Concurrent Sessions

Fisheries

1. Spatial Heterogeneity of Metabolism in the Kansas River.
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River metabolism is a functional indicator consisting of the balance of Gross Primary Production (photosynthetic carbon fixation), Ecosystem Respiration (carbon oxidation), and their balance, Net Ecosystem Production. Estimating these rates allows us to examine total biological activity and reliance of the food web on external versus internal carbon sources. Gage point-measures over short time periods are generally used to assess metabolism, but they cannot encompass the variability of such a shifting and large river, so we sought to identify controls on rates of metabolism as varied with flood stage, location, and upstream geomorphology. We used a year (over flood and drought extremes) of dissolved oxygen data at three locations on the Kansas River in conjunction with bathymetry transects and USGS discharge and gage height data in order to estimate rates of river metabolism, link them to different flow regimes, and evaluate the degree of heterogeneity over the study area. We anticipated muted seasonal cycles of rates of metabolism due to flow control and the Kansas climate. Initial findings point to seasonal patterns of net ecosystem production, and confirmed hypothesized net heterotrophy.

2. A Case Study and Characteristics of the Blue Catfish Population and Fishery at Milford Reservoir, Kansas.
Brett Miller, John Reinke, Ely Sprenkle, Ben Neely, and Jeff Koch. Kansas Department of Wildlife, Parks, and Tourism, 1782 10th Road, Clay Center, KS 67432 | 785-461-5095 | brett.miller@ks.gov

Milford Reservoir is the largest impoundment in Kansas (6,556 surface ha) and supports several important sport fisheries, including Blue Catfish *Ictalurus furcatus*, that has developed into a nationally-recognized trophy fishery. However, information to describe both the population and fishery is relatively limited. We aim to provide historical information on Blue Catfish management in Milford Reservoir along with current research questions. In the past two years, we examined several components of the population and fishery to inform future management decisions. Specifically, we evaluated angler creel information, Blue Catfish population size, and angler exploitation. Blue Catfish were the most targeted species by anglers in April, July, August, September, and October 2018, but were only targeted by 15% of the total interviewed anglers from March to October 2018. Creel surveys estimated 17,011 Blue Catfish were harvested from March to October, 2018, and 23,726 released. Through a mark-recapture study from 2,342 tagged fish > 200 mm, population size was estimated at 1,043,906 (95% CI: 37,680 to 2,050,132), and relative abundance was 342.6/hr (SE = 59.5) using low-frequency electrofishing. Population size of fish > 635 mm was estimated at 16,388 (95% CI: 5,608 to 79,467) and CPE was 4.8/hr (SE=1.2). Through August 2019, anglers have reported capture of 54 tagged fish, including one that was captured twice. Anglers reported 30 captured fish (57% of which were harvested) < 635 mm and 25 captures of fish (8% were harvested) ≥ 635 mm. These results demonstrate the relative rarity and importance of Blue Catfish > 635

mm to the recreational fishery at Milford Reservoir. Further, they provide population-level insights that can be used to facilitate effective management of the fishery.

3. Status of the Blackside Darter (*Percina maculata*) in Kansas.

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The Blackside Darter (*Percina maculata*) is a threatened species in Kansas and a Tier 1 species of greatest conservation need. Since 1980 there are only 14 collection records of Blackside Darter in Kansas, with 12 collections from the Mill Creek watershed in Wabaunsee County and two collections from the Vermillion Creek watershed in Pottawatomie County. Three or fewer individuals have been recorded per collection, highlighting the restricted distribution and low abundance of Blackside Darter in Kansas. Recent information on the species status is limited, and as such the objective of our research was to assess its current distribution. We sampled 14 sites during June-July 2019 using backpack electrofishing and seining, and at all sites we identified every fish captured. We found a total of 6,392 individuals across 39 different species, but we did not find a single Blackside Darter. Our results indicated that the Blackside Darter remains extremely rare in Kansas and may be becoming rarer since we were unable to find it in streams where it recently occurred. Drought followed by flooding during 2018-2019 may have resulted in further range reductions, but additional study is needed concerning the Blackside Darter's status and the environmental factors regulating its occurrence.

4. White Perch (*Morone Americana*) Age and Growth at Select Kansas Reservoirs.

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White perch (*Morone americana*), an invasive fish species, are present in several Kansas reservoirs, including three Federal Reservoirs (Wilson, Cheney, and El Dorado). As with most invasive species, once established they can be difficult to eradicate and alter current community structure. They are complicating recruitment of sport fish by outcompeting them for resources vital at early growth stages, while adult White Perch prey on the native fish juveniles, whether it be the eggs, fry, or fingerlings. In reservoirs infested with white perch, sport fish have experienced inconsistent recruitment due to several abiotic and biotic factors, likely including competition with perch. This has caused biologists to alter management strategies to reduce abundance of White Perch. Despite growing concern for white perch, no formal age and growth studies have been implemented in Kansas reservoirs. This baseline information is valuable to determine natural mortality, predation risk, and density-dependent interactions, among other population indices. White Perch were collected by using experimental gill nets at Wilson, Cheney, and El Dorado reservoirs. Back calculation for age and growth data will be derived from otoliths using R-software. This information will be used to guide future management decisions regarding the ever-changing dynamic between fish populations in these reservoirs.

5. Scaling Predator-Prey Interactions: Does Prey Aggregation and Movement Mediate Scale-dependent Predator Consumption Rates?

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Relationships between species and the abiotic environment often vary across spatial and temporal scales. Understanding how ecological relationships vary across scales helps link observations and predictions

from small experiments conducted at fine-scales to broader ecological patterns and processes. We manipulated the size of stream arenas to determine how predator-prey interactions of stream fish vary across different spatial scales. We predicted changes in prey aggregation, movement, and spatial overlap with predators would lead to decreased per capita consumption with increasing arena size. We tested these predictions using two prey species occupying different habitat guilds (water-column versus semi-benthic), and predicted patterns of consumption across arena sizes would hold true for both species. Per capita consumption (number of prey eaten per predator) increased with arena size ($F_{2,17}= 2.99$, $p=0.07$), but predators did not consume one species more than the other (deviance=1.29, $p=0.61$). Prey generally aggregated less and moved more with increasing arena size, but water-column and semi-benthic species exhibited unique responses in habitat use when overlapping with predators. While our observed increase in consumption with increasing spatial scale fits theory developed in other systems, the mechanisms driving this relationship may differ, and variation in prey behavior may drive different scaling relationships between predators and different prey species.

6. Can Freshwater Darters (*Percina*) Pass the Mirror Test? An Experiment in an Undergraduate Biology Classroom Based on Recent Cutting-Edge Science.

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Recently, a paper by Kohda and others (2018) presented the results of a small experiment using the cleaner wrasse (*Labroides dimidiatus*) that tested this fish's ability to pass the mirror test; a well-known, albeit controversial, test for self-awareness. Their interpretation of the results from their experiment suggested this species demonstrated the capacity to pass the mirror test and therefore can be considered "self-aware". We adapted their experiment and tested two species of freshwater darters native to Kansas, the Ozark Logperch (*Percina fulvitaenia*) and Slenderhead Darter (*Percina phoxocephala*). The experiment was part of a Course-Based Undergraduate Research Experience (CURE) for freshmen introductory biology laboratory (GB141). Twelve fish were collected from the Neosho River and Cottonwood River near Emporia, KS. We conducted three different experimental iterations over the month of October 2019, using a combination of personal observations at various times during the day and video recording. We adjusted our experimental design based upon the results of the previous experiment. We discuss the implications of fish self-awareness, the efficacy of the mirror test, difficulties with behavioral studies on fishes, and how our results fit into the current research on understanding non-human self-awareness.

7. Missouri River Flooding and Changes to a Floodplain Fish Community.

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The Department of the Army is constantly assessing natural resources on its posts in order to provide realistic training environments for troops and to be good stewards of those resources for the American people. Two scour holes, formed in levee breaches during 1993 flooding, were sampled in October 2018 to observe fish communities isolated since 2011. Missouri River flooding in November 2018 and in the spring and summer of 2019 all provided an exchange of fish and aquatic life between the river and the scour holes. Preliminary results from follow up sampling, in Oct 2019, will be presented and contrasted with pre-flood results. Results show the importance and impact of floodplain connectivity on floodplain fish communities.

8. Assessing Sportfish Diet in Kansas Small Impoundments with Variable Gizzard Shad Densities.

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Gizzard shad (*Dorosoma cepedianum*) often dominate the biomass of reservoir fish communities and represent the bulk of piscivorous fish diets. As part of a four-year, whole food web project to evaluate the role of gizzard shad in small Kansas impoundments, we analyzed the stomach contents of bluegill (*Lepomis macrochirus*), largemouth bass (*Micropterus salmoides*), and white crappie (*Pomoxis annularis*) across a gradient of gizzard shad densities. We sampled 12 impoundments in June, August, and October 2017 and 2018. Specimens were collected via daytime shoreline electrofishing and seining in littoral habitats. Ten individuals from different length categories were sacrificed for diet analysis during each sampling event. Stomach contents were identified to the lowest possible taxon under a dissecting microscope. Frequency of occurrence was calculated for prey items and compared across impoundments with variable densities of gizzard shad. We anticipated a higher frequency of occurrence of fish in largemouth bass diets in impoundments with higher densities of gizzard shad, as well as a higher frequency of occurrence of macroinvertebrates in the diets of bluegill in impoundments with higher shad densities. The frequency of occurrence of fish in largemouth bass diets ranged from 0.24 to 0.34 in impoundments without shad and 0.11 to 0.26.

9. Influence of Water Velocity on Growth of Two Minnow Species in the Gila River Basin.

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Understanding habitat needs of fishes can help managers decide which streams are optimal for translocation events. Habitat use by fish species is mediated by multiple biotic and abiotic factors making it difficult to gain a mechanistic understanding of habitat use. Experimental manipulations, however, can provide such an understanding because we are able to control potentially confounding variables. We evaluated the interactive effects of current velocity and aquatic insect availability on growth of longfin dace (*Agosia chrysogaster*) and speckled dace (*Rhinichthys osculus*) within instream enclosures placed in the Gila River, New Mexico. Biomass of drifting insects was positively correlated with increased velocities while biomass of benthic insects did not change across velocities. Total length did not change along a velocity gradient but speckled dace gained more weight in higher velocity habitats while longfin dace gained more weight in low velocity habitats. Our results indicate that fish have optimal growth in different habitat types and understanding these habitat needs can assist in managing species by aiding decisions in determining optimal translocation locations.

10. Using Remote Cameras to Estimate Angler Use at Five Small Impoundments in Kansas.

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Understanding human dimensions and collecting reliable data is an invaluable tool in effective fisheries management. Standard creel surveys using roving creel clerks interviewing anglers have traditionally been the most common method of obtaining angler use and fish catch data. These surveys provide a wealth of information and have been used by fishery managers for decades to assist with altering length and creel limits, stocking plans, and determining angler desires. Oftentimes, this method may not be feasible due to a lack of funding, inability to hire creel clerks, remoteness of the water body, or the scope of the project may be too narrow to warrant a standard creel survey. Remote cameras, including trail cameras and time-lapse units, are becoming more popular for collecting both spatial and temporal angler use patterns throughout the United States and overseas. In this study, remote cameras were placed at five

small Kansas impoundments and monitored from March 2018 to October 2018 to determine the feasibility of this method in Kansas. In addition, standard creel surveys were simultaneously conducted as a means of comparing results of the two methods. We present data collected using the remote cameras and the standard creel surveys and compare the two methods. In addition, we discuss the practicality of using this relatively new method and the best applications for it in the future.

11. Passive Telemetry Reveals Fine-Scale Use of a River-Reservoir Inflow by an Endangered Sucker.

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Reservoirs are common features in contemporary riverscapes. There is limited understanding of fish use of river-reservoir inflows for many species, but these habitats might provide trophic resources, spawning habitat, or optimal temperatures throughout the year. Razorback Sucker *Xyrauchen texanus*, a highly imperiled and endemic fish to the Colorado River basin, occurs in multiple large mainstem-reservoirs, and previous research has documented movement by individuals between reservoirs and river tributaries. To gain a more complete understanding of fish use of the river-reservoir inflow, we assessed movement and habitat use of Razorback Sucker along 52 km of the San Juan River inflow to Lake Powell from April 2018-March 2019 using acoustic and passive integrated transponder (PIT) telemetry. Razorback Sucker spawn from April-June in the San Juan River and previous research has documented annual movements of hundreds of fish towards the San Juan River in February-April, presumably for spawning, but sampling in the reservoir in April-June also readily captures ripe or spawning Razorback Sucker. This study provides an assessment of movement dynamics between the reservoir and river at finer temporal scales than was previously available, which will contribute to a more complete understanding of fish use of river-reservoir inflows.

12. A Comparison of Sampling Methods to Quantify Species Occurrences and Proportional Abundance in a Prairie Stream.

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Sampling methods play a vital role in determining fish community structure in prairie streams. However, some methods can bias the representative sample in these ecological and regional communities. Our goal was to test if sampling method resulted in different species richness and proportional abundance in a Flint Hills prairie stream. We tested for occurrence of species and proportional abundance using video monitoring, baited minnow traps, seining, and backpack shocking along multiple pools in Kings Creek on the Konza Prairie Biological Station. Preliminary results indicate that benthic species are under-represented with seines and water-column species are under-represented with backpack electrofishing. Video cameras captured more species than baited minnow traps, but neither of these two methods yielded the same diversity as electrofishing and seining. Further synthesis of data and additional experiments in different habitats is needed to gain a better understanding of how sampling methods might bias effort to quantify prairie stream fish communities.

13. Importance of Fish Passage for Intermittent Prairie Streams.

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Stream fragmentation due to poorly constructed road crossings can negatively affect native fishes by inhibiting access to spawning, feeding or refugia habitats. Many roads crossing through intermittent prairie streams have perched culverts acting as barriers to fish movement. Although these barriers can be mitigated, there is little research quantifying the benefits of barrier removal on fishes in these highly dynamic systems. We designed a study to test if the removal of a perched culvert in an intermittent reach of Kings Creek would allow upstream movement of fish from a perennial to an intermittent stream reach. We used passive integrated transponder (PIT) tags to track movement of three common prairie stream fish between 2016 and 2018, prior to removing the barrier, and again in 2019 after barrier removal. Although up to 50 percent of tagged fish moved into the intermittent reach in spring following rain events, none were observed moving past the perched culvert in the three years prior to barrier removal. In contrast, we detected seven individuals moving upstream after the barrier was removed. Although results are promising, we will continue to collect data through 2021 to rigorously evaluate the dispersal of fish through the system following the barrier removal.

14. Walleye *Sander vitreum* Sex Reversal in Kansas.

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The Fisheries Division of the Kansas Department of Wildlife, Parks, and Tourism recently completed a project aimed at sex reversal in walleye Sander vitreum. In conjunction with the personnel from Idaho and Iowa, hormones were utilized during the early life stages of intensive walleye culture. The intensive culture techniques provide the opportunity to manipulate sex via the incorporation of the hormones into the diet of walleye at a young age when gonad development occurs. Objectives were to determine a recipe for reversing the sex of walleye both female to male and male to female. Sex reversal has implications for both sportfish management and non-native eradication efforts.

Forestry, Wetlands, and Landscape Management

15. Cross-Timbers Oak Savanna Restoration: Rates and Mechanisms of Recovery in Understory Plant and Invertebrate Communities.

F. Leland Russell. Wichita St. University, Department of Biological Sciences, Wichita KS 67260 | 316-978-6091 | leland.russell@wichita.edu

The historical extent of Midwestern oak savannas has been greatly reduced, in part, through succession to closed-canopy woodlands. Oak savannas and open woodlands are good habitat for wild turkey reproduction because abundant arthropods in these high-light environments provide protein for poults. I present first-year data from a project to quantify rates and mechanisms of changes in understory plant and arthropod communities in thinned vs. unthinned one hectare plots in southeastern Kansas oak woodland as part of a savanna restoration. These first-year data compare understory plant and arthropod communities in woodlands with glades embedded within these woodlands, which I use as a restoration benchmark. In August, closed-canopy woodland understories had lower plant species richness, graminoid and legume covers but greater woody plant cover than glades. June sweep-net sampling showed 4X greater arthropod biomass in glades as in woodland. In greenhouse trails to evaluate woodland seed bank composition, only one of the 10 most frequently encountered plant species in glades emerged from woodland soils. These data provide a baseline for quantifying understory recovery as savanna restoration

proceeds. Further, dominant tallgrass prairie plants, which are thought to characterize oak savanna understories, are unlikely to recolonize from woodland seed banks.

16. Fifty Years of Urban Forestry: Cultivating Resilient Urban Ecosystems for Northwest Kansas.
Jami Seirer and Zoe Buffington. Kansas Forest Service, 3012 Broadway Ave, Hays, KS 67601 |785-410-2956 | jseirer@ksu.edu

Fifty Years. Four foresters. Thousands of trees. Hays High student, Zoe Buffington, has worked diligently to digitize historical urban forestry records written over the last half century by foresters representing the Kansas Forest Service for various cities across northwest Kansas. Historical community forestry plans were documented using ArcGIS Online, with species distribution tables and planning timelines and recommendations attached to each point as PDF files. Join us as we ditch the filing cabinets to explore Zoe's digitized work, taking a look at urban forestry in northwest Kansas through the years- explore lessons learned in the past – and hear our future plans for conserving northwest Kansas's urban forests during the extremes by cultivating urban ecosystem resilience.

17. Great Plains System of Growing for Long Lived Trees.
Brian Byers. Great Plains Nursery, 3074 County Rd. I, Weston NE 68070 | 402-540-4801 | brian@greatplainsnursery.com

A power point presentation showing new growing methods in the nursery industry using the Great Plains System (GPS) for growing trees. GPS utilizes RootMaker™ and RootTrapper™ containers and bags to produce a fibrous root system with lots of root tips. The more the fibrous root tips the better the nutrient uptake as well as quicker establishment for trees. Above the root system GPS focus on a lower branched tree with good caliper to withstand our Midwest winds and reduce the need for staking. All together the Great Plains System produces trees that strive in harsh mitigation or windbreak conditions that may not receive the attention of being planted in a manicured landscape.

18. Kansas Playas – A Past & Future Resource.
Jude Kastens, Randy Stotler, Debbie Baker and Don Huggins. University of Kansas, Kansas Biological Survey, Higuchi Hall, 2101 Constant Avenue, Lawrence, KS 66047 | jkastens@ku.edu

In the uplands between the main drainages of western Kansas, thousands of playas perforate the landscape. These ephemeral wetlands, sometimes called buffalo wallows, lagoons, or sloughs by local farmers, were a valuable resource for Native Americans and European settlers, providing sustenance in a water-scarce environment. Hundreds of species of plants and animals, indigenous and migratory, rely on playas for food, water and shelter. Presently, the vast majority of Kansas playas are embedded in farm fields and have long been viewed as an obstacle to production agriculture—that is until recently when playa functions and benefits have come into sharper focus. Primary among these are their role as hotspots for both biodiversity and, critically for the region's citizens and communities, aquifer recharge. A number of government programs provide landowners with options for conserving or restoring their playas, supported by tremendous efforts from a network of stakeholders ranging from concerned individuals to state agencies and non-profit organizations such as PLJV, KAWS, and DU. As we shed more light on the science and nature of playas, the importance of this abundant landscape feature for future generations of western Kansans is becoming increasingly apparent.

19. Playas Recharging Kansas Communities.

Matt Smith. Playa Lakes Joint Venture, Conservation Delivery Specialist, P.O. Box 177, Wilson, KS. 67490 785-420-7000 | matt.smith@pljv.org

There is growing recognition that playa conservation is an important strategy to preserve water quality and quantity, along with more programs and funding that engender and support a coordinated, regional approach to conserving and restoring playas. For example, a playa restoration model that provides collateral benefits to the people who live in small towns in western Kansas is really gaining traction. Not only does the restoration work provide critical habitat for wetlands birds and other wildlife, but more importantly, results in increased and cleaner water recharge to the High Plains aquifer – the primary source of water for western Kansas towns. Showing how playa restoration is relevant to people's lives has fostered a growing diverse partnership among water stakeholders. This session will describe the journey how playas became more relevant to people, the current efforts to develop a Regional Conservation Partnership Program in western Kansas and what the future may look like as this model is exported to other communities.

20. Delineating Problematic Wetlands in the Midwest and Great Plains.
Frank Norman. Norman Ecological Consulting, LLC, 468 N. 1700 Road, Lawrence, KS 66049 | fjnorman52@gmail.com

Delineating wetlands following federal guidelines described in the Corps of Engineers regional supplements of the wetland delineation manual are often straight forward. In those instances, the three wetland indicator approach is utilized where there is a predominance of wetland vegetation, presence of hydric soils, and the presence of one primary indicator or two secondary indicators of wetland hydrology. For example, a seasonally flooded oxbow dominated by reed canary grass that exhibits a soil with a low chroma matrix and redoximorphic features (mottles) is an obvious wetland under the guidelines of Corps wetland supplements. However, on rare occasions not all three wetland indicators may be present. Those situations would include cropland where wetland vegetation is typically missing being replaced by soybeans or corn. Or hydrology has been altered as a result of ditching or other types of excavation. And lastly, hydric soils may be lacking due to an anthropomorphic disturbance or the wetland is just forming. Norman, who is a Professional Wetland Scientist with 30 years of field experience will discuss the wetland delineation procedure for 'difficult wetland situations in the Midwest and Great Plains" described in the two wetland supplements as well as provide several examples of delineating problematic wetlands.

21. Impoundments: A Conservation Problem and Solution for Stream Fishes?
Skyler C. Hedden, Lindsey A. Bruckerhoff, and Keith B. Gido. Kansas St. University, Division of Biology, 116 Ackert Hall, Manhattan, KS 66506 | skyh@ksu.edu

Freshwater fish populations continue to decline due to anthropogenic alterations and immediate conservation actions are needed. Unfortunately, conservation actions are often difficult because of knowledge gaps that lead to uncertainties in the decision-making process. Small impoundments are widespread in Kansas and have negative consequences on stream fishes, but effects are difficult to mitigate. Our objectives were to evaluate how impoundment construction has led to changes in stream fish community structure and if impoundments could be used as a conservation tool. We examined stream fish communities in the Upper Cottonwood River basin (1948-2018) to see how species occurrences have changed since impoundment construction. By sampling small impoundments, we assessed if variation in species occupancy in streams were related to their prevalence in impoundments. Six species showed gradual changes in their stream occupancy while four species showed abrupt changes since impoundment construction. Impoundment sampling indicated that some water bodies (32%) have fish communities

similar to a stream assemblage while other (68%) are dominated by species frequently found in impoundments. Changes in stream occurrences were correlated with occurrence in impoundments, with increasing stream occurrences observed when a species occupied impoundments. This research highlights the potential linkage between fish communities of impoundments and streams.

22. Distribution and Population Demographics of Silver Carp (*Hypophthalmichthys molitrix*) in the Lower Kansas River.

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Silver Carp are distributed throughout much of the lower Missouri River basin and the presence of anthropogenic barriers across the landscape is the primary mechanism slowing range expansion. The Kansas River is a large tributary system that drains most of northern Kansas. Silver Carp are thought to be restricted to the lower reach of the Kansas River (~83 rkm) due to multiple barriers. High water events in 2019 may have facilitated movement over the largest of the barriers, Bowersock Dam, and an environmental DNA (eDNA) analysis was incorporated to evaluate Bowersock Dam's ability to impede upstream movement during high water events. Adult Silver Carp were collected from above and below the Johnson County Weir using a suite of gears, however conventional gears failed to capture Silver Carp above Bowersock Dam. Silver Carp relative abundance was lower above the weir, but individuals attained longer total lengths similar to lesser abundant populations along the invasion front. Juveniles were scarce above the weir indicating that reproduction is limited in this reach.

23. Overview of the U.S. Army Corps of Engineers Regulatory Permitting Program.

Steven Whetzel. U.S. Army Corps of Engineers, Kanopolis Regulatory Office, 107 Riverside Drive., Marquette, KS 67439 | 816-389-3098 | steven.m.whetzel@usace.army.mil

The Department of the Army Regulatory Permitting Program is one of the oldest in the Federal Government. Initially it served a simple, straightforward purpose: to protect and maintain the navigable capacity of the nation's waters. Public needs, evolving policy, case law, and statutory mandates have changed the program, adding to its breadth, complexity, and authority. The mission of the Corps' regulatory permitting program is to protect the nation's aquatic resources, while allowing reasonable development through fair, flexible, and balanced permit decisions. In Kansas, the Corps does this under the authorities of Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The Corps evaluates permit applications for essentially all construction activities that occur within jurisdictional waters of the U.S., including wetlands. Permit decisions are subject to other federal laws applicable to federal actions (e.g., Endangered Species Act and National Historic Preservation Act), as well as, general and regional permit conditions.

24. Using National Wetland Condition Assessment Data for Hydric Soil Research and Ecological Site Description Development.

Jacob Ziggafoos and Colby Moorberg. Kansas St. University, Department of Agronomy, 2004 Throckmorton Hall, 1712 Claflin Rd., Manhattan, KS 66506 | 785-532-7204 | jakezig@ksu.edu

Ecological Site Descriptions (ESDs) provide vital interpretations for successful land management, but few wetland ESDs are available. The study objectives are to 1) analyze the National Wetland Condition Assessment (NWCA) database to identify trends, relationships, and correlations among site features helpful in developing ESDs and in conducting wetland compliance evaluations; and 2) test the use of NWCA data in developing new or enhancing provisional ESDs. In this ongoing study, we are exploring

the datasets from the 2011 and 2016 NWCA field campaigns to identify connections between hydric soil field indicators and site properties such as wetland type, hydrology field indicators, landscape information, dominant plant species present, and soil chemical, physical, and biological properties. We are also testing the effectiveness of using the NWCA database for ESD development using two different approaches, 1) develop one new provisional ESD based primarily on the NWCA data, and 2) evaluate an existing provisional ESD using the NWCA data. We are conducting this study in cooperation with the Natural Resources Conservation Service and the Environmental Protection Agency. This study is ongoing. Preliminary findings will be presented.

25. Enhancing Agroecosystem Productivity and Resilience Through Precision Conservation.
Andrew R. Little. University of Nebraska-Lincoln, School of Natural Resources, 3310 Holdrege St, Lincoln, NE 68583 | 402-219-1913 | alittle6@unl.edu

Agricultural production in the Midwest has trended towards increased field sizes, removal of non-crop habitat, and a reduction in crop diversity (e.g., corn and soybean rotations) with the goal of increasing yield and associated farm revenue. In the coming decades, agricultural intensification is expected to increase with the increasing human population. Simultaneously, rural and urban residents are becoming increasingly affected by multiple emerging and continuing challenges including environmental concerns (e.g., water pollution and soil erosion) and economic uncertainties. New precision technologies and conservation planning frameworks offer potential solutions to optimize agricultural production and natural resource conservation by strategically targeting low yielding acres for conservation program enrollment while farming highly profitable acres. For example, research in Iowa found that switching less productive and profitable regions to a lower input management option, such as perennial vegetation featured in a conservation program, could increase overall cropland profitability by 80%, and reduce water pollution by 38% (Brandes et al. 2018). This approach of targeted conservation delivery can not only benefit natural resource conservation but also increase cropland profitability. My presentation will address 21st century conservation challenges in agricultural landscapes and discuss potential methods to balance agricultural production, conservation, and environmental quality goals.

26. Agricultural Transition in the Great Plains: Patterns and Proposed Solutions.
Anne Bartuszevige, Mike Carter, and Kyle Taylor. Playa Lakes Joint Venture, 2675 Northpark Drive, Suite 208, Lafayette, CO 80026 | 303-926-0777 | anne.bartuszevige@pljv.org

Conversion of grasslands to row crop agricultural fields has been the major driver of habitat loss for many grassland dependent species. In the central Great Plains, much of the agriculture relies on the High Plains aquifer, however, in many areas it is at risk of going dry. As irrigation becomes less reliable, we project that changes in agriculture will occur and be exacerbated by climate change. As these changes occur, the Playa Lakes Joint Venture (PLJV) thinks there is an opportunity to incorporate grassland and wetland conservation programs into new farm management regimes. We will present models that portray aquifer depletion and areas where grassland programs like Conservation Reserve Program may be used to increase grass and provide conservation payments to farmers. Then we will discuss scenarios and potential conservation actions that will assist farmers and benefit birds. This scenario building process may be useful in other grasslands to conceptualize large-scale conservation programs.

27. The Right Tool for the Right Job: Using Conservation Easements to Prevent Ranch and Native Prairie Fragmentation.
Stephanie A. Manes. Ranchland Trust of Kansas, Inc., 6031 SW 37th St., Topeka, KS 66614. | 620-388-3843 | stephanie@kla.org

Quantity or Quality? Such is the dilemma we often face when deciding the most effective use of limited conservation funding. A growing body of research indicates that the outright loss, fragmentation and development of remaining native prairies are the predominant threats to declining populations of grassland obligate wildlife. While land management professionals have thorough training and a variety of funding options to improve vegetation composition and quality, these investments are often made on ever-shrinking islands of prairie. Voluntary conservation easements are a durable and lasting tool designed specifically to restrict development rights in order to protect the conservation values of land. These protected properties serve as both an inspiration to others and as a ballast of local conservation resilience. Many people presume that conservation easements are a niche conservation effort that isn't scalable, and is underfunded, incompatible with mineral development, unpopular with landowners, or generally inaccessible to them. Presented are updates on new sources of conservation easement funding, improved Farm Bill rules for accessing them, and the surprising results of a targeted 10-year effort to secure conservation easements in the Smoky Hills of central Kansas.

28. The Fate of Conservation Reserve Program Grasslands after Expiration.
Daniel S. Sullins, Meghan Boagerts, Bram H. F. Verheijen, and Christian A. Hagen. Kansas St. University, Horticulture and Natural Resources, Manhattan, KS | sullins@ksu.edu

In the Great Plains of North America, the Conservation Reserve Program (CRP) has been used as a tool to convert cropland into a grassland state that provides a multitude of ecosystem services. After 10-15 year CRP contracts expire, it is unclear if fields remain as grassland and how long ecosystem services linger. We evaluated 10,879 CRP fields that expired in 2007. Using known fate models and cropland data layers, we estimated a 0.589 (SE = 0.004) probability of former CRP fields remaining as grassland. Conversion to cropland largely occurred <5 years after expiration and durability was best predicted by spatial variation in grassland composition within 4 km, area, tillage risk, and annual average precipitation. Expired CRP in portions of northeastern Nebraska, eastern Colorado, and western Kansas exhibited the greatest risk of becoming cropland. Temporally, durability was influenced by corn prices and drought severity. Our results suggest that CRP can impact a footprint that is larger than indicated by the number of acres enrolled. The footprint could be further maximized by strategically enrolling areas less likely to convert back to cropland and manipulating enrollment/re-enrollment return intervals.

Grazing Lands and Plants

29. Effects of Prescribed Fire Timing on Stocker Cattle Performance, Native Plant Composition, Forage Biomass, and Root Carbohydrate Reserves in the Kansas Flint Hills.
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In year one of a six-year study, 18 pastures were assigned to three prescribed-burn treatments: spring, summer, or fall. Fire treatments were applied before grazing began. Yearling heifers (n = 360) were grazed for 90 days beginning May 1. Plant composition, forage biomass, and root carbohydrate concentrations in 4 native tallgrass prairie plants were evaluated. Heifers grazing spring-burned pastures

had greater average daily gain (P=0.02) than heifers grazing summer- or fall-burned pastures. Pre-treatment forage biomass was not different (P=0.12) between treatments. One year following fire application, forage biomass was greatest (P≤0.01) in the summer-burn treatment, intermediate in the spring-burn treatment, and least in the fall-burn treatment. Total grass and forb basal cover did not differ (P≥0.13) between treatments. Conversely, spring and summer fires were associated with greater (P=0.03) native-grass basal cover compared with fall fire. Furthermore, summer fire had less (P=0.02) introduced grass species basal cover than fall fire. Root starch concentrations in 3 C4 forage grasses and one native legume did not differ (P≥0.23) between treatments. Prescribed fire timing influenced cattle growth and was associated with small changes in plant composition and biomass; however, fire timing did not affect root carbohydrate reserves of key native plants.

30. Fire History and Fertilization Changes Tallgrass Prairie Soil Fertility and Microbial Diversity.
Lydia Zeglin, Christine Carson, Janaye Hanschu, Priscilla Moley, and Matt Nieland. Kansas St. University, Division of Biology, 113 Ackert Hall, 1717 Claflin Rd, Manhattan, KS 66506 | lzeglin@ksu.edu

We asked how fire history (annual vs. unburned) and fertilization (approx. 90 lbs. N per acre per year as ammonium nitrate) treatments affected soil carbon (C) and nitrogen (N) cycling and microbial diversity using a 30-year plot-scale experiment at Konza Prairie Biological Station. Composite soil samples were collected in each of four replicate plots per treatment combination, and microbial community composition, enzyme activity, and soil C and N cycling was measured using lab assays. Results showed that ceasing fire increased soil N availability nearly as much as continuously fertilizing the prairie, and both also caused increases in potential nitrification and denitrification (i.e. potential nitrate leaching and gaseous N loss). Fire cessation directly affected soil fungal community composition, but not bacterial composition, which could be related to fungal-plant interactions and the large change in vegetation (i.e. woody encroachment). Soil microbial biomass and N-seeking enzyme activities were lower in both unburned and fertilized plots, indicating less N limitation and less capacity to immobilize N in the soil. Overall, not only did the extended lack of fire promote woody encroachment, it reduced soil microbes' potential for nitrogen conservation and increased potential nitrogen loss from the soil, similar to excessive fertilization.

31. Caucasian Bluestem Control Using Glyphosate, Imazapyr, and Imazapic.
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Caucasian bluestem (*Bothriochloa bladhii*) has invaded rangeland across Kansas. A study was conducted in Chase County to 1) compare the efficacy of glyphosate and imazapyr applied once or two years in a row for Caucasian bluestem control, 2) determine effects of imazapic applied a year after glyphosate or imazapyr, and 3) determine any changes in botanical composition following herbicide application. The site was dominated by Caucasian bluestem, with native grasses, sedge, and forbs also present. On July 8, 2016 and July 12, 2018, 0.56 kg ha-1 imazapyr and 2.24 kg ha-1 glyphosate were applied. About 1 year after the initial herbicide applications, the same rate of imazapyr, glyphosate, and 0.21 kg ha-1 imazapic were applied. The Daubenmire Canopy Coverage method was used to assess vegetative cover. Eleven months after treatment in 2016, Caucasian bluestem was reduced 74 and 99% by imazapyr and glyphosate, respectively. Warm-season grasses increased 24% on the imazapyr plots, but decreased 98% on glyphosate plots. In 2018 treatment with imazapyr and glyphosate provided 99 and 77% control, respectively. Treatment with imazapic in year 2 after imazapyr and glyphosate maintained

Caucasian bluestem control. Increases in bare ground associated with herbicide application typically increased the cover by forbs.

32. Detection of an Invasive Legume, Sericea Lespedeza, by Small Unmanned Aerial Systems over the Growing Season.

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The application and usefulness of small unmanned aerial systems (sUAS) has increased considerably in the past few years due to their increased autonomy and affordability. Fields that have applied sUAS technology include but are not limited to ecology, rangeland management, precision agriculture, and various commercial enterprises. We used sUAS to capture low-altitude aerial photos of tallgrass prairie infested with sericea lespedeza (*Lespedeza cuneata*), an invasive legume that is listed as a noxious weed in the state of Kansas. We collected images at 30-m altitude and used GIS software to locate and detect sericea lespedeza plants. For this part of the study, we compared images from a single site to determine an optimal time during the growing season to detect sericea lespedeza plants. The detection rate of sericea lespedeza using sUAS captured images increases over the growing season with the highest detection rates occurring late in the growing season. The aim of this study is to increase the detection of isolated sericea lespedeza infestations, and provide land managers with tools to evaluate the effectiveness of various land management techniques.

33. Experimental Multi-Year Drought Shows Resiliency of Tallgrass Prairie and Physiological and Microanatomical Adaptation in *Andropogon gerardii.*

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Climate models project enhanced risks from drought in the tallgrass prairie by the end of this century; which will alter productivity, ecosystem functioning, and may promote woody encroachment. To understand the role of reduced precipitation, rainout shelters were constructed at Konza Prairie Biological Station, to simulate an extreme multiyear drought (~50% rainfall reduction). We measured species composition and aboveground net primary productivity (ANPP) at the plot level, and leaf-level physiology and microanatomy in big bluestem (*Andropogon gerardii*) during the 2016-2019 growing seasons. Results indicate that prolonged drought will negatively impact big bluestem's leaf physiology and microanatomy, decrease community productivity, and alter species composition. During the 2018 growing season, regional drought conditions enhanced the effects of our drought treatment. However, the resiliency of the tallgrass prairie was highlighted in this experiment, by the recovery of dominant species' cover and productivity when precipitation returned to ambient levels.

34. Grazing Reduces Grass Root Biomass, and Alters Root Length and Non-Structural Carbohydrates at Varying Soil Depths.

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Grassland plants invest in growth, biomass, and energy storage belowground disproportionately more than species in other ecosystems. However, grassland research traditionally focuses on how grazing impacts aboveground productivity, ignoring this critical component of grasslands. The broad objective of our research was to investigate how grazing (by cattle) impacts grass root structure and function. Our research was conducted at three sites within the Great Plains region and focused on root dynamics of two

dominant tall grass species, big bluestem (*Andropogan gerardii*) and Indian grass (*Sorghastrum nutans*). We asked how does grazing impact investment into grass roots by specifically looking at changes in total root length, biomass, and root non-structural carbohydrate storage (starches and sugars) by varying soil depths. Our results demonstrate that grazing reduces investment into grass root length and non-structural carbohydrates, but these changes vary by soil depth and with subtle differences among sites . This investigation is noteworthy as it provides us with fundamental yet crucial knowledge about belowground growth and resource investment for two key forage species, as well as highlights the need for more research on how grazing may alter non-structural carbohydrate storage in grasses for next season's growth.

35. Mesophytic Invasive Plant, Sericea Lespedeza, Impacts on Fuel Bed and Flammability Characteristics in Tallgrass Prairie.

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Fire and grazing are two of the most common global disturbances that maintain and promote many grassland ecosystems worldwide. Presence of non-native, invasive plant species can alter fire regimes through changes in fuel properties that affect native vegetation in many ecosystems, and are a leading threat to biodiversity and ecosystem function. Sericea lespedeza, an invasive plant in tallgrass prairie, may be changing fuel bed characteristics to reduce fire in a fire-dependent ecosystem. The goal of this research was to examine the influence of the non-native, sericea lespedeza, on fuel bed structure, moisture, and flammability compared to native grassland fuels. Fuel bed burning trials, conducted in a controlled laboratory setting, tested for the effect of fuel load mass of native grass and sericea lespedeza litter, proportion of sericea fuel load, and fuel moisture content on flammability metrics. Regardless of moisture content, sericea lespedeza reduces flammability of fuel beds, and reduces maximum fire temperatures by as much as 500C. Sericea lespedeza poses a major threat to tallgrass prairies in the United States by decreasing flammability of fuel beds through increased moisture retention and decreased oxygen availability, and as a result, drastically reduces fire intensity.

36. Water Use Efficiency and Land Use Management Variability on Native Grassland Ranches on the Pampa Biome of Uruguay.

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Sustainable cattle ranching should target physical variables of the ranching process, as well as, the socioeconomic dimensions. In a previous study, producers associated with the Grassland Alliance identified water cycle regulation and water quality, as the most important ecosystem services provided by natural grasslands on their properties. We plan to determine if the producers actual land use management align with the importance they placed on water. For this purpose, we chose nine properties located in the floodplain of the Queguay River, northwestern Uruguay. We inventoried land cover, soil types, and elevation as potential physical variables influencing the water cycle, and to decrease variability, we chose paddocks that shared these same variables. Then we focused on a detailed evaluation of historical and current land use, choosing the paddocks that had verifiable variability in land use management throughout time. Here we explain the results of an analysis of physical variables using a Google Earth Engine platform to calculate Water Use Efficiency (WUE). Preliminary results show different WUE in paddocks with differing land use management. We plan to compare these results to properties that do not subscribe to the Alliance ideas to determine whether the stated preferences of Alliance ranchers align with differences in practice that improve environmental outcomes.

37. Woody Encroachment Alters Grassland Ecohydrology and Requires Novel Solutions for Rangeland Management.

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The Konza Prairie Biological Station supports ecological research focused on the dynamics and drivers of tallgrass prairie. In addition to biotic research, detailed hydrological characterization has provided insight about the roles of climate and land-use history on site ecohydrology. Fire frequency on Konza is prescribed at varying intervals for different watersheds, resulting in C4 grass dominance with frequent fire, mixed species assemblages with ~3-year fire frequencies, and woody encroachment in areas that were infrequently burned. Here, I will present a conceptual overview linking the physiological and morphological characteristics among C4 grasses, C3 forbs and C3 woody plants. Fundamental ecophysiological differences among woody and herbaceous plants are manifest as distinct traits when competition for water is high, compared to coexistence when water is plentiful. Ultimately, these ecohydrological strategies among species influence landscape patterns, ecosystem processes, and susceptibility to drought. I will provide evidence that woody plants alter the ecohydrological dynamics of grasslands by changing infiltration pathways, alter groundwater recharge, and exhibit distinct patterns of plant water use. Identifying these unique traits of woody shrubs may facilitate successful ecosystem management by utilizing management strategies that increase stress among undesirable woody species and maximize the likelihood of mortality during prescribed fires.

38. Bison Grazing and Fire Impact Tallgrass Prairie Soil Carbon and Nitrogen Cycling and Microbial Diversity.

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Tallgrass prairie was historically maintained by fires and large herbivore grazing, with *Bison bison* the keystone herbivore. It is important to understand how our modern fire and grazing management practices influence soil quality and the microbial communities that mediate fertility. We asked how long-term burn treatments (annual vs. 20 year) and bison grazing treatments (grazed vs. ungrazed) affected carbon (C) and nitrogen (N) cycling and soil microbial diversity across watersheds at Konza Prairie Biological Station. Soil samples were collected along linear transects, and microbial community composition and soil C and N cycling was measured using lab assays. Results showed higher belowground C inputs and losses in unburned watersheds, and lowest C inputs and losses in grazed and annually burned watersheds. Soil N availability was higher with grazing, but infrequent burning caused a greater potential for N loss via leaching and denitrification. Concurrently, microbial diversity differed among watershed treatments, and management practice affected microbial communities more than soil characteristics did. Overall, grazing increased N availability, but not soil C inputs or losses; and in "unmanaged" (ungrazed, unburned) areas, soil organic matter can accumulate, but this can happen along with greater potential for greenhouse gas and nitrate production.

39. The Purple Plague: Effects of Grazing Post Fire on Purple Threeawn and Prairie Dog Responses.

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Purple threeawn (*Aristida purpurea*) is a native warm-season bunchgrass quickly gaining attention in western Kansas on The Nature Conservancy's Smoky Valley Ranch. Upon reaching maturity, grazing/clipping pressure decreases for this bunchgrass due to poor forage quality and extreme unpalatability for cattle (*Bos Taurus*) and Black-tailed prairie dogs (*Cynomys ludovicianus*). This decrease in grazing/clipping has led to near monocultures which cause negative impacts to the prairie ecosystem including decreases in forage quality and suitable habitat for prairie dogs; a keystone species. This directly affects many species on the ranch that rely on prairie dogs for habitat including the Black-footed ferret (*Mustela nigripes*). This study aimed to determine a large-scale management strategy using natural processes such as fire and grazing to decrease purple threeawn cover and reproductive effort. Treatments investigated high intensity grazing by cattle, at short duration and season long, post burn. Through two grazing seasons, purple threeawn percent cover did not change. However, reproductive ability decreased, and prairie dog densities increased in both grazing treatments with a greater impact in short duration treatments. These results will help inform management of purple threeawn to increase forage quality and associated economic benefits while creating better quality habitat for prairie dogs and the organisms that rely on them.

40. Effects of Grazing and Conservation Practices on CRP Plant Communities across Kansas.

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The Conservation Reserve Program (CRP) aims to restore plant communities on former cropland to reduce erosion, improve water quality, and enhance wildlife habitat. Nationwide, CRP comprises 22 million acres, yet few studies have examined these plant communities across large scales. We collected vegetation data from 2017-19 on 108 CRP sites across the longitudinal precipitation gradient in Kansas to quantify the effects of conservation practices (CP2 and CP25) and periodic cattle grazing (2017-18) on plant communities. Collectively, we found 307 plant species representing 15% of Kansas plant diversity. Site species richness doubled across the precipitation gradient. Plant community differences among sites were correlated with changes in precipitation, soil pH, and potassium. Eastern and western communities were significantly different and central communities were intermediate. On CP25 sites, forb cover increased with precipitation at a greater rate, suggesting greater forb establishment in the eastern region. Grazing resulted in community differences in 2018, but not 2017 or 2019. These differences were subtle and did not correspond to consistent changes in non-native abundance, floristic quality, or dominant grass abundance. Grazing created greater vegetation structural heterogeneity in 2017 and 2018. These results suggest moderate, periodic grazing can enhance structural heterogeneity while causing minimal plant community changes.

41. A Case Study of Super Short Season Corn use in Marion County, Kansas.

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Livestock producers in Marion County have been looking to increase diversity, reduce risk, and increase options for livestock feed. With the increase in cover crops and annual forages in livestock operations the production of grain crops in conjunction with primarily livestock operations is declining. Most operations have native tallgrass pastures which are prime grazing in May through early August. This case study is an attempt to gauge the feasibility of growing a grain crop in this window when annual forages are not

needed while still allowing ample time to seed and grow an annual forage crop before cattle come off of rangeland.

42. Bulk Density and Volumetric Water Measurements of Cover Crops in Northeast Kansas.
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In Kansas, there is an increase in the planting of cover crops to improve soil health and increase biological activity. Most of the research has been confined to the university experiment stations.
In 2018, nine mixes and twenty single species were planted three miles south of Leonardville, Kansas. Bulk density measurements were taken March 21, 2019. The samples were taken using two 53 x 51 mm Eijkelkamp rings for a total of 102 mm. Four repetitions of six treatments were sampled. The treatments were winter oats, winter barley, winter triticale, cereal rye, winter grazing and cereal killer, and a control sample with no growing vegetation. The samples were weighed and dried. Bulk density values were calculated along with volumetric water content.

Wildlife

43. The Northern Map Turtle (*Graptemys geographica*) in Kansas: A Threatened Species.
Michael S. Mahr, Justin Autz, Jennifer L. Buchanan, Alexis F. L. A. Powell, Lynnette M. Sievert, and J. Daren Riedle. Emporia St. University, Department of Biological Sciences, Emporia, KS, 66801 | mmahr1@g.emporia.edu

Due to its limited distribution and elusive nature, the Northern Map Turtle (*Graptemys geographica*) is among the most poorly documented turtle species in Kansas. Limited museum records (nine individuals, collected 1911¬–1952), followed by 35 years with no records, led to *G. geographica* being classified as extirpated from the state. However, after 10 individuals were captured through trapping surveys in 1990–1991, *G. geographica* was listed as a threatened species by the Kansas Department of Wildlife, Parks and Tourism. To evaluate the current conservation status of this species in Kansas, we conducted a three-year survey to document its distribution and abundance. Two survey methods were utilized—baited hoop-nets and visual encounter via spotting scope and camera. In 2017–2019, seven individuals were captured in traps—two at historic sites and five at new locations. During fall 2018–2019, utilizing visual surveys, we documented 71 individuals at three historic sites plus 41 new locations. We have expanded the known range of *G. geographica* in Kansas from six to thirteen counties, including range extensions to both north and west. Additionally, the species was discovered to occur in the Missouri River drainage in Kansas, which warrants further investigation across state boundaries.
Format: Oral

44. Fawn Survival of Mule Deer and White-tailed Deer in Western Kansas.
Mitchell Kern, Maureen Kinlan, Talesha Karish, Andrew Ricketts, David Haukos, and Levi Jaster. Kansas St. University, 1712 Claflin Road, 2021 Throckmorton, Manhattan, KS 66506 | mkern8@ksu.edu

White-tailed deer (*Odocoileus virginianas*) populations have expanded in the Central Plains over the past decade while mule deer (*O. hemionus*) populations have contracted westward. We assessed the influence of fawn intrinsic factors, maternal condition, and bed-site habitat characteristics on fawn survival of mule

deer and white-tailed deer fawns to test the hypothesis that fawn survival differs between species. We captured 100 fawns during the summer of 2018 and 2019 in western Kansas, fitted them with expandable VHF collars, and located fawns daily to assess survival. Overall 10-week fawn survival was 0.32 and did not differ by study area ($p = 0.34$), species ($p = 0.41$), or sex ($p = 0.90$). Chest girth of adult does was the best intrinsic predictor of 10-week survival for white-tailed deer fawns and larger does increased fawn survival. Mule deer fawn home ranges containing grasslands, increased edge, and more disaggregation had greater survival, whereas white-tailed deer fawn survival decreased as woodland cover within the home range increased. Our research suggests landscape composition and configuration could influence deer population trends in Kansas and managers should focus on creating heterogeneous landscapes composed mainly of native grasslands to bolster mule deer fawn survival.

45. Using Citizen Science Data to Describe Diversity and Distribution of Amphibians and Reptiles in Kansas.

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Citizen science is fast becoming a popular trend among natural resource agencies and consequently, there is also much discussion regarding the value and validity of those data. Since its inception in 1974, the Kansas Herpetological Society (KHS) has implemented regular field trips to better understand the distribution of amphibians and reptiles in the state. In 1989 KHS instituted spring herp counts, which were semi-standardized herp counts designed to take place in April and May of each year. I analyzed results from herp counts and field trips to determine if they provided valuable quantitative information. I entered 472 separate counts covering 81 of the 105 KS counties. Issues regarding the counts were details of location information varied considerably, and effort was not always recorded, although effort was not indicative of success. Using latitude and longitude as covariates with in a detrended correspondence analysis demonstrated predictable geographic patterns of species distributions across the state. Similar patterns were also observed when Ecological Focus Areas as defined by KDWPT were added as explanatory variables. Since very few counts were repeated at the same site it was difficult to discern temporal patterns in species occurrence and abundance.

46. Stomach Content Analysis of the Mudpuppy (*Necturus maculosus*) in Kansas.

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The Mudpuppy (*Necturus maculosus*) is an elusive and poorly understood permanently aquatic salamander in the eastern United States. Little has been published on its natural history in Kansas and baseline data are needed to assess its status and to inform conservation efforts. Our goal is to examine the trophic role and community interactions of the Mudpuppy through examination of its diet. We predict that dietary differences exist between sexes resulting from their different roles in reproduction. We also predict dietary differences between lake and river populations due to differences in available prey. We have caught mudpuppies in the Marais des Cygnes, Neosho, Cottonwood, Elk and Verdigris rivers and at Melvern and Pomona lakes in Kansas. We have obtained the stomach contents of each individual with a non-lethal flushing protocol. Stomach contents are preserved in 70% ethyl alcohol for identification to the lowest identifiable taxon. We have recovered fish (*Teleostei*), frogs (*Rana sp.*, *Acris blanchardi*), crayfish (*Procambarus sp.*), shrimp (*Palaemonidae*), caddisfly larvae (*Trichoptera*), mayfly nymphs (*Ephemeroptera*), Dobsonfly larvae (*Corydalus cornutus*), midge larvae (*Chironomidae*), water fleas

(*Cladocera*), and zebra mussels (*Dreissena polymorpha*). Knowledge of diet variation will provide valuable insight into the species' natural history and provide data for state conservation efforts.

47. Resource Selection by Female Mule Deer and White-Tailed Deer in Western Kansas.
Talesha Karish, David Haukos, Andrew M. Ricketts, Levi Jaster, Maureen Kinlan, and Mitchell Kern. Kansas St. University, Kansas Cooperative Fish and Wildlife Research Unit, Division of Biology, 1712 Claflin Road, Manhattan, KS 66506 | tkarish@ksu.edu

Abundance and occupied range of mule deer (*Odocoileus hemionus*) in Kansas have been declining for 20 years. Predominant hypotheses for the loss of mule deer and concurrent expansion of white-tailed deer (*O. virginianus*) are avoidance or adaptation to changes in land use and land cover as reflected in resource selection. Our objective was to evaluate and compare resource selection by adult female mule deer and white-tailed deer in western Kansas. In winter 2018 and 2019, 121 females were captured between two study sites that have different land uses and management practices. Each deer was fitted each with a GPS satellite radio collar that recorded locations every hour. We used logistic regression to determine resource selection from vegetation metrics surveyed at the females' used points, and random locations, from March through December for each year. Resource selection by females was compared across a combination of reproductive stages and annual seasons. Finer scales periods of resource selection based on the rut, rifle season, and fawn lifespan were also assessed. These results will be included in a larger assessment of how resource selection between these species and study sites may contribute to the differing population trends.

48. Small Mammals in Tallgrass Prairie: Responses to Shifts in Experimental Fire Regimes.
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Based on our early research on Konza Prairie, most common species of small mammals responded either positively or negatively to conditions created by presence or absence of prairie fires. Recently, we focused on responses to coordinated reversal of (1) annually burned prairie (essentially free of woody vegetation) to unburned prairie in one area and (2) infrequently burned (encroached by woody vegetation) to annually burned prairie in a contiguous area. Field work started with two years of sampling before the shifts in fire regimes followed by 10 years of sampling after the changes. We recorded 11 species of rodents, 2 species of shrews, and over 2,400 individual small mammals as well as a variety of population and community changes after shifts in prescribed fire. For example, white-footed mice decreased as woody encroached sites were annually burned and increased slightly over 10 years following the shift from annually burned to unburned conditions; for deer mice, opposite responses were observed. During both autumn and spring, we observed a low similarity in the composition of small mammals in the two research areas before shifts in fire regimes. Community similarity between the two areas then increased through the remainder of our study period.

49. Post-Translocation Survival and Movements of Muskrats in a Lacustrine System.
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Invasive hybrid cattails (*T. x glauca*) are expanding and negatively affecting native wetland biodiversity. Current management techniques (e.g., herbicides, cutting) for *T. x glauca* are costly and have the potential to adversely impact native ecosystems. Muskrats (*Ondatra zibethicus*) are native herbivores that can

reduce wetland vegetation through intense herbivory. Muskrats may be a potential biocontrol for *T. x glauca* if managers can increase their abundances in affected areas via translocation. However, it is unclear how translocating muskrats will affect their survival and space use – both critical to effective translocation efforts. We live-trapped muskrats (n = 72) during the summers of 2018-2019 in Voyageurs National Park, MN, USA and assessed post-translocation effects on weekly survival rates and space use patterns. We implanted muskrats with internal VHF transmitters, moved them to treatment wetlands, and tracked space use and cause-specific mortality. On average, individuals established a home range within 38 days post-translocation and there was no evidence of homing behavior (i.e., returning to their previous home range). Weekly survival rates were moderate (0.96, SE = 0.01) and our top known-fate survival model indicated that day of translocation and muskrat weight had the most influence on post-translocated muskrats. Our study provides the first empirical assessment of translocation effects on muskrats and establishes a methodological technique to assess future efforts to use muskrats as a native biocontrol of *T. x glauca*.

50. White-Tailed Deer Foraging Habits in Great Plains Grasslands Near Wooded and Agricultural Habitat Edges.

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Altered fire regimes and intensification of human land use in Kansas has fragmented many formerly grassland landscapes, creating a mosaic of grasslands, woodlands, and agricultural fields. These changes have allowed white-tailed deer to encroach further into Great Plains grasslands compared to historic numbers. Moreover, the complex habitat edges may strongly influence deer foraging patterns. Our study addresses: 1) which grassland forb and woody plant species deer preferentially consume, 2) how does the intensity of deer foraging vary with distance into a grassland from a habitat edge, and 3) whether edge type (woody or agricultural) affects foraging distance into grasslands. In June 2019 at 5 woody-edged and 5 agricultural-edged grasslands in south-central Kansas, we quantified deer browsing damage and nearby plant community composition within 1m2 quadrats at 20m intervals extending 100m into grassland from the habitat edge. Preliminary analyses indicate that the three most preferred forbs were Yellow Sweet Clover (*Melilotus officinalis*), Curly Dock (*Rumex crispus*), and Giant Ragweed (*Ambrosia trifida*). Browsing intensity at woody edges (0m) was >2X as great as browsing intensity at the distance with the secondmost intense browsing (60m). Browsing intensity at agricultural edges (0m) was >8X greater than and the next most intensely browsed distance (20m).

51. Let's Get Skinky: Season Three of Herpetofaunal Composition and Monitoring at the Sternberg Natural Area.

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On 10 June 2017, twenty-one 2.4x1.2-meter plywood boards were placed throughout the Dr. Howard Reynolds Nature Trails property (Sternberg Natural Area) to begin monitoring of the area's herptofaunal richness and diversity. The objective of the project is to monitor changes in species richness and diversity in relation to changes in landscape composition, as we continue to restore the habitat to native prairie. The third season of monitoring began on 15 March 2019 with the first observation occurring on that date. Boards were checked once weekly with five temperature variables being measured. To date, 282 individuals of nine species have been encountered. In addition to temperature measurements, Passive Integrated Transponder (PIT) tags were implemented (2018 season) for individual recognition and to get

accurate counts. To date, 74 individuals of six species have been implanted with 48 individuals of three species having been recaptured at least once. In future seasons, we hope to implant more individuals with PIT tags and estimate population sizes for all species and continue collecting temperature data in attempts to correlate cover use and temperature. Herpetofaunal monitoring is an important part of any environmental or restoration assessment as these species act as indicator species of ecosystem health.

52. Integrated Eco-Evolutionary Investigation of Small Mammal Community Dynamics in Kansas.
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We still lack a clear understanding of how community turnover with changing land use impacts small mammals. I will introduce recent research avenues from my lab group that focus on small mammal community dynamics on Konza Prairie. Four years of small mammal sampling has yielded comprehensive specimen resources for eco-evolutionary investigations. Stable isotope analyses indicate that small mammal dietary niche varies by habitat, by species, and through time suggesting that small mammals are highly sensitive to changing environments, and this is corroborated by community responses to land-use (e.g., fire and grazing regimes) and inter-annual weather. Genetic analyses of small mammal species on Konza reflect disparate evolutionary histories, indicating that communities in Kansas have assembled from diverse geographic origins and habitat affinities. Continued fragmentation of native prairies may therefore intensify species interactions and spread of parasites and pathogens. Our appraisal of small mammal ecto-parasites has revealed higher prevalence of zoonotic vectors such as ticks from woodland associated small mammals compared with native prairie species. Finally, analyses of endo-parasite diversity are revealing new insights to local biodiversity and co-evolutionary history. These results demonstrate that collection and curation of small mammals and their parasites increases potential for both basic and applied biodiversity research.

53. Landscape Effects on Colonization and Extinction of Swift Fox in Western Kansas.
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Large areas of the shortgrass prairie ecosystem in Kansas have been converted to alternative land-use types (e.g., agriculture, energy development). It is unclear, however, how land-use change in this region is impacting current distributions of swift fox (*Vulpes velox*) populations. During summer 2018 and 2019, we placed baited camera traps at sites distributed across western Kansas (n = 382; 7.16 million ha) to assess how landscape composition (percent agriculture, shortgrass prairie, CRP, and habitat diversity) and configuration (habitat edge) influenced habitat use by swift fox at multiple scales. Because swift fox are a prairie-obligate species and potential indicators of ecosystem health, we also assessed how site occupancy by swift fox was influenced by these landscape changes. We quantified landscape composition and configuration within multiscale buffers (0.5, 2, 5 km) surrounding each site and developed detection, occupancy, colonization, and extinction rates based on camera-trap data. We predicted that colonization rates of swift fox would be positively influenced by prairie landcover, while extinction rates would respond inversely to proportion of prairie landcover. We also expected lower site occupancy probabilities by swift fox in areas with reduced prairie landcover. We are currently analyzing data and will reveal our results at this meeting.

54. Distribution and Seasonal Activity Patterns of the Mudpuppy in Eastern Kansas.
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While known to be declining in many parts of the Midwest, conservation status of the Mudpuppy (*Necturus maculosus*) is uncertain in Kansas, where almost nothing is known of its distribution and population sizes. Declines elsewhere have been attributed to climate change, habitat degradation, invasive species, and pollution. We are conducting trapping surveys to describe the species' distribution and to assess effects of water chemistry and landscape variables on its occurrence. Target sites in rivers of eastern Kansas include locations of known historical occurrence, low-water dams, and access points below bridges on public roads. We are also trapping Mudpuppies at Pomona Lake and Melvern Lake to study seasonal activity patterns and bait preference. Thus far, from November 2017 through October 2019, we have caught 16 individuals in rivers at 12 locations within the Missouri and Arkansas drainages, and 169 individuals in the reservoirs, for success rates per trap night of 1.5% and 2.9%, respectively. Mudpuppies appear most active between mid-December and late April and prefer liver to other baits, yet they regularly enter unbaited traps. We aim to model relationships between landscape, water quality, and habitat variables, and presence/absence at different spatial scales to identify correlates of patterns of Mudpuppy occurrence.

55. Conservation of the Scott Riffle Beetle.

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The Scott Riffle Beetle (*Optioservus phaeus*) is a small aquatic beetle that is listed as an Endangered species in Kansas and was recently petitioned for federal listing under the Endangered Species Act. Prior to the federal petition, the most recent population assessment of the species was conducted in 1983-1984. To better understand the population dynamics of the Scott Riffle Beetle, Kansas Department of Wildlife, Parks, and Tourism repeated the survey in 2016-2017. A comparison of beetle populations between the previous survey and contemporary survey indicates the population has remained stable over more than 30 years. Survey efforts have also led to insights into life history of the species. Several conservation actions were completed to improve the resiliency of the Scott Riffle Beetle population and the habitat it relies on.

56. Wetland Depth and Size Affect Muskrat Occupancy in Remaining Tallgrass Prairie.

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Muskrats (*Ondatra zibethicus*) are semiaquatic mammals that occur in wetlands throughout North America. Wetland occupancy by muskrats is dynamic with multiple local and landscape factors hypothesized to drive occupancy and turnover dynamics. In the Flint Hills, Kansas, available habitat for muskrats are generally man-made retention ponds distributed across the region. We used multiple walking surveys and occupancy modeling to assess how both local habitat quality (wetland area and depth, percent emergent vegetation) and connectivity (distance to nearest occupied wetland) influenced wetland (n = 100) occupancy in the Flint hills during 2018-2019. Only 1 wetland was occupied during 2018, likely due to historic drought conditions during that time, and prevented us from modelling occupancy during that year. Naïve occupancy was 0.27 in 2019, and our top-ranked detection model (Observer) indicated that there was differences in observers' ability to detect muskrats. After controlling for detection, our per-survey detection probability was 0.77 (SE = 0.08) and corrected wetland occupancy probability was 0.28 (SE = 0.05). Our most supported single-season occupancy model (Area + Depth) suggested that deeper and larger wetlands positively influenced wetland occupancy probabilities. Deeper ponds likely

reflect consistency in water level, which is important for stability of muskrat populations. The importance of wetland area to muskrat occupancy suggests that island biogeography theory could be applicable to isolated freshwater wetland communities.

Birds, Bats, and Pollinators

57. Climatic Variability Explains Interannual Variation in Breeding Distributions of Grasshopper Sparrows.

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Grassland bird populations are declining, but understanding the causes is difficult because grassland birds have notoriously low site fidelity and are highly mobile, both of which complicate calculating apparent survival and determine the causes of population declines. Therefore, it is important to understand what causes grassland birds to move, especially on large spatial scales to determine the causal factors on a species level. Grasslands are highly climatically variable, and climatic variability acts on large spatial scales. We sought to determine which climatic variables influence interannual variation in breeding distribution in Grasshopper Sparrows (*Ammodramus savannarum*) breeding across the Great Plains. We hypothesized that interannual variation in breeding distributions was influenced by (a) minimizing energetic costs, as birds may leave rather than weather cold temperatures, (b) over-winter mortality resulting in fewer birds returning to breed, (c) different vegetation structure, and/or (d) better information about what breeding conditions will be like. We predicted that (a) low temperatures during migration resulted in decreased local abundance, (b) lower temperatures on the wintering grounds resulted in greater variation in local abundance, (c) higher variation in precipitation in the preceding growing season will result in more variation in vegetation and therefore in local abundance, and (d) the earlier the start of the growing season the larger difference in local abundance, as birds could make more informed decisions about what conditions were like later in the year. We obtained data on locations of Grasshopper Sparrows from eBird, a large citizen science database, to determine the breeding distribution for each year. We collected weather data from PRISM and determined the timing of the growing season using MODIS satellite data. Understanding which local climatic variables have the greatest effect on Grasshopper Sparrow abundance will give us a better ability to predict where sparrows will go in a given year. Our results can allow us to account for movement in calculations of survival, and can help to explain the causes of large population declines in grassland birds.

58. Demographic Responses of Greater Prairie-Chickens to Fire, Haying, and Military Activity on Fort Riley Military Reservation in Riley, Kansas.

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Greater prairie-chickens have experienced significant population declines throughout their range in the past 30 years. Kansas presents one of the largest remaining populations and yet intensification of grazing regimes, increased frequency of fire, and woody encroachment have led to population declines over the past decade. The Fort Riley Military Reservation may serve as a buffer for greater prairie-chickens because grazing does not occur on the installation and prescribed burning is not conducted at the same frequency as surrounding areas. To understand greater prairie-chickens response to management regimes and military disturbance on Fort Riley, we tracked the movements of 20 females from April-August 2019

using satellite transmitters. Females select for areas with moderate burn intervals and relatively sparse vegetation, as probability of use decreases as visual obstruction at 75% obstruction increases beyond 3 dm. Nest survival did not differ among attempts or across time (0.3704 ± 0.34(SE)). Adult survival (0.4149 ± 0.09(SE)) did not seem to differ throughout the breeding season (April-August), nor with bird age (SY vs ASY). These demographic rates will add to our knowledge of greater prairie-chickens response to landscape-level disturbances and management regimes outside of traditional grazing pressures experienced by other greater prairie-chicken populations in Kansas.

59. Monitoring Breeding Grassland Birds in Western Kansas: A Statistically Rigorous and Question-Based Method.

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Playa Lakes Joint Venture (PLJV) is one of 22 habitat Joint Ventures found throughout the U.S. and Canada. These Joint Ventures are directed to deliver habitat conservation for birds in support of the national and international bird conservation plans. The PLJV region includes the shortgrass and most of the central mixed-grass prairie ecoregions, which includes the western ⅔ of Kansas. To better understand grassland bird status within its region, PLJV began using a statistically rigorous breeding bird sampling protocol in 2015. One-square kilometer grids are randomly distributed across the landscape, within each grid 16 standard point count surveys using distance and removal sampling are conducted. These data can be used to develop predicted species distribution and density models We will present results of these models for a selection of grassland birds. In addition, we will discuss how this sampling protocol is being used to answer management questions such as how species composition and abundance of grassland birds changes as the cover of eastern redcedar increases in prairie ecosystems.

60. Survival, Recovery, and Translocation of Kansas-Banded Canada Geese.

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The temperate-breeding Canada goose population in Kansas is a valuable resource that provides abundant viewing and hunting opportunities for thousands of Kansans each year. When geese become over-abundant, Kansas Department of Wildlife, Parks and Tourism translocates geese to rural areas to relieve pressure on popular urban and suburban parks; mainly in the Kansas City area. Translocation is preferable to egg oiling or culling because birds are physically removed from the nuisance area and expected to be more vulnerable to hunter harvest; decreasing annual survival and increasing hunter opportunity. Previously we lacked an understanding of Canada goose annual survival and the subsequent effect of translocation on survival. To test the effectiveness of translocation, we estimated annual survival and recovery probability between translocated (# banded = 1155) and non-translocated (# banded = 11706) Canada geese from hunter-harvested leg bands using Brownie recovery models in Program MARK. Kansas temperate-breeding Canada goose annual survival was 0.892 (95% CI 0.856–0.920) from 2012–2017. Translocated temperate-breeding Canada goose annual survival was 0.735 (95% CI 0.679–0.785) from 2012–2017. Translocating nuisance geese from urban to rural areas is an effective management tool that successfully decreases annual survival of temperate-breeding Canada geese.

61. What Determines Lesser Prairie-Chicken Lek Persistence?

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Lesser prairie-chicken management is reliant on lek counts to estimate population size and trends. Density of lesser prairie-chicken leks on the landscape is dynamic, changing between breeding seasons and even within a breeding season. Interestingly, fluctuation in lek presence on the landscape occurs even with the high site fidelity that male lesser prairie-chickens exhibit to their display leks. Factors underlying changes in lek size and if a lek persists into subsequent breeding season remains unclear. We tested spatial and temporal factors such as female density, surrounding nesting and brooding habitat, and changes to vegetation at lek site on the likelihood of a lek persisting through time. We further analyzed observed female visitation rates, date, number of displaying males and vegetation variables to determine what factors influence the persistence of a lek from one breeding season to the next.

62. Does Cattle Grazing in CRP During the Nesting Season Impact Grassland Birds?

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Cattle grazing in Conservation Reserve Program (CRP) grasslands is restricted, especially during avian nesting seasons, despite potential benefits of this disturbance to grassland bird habitat. We investigated impacts of experimental cattle grazing during three nesting seasons (2017-2019, grazing during 2017 and 2018 only) on bird density, occupancy, diversity, and nesting success across Kansas. For most species, density and occupancy estimates were similar between grazed and ungrazed fields, with grazing effects being contingent upon conservation practice (CP2 vs. CP25) or year. As predicted, bird species diversity was higher on grazed fields, but only in eastern Kansas. Nest mortality and brood parasitism by brown-headed cowbirds (*Molothrus ater*) were higher on grazed versus ungrazed fields for some songbirds, though again, this pattern was inconsistent across species, conservation practices, and years. Nest mortality and brood parasitism of some species were less frequent in areas of taller vegetative cover, suggesting that vegetative reductions from grazing might reduce reproductive success in the near term. Thus, effects of cattle grazing in CRP fields on nesting birds were apparent, though variable. Grazing CRP during the nesting season might be compatible with grassland bird conservation, but bird responses would likely vary among species, ecoregions, and years.

63. Influence of a Megafire on Lesser Prairie-Chicken Habitat Use and Quality in the Mixed-Grass Prairie.

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Fire has long played an important role in the ecology of the lesser prairie-chicken (*Tympanuchus pallidicinctus*), a species that now occupies only 14% of its estimated historic distribution. While small-scale fires can be beneficial for lesser prairie-chickens, it is unknown how they respond to megafires (>100,000 acres) such as the Starbuck fire, which burned 623,000 acres in 2017 in Kansas and Oklahoma. We compared lesser prairie-chicken habitat availability and use prior to (2014-2016) and after the fire (2018-2019) in an area burned by the Starbuck fire, giving us a unique opportunity for a before-after control impact study to examine the effects of the fire. We documented a 77% decline in the number of males on leks, and a 30% decrease in use of burned areas two years after the fire. Only 22% of nests were in burned areas in 2018, but increased to 73% in 2019, indicating that nest habitat on the burned grasslands may be improving. Measurements of vegetation mirror these trends, with significant decreases of key nesting components, such as litter and visual obstruction, observed the first year after the

fire. While short-term effects appear negative, this fire presents an opportunity to slow woody encroachment and increase plant diversity, potentially increasing overall habitat availability.

64. Microclimate Use by the Gray Bat Colony in Pittsburg, Kansas.

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The fungal disease, White-nose Syndrome (WNS), has affected bat populations across much of North America, including Kansas. The stormwater system in Pittsburg is the only known location in Kansas inhabited by the federally endangered gray bat, Myotis grisescens. As of 2019, WNS has not been detected in the Pittsburg gray bat colony. The objectives of our study are to 1) evaluate habitat use by roosting gray bats, and 2) assess the potential of the stormwater system to support WNS. We used a network of remote temperature and humidity data loggers to model the microclimates within the stormwater system. We then compared microclimate conditions and habitat features between locations used by the bats to locations where bats were not detected. Bats used portions of the stormwater system with relatively warm air temperatures, high ceilings with rough substrates, and standing water. Conditions inside the stormwater system may not be suitable for the fungus that causes WNS. Monitoring efforts and data analysis are ongoing.

65. Where Do They Go? Lesser Prairie-Chicken Space Use Following Translocation to the Sand Sagebrush Prairie Ecoregion.

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The lesser prairie-chicken (*Tympanuchus pallidicinctus*) has experienced severe population declines. The Sand Sagebrush Prairie Ecoregion of southwestern Kansas and southeastern Colorado historically contained the largest density of lesser prairie-chickens in the southwestern Great Plains with estimates peaking in the 1980s. By 2016, there was an estimated decrease of 98% across the ecoregion. To supplement populations within this ecoregion, 411 lesser prairie-chickens were translocated from 2016-2019, originating from northwestern Kansas, to the Cimarron and Comanche National Grasslands in southwest Kansas and southeast Colorado, respectively. A total of 204 male and 207 female lesser prairie-chickens were translocated and monitored with SAT-PTT and VHF transmitters. However, initial results show birds use more grassland patches on the landscape, specifically Conservation Reserve Program (CRP), than native sand sagebrush where they were released and once thrived therein. With >9,000 VHF telemetry, 130,000 GPS satellite locations, and 124 known nest locations, use of grassland and CRP occurred more frequently than other land cover types. As monitoring continues through the 2020 breeding season, we will continue to explore the overall importance of CRP use in the Sand Sagebrush Prairie Ecoregion.

66. Microclimatic Differences Between Experimentally Placed Nests.

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Nest building is an adaptive behavior, and how a bird builds their nest is linked to climatic variables. Within nest microclimate is influenced by the location, construction, and orientation of the nest. Many grassland birds build their nests into the grass with an opening on one side. Normally, Grasshopper Sparrows (*Ammodramus savannarum*) and Eastern Meadowlarks (*Sturnella magna*) on the Konza prairie

orient their nests facing east. However, during a drought, orientation shifted south, potentially to reduce the deleterious effects of heat stress. If this were true, temperature and humidity would be lower, and wind would be higher at southward nests. Previous work has documented variable non-random nest orientation and hypothesized that these patterns represent an adaptive response to climatic variation. However, no experimental studies have tested this. We placed pairs of nests in vegetation and measured the wind speed, temperature and humidity levels within the nest, as well as wind speed one meter above the nests. During mid-July, the nests differed the most in microclimate consistently with our predictions, and those differences were most evident during the warmest parts of the day. This study provides experimental evidence to show that nest orientation affects nest microclimate, suggesting that climatic conditions are important in shaping the reproductive behavior of these species.

67. CRP Management Practices Differentially Affect Native Bees at an Ecoregional Scale.
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Habitat fragmentation due to agricultural intensification leads to losses of biodiversity and ecosystem services like pollination. Wild bee declines pose a serious threat to pollination stability, providing the impetus for grassland restoration efforts like the Conservation Reserve Program (CRP), which establish pollinator habitat through forb-enhanced plantings. Although currently uncommon, grazing on these restorations may benefit native bees. This study is the first of its kind to assess bee and forb responses to grazing of restoration plantings across multiple grassland ecoregions. From 2018-2019, we surveyed native bee and forb communities across Kansas sand, short-, mixed-, and tall-grass prairie ecoregions on 108 CRP fields either a) forb-enhanced or primarily grass-planted and b) ungrazed or grazed (2017-2018) at moderate intensity. Overall, floral cover differed across ecoregions and was an important predictor of bee responses. 2018 bee abundance and 2019 bee richness were greater on forb-enhanced restorations, although floral cover and richness were not. One year post-grazing, grazed sand prairie fields were significantly more genus-rich than ungrazed fields, while diversity decreased on mixed-grass grazed fields. Our findings provide important insights into bee community responses to land management on restored grasslands in a predominantly agricultural Great Plains landscape.

68. Adding Diversity to the Landscape with Spring Cover Crops.
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Conflicts between agricultural producers and wildlife are spreading and intensifying. Managers must search for compromises between these competing interests so both can flourish through land sharing within a limited landscape. Cover crops offer potential common ground. Cover crop benefits for farmers are widely documented and varied while benefits for wildlife are widely assumed but have little evidential support. We worked with landowners from 2017 – 2019 in western Kansas to gather evidence on the influence of spring cover crops on local wildlife. Planted in March and terminated in June, spring cover crops transform a barren, chemical fallow field into a potential source of cover and food for wildlife species. Study fields were divided into 4 treatments consisting of 3 cover crop seed mixes and a chemical fallow control plot. Our cover crop mixes included Chick Magnet (a warm-season, broad-leafed forb mix designed for precocial chicks), GreenSpring (an agricultural forage mix with cool-seasoned peas and oats), and a Custom Mix (designed to be adaptive with ten species). We monitored vegetation structure, vegetation composition, and insect abundance weekly. Resources in cover crop fields differed from chemical fallow and Conservation Reserve Program fields, offering a different set of resources to wildlife.

69. Effects of Seasonal Burn Treatments on Native Perennial Plants and Pollinator Recruitment: Implications for Prairie Conservation.

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Many environmental factors influence plant responses and plant-pollinator interactions, including the use of prescribed burns for vegetation management. Whereas the effects of springtime-applied burns to manage prairie habitat are well understood, concerns over air quality have prompted recommendations to burn prairies during other seasons. However, the effects of varying seasonal prescribed burns on tallgrass prairie are poorly understood, particularly for the native perennial plants that repopulate prairies post-burn and their interactions with insect pollinators. Using replicated experimental plots, we quantified the impact of three different seasonal burns (fall, spring, summer) on i) the native flowering community, ii) the ability of native perennial plants to recruit pollinators, and iii) the downstream consequences of burns on pollinator recruitment. We focused on members of the milkweed family (*Asclepias* spp.) to measure plant recruitment and fitness by collecting nectar samples, performing pollinator surveys, and assaying seed viability. Results may contribute to conservation management strategies for native prairie plants and insect pollinators.

70. Wind Energy and Birds: Building Engagement in the Central Plains.

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Wind energy production in the Central Great Plains has expanded rapidly in the last decade, posing new challenges for wildlife and natural resource managers. The states within Playa Lakes Joint Venture, a partnership organization focused on conserving habitat for birds and people, are all within the top 10 nationally for wind energy generation or potential. The playas and grasslands of the PLJV region provide wintering and migratory habitat for millions of birds in the Central Flyway. Over the years, PLJV has pursued an inclusive approach to understanding and mitigating impacts from wind energy on birds, arriving at a goal of 80% avoidance of playa wetland clusters. During the session, we'll introduce the tools available to natural resource managers and wind energy professionals, including: wind siting guidance for playas, a web map to track siting patterns, and an evolving Wind Collaborative that provides a forum for discussion. We'll also share thoughts on our next venture, development of an offset framework for wind impacts to playas, and open the door to discussion and new collaborators.