Distribution, population dynamics, and habitat analyses of Collared Lizards

The proposed project focuses on the distribution and population structure of the eastern collared lizards (*Crotaphytus collaris collaris*) in Arkansas. The Collared Lizard is a species of special concern in Arkansas, where, the preferred habitat is a glade. Glade habitats have been greatly reduced due to encroachment of red cedar as a result of fire suppression policies. Thus, the proposed project will examine the distribution pattern and population structure of extant populations and attempt to elucidate historical habitat requirements and distribution.

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Total Project Costs: 50/50 Match: $90,340
65/35 Match: $98,129

Total SWG Funds Requested: 50/50 Match: $45,246
65/35 Match: $64,718

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In support of glade restoration and eventual reintroduction of glade species, we propose a project that will focus on generating information on the distribution and abundance of the eastern collared lizard (*Crotaphytus collaris collaris)* along with a comparison of historical glade sites with and without collared lizard presence. The SWG RFP (pg 1055-1057) notes the lack of basic distributional and abundance data which are needed for conservation status assessment. Acquired data will provide information on the specific habitat requirements that are needed in order to support thriving populations of this potentially threatened species. Additionally, the habitat structure surveys will contribute to the knowledge of the glade habitat, which is a habitat of considerable conservation need. The data collected for the proposed study will assist in habitat management to maintain and increase habitat quality for a variety of glade associated species.

A survey of historical sites in the Ozarks of Arkansas was carried out in the spring and summer of 2010 in order to establish the persistence or extinction of collared lizard populations and their distribution. Due to lack of sites with the collared lizard present, we propose a secondary survey of glades, comparing both glades supporting lizards and those that are no longer occupied by this species. A preliminary survey and data analysis was also carried out in spring and summer of 2010 (before the lizards had emerged) comparing 6 glade sample sites (3 with lizard presence and 3 with absence based on historical collections (Trauth 1989)). Sites where lizards were expected to be present had significantly reduced vegetation cover and significantly increased cover of bare rock. Therefore, methods from the preliminary research were developed on a larger scale to be implemented for the proposed project. The proposed project will look at glade sites found in the Ozarks and River Valley Regions of Arkansas. An equal number (determined by the number of sites with lizard populations) of sample sites with the lizard present and absent will be compared in order to determine the habitat requirements for collared lizard populations.

For each of the five study sites with the lizard present, individual lizards will be noosed. For each capture, the lizard will be assessed for a variety of morphological and life history variables (i.e., snout vent length, tail length, weight, body temperature, sex, and age class). Protocols for identifiable characteristics of each age class (hatchling, juvenile, sub-adult and adult) will be developed in order to establish the age of each individual, so that we can obtain information on the age structure dynamics of the populations at each glade. The date and time of day of each capture will also be recorded, along with the GPS coordinates.

A series of environmental measurements will also be obtained at the location of each individual lizard, including air temperature, relative humidity, wind speed, elevation, slope, aspect, and cloud cover. These measurements will also be taken at the five study sites with lizard absence for comparison.

Various environmental factors at each study site will be measured or determined to quantify the habitat requirements for this species. At each study site, two line transects, each 20 meters long, will be placed in a representative area of glade habitat. Using a modified Daubenmire cover class method, we will determine the percent ground cover (including percent

rock, vegetation, bare soil, and coarse woody debris) using five, 2 by 2 m plots per study site. Plot locations will be randomly selected with the use of a random numbers table. Canopy cover will also be recorded at every meter as the baseline tape is intercepted. These data will be used to calculate the percent canopy cover for the entire transect.

In order to obtain data on species dominance, basal area, and density, the DBH(diameter at breast height) and species of each tree that falls within 2.5 m of the baseline tape (this will result in a 20 by 5 m plot) will be recorded. Within this delimited area, I will also map the location of each tree within the overall transect. In order to examine age structure and age the class of these trees, I will select five of the representative larger trees either within or immediately adjacent to the 20 x 5 m plots and extract an increment growth core in order to carry out tree-ring analysis. I will also estimate the height of these trees using a clinometer.

For each transect, sweep nets and a vacuum backpack collector will be used in order to capture potential insect prey (this will be carried out prior to the habitat survey). Other possible prey found, such as small lizards, will be noted. Scat collections will be taken for microscopic diet analysis (lizard scales and arthropod body parts are non-digestible and identifiable in fecal material).

The distribution and abundance data for *Crotaphytus collaris* can be used for conservation status assessment. Identifying site characteristics and lizard habitat requirements can benefit the development of restoration protocols. We will estimate minimum patch size that can support a persistent population. We will also determine if a population is healthy enough to sustain some harvest to use for reintroduction in newly re-established glades. In addition, our data will be useful for identifying candidate sites for future glade restoration projects aimed at collared lizard recovery.

Budget 65/35 Match

Budget Justification

AGFC (SWG) REQUEST
Travel, Gas/Mileage: AGFC ($5,040), the average distance to field sites is 200 miles, allowing 2 trips per week for 15 weeks per year for 2 years (total of 12,000 miles at $0.42/mile - $5,040)**.**
Miscellaneous Supplies ($500): AGFC will cover the price of sample collection material including vials, bags, ethanol, and other disposables at $500.
Software ($1,000): Site licenses for GIS and statistical software – the total of licenses $2000 is split.
Salary/benefits: Graduate Student: 12 months @ $1,500/month for two years. Fringe Benefits: salary x 3.9%
Graduate Tuition: 1 Graduate Student, 12 hours @ $325/Year for 2 years.

UNIVERSITY OF ARKANSAS MATCH
Miscellaneous Supplies ($500): AGFC will cover the price of sample collection material including vials, bags, ethanol, and other disposables at $500.
Software ($1,000): Site licenses for GIS and statistical software – the total of licenses $2000 is split.
Salary/Fringe Benefits Dr. Gary Huxel: 1 month summer salary for each year based on his 9-month salary. Fringe Benefits: salary x 15.7%

Facilities and Administrative Costs (formerly Indirect Costs):

AGFC: F&A @ 10% $43,944 x 10% = $4,394.
UA unrecovered F&A: 34% x $43,944 = $14,941.
UA negotiated federal rate agreement: 44.0% of MTDC in accordance with F&A Rate Agreement, DHHS, 07/01/09 - 06/30/13.

Budget for two years with 65/35 match:			
CATEGORY	SWG	MATCH	TOTAL
Travel: Gas/Mileage	$5,040	$0	$5,040
Miscellaneous Supplies	$500	$500	$1,000
Software licenses	$1,000	$1,000	$2,000
Salary/Benefits	$37,404	$16,969	$54,373
Total Direct Cost	$52,134	$18,469	$70,603
Tuition	$8,190	$0	$8,190
Indirect Costs	$4,394	$14,941	$19,335
Total	$64,718	$33,410	$98,129

Budget 50/50 Match

AGFC (SWG) REQUEST
Travel, Gas/Mileage: AGFC ($5,040), the average distance to field sites is 200 miles, allowing 2 trips per week for 15 weeks per year for 2 years (total of 12,000 miles at $0.42/mile - $5,040)**.**
Miscellaneous Supplies ($500): AGFC will cover half of the price of sample collection material including vials, bags, ethanol, and other disposables totaling $1000.
Software ($2,000): Site licenses for GIS and statistical software.
Salary/benefits: Funds will be split for the graduate student. Graduate Student: 12 months @ $1,500/month for 2 years. Fringe Benefits: salary x 3.9%
Graduate Tuition: 1 Graduate Student, 12 hours @ $325/Year for 2 years.

UNIVERSITY OF ARKANSAS MATCH
Miscellaneous Supplies ($500): UARK will cover half of the price of sample collection material including vials, bags, ethanol, and other disposables totaling $1000.
Salary/Fringe Benefits Funds will be split for the graduate student. Graduate Student: 12 months @ $1,500/month for 2 years. Fringe Benefits: salary x 3.9%. Dr. Gary Huxel: 1 month summer salary based on his 9-month appointment. Fringe Benefits: salary x 15.7%

Facilities and Administrative Costs (formerly Indirect Costs):
AGFC: F&A @ 10% $26,242 x 10% = $2,624.
UA unrecovered F&A: 34% x $26,242 = 8,922.
UA negotiated federal rate agreement: 44.0% of MTDC in accordance with F&A Rate Agreement, DHHS, 07/01/09 - 06/30/13.

Budget for two years with 50/50 match:			
CATEGORY	SWG	MATCH	TOTAL
Travel: Gas/Mileage	$5,040	$0	$5,040
Miscellaneous Supplies	$500	$500	$1,000
Software licenses	$2,000	$0	$2,000
Salary/Benefits	$18,702	$35,671	$54,373
Total Direct Cost	$34,432	$36,171	$70,603
Tuition	$8,190	$0	$8,190
Indirect Costs	$2,624	$8,922	$11,546
Match	$0	$0	$0
Total	$45,246	$45,094	$90,340

Qualifications of Project Participants

Dr. Gary Huxel: Dr. Huxel is a tenure-track faculty member of the Department of Biological Sciences with a specialty in Ecology. Dr. Huxel has worked in a variety of systems from freshwater to marine to terrestrial. He has worked with reptiles in Arkansas including collared lizards and box turtles.

Dr. Steve Beaupre: Dr. Beaupre is a Professor of the Department of Biological Sciences with specialties in Physiology and Herpetology. He has studied numerous reptile species in Arkansas.

Ashley Grimsley, MS student. Ms. Grimsley is a Master's Degree student in the Department of Biological Sciences. She was worked with Dr. Huxel and Dr. Beaupre in the past on projects involving collared lizards (thesis project), box turtles and timber rattlesnakes.

All three participants are associated with the University of Arkansas (two faculty and one graduate student). The University of Arkansas is a Research 1 Institute.