

# NSRL NEWS

Natural Science Research Laboratory  
Museum of Texas Tech University

Volume 9, Fall 2019 and Spring 2020 (double issue)



## ***Research Highlight:* Museum Collections Enable Research on Rare Mammals**

### **Determining the Status of *Sigmodon fulviventer* in Texas**

Just about anywhere in Texas, if you know where to look, you can find cotton rats. The Hispid Cotton Rat (*Sigmodon hispidus*) constructs networks of runways in the grass and shrubland habitats throughout the state. In contrast, the Yellow-nosed Cotton Rat (*Sigmodon ochrognathus*) inhabits rocky slopes and pockets of grassland on hills and mountains throughout the Trans-Pecos region. Finally, a third species of cotton rat (Tawny-bellied Cotton Rat, *Sigmodon fulviventer*) was discovered in 1991 by Dr. Fred Stangl of Midwestern State University. This relatively new addition to the mammals of Texas was found to occur from an area 15 miles west of Fort Davis along State Highway 166. In 1992, Stangl described this population as a unique subspecies, *S. f. dalquesti*.

Most of the range of *Sigmodon fulviventer* stretches in a broad line on the eastern slope of the Sierra Madre Occidental, beginning in central Mexico in Michoacán and stretching north to southeastern Arizona and central New Mexico. The species was not known to be present in Texas before being found at Fort Davis, and the extent of its range in Texas is not known. With no other reports of the tawny-bellied cotton rat in Texas before or since 1991, it is not even clear whether the population represents: 1) an established population, 2) a locally extinct remnant population, 3) an inadvertent in-

roduction by human activity, or 4) a recent expansion from other parts of the species' distribution.

Because so little is known about this species in Texas, it is difficult to determine if the species warrants monitoring or any type of conservation action. In its conservation action plan, the Texas Parks and Wildlife Department lists the Chihuahuan Desert grassland habitat in the Trans-Pecos region as an area of conservation priority, and the tawny-bellied cotton rat as a species of greatest concern in that region. The primary challenge facing managers regarding the species in Texas is a lack of information. To help better inform decisions that might impact this species, Preston McDonald is conducting his thesis research in the laboratory of Dr. Caleb Phillips (faculty member in the Department of Biological Sciences and Curator of the Robert J. Baker Genetic Resources Collec-



*Representative habitat of Sigmodon fulviventer near Fort Davis, Texas.*



*Phillips lab members Rachael Wiedmeyer, Megan Rowe, Oscar Sandate, and Preston McDonald during field work near Fort Davis, Texas.*

tion) through a TPWD-funded study. Preston hopes to clarify the validity of this subspecies, its status in Texas (extinct or extant), and the extent of the species' range. Preston plans on using morphometric and genetic techniques to assess the distinctiveness and origin of the Fort Davis population.

The project began in the spring of 2018 with an examination of the 20 voucher specimens of tawny-bellied cotton rats collected by Dr. Stangl from near Fort Davis, Texas. As in the Stangl study, measurements and examinations of the skulls of museum-preserved cotton rats has been an important component of the project. Determining if a population of animals should be considered a unique subspecies or species often depends in part on finding physical characteristics that can be used to distinguish them. In addition, *Sigmodon fulviventer* voucher specimens held in the collections of Midwestern State University, the NSRL, the Smithsonian Institute's National Museum of Natural History, the Museum of Vertebrate Zoology, and the Museum of Southwestern Biology all have been important resources for this study, and Preston has visited these museums over the last two years to examine their specimens. Together, measurements of more than 130 skulls of tawny-bellied cotton rats representing three subspecies from across the range of the species have provided a picture of some of the physical variation that exists in this species.

Specimens don't just provide physical information about animals. Preston also has been able to use samples of skin, toes, and frozen tissues to extract DNA. By analyzing the sequences of mitochondrial DNA extracted from these samples, Preston has created phylogenetic trees showing how groups of tawny-bellied cotton rats are related to each other. Just as physical characteristics give clues about the distinctiveness of animal populations, genetic analysis also provides important information. From a cotton rat's perspective, physical differences that are difficult for human researchers to notice may be important.

Along with the specimens themselves, the location information recorded for each specimen has allowed Preston to



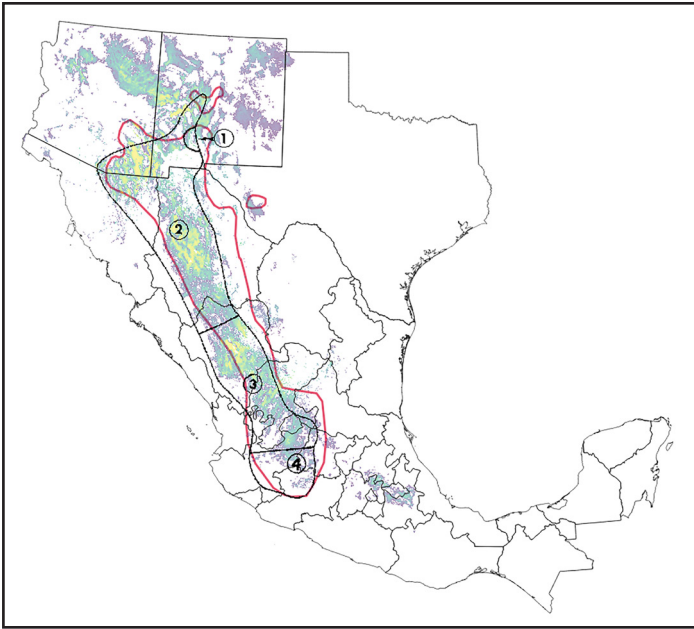
Left to right: Voucher specimens of *S. arizonae*, *S. hispidus*, *S. ochrognathus*, *S. f. dalquesti*, and *S. f. fulviventer* in the Mammal Collection of the NSRL.



Views of the skull of the type specimen for *S. f. dalquesti*, archived in the NSRL's holotype collection.

help build a predictive distribution for the areas tawny-bellied cotton rats might inhabit. Collaborations between museum research collections to ascertain location and other data digitally has resulted in the development of online resources like the Global Biodiversity Information Facility (GBIF). Having access to thousands of records showing us when and where researchers and collectors found different species provides the ability to create models of habitat preferences. This in turn allows predictions about where they might be found.

To determine if the tawny-bellied cotton rat still occurs in Texas, Preston and his colleagues have conducted field surveys in Jeff Davis County hoping to capture the species. They used Sherman live-traps set along transects in the grassland habitats where the rats are expected to occur.



Composite map of predicted distributions for *Sigmodon fulviventer*. The area enclosed with the black border represents Rollin H. Baker's 1969 distribution map of subspecies ranges: (1) *S. f. fulviventer*, (2) *S. f. goldmani*, (3) *S. f. melanotis*, and (4) *S. f. minimus*. The area enclosed with the red border represents the International Union for the Conservation of Nature's published distribution for *S. fulviventer*. The colored areas of the map illustrate the predicted distribution of *Sigmodon fulviventer* as determined by this study.

So far, the tawny-bellied cotton rat has not been captured, although many other species of small mammals have been collected. Although the failure to find a tawny-bellied cotton rat is disappointing, Preston's efforts still provide information. Previous research on cotton rats has found that hispid and tawny-bellied cotton rats tend to compete for habitat space in grasslands in Mexico. Cotton rat populations also are affected by rainfall. With frequent drought conditions affecting much of Texas over the last two years, including the Trans-Pecos, it is possible any tawny-bellied cotton rat populations are depressed and also may be affected by competition from hispid cotton rats. Many areas of the Trans-Pecos have not been surveyed or have only been surveyed lightly. Range extensions for this species are still being published in lightly surveyed areas of New Mexico, so it is plausible that tawny-bellied cotton rat populations are passing undetected in poorly surveyed areas.

Preston's experiences on this project not only have built upon Stangl's earlier work, but they have highlighted the importance of museum research collections. Without the voucher specimen collections archived at the NSRL and other museums, this project would never have been possible. Many other research projects depend greatly on museum specimen collections, and on databases of occurrence records derived from museum collections. Obviously, museums play a vital role in aiding our understanding of biodiversity.

## NSRL CURATORIAL AND SUPPORT STAFF



**Heath Garner** is the NSRL Curator of Collections. His role is to facilitate the daily operations and maintenance of the NSRL collections. His duties include specimen processing, cataloging, and tracking, loan processing, student worker and volunteer training and supervision, documentation, and collections preventative conservation.

[heath.garner@ttu.edu](mailto:heath.garner@ttu.edu)



**Kathy MacDonald** is the Collections Manager for the Genetic Resources Collection. Her primary duties include the organization and processing of incoming samples and the subsampling and processing of loans. Other duties include assisting with specimen tracking in the collections and data management and design.

[kathy.macdonald@ttu.edu](mailto:kathy.macdonald@ttu.edu)



**Lisa Bradley** is the Production Editor for Occasional Papers and Special Publications. Her duties include coordinating the review and revision process, copy editing, and final layout and design. She also assists in the writing and editing of scientific articles published by NSRL staff, preparation of grant proposals, development of NSRL exhibits for the Museum, and maintenance of the NSRL website.

[lisa.bradley@ttu.edu](mailto:lisa.bradley@ttu.edu)



**Jennifer Girón, Ph.D.**, is Acting Collections Manager in the Invertebrate Zoology Collection. She handles loan and data requests, organizes and processes incoming specimen donations, and manages the specimen database hosted in SCAN (<https://scan-bugs.org/portal/collections/misc/collprofiles.php?collid=7>). She also works with student volunteers and does research on beetle biodiversity.

[jennifer.giron@ttu.edu](mailto:jennifer.giron@ttu.edu)

## NSRL FACULTY CURATORS



**Dr. Robert D. Bradley** is Director of the NSRL, Curator of Mammals, and Professor of Biological Sciences. Dr. Bradley's research foci are systematics and molecular evolution of New World rodents; hybridization; infectious zoonotic diseases; and natural history of mammals. He has been a faculty member since 1994. He currently is advising 6 PhD, 1 MA, and 7 undergraduate students. He has graduated 20 MS, 2 MA, and 11 PhD students, and he has published 1 book and 190 peer-reviewed articles, all pertaining to mammals.

[robert.bradley@ttu.edu](mailto:robert.bradley@ttu.edu)



**Dr. Nancy McIntyre** is the NSRL Curator of Birds and a Professor of Biological Sciences. She is a landscape ecologist whose research focuses on how land conversion and climate change are fragmenting migratory habitats for wildlife in the Great Plains of North America. Dr. McIntyre has served as Curator of Birds since 2006. She currently is advising 2 MS and 1 PhD students.

[nancy.mcintyre@ttu.edu](mailto:nancy.mcintyre@ttu.edu)



**Dr. Caleb D. Phillips** is the Curator of Genetic Resources of the NSRL and an Assistant Professor of Biological Sciences. The Phillips' lab studies how gene expression and microbiome communities evolve in support of mammalian life histories; bioinformatics; and the evolutionary/developmental process of mammalian divergence. He currently is advising 3 PhD and 3 MS students.

[caleb.phillips@ttu.edu](mailto:caleb.phillips@ttu.edu)



**Dr. Richard Stevens** was appointed as Assistant Curator of Mammals in 2018 and is a Professor of Natural Resources Management. He is a bat and rodent community ecologist, macroecologist, and biogeographer. His lab conducts collections-based ecological work in Paraguay, Colombia, Mojave Desert, and Texas. He currently is advising 10 PhD, 2 MS, and 5 undergraduate students.

[richard.stevens@ttu.edu](mailto:richard.stevens@ttu.edu)

# NSRL COLLECTIONS - SUMMARY AND STATISTICS

The Natural Science Research Laboratory (NSRL) is a division of the Museum of Texas Tech University that archives biological samples and their associated data. These collections serve as a library of our natural heritage for education and research purposes. Natural history collections provide the foundation for our understanding of biodiversity. They serve as a historical reference for documenting changes in our environment and the effects of those changes on wildlife and, ultimately, on humans.

The collections maintained by the NSRL are available to researchers at academic, scientific, and government institutions around the world for scientific investigation, discovery, and problem-solving in the natural sciences. The causes and/or effects of animal-borne diseases, environmental pollutants, parasites, climate change, habitat loss, geographic isolation, and natural evolutionary processes and speciation are just a few examples of the investigations that can be conducted utilizing specimens and tissues archived in a natural history collection. Further, the resources of the NSRL are utilized by the academic and scientific communities to train and educate students at the undergraduate and graduate levels for careers in the natural sciences as well as museum science.

## Mammal Collection



The Mammal Collection currently contains 150,297 cataloged specimens of an estimated 1,441 species. Specimen preparation types include preserved skins, skeletal materials, alcohol-preserved specimens, and taxidermy mounts. In 2019, the Mammal Collection cataloged 5,310 specimens and granted 17 loans totaling 268 specimens.

## Bird Collection



The Bird Collection currently contains 5,532 cataloged bird specimens, as well as eggs and nests, of approximately 890 species. In 2019, the Bird Collection cataloged 2 new specimens and granted 6 loans totaling 121 specimens.

## Invertebrate Zoology Collection



The Invertebrate Zoology Collection contains an estimated 4.5 million specimens. These include insects, crustacea, endo- and ecto-parasites, and arachnids. Specimen preservation methods include dried, fluid (ethanol or formalin), slide-mounted, and frozen. In 2019, the collection granted 2 loans totaling 183 specimens.

## Genetic Resources Collection



The Genetic Resources Collection contains >414,000 samples of tissues, blood, and extracted DNA from >100,000 specimens of mammals and other taxa. In 2019, the GRC granted 53 loans totaling 1,200 samples. The Collection incorporated 11,218 new samples obtained from 3,133 individuals.

As a whole, the NSRL hosted 194 visitors and volunteers in 2019, including researchers utilizing the collections, students taking classes, individuals and groups on tours, and volunteers assisting in the collections. The NSRL also filled 118 data requests by researchers. Seventeen students (6 graduate, 8 undergraduate, and 2 high school) were employed by the NSRL during 2019.

## NSRL Celebrates Several Achievements

On 22 October 2019, the NSRL hosted an event to celebrate four recent achievements of the NSRL. First, the Genetic Resources Collection was renamed in honor of Dr. Robert J. Baker. Second, a volume of scientific papers, essays, and encomia was published in memory of Dr. Baker. Third, the NSRL catalogued its 150,000th mammal specimen. And fourth, the Genetic Resources Collection of the NSRL received the first accreditation of such a collection by the American Society of Mammalogists.

Dr. Baker was a key figure in the establishment, growth, and development of the NSRL and the GRC. By request of the current Director of the NSRL, Dr. Robert Bradley, and with the support of Dr. John Zak, Chair of Biological Sciences, Dr. Gary Morgan, former Executive Director of the Museum, Dr. Jill Hoffman, Acting Executive Director of the Museum, and Dr. Michael Galyean, Provost, the Texas Tech University Board of Regents officially approved the renaming of the GRC as the Robert J. Baker Genetic Resources Collection at its Board meeting on 12 August 2019. This recognition is in honor of Dr. Baker for his establishment of the GRC and his enthusiastic support and development of the collection through field work, grants, publications, student research, and personal financial support.

Also in recognition of Dr. Baker's contributions to mammalogy, research, education, and Texas Tech University, a memorial volume was developed and published as volume #71 of the Special Publications of the Museum. The resulting work, entitled *From Field to Laboratory: A Memorial Volume in Honor of Robert J. Baker*, contains more than 900 pages, 43 peer-reviewed scientific manuscripts and essays, and 54 encomia contributed by Dr. Baker's former students, colleagues, and friends. The variety of topics in the volume reflects Baker's diverse interests and contributions to science and education. The volume was edited by Robert D. Bradley, Hugh H. Genoways, David J. Schmidly, and Lisa C. Bradley. The editors wish to thank everyone who made this project possible, including 121 authors, 77 reviewers, 63 donors, and more. This collaborative effort was completed in less than 18 months and was truly a labor of love for everyone involved.

Also at the October event, the Mammal Collection of the NSRL celebrated the cataloging of its 150,000th voucher specimen, a Spotted Bat (*Euderma maculatum*) collected, prepared, and deposited by Dr. Richard Stevens and his students. Dr. Stevens and his field crew captured this magnificent specimen during field work near Cloudcroft, New Mexico. Kudos to these field biologists for providing us with a charismatic and memorable 150,000th specimen!

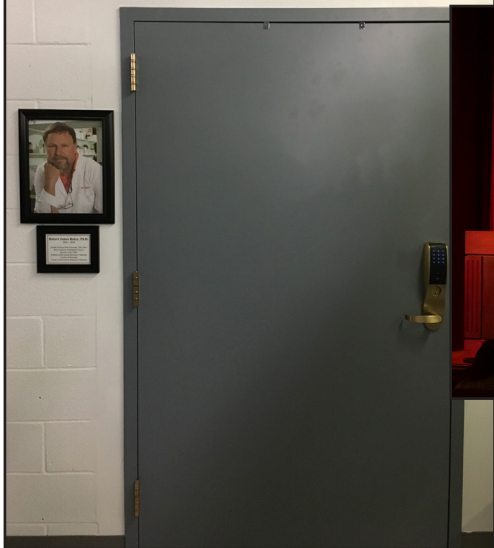
Finally, the Robert J. Baker Genetic Resources Collection received national recognition (officially on 15 December) as it became the first genetic resources collection to be accredited by the American Society of Mammalogists. Accreditation, in this case, means the RJB GRC meets or exceeds a series of criteria relative to systematic collection standards for such collections.

The NSRL played an additional role in this accreditation process as its staff developed the guidelines that set the stage for the professional accreditation process. In 2018, Director Robert Bradley asked Curator Caleb Phillips and staff members of the NSRL (Kathy MacDonald, GRC Collections Manager; Heath Garner, NSRL Curator of Collections; and Lisa Bradley, Research Associate and Production Editor for Publications) to draft a document that would serve as professional standards for the care, maintenance, and use of genetic resource collections (specifically for mammals). Following the initial draft, Curators at the Museum of Southwestern Biology of the University of New Mexico, Angelo State University, Royal Ontario Museum, and Field Museum of Natural History were invited to collaborate and coauthor the final document. The resulting document was presented to the Systematics Collections Committee for review and input. Finally, the guidelines were approved by the Board (or the membership?) at the annual meeting of the American Society of Mammalogists in June 2019. The guidelines were published in the October 2019 issue of the *Journal of Mammalogy* (Phillips et al. 2019. Curatorial guidelines and standards of the American Society of Mammalogists for collections of genetic resources. *Journal of Mammalogy* 100(5):1690-1694. <https://doi.org/10.1093/jmammal/gyz111>).

The October event was attended by more than 50 invited guests, as well as staff and Museum personnel, who enjoyed a brief presentation by Dr. Bradley about the NSRL and remarks from Dr. Hugh Genoways about the development of the Baker memorial volume, followed by a tour of the NSRL facilities and a viewing of the 150,000th voucher specimen. The celebration then moved to the NSRL atrium, where guest speakers, including TTU President Lawrence Schovanec and Dr. Laura Baker, wife of the late Dr. Baker, made a few remarks. Finally, the event concluded with a cake-cutting and refreshments, and signing of copies of the Baker volume by the editors and several authors.

The faculty and staff of the NSRL appreciate the many supporters that attended this event, and we look forward to celebrating many more achievements and milestones of the NSRL in the future.

**ROBERT J. BAKER  
GENETIC RESOURCES COLLECTION**



**FUTURE PLANS - We Want to be THE PLACE for Wildlife-Related Research**

- A) Agreement with TPWD to partner in archiving biological specimens
- B) Expanded Research Role - double/triple research facility and faculty!!!
- C) \$20-25 Million Endowment to fully fund entire operation

TK 203708

SPECIES *Euderma maculatum*

Country USA State TX County Chico

Specific Locality Lovell National Forest, Wright Spring

UTM or Lat/Long 32.766423 N -105.143754 W

Elevation \_\_\_\_\_ Collector R.D. Stevens (Locally name as TK) \_\_\_\_\_

Preparator R.D. Stevens No. \_\_\_\_\_ Pres. Date \_\_\_\_\_

VOUCHER:  Skin  Skull  Post-cranial Skeleton

Alcoholic  Other \_\_\_\_\_

Measurements 12 \_\_\_\_\_ 46 \_\_\_\_\_ 13 \_\_\_\_\_ 41 \_\_\_\_\_ 16 \_\_\_\_\_ 16 \_\_\_\_\_

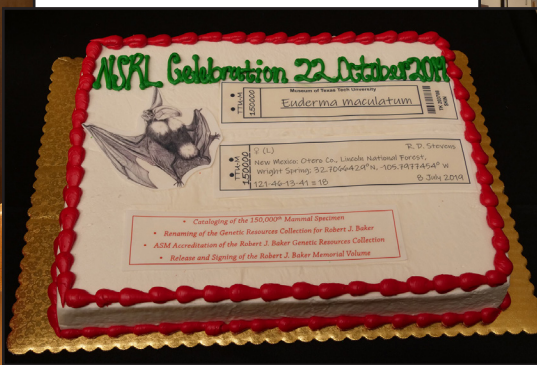
Male  Female \_\_\_\_\_ Reproductive Condition Lact

TISSUES: (indicate # of tissue tubes taken; fill in tissue type for Other, Ethanol, or Lysis)

<input type="checkbox"/>	Heart/Kidney	<input type="checkbox"/>	Brain	<input type="checkbox"/>	Submandibular Gland
<input type="checkbox"/>	L. Heart	<input type="checkbox"/>	Gonad	<input type="checkbox"/>	Entire Specimen
<input type="checkbox"/>	L. Liver	<input type="checkbox"/>	Karyotype	<input type="checkbox"/>	Other _____
<input type="checkbox"/>	L. Muscle	<input type="checkbox"/>	Colon	<input type="checkbox"/>	Ethanol ( _____ %)
<input type="checkbox"/>	L. Spleen	<input type="checkbox"/>	Urine	<input type="checkbox"/>	Lysis Buffer _____
<input type="checkbox"/>	L. Lung	<input type="checkbox"/>	Saliva	<input type="checkbox"/>	Lysis Buffer _____

No tissues taken \_\_\_\_\_

Per death: \_\_\_\_\_



The Systematic Collections Committee  
of the  
**American Society of Mammalogists**  
having reviewed the genetic resources collection  
at the  
**Natural Science Research Laboratory,  
Museum of Texas Tech University**

**HEREBY ACKNOWLEDGES** that this collection meets the curatorial standards for systematic collections as established by the Society, and accordingly issues this

**Certificate of Accreditation**

*Douglas A. Kell*  
Douglas A. Kell, President  
American Society of Mammalogists

*Jonathan L. Dunning*  
Jonathan L. Dunning, Chair  
Systematic Collections Committee

15 December 2019  
Date



From Field to Laboratory: A Memorial Volume in honor of Robert J. Baker

**SPECIAL PUBLICATIONS**  
From Field to Laboratory: A Memorial Volume in Honor of Robert J. Baker

- In True Bakerian Fashion:
- 43 original manuscripts
- 54 ecomedia
- 121 authors
- 77 reviewers - at least 2 per manuscript
- 920+ pages
- 8.2 lb (3.3 kg)
- ~500,000 words
- ~17 trees and 993 gazillion electrons

"Anything worth doing is worth overdoing"



## FACULTY AND STAFF GRANTS (active 2019)

**Bradley, R.D.** “Natural History: Development of a liquid nitrogen system for the Genetic Resources Collection, Natural Science Research Laboratory, Museum of Texas Tech University.” NSF (Collections in Support of Biological Research).

Farmer, M., **T. Kingston**, R. Verble, S. Fritts. “Sustainable development of a tropical agroforestry program in the rural Borneo Highlands.” NSF-IRES.

Griffis-Kyle, K., and **N. McIntyre**. “Great Plains CESU – Connectivity analysis of border roads to protect sensitive natural resources.” Department of Interior – National Park Service.

Kahl, S., R.D. Cox, C. Portillo-Quintero, G. Perry, and **N. McIntyre**. “Landscape assessment of west and south Texas grasslands to inform conservation of two native reptile species of concern in Texas.” Texas Comptroller of Public Accounts.

**Kingston, T., and C.D. Phillips**. “Community processes structuring assembly and disassembly of bat gut-microbial communities across a gradient of habitat degradation.” NSF.

**McGuire, L.P.**, J.G. Boyles, and W.F. Frick. “Manipulating microclimates to reduce disease severity from white-nose syndrome”. National Fish and Wildlife Foundation.

**McIntyre, N.E.**, and K. Hayhoe. “Collaborative proposal: Climatic and anthropogenic forcing of wetland landscape connectivity in the Great Plains.” NSF-Macrosystems Biology.

Morgan, G., E. Johnson, J. Hoffman, and **R.D. Bradley**. “Biodiversity of the Llano Estacado.” The Helen Jones Foundation.

Olson, S.H., **L.P. McGuire**, R.K. Plowright, D.T.S. Hayman, B.G. Dickson, and C.L. Lausen. “Assessing white-nose syndrome in the context of non-stationary conditions in an advancing continental epidemic.” Department of Defense-Strategic Environmental Research and Development Program.

**Phillips, C.D.** “Status, distribution, morphology and genetics of *Sigmodon fulviventer dalquesti* in the Chihuahuan Desert Ecoregion.” Texas Parks and Wildlife Department.

**Phillips, C.D.** “Genetic species identification of *Cicurina* sp.” Zara Environmental LLC.

Plowright, R.K., O. Restif, **L.P. McGuire**, N. Bharti, E. Shanahan, P. Eby, M. Taylor, H. McCallum, and A. Peel.

“Dynamics of zoonotic systems: Human-bat-pathogen interactions.” National Science Foundation, Dynamics of Coupled Natural and Human Systems.

Plowright, R.K. and 24 co-PIs including **L.P. McGuire**. “Preventing emergence and spillover of bat pathogens in high-risk global hotspots”. Defense Advanced Research Projects Agency (DARPA), Biological Technologies Office.

**Ray, D.** RoL: FELS: EAGER: “Genomics of exceptions to scaling of longevity to body size.” NSF.

**Ray, D., R.D. Stevens, and R.D. Bradley**. “Population and conservation status of Texas pocket gophers (*Geomys* and *Thomomys*) in Texas with a focus on the subspecific status of *Thomomys bottae* via populations genomic tools.” Texas Parks and Wildlife Department.

**Ray, D.A. and R.D. Stevens**. “Comparing genetic diversity of the threatened northern long-eared bat across their range using whole-genome and RADSeq approaches.” U.S. Forest Service.

**Salazar-Bravo, J.** and L.T. Figueiredo. Experimental infection of Neotropical bats with Hantavirus. SPRINT- FAPESP.

**Stevens, R.D.** Interagency contract for endangered species research for the continued study of the plains spotted skunk. Texas Comptroller of Public Accounts.

**Stevens, R.D.** “Habitat affinities and day roost characteristics of the Northern Long-eared Bat (*Myotis septentrionalis*) in Louisiana.” USFWS/Louisiana Department of Wildlife and Fisheries.

**Stevens, R.D.** “Winter day-roost characteristics of the Northern Long-eared Bat (*Myotis septentrionalis*) in Louisiana.” U.S. Forest Service.

**Stevens, R.D.** “Interactions between bats and highway structures on the Trans Pecos of Texas.” Texas Department of Transportation.

**Stevens, R.D. and D.A. Ray**. “Distribution and conservation genetics of *Myotis* and other critically imperiled bats in Louisiana.” United States Fish and Wildlife Service/Louisiana Department of Wildlife and Fisheries.

**Stevens, R.D., D. Ray, R.N. Platt, and R.D. Bradley**. “RFP No. 209f for endangered species research projects for the Texas Kangaroo Rat.” Texas State Comptroller.



## NSRL Alumni Highlights

**Jeffrey K. Wickliffe**, former PhD student of Dr. Robert Baker, was named an Emerging Leader in Health and Medicine by the National Academy of Medicine in 2019. Leaders in this program are selected by NAM leadership to engage in a variety of activities throughout the National Academies of Sciences, Engineering, and Medicine over a three-year term. Dr. Wickliffe is an Associate Professor of Global Environmental Health Sciences at Tulane University. He joins **Dr. Jim Bull** as another one of our nationally recognized scientists. For those that may not know, Dr. Bull, who was one of the first undergraduates to conduct research in the laboratory of Dr. Robert Baker, was elected as a member of the National Academy of Sciences in 2016. Recently retired, Dr. Bull was Johann Friedrich Miescher Regents Professor in Molecular Biology in the Department of Integrative Biology in UT Austin's College of Natural Sciences. Together, the National Academies are the country's most prestigious scientific organizations, and election to membership in an academy is one of the highest honors that can be accorded a doctor, scientist, or engineer in the United States.

## Hot Tip for Graduate Students!

In recent years, two papers regarding the history of mammalogy were published that would be great resources for graduate students as they prepare for qualifying exams. Check them out!

Bradley, R. D., and R. C. Dowler. 2019. A century of mammal research: changes in research paradigms and emphases. *Journal of Mammalogy* 100(3):719–732.

Schmidly, D. J., R. D. Bradley, L. C. Bradley, and R. D. Stevens. 2017. A timeline of significant events in the development of North American mammalogy. *Special Publications, Museum of Texas Tech University* 66:1–37.

### OCCASIONAL PAPERS AND SPECIAL PUBLICATIONS OF THE MUSEUM OF TEXAS TECH UNIVERSITY

The NSRL produces two peer-reviewed publication series, Occasional Papers and Special Publications, both of which are edited by Dr. Robert D. Bradley, Director of the NSRL. These series provide outlets for scholarly works resulting from museum-based natural history research. Relevant topics include, but are not limited to, taxonomic studies, faunal lists, species descriptions, zoonoses research, distributional records, and field and museum techniques and methodology, including molecular methods that are applicable to field or museum research. Publication in these series is available to all authors without regard to their association with Texas Tech University. Authors who plan to submit manuscripts to these series should refer to both the Museum Publications Policy and the Guidelines and Procedures for Authors, available at [www.depts.ttu.edu/nsrl/publications/authors.php](http://www.depts.ttu.edu/nsrl/publications/authors.php), for more information.

Lisa Bradley serves as the Production Editor for both series. Our goal is to produce 10–12 Occasional Papers and 1–2 Special Publications per year. Feel free to contact Lisa, [lisa.bradley@ttu.edu](mailto:lisa.bradley@ttu.edu), if you are interested in submitting manuscripts or monographs to the Occasional Papers or Special Publications series.

#### Publications produced in 2019:

**Occasional Paper 359.** Taxonomic and conservation status of the Pecos River muskrat. Jon Hyde Falcone, Patricia Moody Harveson, Matthew R. Mauldin, and Robert D. Bradley.

**Occasional Paper 360.** Field identification key and guide for bats of the United States of America. Clint N. Morgan, Loren K. Ammerman, Krysta D. Demere, Jeffrey B. Doty, Yoshinori J. Nakazawa, and Matthew R. Mauldin.

**Occasional Paper 361.** First records of the Eastern Red Bat (*Lasiurus borealis*) in Arizona, Utah, and western New Mexico. Keith Geluso and Ernest W. Valdez.

**Special Publication 70.** Mitochondrial DNA sequence data indicate evidence for multiple species within *Peromyscus*

*maniculatus*. Robert D. Bradley, James Q. Francis, Roy N. Platt II, Taylor J. Soniat, Daysi Alvarez, and Laramie L. Lindsey.

**Special Publication 71.** From Field to Laboratory: A Memorial Volume In Honor of Robert J. Baker. Robert D. Bradley, Hugh H. Genoways, David J. Schmidly, and Lisa C. Bradley (Editors).

**Special Publication 72.** Three new species of small-eared shrews, genus *Cryptotis*, from El Salvador, Guatemala, and Honduras (Mammalia: Eulipotyphla: Soricidae). Neal Woodman.

View and download Occasional Papers and Special Publications at the NSRL website:  
[www.depts.ttu.edu/nsrl/publications](http://www.depts.ttu.edu/nsrl/publications)

## RECENT PUBLICATIONS BY NSRL FACULTY, STAFF, AND STUDENTS

- Aguirre, L.F., T. Tarifa, R. Wallace, N. Bernal, L. Siles, E. Aliaga-Rossel, and J. Salazar-Bravo. 2019. Lista actualizada y comentada de los mamíferos de Bolivia. *Ecología en Bolivia*, 54(2):107–147.
- Arriaga-Varela, E., A. Brunke, J. C. Girón, K. Szawaryn, J. Bruthansová, and M. Fikáček. 2019. Micro-CT reveals hidden morphology and clarifies the phylogenetic position of Baltic amber water scavenger beetles (Coleoptera: Hydrophilidae). *Historical Biology*. <https://doi.org/10.1080/08912963.2019.1699921>
- Baloun, D. E., Q. M. R. Webber, L. P. McGuire, J. G. Boyles, A. Shrivastav, and C. K. R. Willis. 2019. Testing the “fasting-while-foraging” hypothesis: effects of recent feeding on plasma metabolite concentrations in little brown bats (*Myotis lucifugus*). *Physiological and Biochemical Zoology* 92:373–380.
- Beauchamp-Martin, S. L., F. B. Stangl, Jr., D. J. Schmidly, R. D. Stevens, and R. D. Bradley. 2019. Systematic review of Botta’s pocket gopher (*Thomomys bottae*) from Texas and southeastern New Mexico, with description of a new taxon. Pp. 515–542 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Boissinot, S., Y. Bourgeois, J. D. Manthey, and R. P. Ruggiero. 2019. The mobilome of reptiles: evolution, structure, function. *Cytogenetics and Genome Research* 157:21–33.
- Bourgeois, Y., R. P. Ruggiero, J. D. Manthey, and S. Boissinot. 2019. Recent secondary contacts, linked selection and variable recombination rates shape genomic diversity in the model species *Anolis carolinensis*. *Genome Biology and Evolution* 11:2009–2022.
- Bradley, R. D. 2019. On being a graduate student of Robert J. Baker: prospects, perils, and philosophies – lessons learned. Pp. 847–860 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Bradley, R. D., and R. C. Dowler. 2019. A century of mammal research: changes in research paradigms and emphases. *Journal of Mammalogy*, Centennial Issue 100:719–732.
- Bradley, R. D., J. Q. Francis, R. N. Platt II, L. L. Lindsey, D. A. Alvarez, and T. J. Soniat. 2019. Mitochondrial DNA sequence data indicate evidence for multiple species within *Peromyscus maniculatus*. Special Publications, Museum of Texas Tech University 70:1–59.
- Bradley, R. D., H. H. Genoways, D. J. Schmidly, and L. C. Bradley (editors). 2019. *From field to laboratory: A memorial volume in honor of Robert J. Baker*. Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Bradley, R. D., H. H. Genoways, D. J. Schmidly, and L. C. Bradley. 2019. Overture. Pp. v–ix in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Burnett, K., M. N. Zippel, L. T. Phillips, P. Panwar, L. P. McGuire, and W. A. Boyle. 2019. Nocturnal reductions in body temperature in high-elevation Neotropical birds. *Tropical Ecology*. <https://doi.org/10.1007/s42965-019-00051-y>.
- Campillo, L. C., K. J. Burns, R. G. Moyle, and J. D. Manthey. 2019. Mitochondrial genomes of the bird genus *Piranga*: rates of sequence evolution, and discordance between mitochondrial and nuclear markers. *Mitochondrial DNA Part B*. 4:2566–2569.
- Carrera-E, J. P., C. J. Phillips, S. Solari, N. Ordóñez-Garza, S. Balaguera-Reina, and R. D. Bradley. 2019. Phyllostomid bats as a model to test zoogeographic units in Ecuador. Pp. 309–336 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Cokendolpher, J., A. Zamani, and N. Y. Snegovaya. 2019. Overview of Arachnids and Arachnology in Iran. *Journal of Insect Biodiversity and Systematics* 5(4):301–367. <http://journals.modares.ac.ir/article-36-36405-en.html>.
- Falcone, J. H., P. Moody Harveson, M. R. Mauldin, and R. D. Bradley. 2019. Taxonomic and conservation status of the Pecos River muskrat. *Occasional Papers, Museum of Texas Tech University* 359:1–16.
- Frick, W., T. Kingston, and J. Flanders. 2019. A review of the major threats and challenges to global bat conservation. *Annals of the New York Academy of Sciences*. doi: 10.1111/nyas.14045.
- Fuller, N. W., C. G. Haase, K. A. Silas, S. H. Olson, and L.P. McGuire. 2019. First reported case of diphallia in *Corynorhinus townsendii*. *Western North American Naturalist* 79:454–457.
- Ghosh, A., M. G. Johnson, A. B. Osmanski, S. Louha, N. J. Bayona-Vásquez, T. C. Glenn, J. Gongora, R. E. Green, S. Isberg, R. D. Stevens, and D. A. Ray. 2019. A high-quality reference genome assembly of the saltwater crocodile, *Crocodylus porosus*, reveals patterns of selection in Crocodylidae. *bioRxiv*, 767939.
- Girón, J. C., and A. T. Howden. 2019. Five new species of *Pandeleiteius* Schönherr, 1834 (Coleoptera: Curculionidae: Entiminae: Tanymecini) from South America. *The Coleopterists Bulletin* 73(4):831–845. <https://doi.org/10.1649/0010-065X-73.4.831>
- Gonzalez-Ittig, R. E., N. P. Kandel, C. Bonvicino, and J. Salazar-Bravo. 2019. Does the widely distributed rodent *Calomys tener* (Cricetidae: Sigmodontinae) constitute a single evolutionary unit? *Zoologia* 36:1–11. <https://doi.org/10.3897/zoologia.36.e30354>.
- Haase, C. G., N. W. Fuller, D. T. S. Hayman, C. R. Hranac, S. H. Olson, R. K. Plowright, and L. P. McGuire. 2019. Bats are not squirrels: revisiting the cost of cooling in hibernating mammals. *Journal of Thermal Biology* 81:185–193.
- Huang, J. C.-C., E. L. Jazdyk, M. Nusalawo, and T. Kingston. 2019. Echolocation and roosting ecology determine sensitivity of forest-dependent bats to coffee agriculture. *Biotropica* 51:757–768. <https://doi.org/10.1111/btp.12694>.
- Jayat, J. P., P. E. Ortiz, G. D’Elía, J. Salazar-Bravo, and B. D. Patterson. 2019. Taxonomic status of the nominal forms assigned to *Necomys lactens* (Rodentia, Cricetidae) as revealed by molecular and morphometric evidence. *Journal of Mammalogy*. DOI:10.1093/jmammal/gyz187
- Keith, M. S., R. N. Platt II, and R. D. Bradley. 2019. Molecular data indicate that *Isthmomys* is not aligned with *Peromyscus*. Pp. 613–628 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.

## RECENT PUBLICATIONS (CONT.)

- Limon, D. A., C. J. Garcia, B. B. Gregory, R. D. Stevens, M. A. Barnes. 2019. The status of *Pseudogymnoascus destructans* in Louisiana. *The Southwestern Naturalist* 63:216–219.
- Linzey, A. V., B. H. Blake, R. D. Bradley, R. A. Van Den Bussche, and M. R. Willig. 2019. A century of mammalogy: Centennial Special Issue. *Journal of Mammalogy*, Centennial Issue 100:625–625.
- Manthey, J. D., S. Boissinot, and R. G. Moyle. 2019. Biodiversity genomics of North American *Dryobates* woodpeckers reveals little gene flow across the *D. nuttallii* x *D. scalaris* contact zone. *The Auk: Ornithological Advances*. DOI: 10.1093/auk/ukz015.
- Mello, M. A. R., G. M. Felix, R. B. P. Pinheiro, R. L. Muylaert, C. Geiselman, S. E. Santana, M. Tschapka, N. Lotfi, F. A. Rodrigues, R. D. Stevens. 2019. Insights into the assembly rules of a continent-wide multilayer network. *Nature Ecology & Evolution* 3:1525–1532.
- Marjakangas, E. L., N. Abrego, V. Grøtan, R. A. F. de Lima, C. Bello, R. S. Bovendorp, L. Culot, E. Hasui, F. Lima, R. L. Muylaert, B. B. Niebuhr, A. A. Oliveira, L. A. Pereira, P. I. Prado, R. D. Stevens, M. H. Vancine, M. C. Ribeiro, M. Galetti, and O. Ovaskainen. 2019. Fragmented tropical forests lose mutualistic plant–animal interactions. *Diversity and Distributions*. DOI: 10.1111/ddi.13010.
- McGuire, L. P., H. W. Mayberry, Q. E. Fletcher, and C. K. R. Willis. 2019. An experimental test of energy and electrolyte supplementation as a mitigation strategy for white-nose syndrome. *Conservation Physiology* 7. DOI: 10.1093/conphys/coz006.
- Ordóñez-Garza, N., and R. D. Bradley. 2019. Diversification Patterns of Cricetid Rodents in Mesoamerica. Pp. 30–52 in *Perspectivas de investigación sobre mamíferos silvestres de Guatemala* (C. Kraker, A. Calderón, and Cabrera, eds.). Asociación Guatemalteca de Mastozoólogos (ASOGUAMA); Unidad para el Conocimiento Uso y Valoración de la Biodiversidad, Centro de Estudios Conservacionistas (CECON). 264 pps.
- Parlos, J. A., M. A. Madden, L. Siles, F. A. Anwarali Khan, C. G. Sotero-Caio, K. L. Phelps, R. J. Baker, and R. D. Bradley. 2019. Temporal patterns of bat activity on the High Plains of Texas. Pp. 275–290 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Phillips, C. D., J. L. Dunnam, R. C. Dowler, L. C. Bradley, H. Garner, K. McDonald, B. K. Lim, M. A. Revelez, M. L. Campbell, J. A. Cook, R. D. Bradley, and the Systematic Collections Committee of the American Society of Mammalogists. 2019. Curatorial guidelines and standards of the American Society of Mammalogists for collections of genetic resources. *Journal of Mammalogy* 100:1690–1694. DOI:10.1093/jmammal/gyz111.
- Ray, D. A., J. R. Grimshaw, M. K. Halsey, J. M. Korstian, A. B. Osmanski, K. A. M. Sullivan, K. A. Wolf, H. Reddy, N. Foley, R. D. Stevens, B. A. Knisbacher, O. Levy, B. Counterman, N. B. Edelman, and J. Mallet. 2019. Simultaneous TE analysis of 19 Heliconiine butterflies yields novel insights into rapid TE-based genome diversification and multiple SINE births and deaths. *Genome Biology and Evolution* 11(8):2162–2177.
- Rogers, E. J., A. S. Sommers, and L. P. McGuire. 2019. Seasonal dynamics of lipid metabolism and energy storage in a highly aerobic mammal. *Physiological and Biochemical Zoology* 92:286–395.
- Ruedas, L. A., S. M. Silva, J. H. French, R. N. Platt, II, J. Salazar-Bravo, J. M. Mora, and C. W. Thompson. 2019. Taxonomy of the *Sylvilagus brasiliensis* complex in Central and South America (Lagomorpha: Leporidae). *Journal of Mammalogy* 100(5):1599–1630.
- Schmidly, D. J., R. D. Bradley, E. K. Roberts, L. C. Bradley, and H. H. Genoways. 2019. A scientometric appreciation of Robert J. Baker's contributions to science and mammalogy. Pp. 1–38 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Senawi, J., and T. Kingston. 2019. Clutter negotiating ability in an ensemble of forest interior bats is driven by body mass. *Journal of Experimental Biology*. <https://doi.org/10.1242/jeb.203950>.
- Sommers, A. S., E. J. Rogers, and L. P. McGuire. 2019. Migration and reproduction are associated with similar degrees of phenotypic flexibility in an insectivorous bat. *Oecologia* 190:747–755.
- Stevens, R. D., R. J. Rowe, and C. Badgley. 2019. Gradients of mammalian biodiversity through space and time. *Journal of Mammalogy* 100(3):1069–1086.
- Stuhler, J. D., A. N. Kildow, R. D. Stevens. 2019. Ecology of *Platyrrhinus lineatus* in Atlantic Forest of Paraguay: reproductive patterns, activity, seasonality, and morphometric variability. Pp. 221–237 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Stukenholtz, E. E., T. A. Hailu, S. Childers, C. Leatherwood, L. Evans, D. Roulain, D. Townsley, M. Treider, R. N. Platt II, D. A. Ray, J. C. Zak, and R. D. Stevens. 2019. Ecology of feral pigeons: population monitoring, resource selection, and management practices. *Wildlife Population Monitoring*. DOI: 10.5772/intechopen.84612.
- Swier, V. J., R. D. Bradley, F. F. B. Elder, and R. J. Baker. 2019. Primitive karyotype for Muroidea: evidence from chromosome paints and fluorescent G-bands. Pp. 629–642 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Tanishi, I., A. E. Ogbeibu, and P. J. J. Bates. 2019. Complementary bat (Mammalia: Chiroptera) survey techniques uncover two new country records for Nigeria. *Journal of Threatened Taxa* 11(14):14788–14801.
- Thompson, C. W., F. B. Stangl, Jr., R. J. Baker, and R. D. Bradley. 2019. Ecological niche modeling identifies environmental factors influencing hybridization in ground squirrels (genus *Ictidomys*). Pp. 455–478 in *From field to laboratory: A memorial volume in honor of Robert J. Baker* (R. D. Bradley, H. H. Genoways, D. J. Schmidly, and L. C. Bradley, eds.). Special Publications, Museum of Texas Tech University 71:xi+1–911.
- Tipton, C. D., N. E. Sanford, J. A. Everett, R. A. Gabrilska, R. D. Wolcott, K. P. Rumbaugh, and C. D. Phillips. 2019. Chronic wound microbiome colonization on mouse model following cryogenic preservation. *PLoS One* 14(8):e0221565.

## STUDENT GRANTS AND RESEARCH AWARDS

**Ezra Auerbach**, graduate student, Nancy McIntyre. TTU Graduate Recruitment Fellowship/The CH Foundation Graduate Fellowship.

**Jack Hruska**, graduate student, Joe Manthey. TTUAB Grants-in-Aid; Texas Tech Graduate Student Research Support.

**Macy Krishnamoorthy**, graduate student, Robert Bradley and Richard Stevens. J. Knox Jones Award, TTU Biological Sciences.

**Benneth Obitte**, graduate student, Tigga Kingston. Michelle Knapp Research Scholarship, TTU Biological Sciences; Early Career Grant, National Geographic Society; Rufford Foundation Small Grants: Kate Barlow Award, Bat Conservation Trust.

**Nicole Paulat**, graduate student, David Ray. TTU Association of Biologists Grant in Aid of Research.

**Emily Wright**, graduate student, Robert Bradley. TTU Graduate Student Research Award, Office of Parent and Family Relations, Graduate Assembly, and Graduate School; TTUAB Grants-in-Aid; Michelle Knapp Research Scholarship, TTU Biological Sciences; J. Knox Jones Award, TTU Biological Sciences.

## MAY 2019 GRADUATES

**Devin H. Kilborn**, non-thesis M.S. Chair: Nancy McIntyre. Currently employed with Transglobal Services, L.L.C.

## AUGUST 2019 GRADUATES

**Oscar Sandate, M.S.** Chair: Caleb D. Phillips. Thesis title: Determinants of digestive efficiency during reproduction in a highly vagile colonial bat.

**Taylor Soniat, M.S.** Chair: Robert D. Bradley. Thesis title: Assessing levels of DNA degradation in frozen tissues archived under various preservation conditions in a natural history collection. Currently an ORISE Fellow assigned to the Biorepository of the Centers for Disease Control and Prevention in Atlanta, GA.

## DECEMBER 2019 GRADUATES

**Lucas J. Heintzman, Ph.D.** Chair: Nancy McIntyre. Dissertation title: Past, present, and future landscape changes in the Southern Great Plains: Effects of urbanization and energy extraction on the playa network. Currently an ORISE Postdoctoral Fellow with the USDA-ARS, Las Cruces, NM.

## STUDENT PRESENTATIONS

During 2019, at least 32 graduate students, 6 undergraduate students, and 3 post-docs or technicians gave 48 oral and 15 poster presentations of their research at 6 local/state/regional, 4 national, and 2 international conferences and society meetings.

*Did you know? .....* A group of porcupines is called a prickle.

## UNDERGRADUATE RESEARCH

During 2019, at least 36 undergraduate students conducted research under the direction of 9 NSRL faculty associates.

## STUDENT PRESENTATION AWARDS

**Macy A. Krishnamoorthy**. Graduate student. W. B. Davis Award for best oral presentation in classical mammalogy. Annual meeting of the Texas Society of Mammalogists.

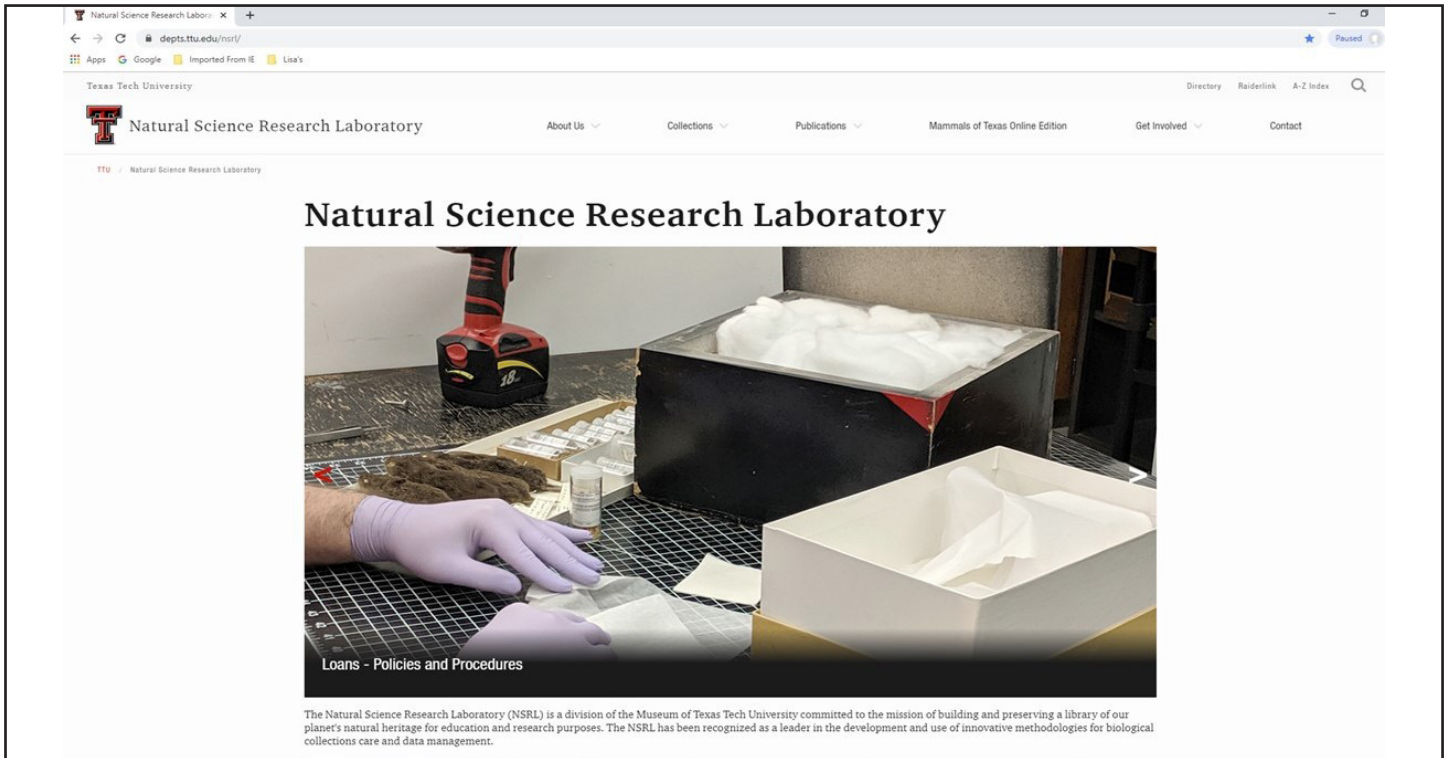
**Emma Kunkel**. Graduate student. Bat Conservation International student presentation award, North American Society for Bat Research; 1st place in Ecology section, Texas Tech Annual Biological Sciences Symposium.

**Jenna Grimshaw**. Graduate student. 1st place oral presentation in Genetics and Genomics section, Texas Tech Annual Biological Sciences Symposium.

**Nicole Paulat**. Graduate student. Clyde Jones Award for best poster in mammalian molecular biology, evolution, and systematics, Texas Society of Mammalogists.

# NSRL Website Gets a New Look and a New Address!

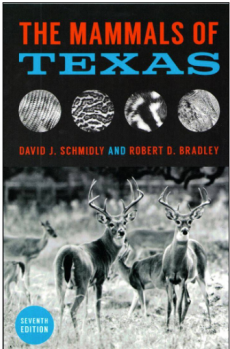
On 10 December 2019, the Natural Science Research Laboratory unveiled its new website, featuring an updated design and layout that is consistent with Texas Tech University standards. The NSRL website can be accessed at its new URL address: [depts.ttu.edu/nsrl](https://depts.ttu.edu/nsrl).



A major feature of the new website is access to the digital version of the 7th edition (2016) of *The Mammals of Texas*, authored by David J. Schmidly and NSRL Director Robert D. Bradley. This online edition is provided to the public courtesy of a cooperative agreement between the NSRL, the authors, the Texas Parks and Wildlife Department, and the University of Texas Press. *The Mammals of Texas* is an excellent resource for students, teachers, and both professional and amateur naturalists with an interest in the mammal fauna of our state. The print edition of this valuable reference book is available for purchase from the website of UT Press at [utpress.utexas.edu](https://utpress.utexas.edu).

TTU | Natural Science Research Laboratory | Mammals of Texas

## The Mammals of Texas, Online Edition



Welcome to the digital version of *The Mammals of Texas*, 7th Edition (2016). This online edition is provided to the public courtesy of a cooperative agreement between the Natural Science Research Laboratory of the Museum of Texas Tech University, the authors, Texas Parks and Wildlife Department, and University of Texas Press.

The print edition of this book was published in 2016 by UT Press and is available for purchase [here](#).

When utilizing material from the online edition, please provide credit as: From *The Mammals of Texas*, Seventh Edition by David J. Schmidly and Robert D. Bradley, copyright © 1994, 2004, 2016. Courtesy of the University of Texas Press.

Please refer to [full copyright information here](#).

The Table of Contents provides links to each section of the book as well as the individual Species Accounts. [Click here to begin](#).

We encourage you to bookmark the new URL and to visit the NSRL website often for access to *The Mammals of Texas*, the Vertebrate Database (also recently updated), free PDFs of our publication series *Occasional Papers* and *Special Publications*, the latest information about the research and curatorial activities of the NSRL, and more.

Many thanks to all of those who contributed to the new website development and to the creation of the digital edition of *The Mammals of Texas*, including Lisa Bradley, Kathy MacDonald, Heath Garner, Caitlin Trobridge, Emma Roberts, Laramie Lindsey, Sally Post, and William Barela.

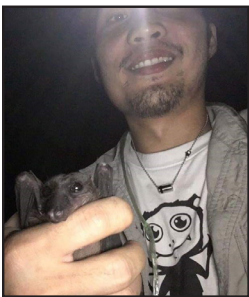
# Student Profiles

The NSRL contributes significantly to the education and research experiences of graduate and undergraduate students. Since 1970, more than 320 graduate students and numerous undergraduate students have used the NSRL for their thesis, dissertation, and undergraduate research projects. In each issue of NSRL News, we will highlight some of these outstanding students.



**Angela Alviz**, Ph.D. student, Department of Natural Resources Management. Advisor: Richard Stevens.

Angela is interested in neotropical mammal ecology and conservation. Currently, she is researching spatial ecology and population dynamics of the Lowland Tapir (*Tapirus terrestris*) in the Orinoquia region of Colombia.



**Isham Azhar**, Ph.D. student, Department of Biological Sciences. Advisor: Tigga Kingston.

Isham's research focus is to investigate the responds of bat community towards environmental pressures along a gradient of habitat degradation and to identify the underlying processes structuring the community.



**Matthew Fox**, Ph.D. student, Department of Biological Sciences. Advisor: Caleb D. Phillips.

Matt studies the molecular mechanisms of craniofacial development during embryogenesis. His research focuses on how developmental genes are regulated by the RNA binding protein Musashi. It is his goal to determine the effects of Musashi activity in the oral palate during development. Through studying the effects of Musashi in the developing palate, he aims to identify genes whose differential regulation by Musashi may be important in mammalian craniofacial evolution.



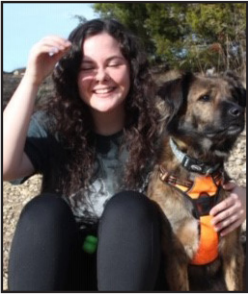
**Samantha Garcia**, M.S. student, Department of Natural Resources Management. Advisor: Richard Stevens.

Samantha is interested in the conservation of biodiversity, specifically the diversity of bats and how biological gradients, such as elevation effect, the distribution and structure of bat communities. She is currently studying the diversity patterns of bats along an elevation gradient located within the sky islands of New Mexico.



**Benneth Obitte**, Ph.D. student, Department of Biological Sciences. Advisor: Tigga Kingston.

Ben's research employs innovative socio-ecological methods to disentangle drivers of the intense Egyptian fruit bat (*Rousettus aegyptiacus*) hunting in southern Nigeria, assess sustainability of hunting offtakes, and predict roost selection in heavily disturbed habitats. This study will help to shape conservation plans, and implement effective conservation education and outreach programs for *R. aegyptiacus* – a species critical for maintaining ecosystem stability of the biodiversity hotspots of southern Nigeria.



**Megan Rowe**, M.S. student, Department of Biological Sciences. Advisor: Caleb D. Phillips.

Megan's research aims to characterize the genomic distribution of the Musashi binding element (MBE) in 3' UTRs of mammalian protein-coding genes. The RNA binding protein Musashi has been found to be critical for cell fate and development through its role as a post-transcriptional regulator. Using bioinformatic methods to survey mammalian 3' UTRs, her objective is to determine where MBEs exhibit phylogenetic conservation, as well as nonrandom frequency and distribution patterns with respect to gene ontology. She expects this information to provide insight into candidate Musashi targets, as well as those for which differential regulation has evolved across mammals.



**Abby Rutrough**, Ph.D. student, Department of Biological Sciences. Advisor: Tigga Kingston.

Abby's research explores the spatial dynamics and drivers of bat hunting for bushmeat and medicine. Utilizing socio-ecological techniques, her goal is to identify hotspots and causes of hunting to better inform conservation actions.



**Hendra Sihaloho**, Ph.D. student, Department of Biological Sciences. Advisor: Caleb D. Phillips.

Hendra investigates the drivers of gut microbiome composition in bats in degraded and unmodified habitats. His study focuses on three bat species occurring in Malaysia that have different social dynamics (solitary, small group and colonial) and rely on insect communities as their prey. He is using community ecology approaches and structural equation modeling to define how endogenous and exogenous processes governing microbiome assembly and disassembly.



**Craig Tipton**, Ph.D. student, Department of Biological Sciences. Advisor: Caleb D. Phillips.

Craig is broadly interested in the dynamics that influence microbiome community structure. His dissertation work is examining how genomic diversity among patients affects microbial colonization of chronic wounds, and is further investigating abundance patterns in wound microbiota using a large-scale dataset obtained through collaboration with a local wound clinic.



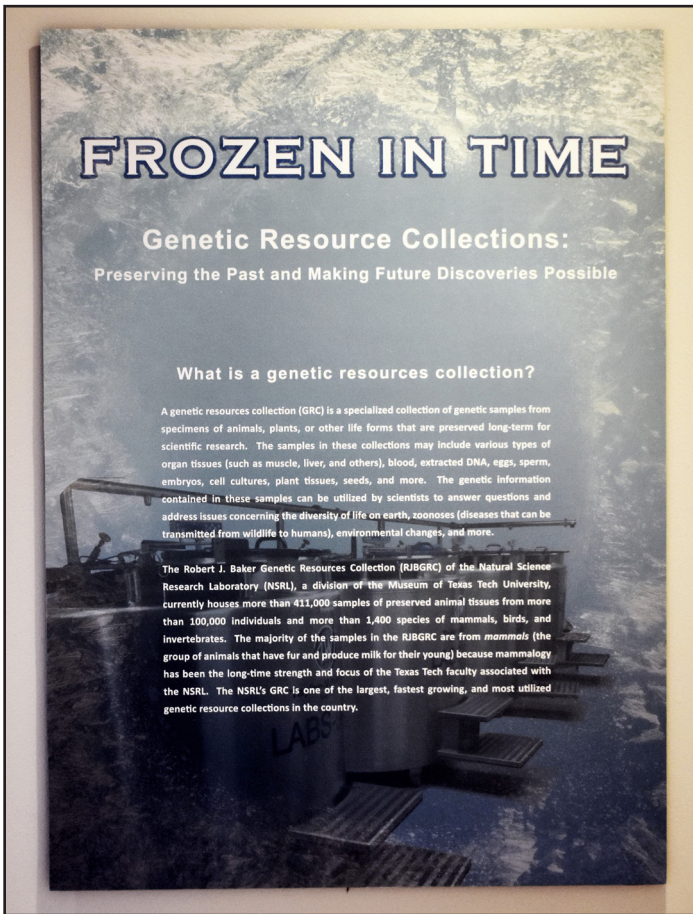
**Sarah Vrla**, Ph.D. student, Department of Biological Sciences. Advisor: Robert D. Bradley.

As an undergraduate at Cameron University, Sarah conducted research involving ultraviolet (UV) vision in the kangaroo rat (*Dipodomys ordii*). She then obtained her Master's degree at the University of Central Oklahoma under the direction of Dr. Michelle Haynie where she investigated the genetic structure and potential hybridization of *Peromyscus* species. As a Ph.D. student, she plans to combine her previous research experiences by focusing on molecular ecology, specifically by using genetics techniques to begin to address sensory ecology questions relating to UV vision and communication of mammals.

## Outreach

Under the aegis of the University of San Agustín (Arequipa, Peru), **Jorge Salazar-Bravo** dictated a 40-hr workshop on mammalogy applied to disease ecology (May 27 to June 6) to the Master's program in organismal biology.

# Frozen in Time



On 6 October 2019, the Museum of Texas Tech University opened an exhibition that highlights the value of genetic resource collections to scientific discovery, education, and society. With text panels and objects, the exhibit, titled *Frozen in Time*, illustrates how genetic resource collections, such as the Robert J. Baker Genetic Resources Collection of the TTU Museum, archive samples of animal tissues from around the world. Each tissue sample in a GRC is unique and irreplaceable, and by being “frozen in time” these samples can be used by scientists to reveal clues to that animal’s genetics, environment (contaminant exposure), health (diseases and parasites), and many other pieces of information vital to our understanding of life on earth.

Funding for this exhibit was provided by the National Science Foundation “Collections in Support of Biological Research” grant to the NSRL (#1451925) for development of the liquid nitrogen system for the Genetic Resources Collection. The exhibit was developed by Lisa Bradley and Museum Science student Heidi Stevens, with additional content and objects contributed by Kathy MacDonald, Heath Garner, Robert Bradley, and Caleb Phillips.





## Coming Soon! (Part 1)

A new gallery at the Texas Tech Museum, *Biodiversity of the Llano Estacado*, will be opening this spring. The gallery will feature an in-depth depiction of the seven major habitats of the Llano Estacado region and the variety of wildlife that it supports.

Formed 23 million years ago and encompassing 50,000 square miles of what is now northwestern Texas and eastern New Mexico, the Llano Estacado is one of the largest plateaus on the North American continent. The gallery explores the history of the region from its geological formation, to its first occupation by humans more than 12,000 years ago, to present day, and illustrates the changing influences and relationships of humans and nature through time. The gallery will be populated with museum specimens and creative graphic designs that allow the visitor to virtually walk through the various landscapes of the Llano. Touchscreen computers will allow visitors to dig deeper into information about habitats and wildlife. Current Texas Tech-based research in biodiversity, natural resource management, human-environmental interactions, and climate change will be profiled in changing modular components.

We hope visitors will come away with an appreciation for the unique value of the landscapes and wildlife of this region and an awareness of the need to preserve these resources for future generations.

*This gallery was funded by a grant from the Helen Jones Foundation, Inc., to Gary Morgan, Eileen Johnson, Jill Hoffman, and Robert Bradley.*

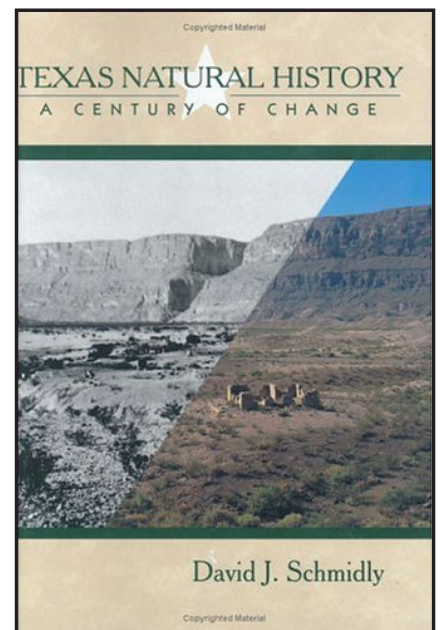


---

## Coming Soon! (Part 2)

In 2002, Texas Tech University Press published the first edition of *Texas Natural History: A Century of Change*, by Dr. David J. Schmidly. Recently, TTU Press approached Dr. Schmidly about publishing a second edition of the now out-of-print book. Dr. Schmidly agreed, and he invited Dr. Robert Bradley and Lisa Bradley to assist him in updating and revising the text. The revised edition is expected to be released in late 2020.

The second edition includes an expanded focus on recent changes in the fauna of the state and the challenges for conserving Texas' diverse wildlife resources. It includes two new chapters that focus specifically on current and growing conservation concerns, such as climate change, pollution, and the interactions of human health and wildlife. These environmental and conservation issues are expected to become even more prominent over the remainder of the twenty-first century. Strategies and initiatives are proposed that, if implemented, could significantly strengthen the conservation of natural resources in the state.



## TTU FACULTY ASSOCIATES OF THE NATURAL SCIENCE RESEARCH LABORATORY

The following faculty at Texas Tech University have research programs that both contribute to and benefit from a working relationship with the Natural Science Research Laboratory. Graduate and undergraduate students of these faculty members, as well as those of the faculty Curators of the NSRL, conduct field-based research studies that result in growth of the NSRL collections and conduct laboratory-based research utilizing the resources of the NSRL to advance the sciences of mammalogy, ornithology, invertebrate zoology, wildlife ecology, and many other disciplines. The NSRL's strong history of field-based and organismal research, and continued commitment to such endeavors, set us apart from many other natural history programs.



**Dr. Warren Conway** is the Bricker Endowed Chair in Wildlife Management within the Department of Natural Resources Management. He and his students are involved in a variety of research projects in Texas, New Mexico, and Oklahoma with common themes of wildlife-habitat relationships, population and community dynamics, population management, restoration, and conservation, and toxicology and disease prevalence. Current projects include mule deer and pronghorn survival and habitat selection; urban mesocarnivore community ecology; elk response to prescribed fire and thinning; wildlife genetics; and disease and toxicology of populations of bighorn sheep, axis deer, and American woodcock.

[warren.conway@ttu.edu](mailto:warren.conway@ttu.edu)

[https://www.depts.ttu.edu/nrm/people/faculty/faculty\\_pages/warrenconway/conway.php](https://www.depts.ttu.edu/nrm/people/faculty/faculty_pages/warrenconway/conway.php)



**Dr. Tigga Kingston** is an Associate Professor of Biological Sciences. Her research and activities are dedicated to the conservation ecology of Paleotropical bats. She has been working on the conservation ecology of bats of Southeast Asia for more than 20 years, with projects in Malaysia, Indonesia, Myanmar, Philippines, and Vietnam. More recently, she has student projects and collaborations in Africa, specifically Nigeria, Kenya, and South Africa.

[tigga.kingston@ttu.edu](mailto:tigga.kingston@ttu.edu)

<http://kingstonlab.org/>



**Dr. Joseph D. Manthey** is an Assistant Professor of Biological Sciences. His research group uses a combination of fieldwork, specimens, ecological data, genomics, and bioinformatics to study how organisms (mostly birds) evolve across both geographic and genomic landscapes. Major research themes include: (1) how and why species' genomes change through evolutionary time, (2) diversification at different spatial and temporal scales in sky islands, and (3) impacts of fragmentation on population connectivity in sky islands.

[joseph.manthey@ttu.edu](mailto:joseph.manthey@ttu.edu)

[mantheylab.org](http://mantheylab.org)



**Dr. Liam McGuire** is an Assistant Professor of Biological Sciences. His research focuses on the ecology and physiology of bats and birds in situations of energy limitation (e.g., migration, hibernation) and the strategies these animals use to cope with environmental variation, often in the context of conservation issues. He takes an integrative approach using techniques ranging from molecular biology and biochemistry, to whole animal physiology, behavioral and movement ecology. Current research foci include the physiological ecology of bat migration, and the physiological ecology and pathophysiology of hibernating bats affected by white-nose syndrome, a devastating fungal disease responsible for killing millions of North American bats.

[liam.mcguire@ttu.edu](mailto:liam.mcguire@ttu.edu)

<https://www.depts.ttu.edu/biology/people/Faculty/McGuire/>



**Dr. David A. Ray** is an Associate Professor of Biological Sciences. The Ray laboratory focuses on the study of genomes and genome evolution with an emphasis on transposable elements and their role in the diversification of species. Model organisms include bats, several other mammals, and crocodylians.

[david.4.ray@gmail.com](mailto:david.4.ray@gmail.com)  
<http://www.davidraylab.com/>



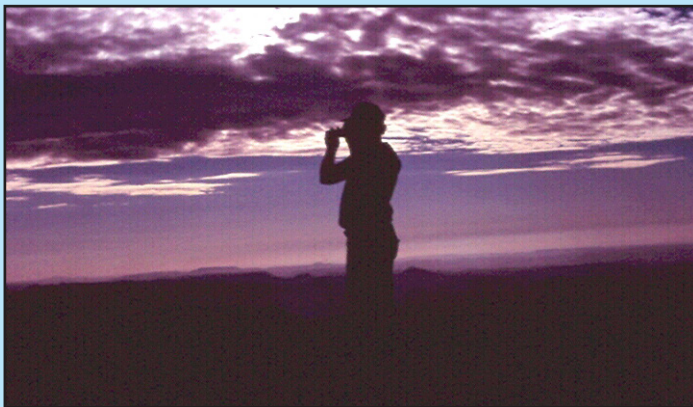
**Dr. Jorge Salazar-Bravo** is an Associate Professor of Biological Sciences. His research revolves around two basic themes: developing and testing phylogenetic hypotheses for mammalian taxa at various hierarchical levels; and using first principles in ecology and evolution to understand the triggers for disease emergence. Research topics he has pursued, as represented in his publications, include: systematics, biogeography, evolution, and conservation of Neotropical mammals; the ecology and evolution of virus/host co-evolution; and the interplay between ecology and disease.

[j.salazar-bravo@ttu.edu](mailto:j.salazar-bravo@ttu.edu)  
<http://www.depts.ttu.edu/biology/people/Faculty/Salazar-Bravo/>

## Faculty Awards and Recognition

In 2019, **Nancy McIntyre** was elected to the office of President-elect of the International Association for Landscape Ecology-North America. She will assume the Presidency from 2020 to 2022.

A small rodent species, endemic to the Andes of Ecuador, *Thomasomys salazari* (Brito, Tinoco, Curay, Vargas, Reyes-Puig, Romero & Pardiñas 2019) was named after **Jorge Salazar-Bravo** for his contributions to Latin American mammalogical research.



*Looking for good students! Bradley in Davis Mountains, Texas.*

### A Message to Prospective Students:

Faculty and staff associated with the NSRL are very active in field- and specimen-based research. Our faculty and students have interests in mammalogy, ornithology, invertebrate zoology, molecular systematics, genomics, ecology, and museum science. Most of the undergraduate and graduate students that are affiliated with the NSRL receive degrees in the Department of Biological Sciences or the Department of Natural Resources Management. We

also have students who are part of the Museum Science program. Together, we have a strong core of faculty and undergraduate and graduate students, and we are always on the look-out for potential new students. If you are interested in pursuing a graduate degree or undergraduate research opportunities, please contact any of the faculty members highlighted in this newsletter.



## PLEASE SUPPORT THE NSRL

Dear Former Students, Colleagues, and Friends:

In 2015, a fund-raising initiative for the NSRL was established. The NSRL Fund for Excellence is designed to help support the many collections activities of the NSRL. Our goal is to use these funds to establish a student curatorial position. This position would enable the NSRL to improve curatorial and collection management activities, as well as help support students with a professional interest in natural history collections. As this fund grows, we envision that we will be able to financially support multiple students.

Your contribution to the Natural Science Research Laboratory Fund for Excellence is very important to the future of the NSRL. With limited, and often declining, funding from state and federal sources, the NSRL needs your help to ensure our continued service to the academic and scientific communities. We appreciate your consideration in giving a tax deductible donation in support of the NSRL's operations and research. Many of you benefited from the resources provided by the NSRL, now we ask that you help the NSRL continue its quest to be among the premier natural history collections in the world.

Donations to the NSRL Fund for Excellence may be made through the Texas Tech Foundation, Inc. To donate by check, please make the check payable to Texas Tech Foundation, designate NSRL Fund for Excellence on the memo line, and mail to: Texas Tech University System, Financial Services, Box 45025, Lubbock, TX, 79409-5025. To give by phone, call toll free: 1-866-448-3888. To donate online, visit the website of TTU Institutional Advancement at <http://donate.give2tech.com/> and enter Natural Science Research Laboratory Fund for Excellence in the search box.

**YOUR SUPPORT IS APPRECIATED! THANK YOU!**

*NSRL News* is produced biannually by Lisa Bradley with assistance from the staff, research scientists, and graduate students of the NSRL. Please contact Lisa to request a hard copy or to submit comments or contributions for upcoming issues of *NSRL News*.

[lisa.bradley@ttu.edu](mailto:lisa.bradley@ttu.edu)

806-834-4732

NSRL, Museum of Texas Tech University, Lubbock, TX 79409

