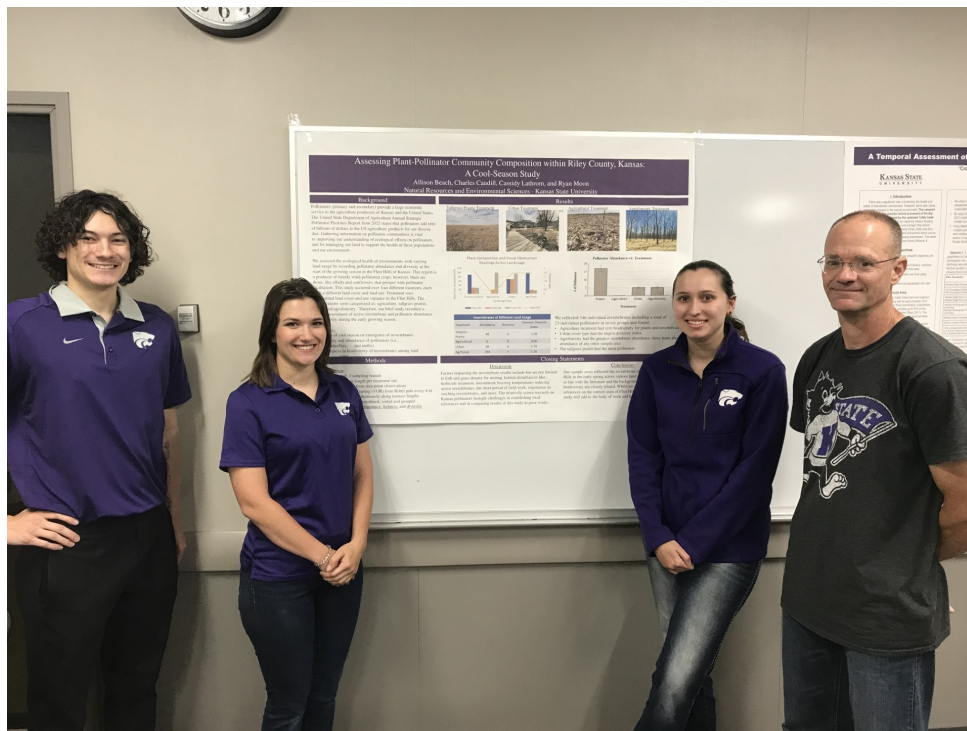




## Biennial Report 2022-2023

We are pleased to provide this report highlighting activities and accomplishments of the Kansas Cooperative Fish and Wildlife Research Unit for 2022-2023. This year marks the 32nd year of the Kansas Unit at Kansas State University. On behalf of the greater than 20 Unit scientists, staff, graduate students, technicians, and associated undergraduate students, we would like to thank the myriad of people, governmental agencies, and nongovernmental organizations for their support of the Kansas Unit.

During the 2022-2023 reporting period, the Kansas Unit had 9 active research grants totaling \$3,964,657 in funding; graduated 4 graduate students; currently supporting 8 graduate students and 1 post-doctoral research associate; published 2 book chapters and 19 peer-reviewed journal articles; and presented 56 talks at professional meetings. Please see our updated website (<https://www.k-state.edu/kscfwru/>) for additional details and specifics relative to our reported activities.



Undergraduate student members of the BAE/DAS/GENAG 582 Natural Resources/Environmental Sciences Project capstone course for the Natural Resources and Environmental Sciences secondary major led by David Haukos. Team members, from L-R, were Ryan Moon, Cassidy Lathrom, Allison Beach, and Charles Caudill during Spring 2023.

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**Kansas Cooperative Fish and Wildlife Research Unit**  
Division of Biology  
205 Leasure Hall  
Kansas State University  
Manhattan, KS 66506  
785-532-6070

## Current Unit Staff

Unit Leader—David Haukos  
Assistant Unit Leader—Martha Mather  
Office Manager—Tara Dreher  
Post-Doctoral Research Associates  
Andrew Whetten (2022-2024)  
Fraser Combe (2021-2022)

## Locations of KSCFWRU Students 2012-2023



## Kansas State University Graduate Students

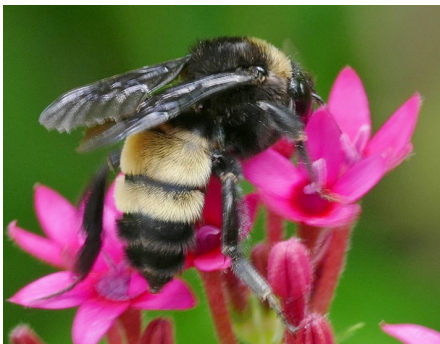
### Completed 2022-2023

**Talesha Kalish** (Ph.D, 2022, Haukos) Survival, activity patterns, movements, home ranges and resource selection of female mule deer and white-tailed deer in western Kansas.

**Megan Vhay** (M.S., 2022, Haukos). Reconstruction of landscape composition and vegetation characteristics in the Sand Sagebrush Prairie Ecoregion.

**Ashley Messier** (M.S., 2023, Sullins/Haukos). Patterns of greenness (NDVI) in the Southern Great Plains and their influence on the habitat quality and reproduction of a declining prairie grouse.

**Camille Rieber** (M.S., 2023, Hefley/Haukos). Treed Gaussian processes for animal movement modelling.



### Current (Graduation Date)

**Olivia Rode** (M.S., GRA, Mather). An adaptive management framework for extracting additional insights from fish monitoring data to aid conservation. (12/23)

**Victoria Read** (MS, GRA, Mather, Department of Biological and Agricultural Engineering). Analyzing empirical fish habitat data can aid fish conservation. (12/23)

**Cassidy Lathrom** (MS, GRA, Haukos). Density, diversity, and relative abundance of bees on Fort Riley Military Installation. (5/25)

**Natalie Pegg** (Ph.D, GRA, Haukos). Movements, space use, and vital rates of mourning doves (5/26).

**Mary Ware** (MS, GTA, Haukos). Response by wild turkeys to harvest and management actions in Kansas. (5/26)

**Elizabeth (Elli) Teige** (Ph.D, GRA, Haukos). Assessing landscape and vegetation characteristics, habitat quality and quantity, and habitat use of Conservation Reserve Program lands by lesser prairie-chickens throughout the species range. (8/26)

**Caroline Skidmore** (Ph.D, GRA, Haukos/Sullins) Population demography of wild turkeys in Kansas. (8/27)

**Sara Hansen** (Ph.D, GRA, Sullins/Haukos). Landscape ecology of wild turkeys in Kansas. (8/27)

## Completed and Active Research Projects 2022-2023

### Completed

Reconstruction of Landscape Composition and Vegetation Characteristics in the Sand Sagebrush Prairie Ecoregion  
Patterns of Greenness (NDVI) in the Southern Great Plains and Their Influence on the Habitat Quality and Reproduction of a Declining Prairie Grouse

The Impact of Future Climate Variability on Shorebirds and Their Wetland Habitats in the South-Central U.S.  
Survival Rates, Habitat Selection, and Movement of Sympatric Mule Deer and White-tailed Deer in Kansas

### In Progress

Multi-scale Response of Lesser Prairie-Chickens to Future Changes in Land Use and Land Cover

Guiding Present and Future Native Fish Restoration Using a Strategic Planning Process, Literature Synthesis, Database Analysis, Field Protocol Development/Testing, and Adaptive Management

Movements, Space Use, and Vital Rates of Mourning Doves

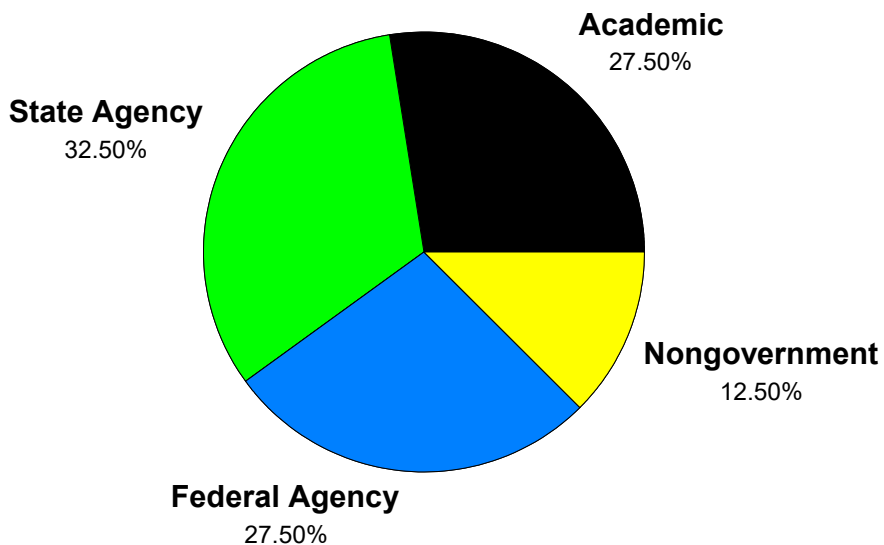
Identification of landscape thresholds and patch dynamics for lesser prairie-chickens

Wild Turkey Population Demography and Ecology in Kansas

Status of Native Bumble Bees (*Bombus* spp.) at Fort Riley Military Reservation, Kansas

Designing Optimal Landscapes for Lesser Prairie-Chicken Conservation

### Graduate Student Employment



## Publications 2022-2023

### *Book Chapters*

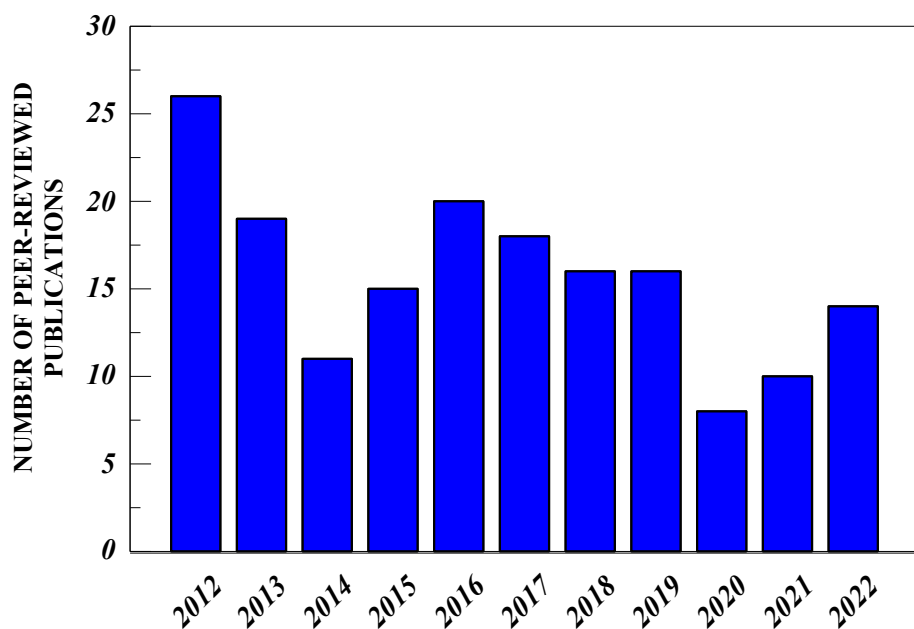
- Vest, J.L., D.A. Haukos, N.D. Niemuth, C.M. Setash, J.H. Gammonley, J.H. Devries, and D.K. Dahlgren. 2023. Waterfowl and wetland birds. Chapter 13 in L.B. McNew, D.K. Dahlgren, and J.L. Beck, editors. *Range-land Wildlife Ecology and Conservation*. Springer Publishing, New York, New York, USA.
- Haukos, D.A. 2022. Chapter 12: Applying key concepts: management of harvested species. *In* E. Gomez, C. Bishop, and J. Organ, editors. *Wildlife Management and Conservation in North America: An Overview*. Cognella, San Diego, California, USA.

### *Journal Articles*

- Andersson, K., C.A. Davis, G. Harris, and D.A. Haukos. 2022. Changes in waterfowl migration phenologies in central North America: implications for future waterfowl conservation. *PLoS ONE* 17(5): e0266785.
- Bergtold, J. S., M. M. Caldas, S. R. Ramsey, M. R. Sanderson, G. Granco, and M. E. Mather. 2022. The gap between experts, farmers and non-farmers on perceived environmental vulnerability and the influence of values and beliefs. *Journal of Environmental Management* 316 (2022) 115186.
- Berigan, L.A., C.S.H. Aulicky, E.C. Teige, D.S. Sullins, D.A. Haukos, K.A. Fricke, J.H. Reitz, L.G. Rossi, K.A. Schultz, and A.M. Ricketts. 2022. Lack of lesser prairie-chicken nesting habitat impairs translocation success. *Wildlife Society Bulletin* 2022:e1379.
- Black, A.N., K.J. Bondo, A. Mularo, A. Hernandez, Y. Yu, C.M. Stein, A. Gregory, K.A. Fricke, J. Prendergast, D. Sullins, D. Haukos, M. Whitson, B. Grisham, Z. Lowe, and J.A. DeWoody. 2023. A highly-contiguous and annotated genome assembly of the lesser prairie-chicken (*Tympanuchus pallidicinctus*). *Genome Biology and Evolution* 2023: evad043.
- Chestnut, K., M. E. Mather, Q. Phelps, D. Shoup. 2022. A review of empirical evidence related to the effectiveness of harvest regulation evaluations: a systematic, standardized collaborative approach to data collection. *Fisheries* 47(10):423-434.
- Combe, F. J., L. Jaster, A. Ricketts, D. Haukos, and A. G. Hope. 2022. Population genomics of free ranging Great Plains white-tailed and mule deer reflects a long history of inter-specific hybridization. *Evolutionary Applications* 15:111-131.
- Gehrt, J.M., D.A. Moon, S.C. Stratton, and D.A. Haukos. 2022. Role of landscape features in resource selection by female Greater Prairie-chickens within a constrained environment. *Global Ecology and Conservation* 38 (2022):e02267.
- Gehrt, J.M, D.S. Sullins, B.H.F. Verheijen, and D.A. Haukos. 2023. Extrinsic variables most influence incubation behavior and nest success of an imperiled grouse species. *Ecology and Evolution* *In Press*.
- Godar, A. A. Piernicky, D. Haukos, and J. Prendergast. 2023. Ring-necked pheasant brood habitat selection and movements in an intensive agricultural landscape. *Prairie Naturalist* *In Press*.
- Granco, G., M. Caldas, J. Bergtold, J. L. Heier-Stamm, M. Mather, M. Sanderson, M. Daniels, A. Sheshukov, D. Haukos, and S. Ramsey. 2022. The role of cultural behavior and natural environment in shaping public support for sustainability policy. *Journal of Environmental Management* 301 (2022) 113776.

## Publications 2022-2023

- Mather, M. E., and J. M. Dettmers. 2022. Adaptive problem maps (APM): Connecting data dots to build increasingly informed and defensible environmental conservation decisions. *Journal of Environmental Management* 312 (2022).
- Mather, M. E., C. Moffitt, M. Fabrizio, D. Parrish, B. Penaluna, B. Brown, S. Nesbit. 2022. Diversity and inclusion: a strategy to implement change for 2021 and beyond: symposium summary. *Fisheries* 47(1):28-34.
- Parker, N.J., D.S. Sullins, D.A. Haukos, K.A. Fricke, and C.A. Hagen. 2022. Recovery of working grasslands following a megafire in the southern mixed-grass prairie *Global Ecology and Conservation* 36 (2022) e02142.
- Parker, N.J., D.S. Sullins, D.A. Haukos, K.A. Fricke, and C.A. Hagen. 2022. Demographic effects of a megafire on a declining prairie grouse in the mixed-grass prairie. *Ecology and Evolution* 12:e9544.
- Portillo-Quintero, C., B. Grisham, D. Haukos, C. Boal, C. Hagen, Z. Wan, and N. Menkiti. 2022. Trends in lesser prairie-chicken habitat extent and distribution on the Southern High Plains *Remote Sensing (Special Issue Wildlife Ecology for a Dynamic Future) Remote Sens.* 2022, 14, 3780.
- Sirch, M.W., D.S. Sullins, N.J. Parker, D.A. Haukos, J.D. Kraft, C.A. Hagen, and K.A. Fricke. 2022. Woody species mortality due to a megafire within the mixed-grass prairie. *Prairie Naturalist* 54:11-23.
- Teige, E.C., N.J. Parker, M.P. Vhay, and D.A. Haukos. 2022. Durability and longevity of *Tympanuchus pallidicinctus* (Lesser Prairie-Chicken) fence tags in Kansas and Colorado. *Ecological Restoration* 40:83-87.
- Vhay, M.P., D.A. Haukos, D.S. Sullins, and M.B. Rice. 2023. Landscape-scale changes in lesser prairie-chicken habitat. *PLoS ONE In Press*.
- Teige, E.C., L.A. Berigan, C.S.H. Aulicky, J.H. Reitz, D.A. Haukos, D.S. Sullins, K.A. Fricke, K.A. Schultz, and L.G. Rossi. 2023. Assessment of lesser prairie-chicken translocation through survival and lek counts. *Wildlife Society Bulletin In Press*.



## Awards and Recognition

### David Haukos

Lifetime Member – The Wildlife Society. 2022.  
Morgart Scientific Publication Award (2022), U.S. Fish and Wildlife Service. Moon, J.A., S.E. Lehnen, K.L. Metzger, M.A. Squires, M.G. Brasher, B.C. Wilson, W.C. Conway, D.A. Haukos, B.E. Davis, F.C. Rohwer, E.M. Wehland, and B.M. Ballard. 2021. Projected impact of sea-level rise and urbanization on mottled duck (*Anas fulvigula*) habitat along the Gulf Coast of Louisiana and Texas through 2100. *Ecological Indicators* 132 (2021) 108276.

### Martha Mather

USGS STAR Award – planning and leading a session at 2023 USGS CRU All-Hands Meeting

### Elizabeth Teige

TWS Associate Wildlife Biologist®, 2023

### Megan Vhay

USFWS Directorate Research Fellowship. 2022

Outstanding KSCFWRU Student 2022

### Ashley Messier

USFWS Directorate Research Fellowship. 2022  
Best Oral Presentation, Kansas Chapter of The Wildlife Society, Kansas Natural Resources Conference – 2022

### Graduate Student Travel Grants

5 Students, 7 Grants, \$3,350

## Teaching

### Graduate Student Teaching Assistants—Total 12 sections

Principles of Biology (6 sections), Organismic Biology (3 sections), Mammalogy (1 section), Wildlife Management and Techniques (1 section), Flora and Fauna of the Great Plains (1 section)

### David Haukos

Introduction to Fisheries, Wildlife, and Conservation Biology (BIOL 433; Spring 2022, 2023)

Habitat Ecology and Management (BIOL 890; Spring 2022, Fall 2023)

Demographic Methods (BIOL 823; Fall 2022)

Natural Resources/Environmental Science (NRES). Capstone Course (Spring 2023)

### Martha Mather

Professional Skills (BIOL 863; Spring 2022)

Biologically-involved Sustainability (BIS): A New Direction for Successful Resource Conservation and Management. BIOL 890 (Graduate); BIOL 697 (Undergraduate).

## Professional Presentations

Total—55; 6—Invited

9—The Wildlife Society

9—Kansas Natural Resource Conference

5—Prairie Grouse Technical Council

10—Midwest Fish and Wildlife Conference

4—American Fisheries Society

7—Joint Aquatic Science Meeting

2—TWS Central Mountains and Plains Section

1—NA Congress for Conservation Biology



Olivia Rode presented a paper "Squeezing additional insights from fish survey data to aid conservation" at the Midwest Fish and Wildlife Conference in Overland Park, Kansas.

## Landowner Award

Stacy Hoeme – Hoeme Land and Cattle, Scott City, Kansas  
Citizens Conservation Achievement Award  
Central Mountains and Plains Section, The Wildlife Society



Current and previous members of the Kansas Cooperative Fish and Wildlife Research Unit gathered at the annual meeting of The Wildlife Society.



A Cooperative Agreement establishes the Kansas Cooperative Fish and Wildlife Research Unit at Kansas State University, with USGS, KSU, KDWP, WMI, and USFWS as signatories to the agreement. A new 10-year agreement was negotiated, signed, and executed in 2022



# Service

## **Research Work Orders Administered**

Where do we look and what should we do: examining the hard questions of chronic wasting disease management and surveillance – Trevor Hefley, KSU Statistics Department

Integrated management of sericea lespedeza on Fort Riley – Sarah Lancaster, KSU Department of Agronomy

Intermittent stream risk assessment: Mapping patterns of stream drying and identifying vulnerabilities of stream fish and crayfish communities – Keith Gido, KSU Division of Biology, Lindsey Bruckerhoff, Ohio State University

Patterns of greenness (NDVI) in the Southern Great Plains and their influence on the habitat quality and reproduction of a declining prairie grouse – Dan Sullins, Department of Horticulture and Natural Resources

## **David Haukos**

3 M.S. and 1 Ph.D Graduate Committee Member

Associate Editor, Wildlife Society Bulletin

Associate Editor, Journal of Fish and Wildlife Management

Co-Chair, Certification Review Board, The Wildlife Society

Adjunct Professor, Texas Tech University

Member, KSU Institutional Animal Care and Use Committee

Faculty Advisor, KSU Student Chapter of The Wildlife Society

KSU Technical Representative, Great Plains Cooperative Ecosystems Study Unit

Member, Playa Lakes Joint Venture Science Advisory Team

Member of the KDWP Threatened and Endangered Task Committee

Kansas Alliance of Wetlands and Streams – Board Member 2018-2022

NRES (Natural Resources and Environmental Sciences Secondary Major), Governing Board, KSU – Natural Sciences Representative 2020-2023.

Search Committee—KSCFWRU (Chair), KSU IACUC Program Manager (Member)

## **Martha Mather**

Kansas Chapter, American Fisheries Society, Membership Committee

Diversity, Equity, Inclusion Committee, National, American Fisheries Society

Organizing, Plenary, and Student Affairs Committees 2023 Midwest Fish and Wildlife Conference

Leadership Team, Kansas State University Chapter, Sigma Xi Member, USGS Fisheries Leadership Team

Subject Editor, Frontiers in Freshwater Science

Co-organizer, Prairie Stream Fish Collaborative Workshop

## **Caroline Skidmore**

Board member of the Kansas Chapter of TWS

## **Elizabeth Teige**

Board Member-at-Large, Central Mountains and Plains Section of The Wildlife Society (CMPS).

CMPS Student and Early Career Professionals Committee Chair

CMPS Elections Committee Acting Chair

## **Camille Rieber**

TWS KSU Student Chapter graduate student liaison

## **Natalie Pegg**

Biology Graduate Student Association Seminar Representative

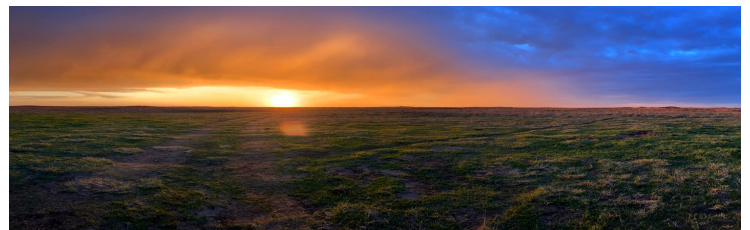
## **Sara Hansen**

Immediate Past President and NW Section Rep - WA Chapter – TWS

Board Member - Inclusion, Diversity, Equity, and Awareness (IDEA) Working Group – TWS

Member – Diversity Resource Center Committee – TWS

Mentor – Leadership Institute – TWS



## KSCFWRU COORDINATING COMMITTEE

