Joint Meeting of the Central Plains Society of Mammalogists & the Central Ecology and Evolution Conference

Sternberg Museum of Natural History

Hays, KS

11-12 October 2024

CPSM and CEEC Program

11-12 October 2024

Overview

The 2024 joint meeting of the Central Plains Society of Mammalogists (CPSM) and Central Ecology and Evolution Conference (CEEC) is held at the Sternberg Museum of Natural History in Hays, KS. We have a set of exciting talks and posters by students from across the Great Plains.

Schedule

Day	Approximate time	Event	Location
Friday, 10/11	10am-afternoon	KBWG	Sternberg Museum: Expeditions room
	6:00-8:00 pm	CPSM opening social	Frontier Park West
Saturday, 10/12	8:00-9:00 am	CPSM/CEEC registration and poster set up	Sternberg Museum Lobby
	9:00-11:30 am	Welcome CPSM/CEEC talks	Sternberg Museum: Engel classroom
	11:30 am-1:00 pm	Lunch (on own) CPSM board meeting	
	1:00-2:00 pm	CPSM members meeting	Sternberg Museum: Engel classroom
	2:00-3:00 pm	Alt-Ac Career Panel	Sternberg Museum: Engel classroom
	3:00-5:00 pm	Poster session CPSM/CEEC	Sternberg Museum Lobby
	4:00-4:45 pm	Collections tour	Meet in Museum Lobby
	5:00-6:00 pm	Keynote Speaker: Daniel Becker	Sternberg Museum: Engel classroom
	6:00-8:00 pm	Banquet Brief CPSM board meeting Student awards	Sternberg Museum Lobby

Opening Social

Friday, 10/11, 6-8 pm, Frontier Park West - Chips, dips, and smores provided; BYOB

Oral Presentations

Saturday, 10/12, Sternberg Museum of Natural History, Engel Classroom

Time	Presenting Author	Title	Presenter Classification	Conference
9:15	Emilyn J. Gilmore	Grassland Fragmentation and Prairie Mammals: A Trait-Based Method for Rapid Vulnerability Prediction	MS Student	CPSM
9:30	Nadiya L. Cavallo	Population Diversity of Mammalian Species Found on Moderately and Highly Disturbed Land Plots in Cushing, Oklahoma.	MS Student	CPSM
9:45	Braidy G. Hunt	Using Automated Radio Telemetry to Track Gray Bats in Southeast Kansas	Undergrad Student	CPSM
10:00	Joseph Paysen	Roosts of Silver-haired Bats (*Lasionycteris noctivagans*) in Riparian Habitats of Western Nebraska	Undergrad Student	CPSM
10:15	Heather Burrow	Seasonal Use of Abandoned Mined Lands by Non-breeding Birds: Preliminary Findings	Undergrad Student	CEEC
10:30		Break		
10:45	Ben J. Wiens	Unidirectional mitochondrial introgression supports distinct biogeographic history of red-backed voles in southeast Alaska	PhD Student	CPSM
11:00	Matthew T. Turnley	Harmless tags or hazardous ads? Investigating the potential for ear tags to increase predation on neonatal ungulates	PhD Student	CPSM
11:15	Miranda K. Theriot	Abundant, accessible, and overlooked: The case for prioritizing systematic collecting in our local environments	PhD Student	CPSM

11:30 a.m.-1:00 p.m. Lunch on your own

CPSM Board meeting meets during the lunch hour in the Engel Classroom

Alt-Ac Careers Panel

2:00-3:00 p.m. in the Engel Classroom

Panelists:

- Justin Roemer from The Nature Conservancy
- Zack Cordes from Kansas Department of Wildlife and Parks
- Zach Roth from Natural Resources Conservation Service (NCRS)

Poster Presentations

Saturday, 10/12, Sternberg Museum of Natural History, Lobby

	Presenting Author	Title	Presenter Classification	Conference
1	Hana L. Walker	Trait-based comparisons of adaptive capacity in two montane lagomorphs	MS Student	CPSM
2	Brandon Bernhardt	Home-range size and nest-site selection of southern flying squirrels at their range edge	MS Student	CPSM
3	Jacqueline W. Olexa	Gliding into genetics: phylogeography and evolutionary history of Kansas southern flying squirrels (*Glaucomys volans*)	MS Student	CPSM
4	Lydia Robbins	Quantifying the spatial distribution of southern flying squirrels (*Glaucomys volans*) at their range edge	MS Student	CPSM
5	Patrick Geyer	Vigilance and foraging behaviors of two sciurid species between college campuses and urban environments	MS Student	CPSM
6	Kaitlyn J. Bebensee	Small mammal community composition and diet in Southwestern Missouri prairies	MS Student	CPSM
7	Daniel Ibañez IV	Generating mitogenomes for potential zoonotic reservoir species in Kansas using Nanopore Adaptive Sampling	MS Student	CEEC
8	Nana-Esi Irie Hanson	The Impact of Anthropogenic Infrastructure on Avian Reproduction: A Study of House Wrens in Proximity to Highways	MS Student	CEEC
9	Zachary Herbert	The Swimming of Sea Serpents: A Geometric Morphometrics Analysis of the Locomotive Morphology of Mosasauroids	MS Student	CEEC
10	Marisa S. Pitts	Seasonal and Interannual Variation in Bat Communities at the Sam Noble Museum	Undergrad Student	CPSM

11	Dawson V. Kosmicki	Seasonal Distribution by Month for Evening Bats (*Nycticeius humeralis*) in North America	Undergrad Student	CPSM
12	Samuel C Speck	Impacts of contemporary mammalian species turnover across the central Great Plains.	Undergrad Student	CPSM
13	Taylor C. Lowe	Wiggling tail behaviors in grassland and shrubland rodents in the Great Plains	Undergrad Student	CPSM
14	Chad Zerr	Ordinal-level Biomass of Insects Collected On and Off Prairie Dog Colonies	Undergrad Student	CEEC
15	Lorelei E. Patrick	Effects of student demographics on self-identity as a scientist in course-based research modules	Other	CPSM
16	Zackary Cordes	Trends in Abundance of Cave Myotis in Kansas Hibernacula	Other	CPSM

Keynote Address

Bat migration, immunity, and infection dynamics in the Great Plains

Dr. Daniel Becker, University of Oklahoma

Bats are well-recognized to harbor diverse zoonotic viruses, bacteria, and protozoa and, at the same time, are vulnerable to some fungal and bacterial pathogens. In other taxa such as birds, ungulates, insects, and even fish, long-distance migration has been well-studied as a behavior that can increase infection risk in wildlife, through increasing exposure to pathogens and suppressing immune function in ways that enhance susceptibility to new or chronic infections. The interactions between migration, immunity, and infection in bats may operate differently than in other taxa, given some distinct aspects of bat immune systems, the overlap between bat migratory and reproductive periods, and the need of these nocturnal mammals to couple both migration and foraging during night. In this talk, I will discuss ongoing work focused around Mexican free-tailed bats (*Tadarida brasiliensis*) sampled seasonally in western Oklahoma between their spring arrival from Mexico through their fall departure. I will highlight molecular analyses of pathogens detected in blood and saliva samples, immunological analyses through hematological and proteomic assays, efforts to monitor migration timing and duration using lightweight tracking technologies, and mathematical modeling approaches to lastly project pathogen spread across a migratory network of bats.

Abstracts - Oral Presentations

Grassland Fragmentation and Prairie Mammals: A Trait-Based Method for Rapid Vulnerability Prediction

Emilyn J. Gilmore* (MS Student), Hayley C. Lanier

Sam Noble Oklahoma Museum of Natural History, University of Oklahoma, Norman, OK, USA; School of Biological Sciences, University of Oklahoma, Norman, OK, USA

Anthropogenic change—impacts humans have had upon the environment—has become the major driver of decline for biodiversity across the globe. Predicting how biota are impacted by anthropogenic change can be difficult and can often require detailed knowledge of systems prior to noticeable aspects of change. Yet, most management and land use decisions need to occur on a much shorter timeline. Thus, methods are needed to harness the biological and ecological data we already possess for assessing the vulnerability of species before widespread declines. One approach—trait vulnerability assessment—has been used to predict sensitivity to climate change but is less commonly applied to other stressors, such as habitat fragmentation. Here, we develop this framework for predicting the vulnerability to habitat fragmentation and demonstrate the application with respect to small mammals across prairie habitats in Oklahoma. We contrasted these results with conservation rankings from NatureServe and the Oklahoma Department of Wildlife Conservation species' rankings and identified discrepant predictions which suggest further research is needed. This framework will allow us to rapidly predict and hopefully mitigate the effects of habitat fragmentation on sensitive species and provides an approach that can be applied for predicting sensitivity and exposure to fragmentation in other systems.

Population Diversity of Mammalian Species Found on Moderately and Highly Disturbed Land Plots in Cushing, Oklahoma

Nadiya L. Cavallo* (MS Student), Richard W. Dolman, Michelle L. Haynie

University of Central Oklahoma

Effects of chemical pollution can be observed at all levels of biological organization. At the population level, species, genetic diversity, and genetic structure may be affected by exposure to petroleum contamination. This research will occur on two privately owned land plots in Cushing, Oklahoma – one identified as moderately disturbed due to hayed fields and use of farm equipment, and one identified as heavily disturbed from orphaned oil wells. Floristic Quality Assessment will measure disturbance levels between the two sites. I will conduct a general mammalian survey using Sherman, Tomahawk, and camera traps to gather data from both properties. Data will be analyzed using Shannon's diversity index. Resulting data will be used to determine variation within the communities on these two plots and identify impacts of petroleum extraction on species diversity. I will also collect 20 *Peromyscus leucopus* and 20 *P. maniculatus* from each site to be used in genetic identification. In addition to my samples

collected from Cushing, I will use samples collected from northeast, northwest, southeast, and southwest Oklahoma to observe population structure across the state.

Using Automated Radio Telemetry to Track Gray Bats in Southeast Kansas

Braidy G. Hunt* (Undergraduate Student), Andrew D. George

Pittsburg State University

The Gray Bat (*Myotis grisescens*) is a federally endangered species that reaches the westernmost limit of its geographic range in southeast Kansas. Gray Bats are migratory, traveling biannually between summer colonies and large communal hibernacula. However, little is known about the timing of migration, routes taken, and connectivity among caves. Our objective was to track migrating Gray Bats using the Motus automated telemetry network, an international collaborative project for tracking migratory animals. In October 2023, we attached 20 transmitters to Gray Bats near Pittsburg, Kansas. We also deployed Motus nodes at the two known roost exits to detect the presence of tagged bats and estimate their departure dates. Our preliminary results suggest that Gray Bats departed from their summer roost near Pittsburg in late October and early November, traveling east into Missouri. We recently deployed Motus nodes at most known Gray Bat hibernacula in Missouri, which will be used to link the Pittsburg colony to specific caves. We plan to track an additional 40 bats in 2024 and 2025. The expanding Motus network will continue to enhance our understanding of the movement of Gray Bats and other migratory animals.

Roosts of Silver-haired Bats (*Lasionycteris noctivagans*) in Riparian Habitats of Western Nebraska

Joseph Paysen* (Undergraduate Student), Dawson V. Kosmicki, Keith Geluso

Department of Biology, University of Nebraska at Kearney

Silver-haired Bats (*Lasionycteris noctivagans*) are a migratory bat species that occur across most of the United States and Canada. Silver-haired Bats roost in trees in both coniferous and deciduous trees throughout their range. In Nebraska, Silver-haired Bats are a Tier 1 species of concern, and knowing their roosting habits in the state is vital for future conservation efforts. In late May 2024, we captured Silver-haired Bats at Ash Hollow State Historical Park in Garden County. We attached radios to 5 bats (4 females and 1 male) of which 2 females and 1 male were tracked to roost trees the following week. For day roost, we recorded the tree species, DBH, % dead, % cover, height, and distance to nearest neighboring tree. We also recorded trees (species, DBH, and life status) in plots around roost and random trees in the forest. Compared to the average reference tree, the average roost tree had a greater DBH, lower % dead, lower % canopy cover, greater height, and was closer to nearest neighboring tree. Compared to the average reference plot, the average roost plot contained more trees with similar average DBHs. We detected a significant difference between roosts and reference trees

with roost trees having larger DBHs and taller heights. No roost and reference plot measurements were significantly different. All roosts were located in Eastern Cottonwoods (*Populus deltoides*) and signal strength suggested that all bats were roosting under exfoliated bark or in cavities on dead or dying parts of these trees. Our findings suggest maintaining old growth Cottonwood forests along riparian corridors in western Nebraska may be important for maintaining summer reproductive sites for Silver-haired Bats.

Seasonal Use of Abandoned Mined Lands by Non-breeding Birds: Preliminary Findings

Heather Burrow* (Undergraduate Student), Andrew George

Pittsburg State University

During winter and migration, birds rely on habitat that provides high-energy food and protection from predators and adverse weather. Abandoned mined lands (AMLs) are disturbed ecosystems that often include a mosaic of successional habitats, some of which may support diverse bird communities. Our goal is to establish a long-term banding study to investigate bird use of AMLs during the non-breeding season. We established 4 study sites in 2023 in a formerly surface-mined landscape in Crawford County, in southeast Kansas. We used constant-effort mist-netting to survey birds each month, including biweekly during fall and spring migration. Thus far, we have captured 57 species on AMLs, including 12 residents and 45 migrants, of which 24 do not breed in the study region. Analysis of seasonal demographics and body condition is ongoing. Our project emphasizes the potential conservation value of AMLs for birds during the non-breeding portions of their full annual cycle.

Unidirectional mitochondrial introgression supports distinct biogeographic history of red-backed voles in southeast Alaska

Ben J. Wiens* (PhD Student), Jocelyn P. Colella

Biodiversity Institute, Department of Ecology and Evolutionary Biology, University of Kansas

Southeast Alaska harbors a distinct faunal assemblage due to the interaction of past glacial cycles and complex regional topography consisting of island archipelagos and coastal mountains. During the last glacial maximum (LGM) terrestrial fauna persisted north and south of North American ice sheets, or in small ice-free glacial refugia along the North Pacific Coast. Such dynamics promote allopatric speciation and secondary contact upon glacial recession, with the potential for hybridization if barriers to reproduction are incomplete. We investigate outcomes of secondary contact between northern (*Clethrionomys rutilus*) and southern (*C. gapperi*) red-backed voles across contact zones that span Southeast Alaska (SEAK) and northern Canada. We used RADseq to generate thousands of SNPs for >200 red-backed vole specimens to test for evidence of admixture and infer biogeographic histories of each species. We found limited evidence for admixture in the nuclear genome, but by analyzing nuclear and mitochondrial RAD loci separately we detected extensive mitonuclear discordance in SEAK and

British Columbia. Interestingly, all cases of mitochondrial discordance involve a *C. rutilus* mitogenome in a *C. gapperi* nuclear background, suggesting demographic biases to hybridization and/or adaptive mitochondrial introgression. Further, we document a distinct *C. rutilus* mitochondrial clade consisting only of SEAK individuals with *C. gapperi* nuclear genomes. Together, our findings suggest a complex biogeographic history for high latitude red-backed voles mediated by the availability of ice-free colonization pathways following the LGM and incomplete barriers to reproduction.

Harmless tags or hazardous ads? Investigating the potential for ear tags to increase predation on neonatal ungulates

Matthew T. Turnley* (PhD Student), M. Colter Chitwood, Michael J. Cherry, Marlin M. Dart, Randy W. DeYoung, Derek P. Hahn, Levi J. Heffelfinger, Robert C. Lonsinger, Celine M. J. Rickels, Evan P. Tanner, H. George Wang, and W. Sue Fairbanks

Department of Natural Resource Ecology and Management, Oklahoma State University (MTT, MCC, DPH, WSF); Caesar Kleberg Wildlife Research Institute, Texas A&M University-Kingsville (MJC, MMD, RWD, LJH, CMJR, EPT); U.S. Geological Survey, Oklahoma Cooperative Fish and Wildlife Research Unit, Oklahoma State University (RCL); 4Department of Biological and Environmental Sciences, East Central University (HGW)

Neonatal ungulates often rely on cryptic coloration to avoid predation while their mobility is limited. Nevertheless, many researchers mark neonates with brightly colored ear tags to facilitate visual identification. We monitored early-life survival of neonatal pronghorn (Antilocapra americana) in Oklahoma, USA to determine if ear tags increased the likelihood of predation-related mortality. Predation was the leading cause of mortality, but ear-tag status (i.e., presence or absence of an ear tag) did not influence the likelihood of predation. Our results complement previous examinations of the relationship between ear-tag status and neonatal survival in areas without predators. All available evidence suggests ear tags do not influence survival of neonatal ungulates.

Abundant, accessible, and overlooked: The case for prioritizing systematic collecting in our local environments

Miranda K. Theriot* (PhD Student), Caleigh R. Schultz, Hayley C. Lanier

Sam Noble Oklahoma Museum of Natural History, School of Biological Sciences, University of Oklahoma

As repositories of biodiversity, natural history collections are essential to monitoring the ongoing impacts of global change on wildlife. Collecting common, local species can provide large sample sizes for testing complex trends, providing key insights into community-level changes, environmental toxins, urban ecology, and threats to endangered species. However, the goals and constraints of collection may lead to common and/or local species being deprioritized. Here,

we assessed recent trends in collecting common species local to North American mammal collections. For our focal collections, we calculated the proportions of recent specimens (2009-2019) that were local or non-local at the county and state levels (based on museum location), and common or rare (based on species conservation status). Results indicate that common species are generally only collected opportunistically at the local county level (for example, representing only about 3% of yearly collections, on average, at the Sam Noble Oklahoma Museum of Natural History), suggesting that the environments immediately surrounding museums may be underrepresented. As museums are typically located in towns and cities, this lack of collection may limit the study of long-term biodiversity trends of urban ecosystems. Uncovering potential collecting bias and its causes is the first step in effectively leveraging our common backyard species—those that may be overlooked or deprioritized—to understand the impacts of widespread environmental change.

Abstracts - Poster Presentations

Trait-based comparisons of adaptive capacity in two montane lagomorphs

Hana L. Walker* (MS Student), Hayley C. Lanier

School of Biological Sciences, University of Oklahoma (OU)

Climate change represents a clear and present threat to biodiversity preservation, yet not all species are equally impacted. One approach for predicting which species are most likely to be at risk involves using existing trait knowledge (e.g., traits enabling or limiting a species' ability to adapt), to generate an assessment of adaptive capacity. Adaptive capacity frameworks can also be applied to compare among species in the same habitat or in the same lineage, allowing us to contrast relative risk. Here, we used trait data to develop an assessment of adaptive capacity in the collared pika (*Ochotona collaris*), a high-latitude and montane lagomorph with potentially low thermal tolerance. We compared the results to existing assessments of its southern cousin, the American pika (*Ochotona princeps*), a species that has become iconic for the risks it faces from climate change. We find that collared and American pikas share many adaptive capacity traits, but have key differences in reproduction and recruitment. Collared pikas have lower recruitment, but their polygynandrous mating system may provide greater potential for adaptive response than the facultatively monogamous American pika. By evaluating adaptive capacity in collared pikas, and considering the results in terms of relative risk, we are able to contrast different in challenges faced by each species, identify existing gaps in collared pika literature, and provide a better understanding of adaptive responses which may allow pikas to persist on the landscape.

Home-range size and nest-site selection of southern flying squirrels at their range edge

Brandon Bernhardt* (MS Student), Andrew Hope, Lydia Robbins, Amanda Bishop, Zachary Cordes, Adam Ahlers

Division of Biology, Kansas State University (BB, AH, AB); Horticulture and Natural Resources, Kansas State University (LR, AA); Kansas Department of Wildlife and Parks (ZC)

Southern flying squirrels (*Glaucomys volans*, hereafter "flying squirrels") are common throughout the eastern United States, with the western edge of their geographic range extending into the Great Plains where deciduous forest transitions into grassland. While numerous studies have explored flying squirrel habitat-driven space use, it is unclear what categorizes good-quality habitat at their western range edges compared to core range populations where habitat quality is assumed to be higher. We are assessing how local habitat features influence flying squirrel space use in eastern Kansas through evaluations of home-range size and nest-site selection during summer and fall 2024. We captured and tracked 3 flying squirrels in summer 2024 using VHF collars to establish average home-range sizes, which can be compared to published home-range sizes from the interior of their geographic range, and we plan to capture and track at least 20 more in fall 2024. We will assess nest-site selection by comparing used nest sites and random locations available within individuals' home ranges. We will also quantify habitat use within home ranges, as well as other randomly selected sites,

through measures of tree diversity and forest structure. Habitat data combined with home-range size and nest-site locations should provide estimates of habitat quality for flying squirrels in Kansas. These data will provide managers with science-based information to inform conservation decisions for flying squirrels and their associated habitat.

Gliding into genetics: phylogeography and evolutionary history of Kansas southern flying squirrels (*Glaucomys volans*)

Jacqueline W. Olexa*[1] (MS Student), Ethan Denk[1], Brandon Bernhardt[1], Zachary Cordes[2], Adam Ahlers[1], Andrew G. Hope[1, 3]

[1]Division of Biology, Kansas State University, [2]Kansas Department of Wildlife and Parks, Kansas State Biorepository

Southern flying squirrels (*Glaucomys volans*) are a Species In Need of Conservation (SINC) within the state of Kansas. Given that G. volans within Kansas is data deficient in terms of both ecology and evolutionary dynamics, collaborative research funded by the Kansas Department of Wildlife and Parks is being conducted to investigate distributions, home range dynamics and genetic legacies. These interconnected projects encompass regional camera surveys, radiotelemetry, and conservation genetics, constituting a holistic species assessment with overlapping methods for locating squirrels, capturing them, and generating data. Despite the camera trap surveys showing significant evidence of G. volans throughout portions of eastern Kansas, traditional live trapping through summer 2024 was largely unsuccessful. Given that nest boxes have proven reliable for communal winter nesting of G. volans, we instead developed, built, and deployed >60 squirrel nest boxes across 21 state wildlife areas, and plan to sample squirrels from these through winter 2025 for genetic analyses. Preliminary phylogenetic analysis using mtDNA Cytb sequencing of four collected G. volans samples (three Kansas, one Virginia) and several geographically diverse GenBank sequences suggests that Kansas specimens represent at least two distinct lineages, possibly increasing overall genetic diversity through Kansas when compared to other regions. This work reflects ongoing efforts towards an integrated conservation program. In progress work includes development of deeper genomic sequencing workflows, and ongoing sample collection from Kansas and across Eastern North America. We discuss our findings in light of how peripheral population management priorities differ from elsewhere across the distribution of this wide-ranging species.

Quantifying the spatial distribution of southern flying squirrels (*Glaucomys volans*) at their range edge

Lydia Robbins * (Undergraduate Student), Amanda Bishop, Brandon Barnhardt, Zackary Cordes, Andrew Hope, and Adam A. Ahlers

Kansas State University

Southern flying squirrels (SFS; *Glaucomys volans*) are a “species in need of conservation” in Kansas, USA because of perceived low abundances and limited distributions. However, recent anecdotal records suggest the need for more rigorous population studies to ascertain their true distribution in the state. We are evaluating their current geographic distribution using camera-trap surveys and occupancy modeling across 400 randomly distributed sites in forested land cover in the eastern part of Kansas in 2023-2025. At each camera site, we place 2-4 suet-baited cameras approximately 2-3 meters in the canopy for ~14 days. Cameras within sites are spaced ≥50 meters apart and we categorized habitat structure and composition surrounding each camera. Since June 2023, we established 191 camera site locations across 38 different counties. Currently, we detected SFS at 40 camera sites (naïve occupancy 0.21) in 14 counties in eastern Kansas. We will complete sampling of all sites in 2025, and our results will provide clearer information regarding the true distribution of SFS in Kansas.

Vigilance and foraging behaviors of two sciurid species between college campuses and urban environments

Patrick Geyer* (MS Student), Zoe Buffington, Lorelei Patrick

Fort Hays State University

A comparison between the extent that sciurid specimens display vigilance and foraging behaviors on college campuses against specimens within urban environments. Observations of fox squirrels and western gray squirrels were taken from the Squirrel-Net behavioral database used for this project. We found there was a significant difference between the percent vigilance behaviors and foraging behaviors on college campuses compared to urban environments. This suggests that squirrels residing on college campuses are more desensitized to pedestrian activity and foot traffic compared to squirrels that inhabit urban areas.

Small mammal community composition and diet in Southwestern Missouri prairies

Kaitlyn J. Bebensee* (MS Student), Sean P. Maher

Department of Biology, Missouri State University (KJB, SPM)

Small mammals provide many important services to the ecosystems they inhabit including being prey and dispersing seeds, and they are indicators for environmental health. Additionally, small mammals in shared environments interact directly and indirectly for similar resources, especially in their diet. To quantify community dynamics better, we need to understand and measure these species’ interactions. In southwest Missouri, prairies support a small mammal community, dominated by the North American deer mouse *Peromyscus maniculatus*, with frequent occurrence of the prairie vole *Microtus ochrogaster* and the cotton rat *Sigmodon hispidus*, based on past surveys. The abundance of these species can fluctuate annually, and the occurrence per site can vary as well. It is unclear how the presence and frequency of prairie voles impacts diet breadth of deermice. To address this, we sampled ten prairies, documenting

presence and collecting fur and vegetative samples. We will complete stable isotope analysis to determine what resources are utilized by the species within the various prairies. If there are similarities in species diet, then the stable isotope signatures of prairie voles and deermice should resemble one another, and we would conclude there is no current competition for food resources. However, if there are differences in diet, and therefore differences in the stable isotope signatures, we would conclude the presence of one species impacts the diet breadth of another because of competition for food resources. Understanding these interactions will help guide future management efforts for these prairies and provide a measure of interaction among small mammals.

Generating mitogenomes for potential zoonotic reservoir species in Kansas using Nanopore Adaptive Sampling

Daniel Ibañez IV* (MS Student), Ben J. Wiens, Alex D. Hey, Jocelyn P. Colella

University of Kansas

Kansas has been identified as a hotspot of zoonotic diseases, defined as those that can move between animals and people. Previous work has used machine learning to identify 13 rodents in Kansas suspected to serve as viral reservoir hosts. Nanopore Adaptive Sampling (NAS) facilitates the detection of pathogens by sequencing only reads that match a reference file. As a proof of concept for this methodology we select ten of these species (*Neotoma floridana, Synaptomys cooperi, Dipodomys ordii, Onychomys leucogaster, Reithrodontomys montanus, Geomys bursarius, Zapus hudsonius, Ictidomys tridecemlineatus, Microtus ochrogaster, and Sciurus nige*r) and showcase our use of NAS to selectively sequence mitochondrial DNA of mammalian origin. All available mammal mitogenomes from NCBI GenBank were compiled as a reference file. Basecalling and alignment of raw nanopore reads to the reference file was performed in real time before assembly and annotation of mitogenomes. We generated 2,168,000 reads, with an average read length of 699bp across all species and an average mitochondrial coverage of 125X. This variance may be attributed to differences in the quality of DNA samples, influenced by the time elapsed between the death of the specimen and tissue collection. To our knowledge these are the first mitogenome assemblies for 3 species, *Z. hudsonius, N. floridana, and R. montanus*. Here we present a comprehensive analysis of the mitochondrial genomes examined. These methods constitute an exciting proof of concept for rapid and real time adaptive sampling which we will use for pathogen surveillance within these host species.

The Impact of Anthropogenic Infrastructure on Avian Reproduction: A Study of House Wrens in Proximity to Highways

Nana-Esi Irie Hanson* (MS Student), Medhavi Ambardar

Fort Hays State University

Road infrastructure has multifaceted effects on bird populations, influencing various aspects of their ecology and behavior. We investigated the impact of road infrastructure, particularly highways, on the reproductive success of House Wrens (*Troglodytes aedon*) in a rural area. We compared the reproductive success of House Wrens in sites close to a major highway (Sternberg Museum Nature Trail) with sites located farther away (along Big Creek) in Hays, KS. We hypothesized that House Wrens near highways would exhibit lower reproductive success. We recorded metrics of reproductive success, traffic volumes, and noise levels. Wrens at the Big Creek site had higher reproductive success, suggesting that this site offers more favorable environmental conditions, such as better food availability, lower disturbance, and higher quality habitat compared to the Sternberg Museum site. There was only one successful nest attempt at the Sternberg Museum site by House Wrens. Within the Big Creek site, as noise levels increased, House Wren reproductive success slightly increased ($r = 0.131$). Conversely, as traffic volume increased, reproductive success decreased ($r = -0.755$). Overall, nests that were farther from major highways exhibited higher reproductive success than sites near the highway due to increased traffic volumes. Further research on how predation and climate change may affect the reproductive success of House Wrens and other songbirds along road infrastructure could provide valuable insights into the impact of anthropogenic structures on avian reproductive success.

The Swimming of Sea Serpents: A Geometric Morphometrics Analysis of the Locomotive Morphology of Mosasauroids

Zachary Herbert* (MS Student), David Tarailo

Fort Hays State University

Mosasaurs are a clade of marine reptiles that went extinct 66 MYA in the K-Pg mass extinction. While previous morphometric studies of mosasauroids have focused on cranial and dental elements, this study seeks to use geometric morphometric techniques to analyze the locomotive morphology, i.e. the limbs and caudal vertebrae. Results from these analyses show some trends that run contrary to phylogenetic expectations, with the shapes of the forelimb bones for tylosaurines being quite unique compared to those of their closest relatives, the plioplatecarpines. Plioplatecarpines have forelimb bones more similar in shape to the more distantly related mosasaurines. Allometry analysis for both forelimb and hindlimb elements revealed strong relationships between the shapes and the sizes of the forelimb bones. For the medial femur, fibula, and ulna data sets, the respective elements had longer shafts and narrower distal ends as overall length increased. Other bones also show signs of allometry, primarily changes in the shapes of the proximal and distal ends. Future analyses will examine the degree to which phylogenetic signal is influencing these relationships.

Seasonal and Interannual Variation in Bat Communities at the Sam Noble Museum

Marisa S. Pitts* (Undergraduate Student), R.J. Trent, Dr. Hayley C. Lanier

Sam Noble Museum of Natural History, University of Oklahoma

Migration and hibernation are important behaviors that help species adapt to colder temperatures and reduced resources in winter months. Changes in climate can interfere with the environmental cues that trigger these behaviors or disrupt them once they have begun. To better understand the relationship between climate and these behaviors, we analyzed bat calls to create a baseline for which species are present during each month of the year. An acoustic detector was deployed on top of the Sam Noble Museum for almost five years to collect a robust baseline. The audio files were uploaded to Kaleidoscope and analyzed to determine what species were present. Of the eight species present at the Museum, two species (*Lasiurus borealis*, Eastern Red Bat, and *Tadarida brasiliensis*, the Mexican Free-tailed Bat) were identified during all twelve months, and one species (*Nycticeius humeralis*, the Evening Bat) was identified during eleven months. In contrast, *Myotis velifer* (Cave Myotis) was only occasionally identified during the summer and fall. By creating a baseline of monthly presence and activity we gain a better understanding of hibernation and migration patterns within these communities.

Seasonal Distribution by Month for Evening Bats (*Nycticeius humeralis*) in North America

Dawson V. Kosmicki* (Undergraduate Student), Keith Geluso

Department of Biology, University of Nebraska at Kearney (UNK)

The Evening Bat (*Nycticeius humerali*s) is a migratory, cavity-roosting tree bat that occurs throughout the eastern United States. In the western and northern parts of its distribution, the species is expanding into states such as Minnesota, Nebraska, Texas, and New Mexico. Little is known about their migratory habits and where this species resides in different seasons of the year. We analyzed seasonal distribution patterns by amassing specimen data from the Global Biodiversity Information Facility website (GBIF.org) and plotted coordinates on ArcGIS for specimen records across both the U.S. and Mexico. By splitting records into 12 monthly maps, distinguishing between the sexes, we can discern areas occupied seasonally by sex and how their movement patterns differ. Results suggest that adult females disperse farther north and east from wintering grounds whereas adult males do not disperse as far or possibly do not disperse at all. In the southeastern U.S., some adult females occur year-round, as not all females appear to migrate. These findings indicate that migration in Evening Bats is not universal for the species. A genetic investigation across females in the U.S. might be interesting. Those that migrate will likely succumb more often to fatalities associated with wind turbines than non-migratory individuals. Knowing where and when this species migrates will assist the wind energy facility operators and biologists with strategies to reduce turbine use when bats migrate through their region, moderating mortality rates to help conserve this and other migratory species.

Impacts of contemporary mammalian species turnover across the central Great Plains

Samuel C Speck* (Undergraduate Student), Andrew G. Hope

Kansas State University (KSU)

The Great Plains are experiencing progressive woody encroachment and loss of native grassland habitats. Grasslands support small mammal communities that are distinct from woodland communities. Each is dominated by a different species of Peromyscus mouse, with *P. maniculatu*s often the most abundant species in open prairies and *P. leucopus* dominant in woody habitats. We investigated changes in abundance of these two species across Kansas at multiple scales of analysis to understand the ecological and evolutionary impacts of faunal turnover within this system. We compiled specimen records of both species from museum collections to assess temporal changes in abundance within Kansas. We also analyzed 40 years of recapture data from the Konza LTER site to understand turnover between these species within a landscape scale experimental system. Finally, we sampled both species for mtDNA cytochrome b sequencing to delineate the distribution of intra-specific lineages across their ranges. We found a steady multi-decade decline in abundance of *P. maniculatus* and increase in abundance of *P. leucopus* within Kansas. From Konza data we observed a striking turnover in numerical dominance favoring *P. leucopus* through time, where woody encroachment leads to both turnover, and increased carrying capacity. From genetic results we show that *P. maniculatus* only has a single lineage within Kansas whereas *P. leucopus* has four evolutionarily significant units. We summarize our results from the perspective of what these changes may mean for the future integrity of prairie communities, and functional consequences for human health through associated changes in parasite densities and pathogen loads.

Wiggling tail behaviors in grassland and shrubland rodents in the Great Plains

Taylor C. Lowe* (Undergraduate Student), Keith Geluso

Department of Biology, University of Nebraska at Kearney (UNK)

Tails in animals have many uses, including locomotion, communication, predator avoidance, thermoregulation, and sensory. Some specific examples include lizards avoid predation by having their tails break off, rattlesnakes use it as a warning, flying squirrels use it for balance while gliding, and some rodents use tails for jumping or climbing. While conducting research on various rodents in the Great Plains, we noted a wiggling behavior with their tails with some individuals while handling them. For this research, we identified which species demonstrated this behavior and correlated it to their natural history and habitat preferences. To date, we have observed this behavior in 4 of 11 species. Most woodland and shrubby habitat species showed this behavior, such as White-footed Mice (*Peromyscus leucopu*s) and Fulvous Harvest Mice (*Reithrodontomys fulvescen*s). In contrast, many grassland species do not show the behavior,

except for Hispid Cotton Rats (*Sigmodon hispidus*). Our data suggest that the wiggle behavior generally is related to locomotion for climbing and semi-arboreal species but secondarily now this behavior also appears used to possibly distract predators. Interestingly a large majority of *S. hispidus* with this behavior were female, which supports the idea that female Hispid Cotton Rats will resort to climbing behaviors when searching for food when it is scarce and taking care of young. As with many traits or behaviors of animals, our study suggested that wiggling tails of climbing and semi-arboreal mice serve more than one function.

Ordinal-level Biomass of Insects Collected On and Off Prairie Dog Colonies

Chad Zerr* (Undergraduate Student), Colby Cook, Lorelei Patrick

Fort Hays State University

Recent work has shown that bats in Colorado and Kansas are more active over prairie dog colonies. It is hypothesized that the reason for this is increased abundance and richness of insects found on colonies versus off colonies. Sampling from 2022 indicated that insect biomass was not different between location types, but suggested that the relative abundance of insect orders may differ. Additional insect sampling was conducted in 2023. Light traps were deployed on the same nights, one on a prairie dog colony and one in adjacent, non-colony habitat. Insects were preserved and stored in ethanol. To measure overall biomass, the samples were drained in a sieve until the drip rate of the ethanol was greater than 10 seconds. Insects were then back into ethanol before being sorted into Orders, then dried and weighed again. Both total biomass and ordinal biomass were corrected for the number of hours the light traps were deployed on a given night. The results from this research will allow us to better understand the biodiversity associated with prairie dog colonies and why bats are more active over colonies.

Effects of student demographics on self-identity as a scientist in course-based research modules

Lorelei E. Patrick* (Other), Hayley C. Lanier, Patrice K. Connors, Jennifer M. Duggan, Laurie Dizney, Christopher Yahnke, Liesl P. Erb, Johanna Varner, Elizabeth A. Flaherty

Fort Hays State University and Sternberg Museum of Natural History (LEP); Sam Noble Museum and University of Oklahoma (HCL); Colorado Mesa University (PKC and JV); California State University, Monterey Bay (JMD); University of Portland (LD); University of Wisconsin Stevens Point (CY); Warren Willson College (LPE); Purdue University (EAF)

Course-based Undergraduate Research Experiences (CUREs) are an ideal teaching method to share the benefits of authentic research experiences to a larger, more diverse population of students. We created a national network of field-based, mammalogy focused CURE modules investigating the behavioral ecology of squirrels, called Squirrel-Net. Previously, we found that Squirrel-Net improves student self-identity as scientists. Here, we describe the demographic parameters of Squirrel-Net students and their impact on students' likelihood to self-identify as

scientists. Students from almost 60 institutions spanning 90 courses responded to surveys before and after participating in a Squirrel-Net CURE between 2019-2022. Student demographics included gender, ethnicity, identification as Hispanic, and first-generation status. Student respondents for pre- and post-CURE surveys (N = 2382) were very demographically similar, with students most often identifying as female, white, non-Hispanic, and non-first-generation. We analyzed demographic parameters as predictors of self-identity as scientists with paired response data (N=466) using GLMs in R. Females and non-first-generation students were more likely to identify as scientists after participating in Squirrel-Net. Females were also more likely to change their response in a positive direction than males, and first-generation students were less likely to change their response than non-first-generation students. Our analyses provide a demographic snapshot of Squirrel-Net students, highlight the importance of expanding and diversifying the network, and confirm the benefits and pedagogical effectiveness of Squirrel-Net for undergraduate students.

Trends in Abundance of Cave Myotis in Kansas Hibernacula

Zackary Cordes* (Other), Diedre Kramer

Kansas Department of Wildlife and Parks

White-nose Syndrome (WNS), and the causal fungus, *Pseudogymnoascus destructans*, was documented in Kansas in 2018. WNS has resulted range-wide declines of several bat species in North America. Studying the impacts of WNS on Kansas bats is highly important, particularly for the Cave Myotis (*Myotis velifer*) as little is known about the species response to WNS. Colony count data collected from a long-term dataset (1965-2024) in gypsum caves located in the Red Hills of south-central Kansas was used to evaluate temporal variation in abundance of hibernating Cave Myotis. We used Spearman Rank Correlation to assess six winter colonies for changes in abundance. Since the introduction of WNS in Kansas, Cave Myotis winter colonies have experienced varying trends. Some hibernacula show significant increases or no significant changes, while data suggests other hibernacula are experiencing significant declines.