

Title of Project: Adapting a habitat model for timber rattlesnakes (*Crotalus horridus*) to assess the potential distribution of western diamondback rattlesnakes (*C. atrox*) in Arkansas.

Project Summary: We propose to use landscape-level habitat variables with logistic regression and geographic information systems (GIS) to model and map areas of west-central Arkansas potentially containing western diamondback rattlesnake hibernacula habitat. Our approach will attempt to adapt a method that successfully modeled timber rattlesnake basking habitat in Virginia. If successful, such a model will improve our knowledge of western diamondback rattlesnake distribution in Arkansas and our ability to identify and locate areas potentially containing their hibernacula habitat.

Project Leader, Affiliation, & Address:

Dr. Todd M. Fearer, Assistant Professor of Landscape Ecology, AR Forest Resources Center, School of Forest Resources, Univ. of AR – Monticello, P.O. Box 3468, Monticello, AR, 71656
fearer@uamont.edu; 870-460-1348 (phone); 870-460-1092 (fax)

Project Partners:

- Dr. Alexandra Felix, Asst. Professor of Spatial Information Systems & Wildlife, School of Forest Resources, Univ. of AR – Monticello; felix@uamont.edu; 870-460-1748
- Dr. Glenn Manning, Asst. Professor of Biology, School of Mathematical and Natural Sciences, Univ. of AR – Monticello; manning@uamont.edu; 870-460-1166
- Bill Holimon, Chief of Research, Arkansas Natural Heritage Division; billh@arkansasheritage.org; 501-324-9761

Total Project Cost: \$42,892

Total SWG Money Requested: \$21,157

Amount & Source of Matching Funds: \$21,735 from the School of Forest Resources, University of Arkansas – Monticello

Funding Priority and Species of Greatest Conservation Need

The funding priority this proposal addresses is improving the distribution and abundance data for western diamondback rattlesnakes (*Crotalus atrox*) in Arkansas. This project may also benefit conservation of the eastern collared lizard (*Crotaphytus collaris*). Improving distribution and abundance data for this lizard is also a funding priority in Arkansas. This lizard shares some habitat preferences with western diamondback rattlesnake hibernacula habitat (rocky outcroppings within forest stands, bare rocks and talus slopes) and their projected ranges overlap in portions of the Ouachita Mountains. We will document any sightings of eastern collared lizards while conducting this project to improve distributional records through this portion of their range.

Study Location

Because the distribution of western diamondback rattlesnakes in Arkansas is likely limited to the Ouachita Mountains in the west-central portion of the state, the study region for this project will be limited to seven ecoregions that contain the majority of the Ouachita Mountain range, with emphasis on the Ouachita and Ozark National Forest lands (Fig. 1).

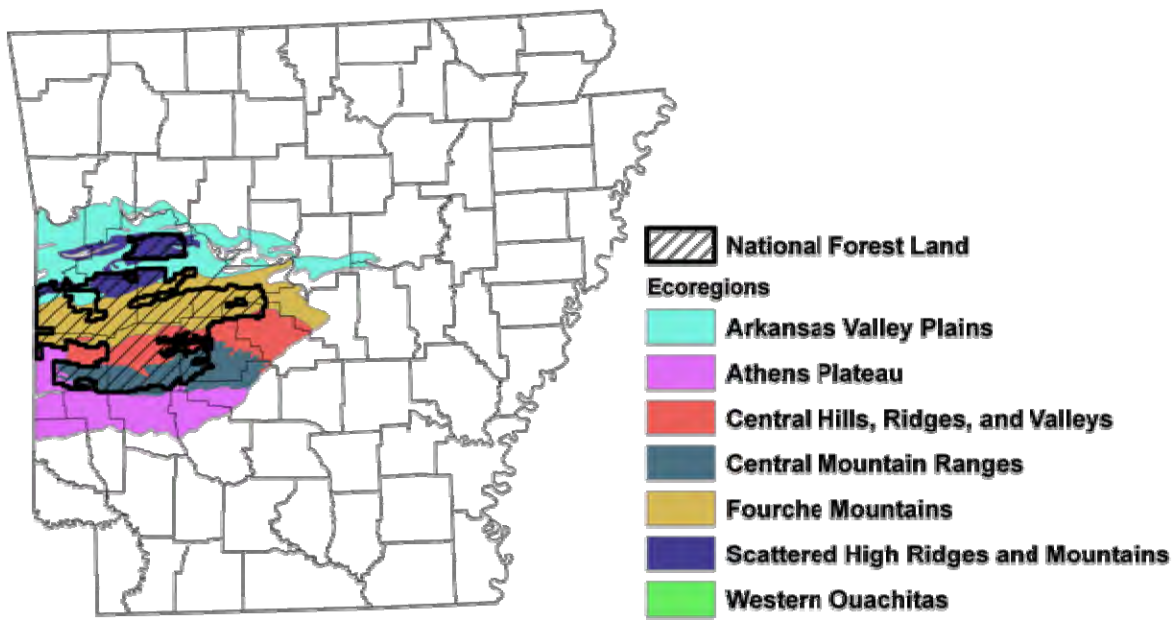


Figure 1: Areas of the Ouachita and Ozark National Forests and corresponding Ecoregions to be included in this study.

Methods

The presence of suitable habitat is one of the most basic requirements for a species' existence in an area. Because little is known regarding the distribution of western diamondback rattlesnakes in Arkansas, their habitat preferences also are poorly understood. However, a habitat that is likely crucial to western diamondbacks in the mountainous regions at more northern and eastern latitudes of their distribution is exposed rocky areas used for hibernacula. To locate areas potentially containing this hibernacula habitat, we propose to adapt a methodology that was successful in developing a predictive landscape-level habitat model for timber rattlesnakes (*C. horridus*) in the Ridge and Valley and Blue Ridge Provinces of the Appalachian Mountains in Virginia (Garst, D.W. 2007. Distribution, habitat analysis, and conservation of the timber rattlesnake in Virginia. M.S. Thesis. Virginia Polytechnic Institute and State University, Blacksburg, VA, USA.) This methodology produced a logistic regression model that included 5 landscape-level habitat variables and geographic information systems (GIS) to map areas of western Virginia potentially containing timber rattlesnake basking habitat. When applied to a dataset of known

basking locations, this model correctly classified 91% of the basking locations. When the model was used to predict basking sites in an area not previously surveyed, 3 of 15 sites (20%) considered as “good” points had timber rattlesnakes present, and 80% of the 15 “good” sites had rock suitable to be used as basking sites. None of the 15 sites classified as “poor” sites had any timber rattlesnakes or rock suitable for basking. We feel this methodology can be adopted to develop a similar model that identifies potential western diamondback hibernacula habitat because the land form, topography, forest types, and management practices of the Ouachita Mountains in Arkansas are similar to those of the Appalachian region of Virginia. Also, many of the characteristics of the hibernacula habitat in this part of the western diamondback’s range can be distinguished at the landscape level using easily acquired remotely sensed data (e.g. slope, aspect, cover type, presence of exposed rocky areas).

We will visit known hibernacula sites and paired random sites during the late summer and fall of 2009 and collect habitat data to identify habitat characteristics distinctive to these areas. It is important to note that many of these habitat characteristics (e.g. aspect, slope, presence of exposed rocks, forest type, basal area) will be consistent across seasons and therefore can be sample during different seasons. Sites identified as hibernacula habitat within the past 5 years that have not been subsequently altered will be considered for this habitat collection. If the number of known sites is extremely limited, we may increase this window to 10 years in an effort to improve sample size. The results of these initial habitat surveys will establish detailed baseline information regarding hibernacula habitat characteristics and facilitate identification of critical habitat components that are easily characterized with remotely sensed data for inclusion as potential habitat variables in the logistic regression model.

During the fall of 2009 and winter of 2010, we will develop a suite of landscape level habitat variables in ArcGIS. Using the locations of known hibernacula sites and a number of random sites, we will build a set of potential models describing hibernacula habitat and choose the best model using Akaike’s Information Criterion (AIC). We will use this selected model to create a map of our study region identifying potential hibernacula habitat. After emergence from hibernation, western diamondbacks remain at their hibernacula area for a few days before dispersing to summer foraging ranges. After dispersing, individuals become very difficult to locate. Because emergence from hibernation seems to occur during March and early April in this part of their range, we will field test the model during March and April of 2010 by visiting a subset of sites located on National Forest or other public land identified as likely hibernacula areas. Given the limited time-span for effective field validation, we will stratify our selection of sites by ecological region to ensure we sample sites across the spatial extent of the snake’s distribution as predicted by the model in an effort to best describe the current extent of their range as well as sample a variety of ecoregional conditions. To maximize our likelihood of detecting snakes and thus improving distribution records, sites identified by the model as having the most suitable habitat will be sampled first followed by less suitable sites as time permits. The total number of sites visited will be a function of the total identified by the model, their spatial distribution, and the number of individuals available to conduct surveys. We will classify sites with snakes present as occupied. If a site contains suitable habitat but no rattlesnakes are observed, it will be classified as suitable and resurveyed at later dates when snakes are most likely to be present and observed (fall 2010 and/or March-April 2011). To further increase the number of sites we can visit during the validation period, we will return to occupied and suitable sites in the months after the snakes have dispersed to their summer ranges to collect the habitat data to be used in refining the original model.

Measurable Products

This project will adapt a methodology used to build a timber rattlesnake basking habitat model to develop a similar model for western diamondback hibernacula habitat. If successful, the model will utilize readily available remotely sensed data to produce a landscape-level map predicting locations of hibernacula habitat in Arkansas and facilitate further targeted inventories for improving western diamondback

rattlesnake distribution and abundance data. We will produce a final report describing the full field data collection, model-building methodology, and model assessment for submission to AGFC, USFS, and other relevant agencies. We will develop a distribution map documenting newly identified occupied sites as well as those with suitable habitat but no snakes observed. As additional habitat and presence/absence data are obtained, the model can be further refined and improved and the distribution map can be updated accordingly. We anticipate publishing at least 2 manuscripts in scientific, peer-reviewed journals; one describing the model-building methodology and a second describing the hibernacula habitat characteristics and distribution map for this part of the western diamondback's range. We also will present results of this project at relevant conferences, including but not limited to meetings of the Arkansas Chapter of The Wildlife Society and/or the Arkansas Academy of Sciences. Upon project completion, we are committed to updating the Comprehensive Wildlife Conservation Strategy database with all new rattlesnake distribution and habitat information as well as any ancillary distribution information for the eastern collared lizard we have acquired from this project.

We will seek to develop public knowledge and understanding of this project through several outlets. First, pending approval of the Arkansas Herpetological Society (AHS) webmaster, we will develop a series of webpages for the AHS website (www.herpsofarkansas.com) that describe the project and track its progress. Second, we will compose an article for publication in the Arkansas Wildlife magazine and/or the Arkansas Outdoors newsletter describing the project that discusses the importance for understanding the distribution of western diamondbacks in Arkansas and the role they play in forest ecosystems. Finally, we will invite volunteer participation from the AHS when conducting surveys of potential hibernacula habitat for rattlesnakes and collecting the habitat data for developing and refining the habitat model.

This project will lay the groundwork for improved conservation and management of the western diamondback rattlesnake in Arkansas. Understanding the distribution of the western diamondback rattlesnake in Arkansas will enable biologists to better manage the landscape in a way that promotes the species' survival and long-term persistence. The ability to predict habitat potentially suitable for western diamondback rattlesnake hibernacula would allow areas to be identified and protected against human induced threats. It will also identify areas containing potential but marginal habitat that could be enhanced by management. This project can serve as a stepping stone for future projects studying this species' movement, home range, and habitat use in this portion of their range. Such studies typically require radio telemetry or similar mechanisms for monitoring movement and habitat use. The most opportune time and location for affixing transmitters to a large number of snakes would be in their hibernacula habitat as they emerge from hibernation.

Deliverables Calendar

Task	2009					2010												2011	
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar	Apr
Locate known hibernacula sites	■	■																	
Habitat inventories	■	■	■	■															
Accumulate remotely sensed imagery			■	■	■														
Develop metrics for predictive habitat model					■	■													
Develop predictive model						■	■												
Select sites for model validation							■												
Survey validation sites								■	■						■	■		■	■
Habitat inventories at new hibernacula sites										■	■	■							
Evaluate & refine model										■	■	■	■						
Final Report												■	■	■	■				
Updated distribution map ¹										■							■		■
Manuscripts in peer-reviewed journals												■	■	■	■	■	■		
Presentations ²									■					■					■

Deliverables Calendar, continued

Task	2009					2010												2011	
	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mar	Apr
Develop & update webpages on AHS website																			
Article in Arkansas Wildlife/Arkansas Outdoors																			

¹We will produce updated distribution maps after completing each of the three rounds of surveys at predicted hibernacula sites

²We will likely present results of this project at the 2010 and 2011 meetings of the Arkansas Chapter of The Wildlife Society and the 2010 meeting of the Arkansas Academy of Sciences. The dates provided in this calendar represent the tentative months for those meetings.

Monitoring Project Progress and Performance

Because this project addresses a data gap and components of it are exploratory in nature, progress and performance measures typical of more management or restoration oriented conservation projects will be difficult to apply here. Therefore, the primary means of monitoring the progress of this project will be by strictly adhering to the deadlines established in deliverables calendar above. For that reason, we delineated each major step of the project as a line-item in the calendar to facilitate effective evaluation of our progress and ensure we have the best habitat model developed (given the data) and sites selected for model validation prior to the snakes emergence from hibernation. Use of this calendar also will assist in communicating our progress to the public. A version of this calendar tailored to the general public can be posted on the AHS website, and varying color schemes can be used to represent the initiation and completion of each step.

Once we initiate the model validation process, our goal for model performance is a 90% correct classification rate of suitable hibernacula sites. We feel this is a realistic goal given the performance of the timber rattlesnake model developed using the same methodology and the similarity in timber rattlesnake basking habitat to western diamondback hibernacula habitat. We will evaluate model performance in two ways. First, we will use a standard cross-classification method of applying the model to a dataset of known hibernacula locations and evaluate its classification accuracy of these known sites. Second, we will assess its performance based on the field surveys of the predicted hibernacula sites. We will consider a successful classification to be sites with snakes present or sites containing suitable hibernacula habitat based on comparisons of habitat characteristics for known hibernacula sites. This is another performance measure that can be summarized in a format easily understandable to the general public.

A third performance measure we will establish is to survey at least 50% of the predicted hibernacula sites by April of 2011 during periods when rattlesnakes will be present and easily observed (March-April and October-early November). We note that this goal is highly dependent on the

total number of sites identified by the model, and therefore may need to be adjusted accordingly. The end of the first validation survey period in April 2010 will serve as a performance benchmark for this goal, and we will make adjustments as necessary based on our progress at that time.

Use of Existing Resources and Partnerships

This project will be completed through a partnership between the School of Forest Resources (SFR) and the School of Mathematical and Natural Sciences at the University of Arkansas – Monticello, the Arkansas Natural Heritage Commission (ANHC) and the Arkansas Herpetological Society (AHS). The habitat GIS analysis, model building, and validation will be integrated into an undergraduate research project for a student enrolled in the wildlife program at UAM under the supervision of the PI and Co-PIs. It will make use of existing hibernacula locations available from members of the AHS and through input from ANHC. Any new western diamondback distribution data obtained during this study will be provided to ANHC in a format that is compatible for entry into their heritage database. All resources within the SFR for field research and analysis (e.g. field vehicles, equipment, GPS units, computer hardware and software) will be available for this project.

Qualifications of Individuals and Organizations Conducting Project:

The School of Forest Resources (SFR) at the University of Arkansas – Monticello (UAM) is part of the Arkansas Forest Resource Center and a University Center of Excellence. The SFR maintains a fleet of over 10 4X4 trucks and 2 ATVs available to faculty, staff, and students for field work and travel. The computing resources of the UAM SFR include 2 computing labs that provide access to statistical and geographical analysis software. The SFR maintains a computing network with substantial data storage capacity as well as full internet access necessary for data retrieval. The SFR is also home to the Spatial Analysis Laboratory (SAL), which is involved in research and development in the areas of Geographic Information Systems (GIS), Global Positioning Systems (GPS), and remote sensing.

Dr. Todd M. Fearer: Assistant Professor of Landscape Ecology, School of Forest Resources, University of Arkansas at Monticello, www.afrc.uamont.edu/fearert/

My research interests include wildlife-habitat relationships at the landscape scale, the conservation of oak forest ecosystems, landscape ecology, and GIS. My research to date has focused on integrating data from different sources (e.g. BBS, FIA, NOAA Climate Data) to model wildlife-habitat relationships (with a focus on forest song and game birds). A secondary focus has been modeling spatial patterns of acorn production relative to physiography and climatic factors. My current research is focused on assessing the impacts of natural and anthropogenic disturbance events on forest-bird communities.

Dr. Alexandra Felix: Assistant Professor of Spatial Information Systems, School of Forest Resources, University of Arkansas at Monticello.

I have a Ph.D. in Fisheries and Wildlife, and a forestry and GIS background. My research applies the fundamental principles of spatial science to answer spatial questions such as effects of resource use or landscape changes on wildlife and forests. My research primarily focuses on understanding wildlife-habitat relationships, and modeling spatial and temporal changes in wildlife habitat in response to land-use, succession, or resource management activities. My teaching responsibilities include a freshman-level Introduction to Spatial Information Systems, a junior-level GIS course, and an Advanced GIS II course offered through the School of Forest Resources at UAM.

Dr. Glen Manning: Assistant Professor of Biology, School of Mathematical and Natural Sciences, University of Arkansas at Monticello.

My interests include many aspects of vertebrate zoology, but my emphasis is on herpetology. My Ph.D. research was looking into the distribution and species interactions of a unique genus of lizards in Eastern New Mexico. My work was with the genus *Aspidoscelis* (whiptail lizards) and about 60% of the

species in this genus are parthenogenetic. Parthenogenesis is a rare form of reproduction in which an egg is not reduced via meiosis and an individual lays eggs that are essentially clones. All young produced via this form of reproduction in whiptails are female. During my research I identified cases of hybridization between a "normal" (sexual) and a parthenogenetic species that created a triploid hybrid. Not only do I enjoy the research aspect of herpetology, but I am also an avid herper. I spend many a day or night looking for snakes, salamanders, and other herps.

Bill Holimon: Chief of Research, Arkansas Natural Heritage Program.

I coordinate the research section of our agency, whose mission includes maintaining information on the distribution and status of rare species that live in Arkansas. To accomplish this, the ANHC maintains the Natural Heritage Inventory. This dynamic database tracks the precise location and status of rare species, along with the location and condition of high-quality natural communities throughout the state. As the central repository for statewide locational information on rare species and natural communities, the Natural Heritage Inventory is useful to a wide range of groups. For example, the data is commonly used for identifying ecologically significant lands, for environmental review, and for guiding ecological management activities.

**STATE WILDLIFE GRANT PROGRAM
SUBGRANT PROJECT BUDGET**

1. Budget summary

Complete the project budget summary form below.

Budget Category	State Wildlife Grant Funds (Federal)	Cash Match (Non-Federal)	In-Kind Match (Non-Federal)	Total Project Cost
Salaries	\$7506	\$16466	-	\$23972
Contract Services	-	-	-	-
Supplies and Materials	\$1500	-	-	\$1500
Travel	\$7000	-	-	\$7000
Equipment	\$3500	-	-	\$3500
Indirect Costs	\$1651	\$5269	-	\$6920
TOTAL	\$21157	\$21736	-	\$42892

Budget Justification

The duration of this project will be approximately 1.5 years, beginning August 2009.

Budget Category/Activities	SWG	UAM SFR	Total
Salaries & Benefits			
PI Salary (\$5,274 x 12 months x 10%)		\$6,329	\$6,329
PI Fringe (@ 25.3% of salary)		\$1,601	\$1,601
Co-PI Salary (\$5,208 x 12 months x 5%)		\$3,125	\$3,125
Co-PI Fringe (@ 25.3% of salary)		\$791	\$791
Research Technician (\$2,458 x 12 x 12.5%)		\$3688	\$3688
Research Tech Fringe (@ 25.3% of salary)		\$933	\$933
Hourly, non-student (summer months)	\$3,960		\$3,960
Hourly, non-student fringe (@7.4% of salary)	\$3,240		\$3,240
Hourly, enrolled student	\$293		\$293
Hourly, enrolled student fringe (@0.4% of salary)	\$13		\$13
Operating Expenses			
Field Vehicle (gas)	\$1,320		\$1,320
Per-diem expenses (lodging & meals)	\$5,680		\$5,680
Publication page charges	\$1,000		\$1,000
Office expenses (photocopies, etc.)	\$500		\$500
Capital Expenses			
Field Computer for data collection	\$3,000		\$3,000
Field Equipment	\$500		\$500
Overhead (@ 10% to SWG & 32% to UAM SFR)	\$1,651	\$5,269	\$6,790
TOTAL PROJECT EXPENCES	\$21,157	\$21,735	\$42,892

Salaries and Benefits

- The PI (Dr. Todd Fearer), Co-PI (Dr. Ali Felix), and a UAM research technician will be directly involved with the project and be devoting a portion of their professional time to its completion. Therefore, we are using what we feel is a representative proportion of our salaries and benefits as match.
- Hourly wages: these will support an undergraduate student's work on the project. Because this student will be using this project as an undergraduate research project and contributing to its completion, the PI is seeking full wage and fringe support for this position. We set the hourly rate at \$9.00. We estimated the summer amount at a total of 440 hours (40 hrs/week during the summer of 2010). We estimated the enrolled student amount at 360 hours (10 hrs/week for 2 semesters, fall 09 and spring 2010).

Operating Expenses

- Gas for field vehicles: UAM faculty will be using UAM SFR fleet vehicles for transportation to and from field locations as well as attendance to professional meetings for presenting results of this study. We are requesting funds to cover the estimated fuel costs based on a fuel price of \$2.00/gallon at an estimated average mileage of 15 miles/gallon for our field trucks. This allows for approximately 3300 miles of travel which we feel is sufficient for completing this project.
- Per-diem expenses: We are requesting funds to cover per-diem expenses related to field data collection necessary for completion of this project as well as attendance to professional meetings for presenting results of this study. This estimate is based on current per-diem rates allowed for meals (\$36) and hotels (\$70/night), and provides for approximately 50 consecutive days of overnight travel

and meals. We feel this amount is sufficient for completing this project, especially because not all field visits will require overnight travel.

- Publication page charges: We anticipate submitting manuscripts to peer reviewed journals that may have page charges and are requesting funds to cover a portion of these charges. We estimated these costs using the Journal of Wildlife Management rate per page (\$90 for the first 8 pages, \$150 for every page thereafter) for one 10-page manuscript.
- Office expenses: These include photo copies, printing supplies, flash drives, etc. A variety reports detailing project results we be produced for dissemination to project collaborators and other agencies, and we feel this is an appropriate estimate for the expenses related to producing these reports. Also, this project will involve a fair amount of data management and exchange, and this figure covers those expenses, also.

Capital Expenses

- Field Computer: We are requesting funds for one Juniper Systems Allegro CX Field PC to be used for field data collection. These units are small handheld field-computers designed specifically for collecting field work (waterproof, drop-proof, etc.). There will be a large volume of field data associated with this project. Having the ability to enter those data directly to data forms on field computers eliminates the need for paper datasheets and keying data after returning from the field, significantly reducing data entry errors and improving overall data quality and efficiency of the project. Additionally, these units have GIS/GPS capabilities that may be necessary while conducting the field work. The per unit cost of these computers is approximately \$3000.
- Field equipment: We anticipate needing field equipment specific to this project (e.g. snake chaps, habitat sampling equipment), and we estimate the costs of this equipment will not exceed \$500.

Overhead

- The UAM School of Forest Resources is subject to the 42% overhead rate standard to the University of Arkansas system. Because the overhead rate for SWG proposals is limited to 10%, we are requesting that amount as part of the proposal and using the remaining 32% as matching.

Division of Agriculture
PROPOSAL ROUTING FORM
 Arkansas Agricultural Experiment Station
 Requesting External Funds

Log-in Date: _____
 Proposal # _____

Todd Fearer	10%	Forest Resources	Asst. Professor	(870) 460-1348	(870) 460-1092	fearer@uamont.edu
PI Name	% of effort	Unit	Title	Phone	FAX	e-mail address
Alexandra Felix	5%	Forest Resources	Asst. Professor	(870) 460-1748	(870) 460-1092	felix@uamont.edu
Co-PI Name	% of effort	Unit	Title	Phone	FAX	e-mail address

*Note: % of effort should be the same as that shown on Current & Pending Support Form

PROPOSAL TITLE: Adapting a habitat model for timber rattlesnakes (<i>Crotalus horridus</i>) to assess the potential distribution of western diamondback rattlesnakes (<i>C. atrox</i>) in Arkansas.	
SPONSOR NAME/MAILING ADDRESS: Arkansas Game and Fish Commission, 2 Natural Resources Drive, Little Rock, Arkansas 72205	
PROPOSAL TYPE: <input type="checkbox"/> Pre-Proposal <input checked="" type="checkbox"/> New (Full Proposal) <input type="checkbox"/> Continuation/Supplement Grant #: _____ Cost Center #: _____	PROJECT CATEGORY: F & A (FACILITIES & ADMINISTRATIVE COSTS) <input type="checkbox"/> Research: (Full rate) _____% of MTDC (Modified Total Direct Costs) <input type="checkbox"/> USDA/CSREES _____% of TDC (Total Direct Costs) (20% of Total Project Costs) <input checked="" type="checkbox"/> Other: <u>10.0</u> % Sponsor Guidelines or other justification required NOTE: Minimum Industry Rate: 25% of Total Direct Costs (AES Policy)

PROPOSED BUDGET: Dates: 08/01/2009-08/01/2011		
LINE ITEM	SPONSOR	UA COST-SHARING
SALARIES & WAGES		
PI: Todd Fearer	\$	\$6,328
Co-PI: Alexandra Felix	\$	\$3,125
Research Assoc.:	\$	\$3,688
	\$	\$
GRA(s) No.	\$	\$
Other: Hourly technicians (1)	\$7,200	\$
A. Total Salaries & Wages		\$
Fringe Benefits: (Rates as of 7/1/08)		\$
B. Employee: 25.30%	\$	\$3,325
C. Hourly: 7.40%	\$293	\$
D. Graduate Assistants: 4.00%	\$	\$
E. Students: 0.40%	\$13	\$
F. Materials & Supplies	\$1,000	\$
G. Report Preparation	\$1,000	\$
H. Communications	\$	\$
I. Travel: Domestic	\$7,000	\$
J. Foreign	\$	\$
K. Subcontracts	\$	\$
L. Other Direct Costs	\$	\$
M Modified Total Direct Costs (Total of lines A-L)	\$16,506	\$16,466
N. Tuition	\$	\$
O. Equipment (\$2,500 or more)	\$3,000	\$
P. Participant support	\$	\$
Q. Total Direct Costs (Total of lines M-P)	\$19,506	\$16,466
R. Facilities & Administrative Costs	\$1,651	\$5,269
S. Total Project Costs	\$21,157	\$21,735
Cost Share Funding Source CCN#: _____ Grants Office initials indicates the proposal is complete for AD review		

SPECIAL REVIEW CHECKLIST (Must be completed in full)

The proposal submitted herewith involve(s) the following (ANSWER YES OR NO FOR EACH):

<input type="checkbox"/> Human Subjects __YES X_NO	<input type="checkbox"/> Chemical Carcinogens, Biohazardous Agents, Infectious Agents, or Recombinant DNA Techniques __YES X_NO	<input type="checkbox"/> Restrictions on University/Investigator Publication or Intellectual Property Rights __YES X_NO
<input type="checkbox"/> Animal Use __YES X_NO	<input type="checkbox"/> Medical Surveillance or Biological Monitoring Required __YES X_NO	<input type="checkbox"/> Commitment of University/Investigator Intellectual Property or "Background" Rights __YES X_NO
<input type="checkbox"/> Radioactive Materials __YES X_NO	<input type="checkbox"/> Subcontractors or Subrecipients are proposed __YES X_NO	<input type="checkbox"/> Company Confidential Information will be provided to University __YES X_NO
<input type="checkbox"/> Sponsor is Foreign-Owned Company or Foreign Government __YES X_NO	<input type="checkbox"/> Security Classification will be imposed __YES X_NO	<input type="checkbox"/> Water Related __YES X_NO

INVESTIGATOR(S)/PROJECT DIRECTOR(S) DISCLOSURES AND ASSURANCES

APPROVALS:

By signing below, I certify that I have read the following statements and those contained on the Proposal Routing Form and I further certify that the statements contained therein are accurate and truthful to the best of my knowledge and belief:

*All investigators have read and understood UA's conflict of interest policies and the University's *Disclosure of Financial Interests Related to Sponsored Projects*, have made all financial disclosures required by them, and prior to the expenditures of any award funds, shall have reached an agreement with the University which provides for conditions or restrictions necessary to manage, reduce, or eliminate conflicts of interest under University policy.

*The proposal submitted herewith is (1) complete in its technical content, (2) adheres to the rules of proper scholarship, including specifically the proper attribution and citation for all text and graphics, (3) complies with federal standards for the integrity of research (e.g., NSF Misconduct in Science Policy, see University policy), and (4) is in accordance with specifications established by the sponsoring agency.

*The facilities/space and other Division of Agriculture resources necessary to complete the proposed project are available to the project, or provisions have been arranged with Unit/College to make such space or other Division of Agriculture resources available in the event an award is made.

*If the proposal submitted herewith is funded and accepted by the Division of Agriculture, I will conduct the project in accordance with the terms and conditions of the sponsoring agency and the policies of the Division of Agriculture, and I will be fully responsible for meeting the requirements of the award, including providing the proper stewardship of sponsored funds, submitting all required technical reports and deliverables on a timely basis, and properly disclosing all inventions to the University's Intellectual Property Office, in accordance with Federal, Division of Agriculture, and University policies.

*Each individual signing below is certifying to the best of their knowledge and belief that they have not defaulted on any federal debt nor are they currently prohibited through debarment, suspension, indictment or voluntary exclusion from receiving funds from any federal department or agency (Executive Order 12549). If you are unable to sign this statement please notify the AES Grants Office.

PI <u>[Signature]</u>	Unit <u>SFR</u>	Date <u>4/1/09</u>
Co-PI <u>[Signature]</u>	Unit <u>SFR</u>	Date <u>04/01/09</u>
Co-PI _____	Unit _____	Date _____
Dept. Head <u>[Signature]</u>	Unit <u>SFR</u>	Date <u>4/1/09</u>
Dept. Head _____	Unit _____	Date _____
Associate Director _____	Unit <u>DREX</u>	Date _____

NOTICE: Complete proposals are to be submitted to the AES Grants Office at least five (5) working days prior to Sponsor deadlines. Complete proposals are those for which no further work is required in order to submit (including this signed routing form and any other forms required by any reviewing office on this campus). Proposals needing revision of any kind will again have to meet this 5-day requirement. During times of heavy volume, proposals will be reviewed (and submitted electronically if that is required) on a first-in, first-out basis.

SUBMIT THIS FORM WITH THE PROPOSAL