

Title of Project: Distribution of the Collared Lizard, *Crotophytus collaris*, in the Arkansas River Valley and Ouachita Mountains

Project Summary: This project will seek to monitor the status of Collared Lizards across the Arkansas River Valley and Ouachita Mountains. In order to accomplish this task, we will monitor historic population sites for this species in order to determine presence/absence. We will use habitat data collected at these sites to develop a strategy, employing GIS, to determine the most appropriate sites to survey for novel populations of Collared Lizards across these two ecoregions in order to develop a conservation plan for this species.

Project Leader: David E. Starkey, Assistant Professor of Biology

Affiliation: University of Central Arkansas

Email: dstarkey@uca.edu

Mailing Address: University of Central Arkansas
Department of Biology
201 Donaghey Ave.
LSC 164 E
Conway AR, 72035

Telephone and Fax: 501-450-5551, 450-450-5228

Project Partners: Dr. Jeff Miller
Same as above

Total Amount of Project: \$119,059

Total Amount of SWG: \$56,472

Amount of Matching: \$62,587

Background: The Eastern Collared Lizard (*Crotaphytus collaris*) is a large stout-bodied lizard that occupies open habitat and is almost never found in forested terrain. In Arkansas, this species reaches its eastern-most distribution where it inhabits rocky outcrops, glades, and talus slopes in elevated areas across the Ozark and Ouachita Mountains, as well as suitable habitat throughout the Arkansas River Valley. Collared Lizards are active from April through October, and spend the majority of their day basking, locating prey and using rocky outcrops to avoid being depredated. However, suitable habitat for Collared Lizards is being threatened by invasive woody plant species (i.e., maple, gum, and cedar) that are establishing populations in the open areas used by the lizards; this disrupts the connectivity among areas suitable lizard habitat as well as reducing the size of the habitat. In the Arkansas State Wildlife Action Plan, habitat conversion and the alteration of natural fire regimes resulting from forestry activities, are listed as known and potential problems impacting the survival of this species. Previous population estimates have been quite variable with densities ranging from 24.7 (glades) to 247.0 (rock quarries) animals per hectare (Trauth, Robison, and Plummer, 2004). Therefore, additional data are sorely needed regarding the distribution and abundance of this species in order to support the appropriate conservation action plan.

At the present time, *C. collaris* has not been listed as threatened or endangered in Arkansas, although it has been suggested that habitat loss and specimen collection may be reducing the numbers of these lizards in the wild throughout its range (Trauth, Robison, and Plummer, 2004). There are currently few records (n= 3) of *C. collaris* from the Ouachita Mountains, or Arkansas River Valley (n= 13) (Trauth, Robison, and Plummer, 2004). Therefore, there is a large gap in the database regarding the distribution and habitat use of this species throughout these regions of Arkansas. Therefore, this proposal is targeted to investigate the abundance and distribution of this species across two regions: Ecoregion 37 (the Arkansas River Valley) and Ecoregion 36 (the Ouachita Mountains).

Funding Priorities Addressed: This project will address funding priority 2, addressing species of conservation need while benefiting other wildlife as required by the 2009 request for preproposals. This project will also address a critical gap in knowledge regarding the distribution and abundance of this species across two ecoregions in central Arkansas.

Conservation Priorities Addressed: This project will lay the groundwork needed to address two extremely important questions related to the biology of Collared Lizards. First, the distribution of Collared Lizards will be assessed across two ecoregions. Second, the abundance of Collared Lizards will be determined at each site, and the associated habitat characteristics. Third, protocols will be established

to monitor these populations and determine what effect, if any, these invasive woody species are having on the population size and distribution of Collared Lizards in the state.

Location of the Work: This project will be conducted in the Arkansas River Valley and in the Ouachita Mountains at known and novel sites.

Goals: The goal of this project is to survey known and selected habitats across Arkansas for Collared Lizards to establish presence/absence and habitat characteristics. This project will also serve to address the impact of the current Arkansas State Wildlife Action Plan on the distribution and abundance of this species.

Methods: *Year 1:* Areas that have been documented as suitable habitat will be searched for the presence/absence of Collared Lizards at multiple times throughout the active period of adults (April through October). Initially, visual surveys will be conducted to determine the presence/absence of lizards at each site. At each site, several lizards (3-5) will be captured by-hand or through the use of drift fences and/or pitfall traps (and other appropriate methods). Individual lizards will be sexed (male, female), assessed for maturity (Adult, juvenile), measured (SVL and TL), and weighed. At each site where collared lizards are present, we will also measure multiple habitat variables including: GPS location, percent canopy cover, soil moisture, air temperature, soil temperature, litter depth, nearest tree specie(s), and habitat type. The same habitat variables will be measured in the surrounding habitat, at a minimum of 5 sites, to determine the habitat characteristics for this species. Population sizes will be estimated by surveys during at least two intervals at each site.

Year 2: Using GIS software, we will map the locations of known *C. collaris* populations, and use this data to predict suitable habitat within the Arkansas River Valley and Ouachita Mountains prior to the active period. Using these data, we will conduct surveys, similar to those of Year 1, to determine the presence/absence of Collared Lizards in each habitat.

Measureable Products or Outcomes: This project will result in two direct outcomes including a report and a publication. During this study, we will also gain valuable data regarding population density and structure of a potentially threatened reptile species in Arkansas. Further, the project will establish protocols for future monitoring of populations and additional habitat assessment. Finally, this research program will be highly visible to the general public who visit the various parks, especially on nature hikes and tours, and will help to raise the profile of the Arkansas Wildlife Action Plan.

Existing Resources: Dr. Starkey will conduct and coordinate the field work. He is within a 45 minute to two-hour drive from the majority of the study and/or potential study sites. A number of the sites exist within State Parks, State Game areas and State Forestry areas. Personnel at these locations will be invited to participate in the study by contributing observations of the locations used by the lizards. Additionally, citizen-scientists may be used to monitor the presence/absence of *C. collaris* populations long-term. Dr. Jeff Miller is highly experienced with GIS modeling procedures, and will coordinate the development of spatial models to predict suitable habitat for Collared Lizards.

Handling of Long-term Maintenance: This project is designed to produce quality results and fill a data gap within the stated 2-year time period. However depending upon the results, this project may be continued and we will monitor the animals past the formal study period as well as continue to try and identify novel quality habitat for Collared Lizards in Arkansas. Overall, this project, this will strengthen our knowledge of the abundance and distribution of a potentially threatened species and its habitat requirements; in addition, the project will increase visibility of this dynamic species to the general public. The data generated by this project will also be made available to U.S. Fish & Wildlife Service’s State Wildlife Grant (SWG) program for their use in designing conservation programs for other Arkansas wildlife across these ecoregions.

Total Project Budget:

	<i>State Wildlife Grant</i>	<i>In-Kind Match</i>	<i>UCA In-Kind</i>	<i>AG&F In-Kind</i>
Salary/ Benefits:	\$19,100	\$25,587	\$28,000	\$0
Operating Expenses:	\$15,500	\$500	\$0	\$0
Capital Expenses:	\$16,738	\$3,500	\$0	\$5,000
Indirect Costs:	\$5,134	\$0	\$0	\$0
	<hr/>	<hr/>	<hr/>	<hr/>
	\$56,472	\$29,587	\$28,000	\$5,000

Dr. David Starkey received a Masters degree in Biology from the University of Illinois and a Doctorate in Genetics from Texas A&M University. Dr. Starkey is currently employed as an Assistant Professor in the Department of Biology at UCA where teaches multiple courses including Genetics, Advanced Genetics, and Evolution. Dr. Starkey's research at UCA currently focuses on the phylogeography and population genetics of Western Chicken Turtles and Grotto Sculpin and their Acanthocephalan parasites using analyses of DNA and morphological characters. Additionally, Dr. Starkey is working on several additional turtle related projects, including a survey of the diversity in the stinkpot turtle, the population genetics of the painted turtle, and the systematics of the common snapping turtle and alligator.

Dr. Jeff Miller received a Masters degree in Environmental Studies from the University of Montana at Missoula and a Doctorate in Zoology from the University of New England (Armidale, NSW, Australia). Dr. Miller is currently employed as a private consultant and a Visiting Assistant Professor at the University of Central Arkansas. Previously, he worked for Queensland Parks and Wildlife Service where he designed and conducted conservation-management programs primarily on the Saltwater Crocodile (*Crocodylus porosus*) and Sea Turtles. His other research interests focus on spatial modeling of animal abundance and habitats, reproductive physiology of reptiles, and tardigrade ecology. Dr. Miller contributes geographic analysis and provides GIS advice and training to post graduate students at UCA.

Dr Miller is the GIS analyst of choice because he has experience with applying Geographic Information System to biological data. Besides working with estuarine crocodiles, sea turtles, and sea snakes, he has dealt with over 100 species of lizards using GIS mapping and analysis to describe their habitat use. He developed and taught a course in applied GIS for biology students at the American University in Cairo and has trained undergraduate and graduate students in the use of GIS to display and analyze biological data. His role in the project will be three fold: first, to ensure that appropriate data are collected to support a rigorous analysis of habitat use; second, to train students who are involved in the project to use GIS for data display and habitat analysis; third, to ensure the analysis is completed.

Bibliography

Trauth, S. E., H. W. Robison, and M. V. Plummer. 2004. *The Amphibians and Reptiles of Arkansas*. The University of Arkansas Press, Fayetteville, AR.