DISTRIBUTION OF THE EASTERN SMALL-FOOTED BAT IN THE OUACHITA MOUNTAINS OF ARKANSAS

PROJECT SUMMARY:
The use of new sampling techniques that target specific habitats of the Eastern small-footed bat (*Myotis leibii*) have led to higher capture rates and have resulted in a better understanding of the species' distribution in parts of its range. Thus in some areas this species is now known to be much more abundant that once thought. However, these new sampling techniques have not been employed in any systematical way in Arkansas. Currently this species is listed as critically imperiled, but this may not be the case and *M. leibii* may be more widespread and abundant than current distribution data suggest. In fact a recent paper greatly expanded the known distribution of the species in the Ozarks of Arkansas, the Ouachita Mountains also contain suitable habitat and much of this area has not been sampled. We propose to systematically sample suitable habitats of the Ouachita Mountains in Arkansas via mist-netting, searching under rocks and in crevices, and bridge surveys. The results of this study will fill in the distribution data gap on this species in Arkansas, characterize roost sites to direct conservation of glades and talus slope, produce a baseline population estimates of bats in focal talus slopes, and result in data that can be used to produce a predictive model of the species' distribution throughout its range.

Project Leader:
Thomas S. Risch, Ph.D.
Professor & Chair
Department of Biological Sciences
Arkansas State University
P.O. Box 599
State University, AR 72467
vrolland@astate.edu
phone: (870) 972-3333
fax: (870) 972-2638

Project Partner, Co-Principal Investigator:
Virginie Rolland, Ph.D.
Assistant Professor of Quantitative Ecology
Department of Biological Sciences
Arkansas State University
P.O. Box 599
State University, AR 72467
trisch@astate.edu
phone: (870) 972-3194
fax: (870) 972-2638

Total Project Cost = $57,586
Total Arkansas SWG request = $37,471 (65%)
Total Matching Funds* provided = $20,115 (35%)

***these are non-federal dollars supplied by Arkansas State University**

Distribution of the Eastern Small-Footed Bat in the Ouachita Mountains of Arkansas

PROJECT STATEMENT:

Need: Bats are experiencing an overall decline in population due to wind turbines, which are responsible for more than 800,000 bat mortalities per year (Smallwood, 2013). Moreover, introduction of the fungus that causes White-Nose Syndrome (WNS) (*Pseudogymnoascus destructans*) in 2006 has caused mortality rates up to 99% in WNS-positive caves. WNS is responsible for more than 5.7 millions deaths since its introduction (U.S. Fish and Wildlife, 2014b) and has since been officially reported in Arkansas. Local extinctions of once common bat species may occur, and damages to the agricultural industry may reach billions of dollars a year (Frick et al., 2010; Boyles et al., 2011; USFWS 2012). In addition to these catastrophic losses to agriculture are the unknown impacts on human health, as the species of bats in decline are known to prey on mosquitoes, which are vectors of many human diseases (e.g., Rydell et al., 2002). Thus, conserving bats species is currently of paramount importance.

Conservation programs require complete data on the range and distribution for species of interest. The Eastern small-footed bat (*Myotis leibii*) is a species native to the southeastern United States. This is a small bat species that use a variety of roost types including buildings (O'Keefe and LaVoie 2011) and small cracks within cliff faces (Best and Jennings 1997). However, detailed regional information on the presence of this species is often lacking. As a result, the Arkansas Wildlife Action Plan rates this species as a priority score of 34 and indicates that the population trend for the species is unknown. It is given a Grank of G3 indicating that the Eastern small-footed bat is a vulnerable species and S Rank of S1 indicating the species is critically imperiled in Arkansas. The conservation actions required for the species include filling data gaps so that conservation actions can be determined.

Recent studies suggest that this species may be more abundant and less imperiled than previously believed. Importantly, *M. leibii* does not appear to be heavily impacted by WNS (Mooseman et al. 2013). Moreover recent developments in sampling techniques and a better understanding of the species habitat preferences has led to higher captures and the discovery of more populations in New Hampshire (Mooseman et al. 2013), Virginia (Mooseman et al 2015), and Illinois (Confortin and Carter 2017). These studies have identified talus slopes and rock glades as prime habitat for this species and researchers have sampled for the species by searching under rocks as one might when searching for herpetofauna. Moreover traditional netting techniques focused in these habitats and at the base of cliff faces, as well as searches of the expansion joints of highway bridges, have been extremely successful in increasing the known distribution of the species.

Although a recent study in Arkansas (Sasse et al. 2013) expanded the known distribution in the Arkansas Ozarks by complying existing mist-net records and performing a search of expansion joints of highway bridges, a systematic search of the Ouachita Mountain ecoregion has not been performed to date. Without these data, the existing data gaps within the Arkansas Wildlife Plan will remain. However if this species is more abundant and widely distributed in Arkansas than previously believed, it can be considered for removal from the Arkansas Wildlife Plan, which would allow resources to be focused on other species that may be more at risk than the Eastern small-footed bat.

Purpose and Objectives: The purpose of this project is to systematically sample the entire

Ouachita Mountain ecoregion for Eastern small-footed bats to 1) fill in the distribution data gap on distribution on this species, 2) characterize roost sites to inform management of glades and talus slopes, 3) establish baseline population estimates of roosting bats in focal talus slopes, and 4) produce data that can be used to produce a predictive model of the species' distribution throughout its range.

What is the location of your work? The proposed study area is the Ouachita Mountains of Arkansas (Fig 1). Arkansas has 14 counties that lie partly or totally within this ecoregion. There are abundant areas of state and federal public lands within this region including the Ouachita National Forest. We have used Google Earth to search these public lands to identify suitable habitat in state and public lands and have identified 30 unique araes of suitable habitat within the region (list avaible open request (following Mooseman et al. 2015).

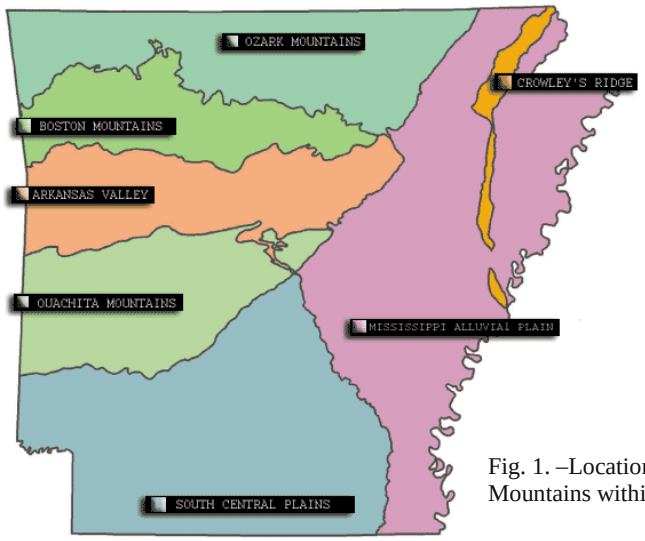

Fig. 1. –Location of the Ouachita Mountains within Arkansas

Approach: We will systematically sample all public lands within the 14 counties of the Ouachita Mountain via mist-netting, bridge searches, crevice searches and 'rock flipping'. We will mist-net ≥ 50 nights during the summers of both 2018 and 2019 for a total of 100 sampling nights. Each night will consist of setting up and opening ≥ 3 nets for ≥ 5 hours. Each area will be sampled for 3 nights or until a *M. leibii* is captured. Areas netted for ≥ 3 nights that do not produce a *M. leibii* capture (in conjunction with no bats found by rock flipping – see below) will be coded as not containing the species. Standard data will be taken on all captured bats. All cave-species, including *M. leibii*, will receive an Arkansas band.

To search glades and talus slopes, we will search under rocks and record data following Confortin and Carter (2017). Areas will be coded as having the presence of the bat or not. During one month of each summer, ≥ 3 people will be involved in rock searches, which will allow sampling under larger, heavier rocks. During these periods, roost data will be collected. Each rock that is discovered with bats under it will be measured to estimate volume ($l * h * w$). Other data will include: nearest rock, percent vegetation in 5-m circumference around rock, percent dry area under rock, and percent debris under rock. Each roost site will be paired to a rock selected at random and these data will also be compared to this random location. We will use an information-theoretic approach to determine the model that best describes roost characteristics.

In addition during these periods of intensive rock sampling, we will select 4 focal talus slopes to estimate the number of bats per talus slope. We will follow the techniques of Mooseman et al. (2015) and randomly select 10-15 circular 78.5-m^2 quadrats and thoroughly search all rocks and crevices for bats. These data will then be used to estimate populations of each of the 4 focal areas and provide baseline data to monitor these populations in the future.

Finally, all presence/absence data will be loaded into a GIS database to characterize areas (slope, elevation, aspect, etc.), which will allow modeling of the range-wide distribution in the future.

Students and technicians will camp during most of the research and we have received several open invitations from friends and colleagues in the region for free housing, which will help contain the cost of this research.

Proposed start date: December 1, 2017 Completion date: November 30, 2019
References: References cited in this proposal can be provided upon request.

Budget:

	Budget Justification	**SWG Year 1**	**Match Year 1**	**SWG Year 2**	**Match Year 2**	**SWG Total**	**Match Total**
PERSONNEL							
Virginie Rolland (Co-PI)	0.25 month summer salary, each year	$1,645		$1,645		$3,290	
Technicians	$1,300/month, 2 months each year	$2,600		$2,600		$5,200	
Graduate Student	$1,500/month, 3 months each year	$4,500		$4,500		$9,000	
Tom Risch (PI)	33% of one month salary		$3,064		$3,064		$5,386
FRINGE BENEFITS							
Virginie Rolland (PI)	17.84% of salary base	$293		$293		$587	
Technician	7.84% of salary base	$204		$204		$408	
Graduate Student	0% of salary					$0	
Tom Risch (PI)	29.75% of salary base		$912		$912		$1,823
SUBTOTAL PERSONNEL & FRINGE		**$9,242**	**$3,976**	**$9,242**	**$3,976**	**$18,485**	**$7,209**
SUPPLIES	Nets, GPS units, Misc	**$2,000**		**$1,500**		**$3,500**	
TRAVEL							
Field Travel	12,000 total miles @ $0.42/mile per year	$5,040		$5,040		$10,080	
Meeting Travel	Dissemination of results	$1,000		$1,000		$2,000	
TRAVEL SUBTOTAL		**$6,040**		**$6,040**		**$12,080**	
TOTAL DIRECT COSTS		**$17,282**	**$3,976**	**$16,782**	**$3,976**	**$34,065**	**$7,209**
INDIRECT COSTS (10%)		**$1,728**		**$1,678**		**$3,406**	
	Waived Indirect costs (29.73% [ASU rate is 39.73%])		**$5,138**		**$4,989**		**$10,127**
	39.73% of matched salary and fringe waived		**$1,580**		**$1,580**		**$2,778**
Totals		**$19,011**	**$10,694**	**$18,461**	**$10,545**	**$37,471**	**$20,115**

Qualifications of the individual(s) and organizations(s) involved

Arkansas State University (A-State) is providing lab space, equipment, and assistance to this project within the College of Science and Mathematics. Dr. Risch's lab has studied Arkansas bats for over 14 years.

Dr. Thomas Risch is bat expert with a Ph.D. from Auburn University. He is a Professor of Animal Ecology, Curator of Mammals, and Chair of the Department of Biological Sciences at AState. Risch's strength is in field ecology with over 14 years' experience studying bats in the Eastern United States. He has served on the Board of Directors of the Southeastern Bat Diversity and was on this group's White-Nose Syndrome committee. Currently he is President of the Arkansas Chapter of the Wildlife Society. He, along with students, has published 19 peer-reviewed papers on bats. He is a co-author of the recent paper that extended the range of the species in Arkansas: New Records of the Eastern Small-footed Bat (*Myotis leibii*) in Arkansas. He will provide expertise and materials and assistance from the field ecology lab at A-State and serve as advisor to the Graduate Student

Dr. Virginie Rolland has a Ph.D. in Population Ecology from University Pierre et Marie Curie (Paris, France). She is an Assistant Professor of Quantitative Wildlife Ecology. Rolland's strength is in quantitative analyses of wildlife data. She has started studying bat roosting and foraging ecology four years ago, supervising three graduate students (two who already graduated and one whose research on CORA and MYAU summer roosting ecology in the Cache River NWR is SWG-funded). She has 12 years of experience manipulating and analyzing datasets from various taxa (birds, bats, small mammals, turtles), resulting in 15 publications and 30+ presentations at local to international conferences. She has mentored another 2 MS and 1 PhD students. She has also served on the graduate committee of 23 students and advised with statistically analyses.

Kyle Edmonds – Graduate Student

Kyle is a former Marine and veteran of the war in Afghanistan where he received extensive training in GIS and map/image interpretation. He has a BS degree from Arkansas State University that focused on Wildlife, Biology, and Criminology. He has over 5 years' experience working with bats of Arkansas and is listed as a sub-permittee on Dr. Risch's federal endangered bat permit.