-term performance measure of this project is to elucidate the activity season, population characteristics, reproductive biology and microhabitat preference of this species in order to establish a basic survey protocol. The biological efficacy will be determined by the ability to locate additional populations using the developed protocol. Long-term monitoring could then be done to provide data and population trends for management and determinations of conservation needs. All monitoring methodologies will be entered into the NRMP at the conclusion of the project.

Line Item Budget

	Arkansas Game and Fish Commission	UCA In-Kind*	UCA Cash Match
Salaries and Benefits			
Dinkelacker Summer Salary			
\$5200 per month, 2 months/year, 2 years	\$5,200	\$10,400	\$5,200
Fringe @ 30%	\$1,560	\$3,120	\$1,560
Graduate Student Stipend	\$3,000		\$8,500
Total	\$9,760	\$13,520	\$15,260
Travel			
	\$1,500		
Total	\$1,500	\$0	\$0
Equipment			
Fyke nets	\$4,000		
Transmitters	\$4,000		
Total	\$8,000	\$0	\$0
Supplies			
Misc. (Net poles, Drift Fence Materials, Epoxy)	\$2,000		
Total	\$2,000	\$0	\$0
Subtotals			
Salaries and Benefits	\$9,760	\$13,520	\$15,260
Travel	\$1,500	\$0	\$0
Equipment and Supplies	\$10,000	\$0	\$0
Total Direct Costs	\$21,260	\$13,520	\$15,260
Indirect Costs @ 10%	\$2,126		
Total by Institution	\$23,386	\$13,520	\$15,260
Total Project Budget	\$52,166		

* In-Kind salaries and fringe are unpaid salaries for time worked

Qualifications of Individuals and Organizations

Dr. Stephen Dinkelacker

Dr. Dinkelacker received a Master degree in Applied Ecology and Conservation Biology from Frostburg State University and a Doctorate in Zoology from Miami University. In the past, he has received SWG money from Nebraska in order to study the impacts of roadways on Blanding's Turtle populations. He has also received grants (not SWG) to study the biology of Alligator Snapping Turtles in Arkansas. Currently, he is an Assistant Professor at UCA and runs the Ecophysiological Herpetology Lab. His lab currently supports four graduate students that work on projects including Alligator Snapping Turtle ecology in Arkansas, Softshell Turtle ecology in Arkansas, and Blanding's Turtle work in Nebraska. Select publications are listed:

Miller, J.D. and S.A. Dinkelacker. 2007. Reproductive structures and strategies of turtles. Wyneken, Bels and Godfrey (eds). *Biology of Turtles: From Structures to Strategies of Life*. CRC Press, Boca Raton, FL. *In review*.

Howey, C.A. and S.A. Dinkelacker. *Macrochelys temminckii* (Alligator Snapping Turtle). Terrestrial Burrow Use. *Herpetological Review*. Submitted.

Howey, C.A. and S.A. Dinkelacker. New distributional records for reptiles in central Arkansas. *Herpetological Review*. Submitted.

Nippert, C.J., C.B. Caldwell, and S.A. Dinkelacker. *Macrochelys temminckii* (Alligator Snapping Turtle). Nesting characteristics. *Herpetological Review*. Accepted for publication.

Dinkelacker, S.A., J.P. Costanzo and R.E. Lee Jr. 2005. Anoxia tolerance and freeze tolerance in hatchling turtles. *Journal of Comparative Physiology Part B*. 175: 209-217.

Dinkelacker, S.A., J. P. Costanzo, J.B. Iverson and R.E. Lee Jr. 2005. Submergence tolerance of hatchling Blanding's turtles (*Emydoidea blandingii*) in hypoxic and normoxic water: adaptations for overwintering in aquatic habitats. *Physiological and Biochemical Zoology*. 77(1):74-99.

Dinkelacker, S.A., J. P. Costanzo, J.B. Iverson and R.E. Lee Jr. 2004. Cold hardiness and dehydration resistance of hatchling Blanding's turtles (*Emydoidea blandingii*): implications for overwintering in terrestrial habitats. *Canadian Journal of Zoology*. 82 (4): 594-600.

Costanzo, J.P., S.A. Dinkelacker, J.B. Iverson and R.E. Lee Jr. 2004. Physiological ecology of overwintering in the hatchling painted turtle: multiple-scale variation in response to environmental stress. *Physiological and Biochemical Zoology*. 77 (1): 74-99.

Dinkelacker, S.A., Wilson, T.P., and J.H. Howard. 2003. Natural history and population characteristics of *Clemmys muhlenbergii* at the SHI wetland in Maryland. *In Conservation and Ecology of Turtles of the Mid-Atlantic Region: A Symposium*. Swarth, C.W., Roosenburg, W.M., and E. Kiviat (eds). Bibliomania, Salt Lake City, UT.