

NSRL NEWS

Natural Science Research Laboratory
Museum of Texas Tech University

Volume 6, Spring 2018



Research Highlight: Statewide Genomic Assessment of Texas Pocket Gophers Takes NSRL Researchers from Alpine to Zapata, from the Panhandle to the Pineywoods

Throughout Texas, mounds abound. Some are conspicuous heaps of brownish or reddish soil, others are less distinct, barely noticeable piles of dirt. Some might confuse these with the fire ant mounds of eastern and southeastern Texas; however, these mounds are constructed by pocket gophers (Family Geomyidae), subterranean rodents with interesting physiologies and morphologies, but with dubious taxonomies. In Texas, there are three genera, 11 species, and > 30 subspecies of pocket gophers. These rodents have been classified based on morphology (e.g. cranial measurements), geographic distributions (e.g. mountain ranges), and in a few cases, genetic data. NSRL researchers are employing a new genomic technique known as restriction-site associated DNA sequencing, or simply RAD-Seq, to resolve the taxonomy and classification of pocket gophers. Recently, Texas Parks and Wildlife Department (TPWD) awarded a research grant to NSRL researchers (Ray, Stevens, and Bradley) to use this method to facilitate the assignment of conservation management units and to determine if conservation efforts are warranted.

The project has three main tasks, which are being overseen by graduate student Michaela Halsey (Ph.D. student, TTU Biological Sciences, TTU Natural Resources Management). The first is to survey the type locality of each subspecies and determine if that subspecies is present, absent, or has been displaced by another species. Dr. Robert D. Bradley (Mammal Curator and Director of the NSRL), who has extensive experience in trapping these rodents, is guiding field crews, comprised of Ms. Halsey and other graduate and undergraduate students from both departments. Pocket gophers occupy many ecoregions in Texas, but because of their unique requirements (e.g. soil type) their populations usually are disjunct. By collecting representative gophers (topotypes) from the type localities, the researchers can assign a genotype to the topotype specimens. Two undergraduate students (Mariah Mills and Cassandra Prohle), working under the supervision of M.S. student Taylor Soniat, are obtaining DNA



Pocket gopher Thomomys bottae caught in Pecos County in October 2017. Photo by M. Halsey.



Ph.D. student Michaela Halsey applies the finishing touches to her two prepped pocket gopher specimens in September 2017. Photo by S. Mangum.

sequences from the mitochondrial cytochrome-b gene to be used as the representative genotype for each pocket gopher subspecies in Texas. Mariah is responsible for obtaining sequences from the topotype samples of *Geomys* and Cassandra is responsible for *Thomomys*. Their studies will serve to help mammalogists across the state to assign specimens collected at other localities to the correct taxonomic category.

The second effort is overseen by Dr. David Ray (Biological Sciences), an evolutionary biologist with broad interests in genomics. With samples collected from contemporary gopher surveys and from historical museum specimens, DNA will be extracted from at least five individuals per subspecies and across two time periods. These data will allow the researchers to determine phylogenetic relationships among individuals, populations, and taxonomic groups.

The third task, supervised by macroecologist Dr. Richard Stevens (Natural Resources Management), is to generate species distribution models utilizing an algorithm known as the principle of maximum entropy. These models output certain probabilities of occurrence based on environmental variables such as elevation, precipitation, and soil type. Records from recent surveys and historical captures serve as input for these models, an obvious reminder that museum facilities around the world, such as the NSRL, are irreplaceable repositories for many areas of biology.

Field crews have traveled to numerous collecting sites across the state. Additional collecting has been conducted by NSRL Research Associate Rick Pitts. In the latter part of 2017, more than 60 pocket gophers were collected at type localities in various parts of Texas, New Mexico, and Oklahoma. Each individual was georeferenced, prepped, and tissues, skin, skull and post-cranial skeletons were deposited in the NSRL. Due to the destruction caused by Hurricane Harvey in August 2017, many of the subspecies in the eastern part of the state have not yet been sampled. Heavy flooding



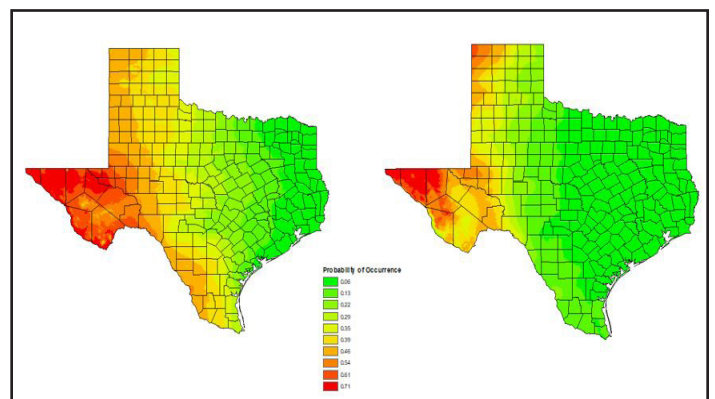
Prepared gopher specimens from South Texas resulting from a spring 2017 collecting trip.

in the region is expected to have impacted pocket gopher populations. Efforts will focus in these areas later in 2018.

Efforts suggest that at least two subspecies, *Geomys personatus fuscus* of Fort Clark in Kinney County and *Thomomys bottae baileyi* of Sierra Blanca in Hudspeth County, could be extinct. Two other *T. bottae* subspecies, *spatiosus* (Brewster County) and *pervarius* (Presidio County), appear to be quite rare. In the latter two cases, *Cratogeomys castanops* is being collected instead. Some researchers have hypothesized that increasing aridity facilitates the displacement of *T. bottae* by *C. castanops* in West Texas. A preliminary species distribution model with aridity as the environmental variable offers some credence to this observation. To date, some other observations from the research team indicate that pocket gophers in central, northern, and Panhandle regions of Texas are doing quite well. Many regions in eastern and southern Texas have sustainable pocket gopher populations, although fire ants may be detrimental in the long run. One of the biggest concerns relates to populations of the genus *Thomomys* throughout West Texas. Hopefully this on-going research will resolve these questions in the next year.



Graduate students Emma Brookover and Emily Wright setting a gopher trap at the Sierra Diablo WMA. Photo by M. Halsey.



Species distribution models constructed in MaxEnt that demonstrate present-day distributions of *Cratogeomys castanops* (left) and *Thomomys bottae* (right) with aridity as the environmental variable. Hotter colors (oranges and reds) represent areas with higher probability of occurrence based on this variable. Figure by M. Halsey.

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 our website, www.nsrl.ttu.edu/publications, 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, if you are interested in submitting manuscripts or monographs to the Occasional Papers or Special Publications series.

Publications produced July–December 2017:

Occasional Paper 347. Distributional and reproductive records of bats from south-central Nebraska. Owen J. Johnson and Keith Geluso.

Occasional Paper 348. Distributional updates and conservation status of bats from Louisiana. Richard D. Stevens, Carlos J. Garcia, Erin E. Bohlender, and Beau B. Gregory.

Occasional Paper 349. Distribution of the Northern Pygmy Mouse (*Baiomys taylori*) in southwestern New Mexico, with notes on reproduction. Keith Geluso, Kenneth N. Geluso, and Brett R. Anderson.

Occasional Paper 350. Genetic diversity and the possible origin of contemporary elk (*Cervus canadensis*) populations in the Trans-Pecos region of Texas. Christopher D. Dunn, Matthew R. Mauldin, Marisa E.

Wagley, Jeremy E. Wilkinson, Caleb D. Phillips, and Robert D. Bradley.

Occasional Paper 351. Noteworthy records for six species of bats from 13 Texas counties and the first voucher specimens from sites with *Pseudogymnoascus destructans*. Krysta D. Demere, Melissa B. Meierhofer, Michael L. Morrison, Brian L. Pierce, Joseph M. Szewczak, Jonah H. Evans, and Loren K. Ammerman.

Occasional Paper 352. Marsupials and rodents of the Admiralty Islands, Papua New Guinea. Ronald H. Pine, Andrew L. Mack, and Robert M. Timm.

Special Publication 66. A timeline of significant events in the development of North American mammalogy. David J. Schmidly, Robert D. Bradley, Lisa C. Bradley, and Richard D. Stevens.

View and download Occasional Papers and Special Publications at the NSRL website:

www.nsrl.ttu.edu/publications

Research Associate Profile

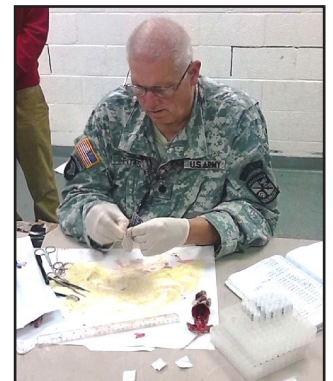
Lieutenant Colonel Richard (Rick) M. Pitts served 28 years (1967–1995) in the US Army (Field Artillery, Aviation, and Medical Service Corps). He served in the 25th Infantry Division, 101st Airborne Division and received 13 commendations for service during the Vietnam War. Rick attended Tarleton State University where he obtained a Master's degree in Biology in 1976. He then pursued post-graduate work in wildlife sciences at Texas A&M University. Rick was employed as a Biology teacher in San Antonio and then as a JROTC instructor at North Dallas High School for 20 years, before retiring from teaching in 2016.

During his education at Tarleton and Texas A&M, Rick enjoyed trapping and preparing voucher specimens for deposit at those institutions. Since 1989, he has been depositing voucher specimens and tissues at the NSRL, with the majority of his deposits being since 2010. In total, Rick

has a field catalog of 15,276 specimens, more than 4,500 of which are at the NSRL. In addition, Rick has authored 49 published papers.

Upon receiving the grant for the gopher project highlighted in this Newsletter, Robert Bradley approached Rick about assisting with collecting efforts. For this project, Rick

has so far collected more than 60 *Geomys* specimens of at least four different species from Flower Bluff, Cuero, Llano, D'Hanis, and Grimes County, Texas, as well as Fort Gibson, Oklahoma. The NSRL is grateful to Rick for his efforts and looks forward to many more years of collaboration.



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 is currently directing 2 PhD and 4 MS students. He has graduated 19 MS, 2 MA, and 11 PhD students, and he has published 1 book and 172 peer-reviewed articles.

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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 is currently advising or co-advising 1 MS and 3 PhD students.

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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 is currently advising 3 PhD, 2 MS, and 1 undergraduate students.

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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.

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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 maintaining the NSRL website, assisting with specimen tracking in the collections, and data management and design.

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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, the preparation of grant proposals, and the development of NSRL exhibits for the Museum.

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The position of **Curator of Invertebrate Zoology** is currently vacant. Due to a state-mandated hiring freeze and a subsequent budget cut, we unfortunately are unable to fill this position at this time. The Invertebrate Zoology Collection therefore is temporarily closed, and we are unable to accept research requests, collection visits, or donations of new material. Current NSRL staff are maintaining the collection. We hope to resolve these funding issues and fill this position in the near future.

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 136,209 cataloged specimens of an estimated 1,441 species. Specimen preparation types include preserved skins, skeletal materials, alcohol-preserved specimens, and taxidermy mounts. From July through December 2017, the Mammal Collection cataloged 1,357 specimens and granted 9 loans totaling 111 specimens.

Bird Collection



The Bird Collection currently contains 5,528 cataloged bird specimens, as well as eggs and nests, of approximately 890 species. From July through December 2017, the Bird Collection cataloged 5 new 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.

Genetic Resources Collection



The Genetic Resources Collection contains >370,000 samples of tissues, blood, and extracted DNA from >100,000 specimens of mammals and other taxa. From July through December 2017, the GRC granted 16 loans totaling 348 samples. The Collection incorporated 1,726 new samples obtained from 344 individuals.

As a whole, the NSRL hosted 188 visitors and volunteers from July through December, including researchers utilizing the collections, students taking classes, individuals and groups on tours, and volunteers assisting in the collections. The NSRL also filled 58 data requests by researchers. Twenty-four students (15 graduate, 9 undergraduate) were employed by the NSRL during all or part of the July through December time period.

FACULTY AND STAFF GRANTS (active July–December 2017)

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).

Conway, W., R.D. Bradley, C.D. Phillips, and S. Cunningham. “Status of bighorn sheep in Texas: Translocation history, disease risk potential, and establishment of archival tissue collection for range-wide disease surveillance.” Wild Sheep Foundation.

Conway, W., R.D. Bradley, C.D. Phillips, and S. Cunningham. “Funding for a PhD student.” Texas Bighorn Sheep Foundation.

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.E. McIntyre.** “Synergistic links between ecological traps and climate change in metapopulation dynamics: The keystone role of arid wetlands.” Texas Tech University Proposal Support Program.

Griffis-Kyle, K.L., and **N.E. McIntyre.** “Assessment of landscape conservation success for non-target species at risk.” Western Association of Fish & Wildlife Agencies - Grassland Initiative.

Johnson, E. and **R.D. Bradley.** “From the African Savannah to the North American Grassland - an Up From the Basement Exhibit.” The Helen Jones Foundation.

Johnson, J.S., **L.P. McGuire,** and M. Scafani. “Phenology of Northern Myotis (*Myotis septentrionalis*) autumn migration in western Pennsylvania.” Pennsylvania Department of Conservation and Natural Resources.

Kingston, T. “Southeast Asian Bat Conservation Research Unit.” NSF-Research Coordination Networks.

Longing, S., R. Cox, **N.E. McIntyre,** C. McKenney, and C. West. “Demonstration of pollinator conservation practices and a framework for regional implementation on the Southern High Plains.” USDA Natural Resources Conservation Service - Conservation Innovation Grants.

McGuire, L.P. “Bat migration across Lake Erie: Implications for offshore wind energy development.” Pennsylvania

Department of Environmental Protection.

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. and **R.D. Bradley.** “West Texas Garden (Stage I)—a landscaped learning experience.” The CH Foundation.

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.

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.

Rico-Cernohorska, A., **J. Salazar-Bravo,** et al. “Generación de fortalezas para la determinación de enfermedades zoonóticas en el norte de La Paz (PBE4 - Phase II).” Proyectos Concursables De Investigacion E Interaccion Social (IDH), Bolivia.

FACULTY AND STAFF GRANTS (continued)

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. and S. Fritts. “Fort Wolters bat surveys.” Texas Army National Guard.

Stevens, R.D. and S. Fritts. “Camp Maxey herpetofauna surveys.” Texas Military Department.

Stevens, R.D. and **L. McGuire.** “Winter site-occupancy and foraging activity of bats on the coastal plain of the southeastern United States with particular focus on Northern Long-Eared Bats (*Myotis septentrionalis*).” National Council for Air and Stream Improvements, Inc.

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.

Varela, R., **J. Salazar-Bravo,** et al. “Identification of peptides isolated from the slime of the Giant African snail (*Achatina fulica*) and their antimicrobial activity”. COLCIENCIAS, Colombia

STUDENT GRANTS AND RESEARCH AWARDS

Ezra Auerbach. Graduate student (Nancy McIntyre). TTU Graduate Recruitment Fellowship/The CH Foundation Graduate Fellowship.

Jeff Clerc. Graduate student (Liam McGuire). Student Research Award, Animal Behavior Society; Grants in Aid, American Society of Mammalogists; Grants in Aid, TTU Association of Biologists.

Demi Gary. Graduate student (Nancy McIntyre, co-advised with Dr. Kerry Griffis-Kyle). Congressional Internship through CASNR.

Lucas Heintzman. Graduate student (Nancy McIntyre). Elo and Olga Urbanovsky Assistantship; TTU Water Conservation Research Scholarship; TTU Graduate Student Research Support Award.

Laramie L. Lindsey. Graduate student (Robert Bradley). J Knox Jones Jr. Memorial Endowed Fellowship, TTU Biological Sciences.

Macy Madden. Graduate student (Tigga Kingston). J Knox Jones Jr. Memorial Endowed Fellowship, TTU Biological Sciences; Travel Grant, TTU Associate of Biologists.

Benneth Obitte. Graduate student (Tigga Kingston). Student Research Scholarship, Bat Conservation International.

Sydney Pope. Graduate student (Jorge Salazar-Bravo). J. Knox Jones Memorial Endowed Scholarship, TTU Biological Sciences.

Cristina Rios-Blanco. Graduate student (Richard Stevens). Grant in Aid of Research, TTU Association of Biologists.

Emma Roberts. Graduate student (Robert Bradley). J Knox Jones Jr. Memorial Endowed Fellowship, TTU Biological Sciences.

Elizabeth Rogers. Graduate student (Liam McGuire). TTU Graduate Student Research Support Award; TTU Association of Biologists Grants-in-Aid.

Pamela Sanchez. Graduate student (Jorge Salazar-Bravo). Research Grant, CONYCET, Peru.

Taylor Soniat. Graduate student (Robert Bradley). J Knox Jones Jr. Memorial Endowed Fellowship, TTU Biological Sciences.

John Stuhler. Graduate student (Richard Stevens). Grant in Aid of Research, American Society of Mammalogists; Grant in Aid of Research, TTU Association of Biologists.

Iroro Tanshi. Graduate student (Tigga Kingston). Michelle Knapp Memorial Scholarship in Mammalogy, TTU; IdeaWild Equipment Grant; Rufford Foundation research grant; Women in Conservation Science Award, Bat Conservation International.

Emily Wright. Graduate student (Robert Bradley). J Knox Jones Jr. Memorial Endowed Fellowship, TTU Biological Sciences.

RECENT PUBLICATIONS BY NSRL FACULTY, STAFF, AND STUDENTS

- Bohlender, E.E., N. Borray-Escalante, J. Perez-Torres, and R.D. Stevens. Dietary variation during reproduction in Seba's short-tailed fruit bat. *Journal of Mammalogy*, In Press.
- Bradley, R.D., L.C. Bradley, and N. Ordóñez-Garza. Species accounts #181–#313 of the Family Cricetidae. Pp. 355–396 in *Handbook of the Mammals of the World*, vol. 7 (D.E. Wilson, T. E. Lacher, Jr., and R. A. Mittermeier, eds.). Lynx Edicions, Barcelona, Spain.
- Collins, S.D., J.C. Abbott, and N.E. McIntyre. Quantifying the degree of bias from using county-scale data in species distribution modeling: Can increasing sample size or using county-averaged environmental data reduce distributional overprediction? *Ecology and Evolution* 7(15):6012–6022. doi:10.1002/ece3.3115.
- de Lara Muylaert, R., R.D. Stevens, et al. ATLANTIC BATS: a dataset of bat communities from the Atlantic Forests of South America. *Ecology* 98:3227.
- Drake, J., K. Griffis-Kyle, N. McIntyre. Graph theory as an invasive species management tool: Case study in the Sonoran Desert. *Landscape Ecology* 32(8):1739–1752.
- Dunn, C.D., M.R. Mauldin, M.E. Wagley, J.E. Wilkinson, C.D. Phillips, and R.D. Bradley. Genetic diversity and the possible origin of contemporary elk (*Cervus canadensis*) populations in the Trans-Pecos region of Texas. *Occasional Papers, Museum of Texas Tech University* 350:1-15.
- Florens, F.B.V., C. Baider, V. Marday, G.M.N. Martin, Z. Zmanay, R. Oleksy, G. Krivek, C. Vincenot, M.L.F. Monty, and T. Kingston. Disproportionately large ecological role of a recently mass-culled flying fox in native forests of an oceanic island. *Journal of Nature Conservation* 40:85–93.
- Heintzman, L.J., S.M. Starr, K.R. Mulligan, L.S. Barbato, and N.E. McIntyre. Using satellite imagery to examine the relationship between surface-water dynamics of the salt lakes of western Texas and Ogallala Aquifer depletion. *Wetlands*. doi:10.1007/s13157-017-0940-2.
- Jayat, J., G. D'Elia, R. Torres, S. Pacheco, P. Ortiz, J. Salazar-Bravo, and B. Patterson. Integration of morphological, ecological, and genetic evidence suggests that the genus *Andinomys* (Rodentia, Cricetidae) is monospecific. *Journal of Mammalogy* 98:1060–1077.
- Martínez, V., I. Gamarra de Fox, R.D. Stevens, M.L. Ortiz, N. de la Sancha, and M. Ruíz-Díaz. Chiroptera. En *Libro Rojo de Mamíferos del Paraguay*. Pp. 55-66. Asociación Paraguaya de Mastozoología y Secretaría del Ambiente.
- Milazzo, M.L., M. N. B. Cajimat, M. H. Richter, R. D. Bradley, and C. F. Fulhorst. Muleshoe virus and other hantaviruses associated with Neotomine or Sigmodontine rodents in Texas. *Journal of Vector-Borne and Zoonotic Diseases* 17:720–729.
- Pardiñas, U.F. J., P. Myers, L. León-Paniagua, N. Ordóñez-Garza, J.A. Cook, B. Kryštufek, R. Haslauer, R. D. Bradley, G. I. Shenbrot, and J. L. Patton. Family Cricetidae. Pp. 204–279 in *Handbook of the Mammals of the World*, vol. 7 (D.E. Wilson, T. E. Lacher, Jr., and R. A. Mittermeier, eds.). Lynx Edicions, Barcelona, Spain.
- Pardiñas, U. F. J., Cañón Valenzuela, C. and J. Salazar-Bravo. A matter of weight: Critical comments on the basic data analysed by Maestri et al. (2016) in *Journal of Biogeography* 44:2673–2677. *J Biogeogr* doi:10.1111/jbi.13098.
- Platt, R.N., B.C. Faircloth, K.A.M. Sullivan, T. Kieran, T.C. Glenn, M.W. Vandewege, T.E. Lee, R.J. Baker, R.D. Stevens, and D.A. Ray. Conflicting evolutionary histories of the mitochondrial and nuclear genomes in New World *Myotis*. *Systematic Biology*, in press.
- Porter, C. A., N. E. Beasley, N. Ordóñez-Garza, L. L. Lindsey, D. S. Rogers, N. Lewis-Rogers, J. W. Sites, Jr., and R. D. Bradley. A new species of big-eared climbing rat, genus *Otodylomys* (Cricetidae: Tylomyinae) from Chiapas, Mexico. *Journal of Mammalogy* 98:1310–1329.
- Schmidly, D. J., R. D. Bradley, L. C. Bradley, and R. D. Stevens. A timeline of significant events in the development of North American mammalogy. *Special Publications, Museum of Texas Tech University* 66:1–37.
- Sommers, A.S., W.A. Boyle, and L.P. McGuire. Validation of a field-ready meter for plasma β -hydroxybutyrate analysis. *Journal of Field Ornithology* 88:399–404.
- Sullivan, K.A.M., R.N. Platt II, R.D. Bradley, and D.A. Ray. Whole mitochondrial genomes provide increased resolution and indicate paraphyly in deermice. *BMC Zoology* 2:11.
- Teeling, E., S. Vernes, L. Davalos, D.A. Ray, M.T.P. Gilbert, E. Myers, and Bat1K Consortium. Bat1K: A proposal to generate chromosome-level genomes for all living bat species. *Annual Review of Animal Biosciences*, in press.
- Teta, P., R. González-Ittig, E. González, U.F.J. Pardiñas, and J. Salazar-Bravo. Notes on the taxonomy of *Calomys laucha* (Rodentia, Cricetidae), with the designation of a neotype. *Mastozoologia Neotropical* 24:419-429.
- Tipton, C.D., M.E. Mathew, R.A. Wolcott, R.D. Wolcott, T. Kingston, and C.D. Phillips. Temporal dynamics of relative abundances and bacterial succession in chronic wound communities. *Wound Repair and Regeneration*, DOI: 10.1111/wrr.12555.
- Yancey, II, F. D., R. W. Manning, J. R. Goetze, L. L. Lindsey, R. D. Bradley, and C. Jones. The hooded skunk (*Mephitis macroura*) from the Davis Mountains of west Texas: Natural history, morphology, molecular characteristics, and conservation status. *Texas Journal of Science* 69:87–95.

Notice to All Authors of Occasional Papers and Special Publications

The NSRL is in the process of reducing our inventory of printed Occasional Papers and Special Publications, for the entire series dating back to 1972. Demand for hard copies has declined over the years, and storage space in the NSRL is at a premium. All recent issues are available online as PDFs, and our goal is to make all volumes available in PDF format via our website over the course of the next year or so. We do plan to retain a limited number of hard copies, but we will cull the excess inventory through several methods, including donation, sales to book dealers, and, as a last resort, recycling.

If you have published in our series and wish to receive hard copies of your publications from this excess inventory, please contact Lisa Bradley at lisa.bradley@ttu.edu, by 1 May 2018, with the volume numbers and quantity of each that you desire, and we will do our best to fulfill your requests. Depending on the quantity requested, authors may be asked to cover the cost of shipping.

The NSRL will continue to produce hard copies of new volumes of Occasional Papers and Special Publications for distribution to authors, libraries, and others through request. Thank you for understanding that we did not come by this decision lightly, but we are confident that the printed copies available in numerous libraries, and the online presence of the PDF files, will not have a negative effect on the availability and distribution of our publications.

Hint to Students!

Did you notice our latest Special Publication, #66, that is mentioned on page 3? This publication, entitled “A timeline of significant events in the development of North American mammalogy,” is a very helpful resource for all students who want to learn about the people, events, and publications that influenced the history of North American mammalogy, from the 16th century to the present. It should prove particularly useful for graduate students in preparation for their written exams! (And faculty members preparing those exams!)

Download a PDF of this publication at <http://www.nsrll.ttu.edu/publications/specpubs/sps/SP66.pdf>.

FACULTY AWARDS



Tigga Kingston received the Gerrit S. Miller Jr. Award from the North American Society for Bat Research at its annual meeting in October 2017. This award is granted in recognition of outstanding service and contribution to the field of chiropteran biology. Tigga is the 26th recipient of the award since it was established in 1977. Tigga joins **Robert J. Baker** (2009) as the second NSRL-associated faculty member to have received this award.

OUTREACH NEWS AND EVENTS

Benneth Obitte, graduate student of **Tigga Kingston**, conducted focus group discussions with households, bat hunters, and bat meat vendors in two southern Nigerian states to obtain information on bat hunting and bat meat consumption. The discussions focused on these broad areas: socio-economic structure of the local communities; attitude and perception towards bats; bat-human interactions (e.g., whether people eat bat meat or not); hunting details (e.g., hunting off-take, method of hunting, mode of consumption); drivers of hunting; meat preferences; forest use and value; and bat meat consumer chain. The focus groups are part of the preliminary studies for his Ph.D. research on conservation assessment and ecosystem services of the Egyptian Fruit Bat (*Rousettus aegyptiacus*) in southern Nigeria.



Benneth Obitte leading a focus group discussion on bat hunting in Ososo, Edo state, Nigeria. 12 July 2017.

Student Profiles



Daniela Arenas-Viveros, Ph.D. student, Department of Biological Sciences. Advisor: Jorge Salazar-Bravo.

My graduate research has focused on the historical processes (intrinsic and extrinsic to the organism) that promoted the evolution and diversification of small Neotropical mammals. Now for my doctoral research, I would also like to study the origins of diversification in situ, by using a combination of field-based and laboratory approaches. One of the goals of my research is to assess whether the Colombian Grass Mouse (*Akodon affinis*), for whom different chromosomal numbers have been reported in populations inhabiting the northern Andes, is indeed one or rather a complex of species. To do so, I will integrate morphological, ecological, phylogenetic, and possibly, genomic data.



Carlos Garcia, M.S. student, Department of Natural Resources Management. Advisors: Richard D. Stevens and David A. Ray.

My research focus is the winter and summer roosting ecology of the threatened northern long-eared bat (*Myotis septentrionalis*) in the Kisatchie National Forest, Louisiana. Roosts provide sites for mating, hibernation, and rearing young, they promote social interactions and facilitate digestion of food, while offering protection from weather and predators. I will also be studying the diets of the northern long-eared bat and the southeastern bat (*M. austroriparius*) using COI barcoding. This research will help the Louisiana Department of Wildlife and Fisheries and the United States Forest Service manage and better understand the ecology of *M. septentrionalis*.



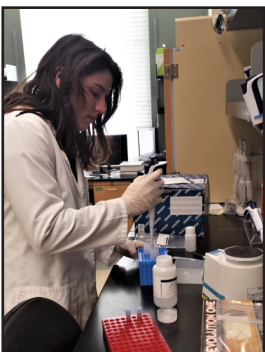
Jenna Grimshaw, Ph.D. student, Department of Biological Sciences. Advisors: David A. Ray and Richard D. Stevens.

My current research is to identify patterns in genetic structure for three species of critically-imperiled Louisiana bats: *Myotis austroriparius*, *M. septentrionalis*, and *Eptesicus fuscus*. More specifically, I will determine if each of these three species comprise a single population or multiple genetic sub-populations with little gene flow. I am also interested in the distribution of transposable elements among mammalian genomes from a genomic ecological perspective.



Preston McDonald, M. S. student, Department of Biological Sciences. Advisor: Caleb Phillips.

I'm currently studying *Sigmodon fulviventer dalquesti*, a rodent thought to be unique to Texas. The questions I am trying to answer concern the population, distribution, and phylogeny of *S. f. dalquesti*. By using molecular and morphometric methods, field sampling, and niche modeling, I hope to inform future decisions about the conservation and management of these rodents within Texas.



Nicole Paulat, M.S. student, Department of Biological Sciences. Advisor: David A. Ray.

My research focuses on examining how transposable elements affect genome structure and gene evolution. Specifically, I am analyzing associations between transposable element activity, including insertion and accumulation patterns, with localized mutations and DNA mutation rates proximal to genes within *Myotis* bat genomes. Identifying polymorphic DNA transposon and retrotransposon accumulation patterns across a dozen *Myotis* species will provide insight on the scope of transposon-mediated mutations in genic regions and structural associations in mammalian systems.

Student Profiles (cont.)



John Stuhler, Ph.D. student, Department of Natural Resources Management. Advisor: Richard D. Stevens.

My dissertation research focuses on the ecology of the Texas kangaroo rat (*Dipodomys elator*), a rare species that today is found in just five counties in north-central Texas. I have combined field surveys and modeling methods to better understand what limits its present-day distribution. The next stage of my dissertation will examine changes in rodent community structure across its historical range over time.

Collection Activities: Installing Specimens

Maintaining specimens in a natural history collection within an organized, logical order is crucial, not only for using resources efficiently and limiting risk to the specimens, but for providing access to the specimens for research. The NSRL's mammal and bird collections are organized by taxonomic order, where specimens are grouped by species, and within species they are grouped by locality. Specifically, the collection is sorted and organized starting at the taxonomic level of order and working through family, genus, species, country, state, county, and finally catalog number.

The process of specimen installation into the NSRL's collections includes a final data check, grouping the specimens in the above order, labeling the skeletal material with its catalog number, inserting each specimen into its new location, and updating inventory records. This process often requires additional space to be made available within the collection for that particular species or locality, which is accomplished by shifting previously installed specimens and updating their locations.

During summer and fall 2017, as part of ongoing curatorial activities, NSRL personnel installed ~1,860 mammal

dry preps (vouchers with a study skin, skeletal material, or both) and ~3,740 fluid-preserved voucher specimens (in 224 jars). This task necessitated the shifting of hundreds of drawers containing previously installed specimens, as well as more than 200 jars of fluid specimens, to allow for the additional specimens to be placed in the correct taxonomic order. This work was accomplished with the help of several collection assistants, graduate students, and undergraduate assistants, including Chris Trobridge, Nicté Ordóñez-Garza, Caitlin Highsmith, Laramie Lindsey, Clay Francis, and Margo Prewitt.



Clay Francis and Chris Trobridge moving specimen drawers during the installation process.

AUGUST AND DECEMBER 2017 GRADUATES

Demi Gary, M.S. Chairs: Nancy McIntyre and Dr. Kerry Griffis-Kyle. Thesis title: Examining the southern Great Plains for hotspots of at-risk species and assessing efficacy of a decision-support tool.

Marina Fisher-Phelps, Ph.D. Chair: Tigga Kingston. Dissertation title: Modeling Asian bat distributions: Assessing the effect of ecology and spatial biases on model accuracy. Current position: Post-doctoral Research Associate, University of New Hampshire and Northern Arizona University.

Amie Sommers, M.S. Chair: Liam McGuire. Thesis title: Phenotypic flexibility and energy demand: Continuous organismal response through the summer season. Current position: Ph.D. student, University of Nebraska.

The Role of Texas Tech University and the NSRL in the History of the Texas Society of Mammalogists

The Texas Society of Mammalogists (TSM) is a non-profit organization of scientists, policy makers, and students dedicated to the study of mammals. The goal of the society is to expand and disseminate knowledge of mammalian ecology, evolution, and conservation, with a primary focus on Texas and the surrounding states. Texas is the only state in the U.S. to have a society devoted to the science of mammalogy. Over the course of its history, more than 30 institutions have been represented at TSM's annual meetings. From its beginning, the mammalogy faculty and students of Texas Tech's Department of Biological Sciences and the NSRL have been heavily involved in the activities of the society, and they remain dedicated to its continued growth and success.

A society devoted to Texas mammals and the science of mammalogy was the vision and passion of Robert L. Packard, the first mammalogist to be hired by Texas Tech University in 1965. Dr. Packard shared his dream for such a society with Dr. Robert J. Baker, who joined the TTU faculty in 1967. It has been through the collaboration of many mammalogists, but particularly the fierce dedication and support of Robert Baker for 40 years, that the Texas Society of Mammalogists has grown to become such a successful organization and a valuable influence on the science of mammalogy in Texas.

In February of 1979, Dr. Packard organized a "Texas State Mammal" meeting of approximately 30 faculty members and graduate students from at least eight universities. The meeting took place at the TTU Center at Junction (Packard was Director of the Junction Center at the time) and was quite informal – no officers were elected, no constitution was drafted, and no other efforts were made to officially establish the society. Sadly, Dr. Packard passed away just two months after this meeting.



Dr. Robert L. Packard

Many of the Texas mammalogists at the 1979 meeting shared Dr. Packard's vision, however, and continued his early efforts by calling for an organizational meeting in 1981. At that meeting, with 29 charter members in attendance, the name of the organization was officially designated as the Texas Society of Mammalogists, and a committee was elected to draft a constitution.

The first annual meeting of the society took place at the TTU Center at Junction in February 1983. With Robert Baker serving as *ad hoc* presiding officer at the business meeting, the constitution was approved and the first group of officers were elected. Also, it was agreed that the 1984 meeting of the society would be held at the TTU Center at Junction. The annual selection of the TTU Center at Junction as the venue for the meeting soon became a "formality," and it has hosted every meeting of the Society to date. The Center has been an ideal venue for TSM thanks to its available facilities, comfortable housing, good food, gracious staff, central location in the state, and beautiful campus, as well as its historical ties to the origins of the society and to Dr. Packard.



Texas Tech University Center at Junction

At the 1983 meeting, fifty-three members were in attendance and 14 oral papers were presented by graduate students from Texas Tech University (7 papers), University of Houston (3 papers), Texas A&M University (3 papers), and Sul Ross State University (1 paper). Since those early years, the Society has grown to an annual attendance of 120–150 members and 35–40 presentations. In 2017, at TSM's 35th annual meeting, 147 members were in attendance and graduate and undergraduate students presented 20 oral papers and 18 posters.

Over the 35-year history of TSM, the following presidents of the society have been TTU faculty during the term of their presidency: J Knox Jones, Jr.; Clyde Jones; Robert J. Baker; Robert D. Bradley; Carleton J. Phillips; and Richard D. Stevens (current President-Elect). Further, 16 of the 35 presidents (46%) were M.S. and/or Ph.D. graduates of Texas Tech University. It is interesting to note that the presidency of TSM actually reflects several academic "generations" (and one genetic) of Texas Tech relationships. Many presidents are 3rd or 4th generation "descendants" of Robert Packard and/or Robert Baker (see diagram on facing page).

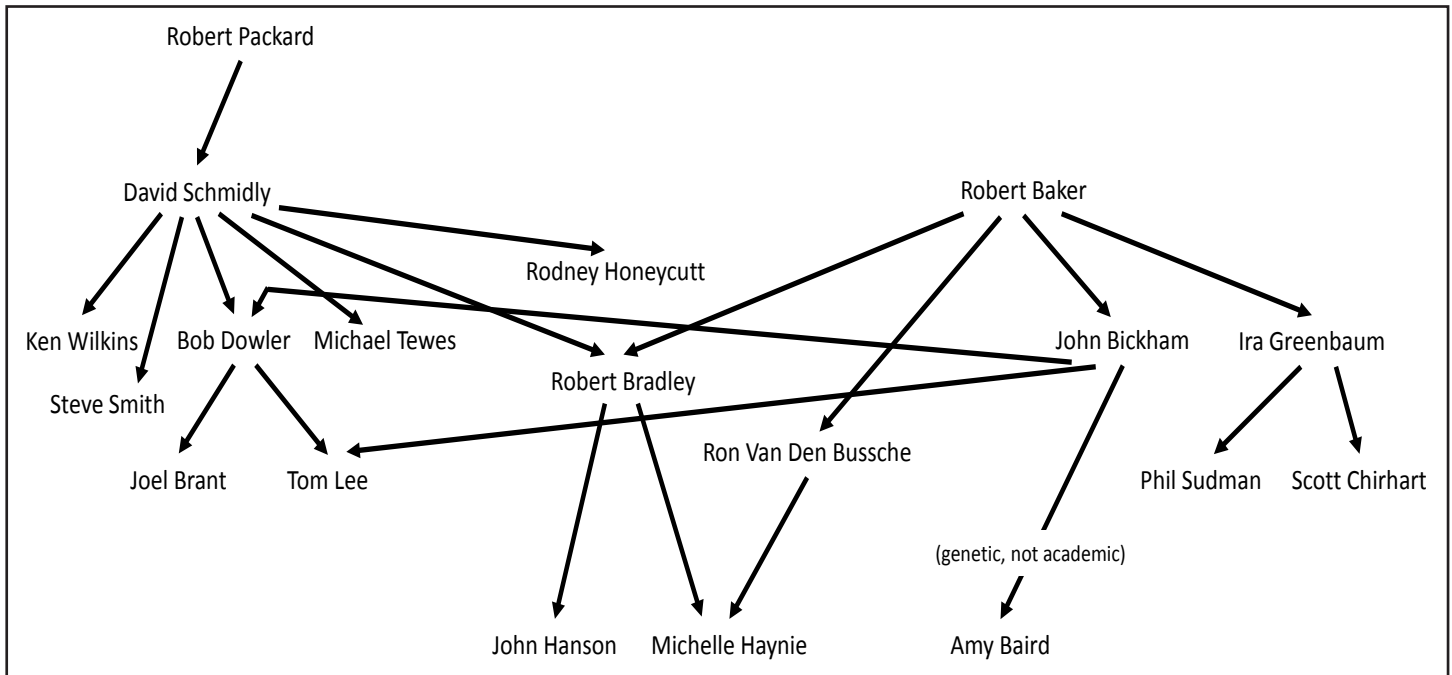
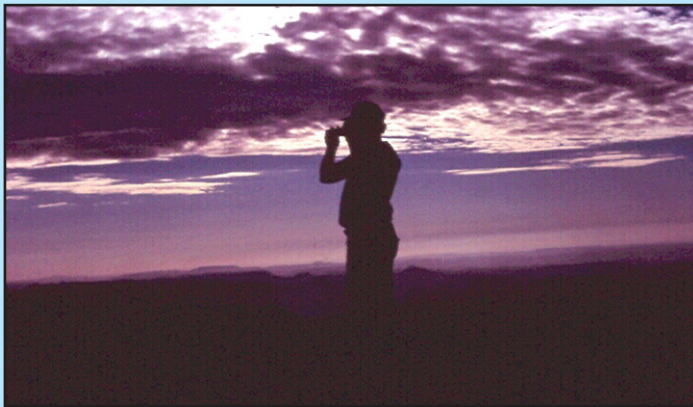


Diagram illustrating the complex 3rd and 4th generation relationships of TSM presidents to Texas Tech University's graduate mammalogy program (2nd generation presidents are not shown unless they had students that became TSM presidents).

Texas Tech graduate and undergraduate students, the majority of which have been closely associated with the NSRL as part of their education and research, have presented 283 (38%) of the 738 total papers at the 35 annual meetings. Of the 136 total student awards presented by the society since 1984, 49 (36%) have been received by TTU students.

The representation of Texas Tech and NSRL-affiliated faculty and students at the TSM meetings is a reflection of the strength of the mammalogy program at TTU. It is also a testament to the value of the NSRL to both the advancement

of the science of mammalogy and to the education and future careers of the young men and women that have been a part of the mammalogy program at Texas Tech University. Synergistically, by providing a venue for students to present their research and to interact with and learn from mammalogists from across the region, the Texas Society of Mammalogists has been a major contributor to the success of these students as they pursue advanced degrees and careers in the natural sciences. The NSRL is grateful for the Texas Society of Mammalogists and is proud to be a part of its history and its future.



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

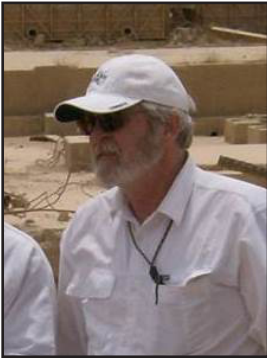
A Message to Prospective Students:

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.

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. Ron Chesser is a Professor of Biological Sciences. His research program focuses on assessing radioactive contamination, reconstructing flow of radioactive materials into the environment, and modeling the impacts and recovery of mammal populations affected by radiation. He has conducted research at Chernobyl, Ukraine, since 1992. He worked in Iraq for eight years (2005–2013) dismantling the former nuclear infrastructure, and he has contracted with the US Department of State, Department of Energy, International Atomic Energy Agency, Great Britain Ministry of Industry, US Civilian Research & Development Foundation, and the European Commission.

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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.

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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 Palearctic 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.

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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.

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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 crocodilians.

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Dr. Brenda Rodgers is an Associate Professor of Biological Sciences. Her research centers on the impacts of radiation on small mammals, mechanisms of adaptation to low dose radiation in pregnant females and fetuses, and human health issues in contaminated environments. She has worked on mammal population impacts at Chernobyl, Ukraine, since 1997. She worked for eight years in Iraq evaluating human impacts in contaminated regions and training scientists on laboratory practices, and she has contracted with the US Department of Energy (Low-dose Program), US Department of State, and the Civilian Research & Development Foundation.

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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.

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Dr. Richard Stevens is an Associate 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. They also conduct morphometric studies to try to better understand the relationship between form and function in bats as well as how phenotypic variation contributes to large-scale patterns of biodiversity.

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UNDERGRADUATE RESEARCH

During the period July through December 2017, 16 undergraduate students were conducting research under the direction of 8 NSRL faculty associates.

STUDENT PRESENTATIONS

During July through December 2017, at least 7 graduate students and 2 post-doctoral associates gave 7 oral and 2 poster presentations of their research at 1 international and 3 national conferences and society meetings.



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*.

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