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## Preview of Award 1440484 - Annual Project Report

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### Cover

Federal Agency and Organization Element to Which Report is Submitted:	4900
Federal Grant or Other Identifying Number Assigned by Agency:	1440484
Project Title:	<p>           LTER: Long-Term Research on Grassland Dynamics- Assessing Mechanisms of Sensitivity and Resilience to Global Change         </p>
PD/PI Name:	<p>           Jesse B Nippert, Principal Investigator            Sara G Baer, Co-Principal Investigator            John M Blair, Co-Principal Investigator            Walter K Dodds, Co-Principal Investigator         </p>
Recipient Organization:	Kansas State University
Project/Grant Period:	11/01/2014 - 10/31/2020
Reporting Period:	11/01/2017 - 10/31/2018
Submitting Official (if other than PD\PI):	<p>           Jesse B Nippert            Principal Investigator         </p>
Submission Date:	10/12/2018
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	Jesse B Nippert

### Accomplishments

#### \* What are the major goals of the project?

The Konza Prairie LTER Program (KNZ) is a comprehensive, interdisciplinary research program with the overarching goal of understanding the interactive effects of natural and anthropogenically-altered drivers on grassland ecological dynamics, and to advance ecological theory through synthesis and integration of long-term datasets. In the most recent iteration of KNZ LTER funding (LTER VII), our focus is on assessing the mechanisms underlying sensitivity and resilience of this grassland ecosystem to a suite of critical forcing factors or 'drivers', by continuation of long-term manipulation of selected historically-important drivers, addition/alteration of novel drivers, and cessation of certain long-term experimental drivers to evaluate the

strength of ecological legacies and feedbacks. KNZ will also continue to support numerous educational, training and outreach activities, contribute knowledge to address land-use and management issues in grasslands, and provide infrastructure and data in support of scientific pursuits across a broad range of disciplines.

Our core research site is the Konza Prairie Biological Station (KPBS), a 3487-ha area of native tallgrass prairie in the Flint Hills of NE Kansas. KPBS was established in 1971 and joined the LTER network in 1980. LTER funding supports collection of long-term data on processes such as hydrology, nutrient cycling, plant productivity and community composition. These long-term records continue to provide unique insights into the dynamics of tallgrass prairie ecosystems, serve as a critical baseline for identifying and interpreting ecological responses to environmental changes, and are made available as a resource for the broader scientific community. The KNZ program encompasses studies at, and across, multiple ecological levels and a variety of spatial and temporal scales. Our unifying conceptual framework focuses on *fire, grazing and climatic variability* as essential and interactive factors determining the structure and function of mesic grasslands. The interplay of these natural disturbances leads to the complex, non-linear behavior characteristic of these grasslands. Because grazing and fire regimes are managed in grasslands worldwide, KNZ data are relevant for understanding and managing grasslands globally, and for addressing broader ecological issues including disturbance and ecosystem stability and resilience, top down vs. bottom up controls, and the interplay of mutualistic and antagonistic biotic interactions. In addition, because human activities alter key ecological drivers in these grasslands, we can use KNZ studies and data to address critical issues related to global change, including land-use and land-cover change, the ecology of invasions and restoration, and the direct and indirect alteration of nutrient and water availability. Thus, the KNZ program, while initiated over 30 years ago to understand the effects of natural disturbances in this grassland, has sustained and immediate relevance for understanding and predicting the consequences of global change for grasslands around the world.

A major goal of the KNZ LTER VII project is the continuation of core watershed-level fire and grazing studies and associated long-term data collection to document both short-term and long-term dynamics in response to these treatments and a variable climate. The KNZ program is built around a long-term database on ecological patterns and processes derived from a fully replicated watershed-level experimental design, in place since 1977 with some modifications to accommodate new long-term studies initiated in LTER V and VI (e.g., watershed-level Fire Reversal and Season of Fire experiments, Riparian Woody Vegetation Removal experiment, Patch-Burn Grazing experiment). This unique experimental design includes replicate watersheds subject to different fire and grazing treatments. In addition to fire and grazing, climatic variability, climate extremes and directional climate change are key drivers of grassland dynamics, and important focal areas for KNZ activities. The collection of diverse data from common sampling locations facilitates integration among our research groups. Within core LTER watersheds, permanent sampling transects are replicated at various topographic positions, where ANPP, plant species composition, plant and consumer populations, soil properties, and key above- and belowground processes are measured. In addition, a number of long-term plot-level experiments allow us to address the mechanisms underlying responses to various fire and grazing regimes, including manipulations of fire and N availability (e.g. Belowground Plots Experiment, Chronic N Deposition experiment) and of climatic variables in both terrestrial (e.g. Irrigation Transect Study, Rainfall Manipulation Plots (RaMPs) Experiment, Climate Extremes Experiment (CEE)) and aquatic (Experimental Stream Studies) habitats. In total, the Konza LTER Program is a rigorous ecological research program designed to elucidate patterns and processes important in grasslands, and address the potential impacts of global change in these ecosystems. Towards this end, we currently maintain 127 datasets (many with multiple subsets) associated with our long-term research and use these to support numerous shorter-term experiments focused on specific drivers and mechanisms.

In the fourth year (2017-2018) of our current funding cycle (LTER VII, 2014-2020) we continued to address fundamental ecological questions within the framework of assessing the mechanisms of sensitivity and resilience to global change, a theme relevant to understanding, managing and conserving grasslands worldwide. We focus on the global changes most relevant to grasslands and grassland streams – *changes in land-use* (altered fire and grazing regimes) and *land-cover* (particularly increases in woody plant cover); *climate change* (altered precipitation patterns including response to extreme events) and *altered nutrient cycles* (changes in nutrient availability) in both terrestrial and aquatic environments; and *restoration ecology* (active management of the ecosystem state) – and we couple long-term observations with manipulative studies to evaluate the strength of biological legacies and feedbacks in conferring sensitivity or resilience of the ecosystem state to these drivers.

Overarching goals for the KNZ LTER VII funding cycle are to:

1. Build upon our core LTER experiments and expand datasets on fire, grazing and climate variability to deepen and refine our understanding of the abiotic and biotic factors and feedbacks affecting grassland structure and function;

2. Develop a mechanistic and predictive understanding of grassland dynamics and trajectories of change in response to selected natural and anthropogenic drivers using long-term experiments and datasets, coupled with complementary shorter-term studies;
3. Conduct new syntheses using KNZ data, alone and in combination with data from other sites, to advance ecological theory, and expand the inference of KNZ research to other grasslands and biomes;
4. Train the next generation of ecologists, educate the public, and provide outreach to increase the relevance of KNZ long-term research to society.

Consistent with our goals as a long-term ecological research program, many of the long-term experiments and datasets initiated in previous LTER grants are being continued throughout the current funding period, while several new experiments and datasets were, and are, being modified or initiated, as detailed in the KNZ LTER VII proposal. The value of these long-term experiments and datasets continues to increase with time. In addition, results from these long-term studies have new relevance as we move towards evaluating the ecological impacts of a suite of global change phenomena occurring at the Konza LTER site and in grasslands worldwide. Below we highlight a few selected activities and findings from our most recent funding period.

**\* What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?**

Major Activities:

In the past year, we continued core KNZ programs including watershed-level fire experiments, contrasts of grazed (bison and cattle) and ungrazed locations, and the associated data collection and synthesis that are central to our research program. This includes maintaining watershed-level manipulations of fire frequencies (1, 2, 4, 20-year fire return intervals), seasonal timing of fires (spring, summer, fall, winter), and the reversal of fire treatments over time to assess the potential for altered fire regimes to mitigate trajectories of land-cover change. Fire and grazing studies address multiple LTER core areas, including primary productivity, nutrient cycling, population and community dynamics (with core datasets on grasshoppers, small mammals, grassland birds, plant communities, and bison). These whole-watershed fire and grazing treatments are focal areas for a number of ongoing LTER data collection efforts, syntheses across networks (NutNet, Drought-net), groundwater and stream-water monitoring networks, flux -tower and micrometeorological (~ Ameriflux), as well as data validation and parameterization for GIS and remote-sensing analyses. This platform of research also provides unique research opportunities for graduate and undergraduate students at KSU, as well as visiting students from many other institutions. We have provided a detailed assessment of ongoing research activities within 2017-18 in the attached 'Findings' .pdf.

A noteworthy outcome from the previous year of funding is the initiation of all research projects proposed in our LTER VII proposal. At the upcoming renewal cycle in 2020, we will have multiple years of data from all projects proposed during our current funding cycle. While detailed project-specific accomplishments are described in the appended Activities and Findings documents, here we note several major activities and findings from our thematic areas of research. Within the Fire and Grazing Studies group, we have developed several new projects focused on the population ecology and demography of consumers and producers. In the past year, Alice Boyle re-initiated surveys of the breeding bird community across multiple watersheds on site. A new experiment established in the summer 2018 was the 'Konza Herbivore Removal Experiment'. This large factorial experiment manipulates the abundance of multiple size classes of herbivores (invertebrates, small mammals, and bison) to identify consumer-identity effects on plant community composition and productivity. Given that the summer 2018 was an anomalously dry period the Climate Change group initiated several studies to assess the impacts of the drought. Specifically, the fish ecologists began several studies to identify the impacts of stream fragmentation on metacommunity dynamics within King's Creek. Many long-term nutrient addition/removal experiments were continued during the past year within the Biogeochemistry group. Within the long-term below-ground projects experiment, we have two years (2017 and 2018) without

fertilizer additions to assess legacies of nutrient additions over the previous 30 years. Work from the Zeglin lab in the past year shows interactions between fire and fertilization on nutrient dynamics, which have promoted changes in microbial communities through time. Woody Encroachment continues to be a primary focal topic for research on Konza Prairie. Research projects within the last year focused on changes in demography of *Cornus drummondii*, the impacts of simulated browsing on shrub physiology and growth, and the first year of data collection for the ShRaMPs shrub rainout experiment. Finally, many projects are underway on Konza that investigate community assembly, invasion ecology and the grassland conservation. These projects are organized within the Restoration focal group. The sequential prairie restoration experiment began in 2010 to disentangle deterministic versus short-term stochastic drivers of grassland community assembly. In 2018, the fifth restoration sequence was established as part of this larger, long-term experiment. This project continues to provide many opportunities for graduate and undergraduate projects in restoration ecology.

A key change within the KNZ program this year was a change in PI leadership from John Blair to Jesse Nippert. Blair has led the KNZ program since 1999, including primary grant-writing responsibilities during LTER V, VI, and VII funding cycles. Nippert has been working with Blair since his arrival in 2007, and will lead the grant writing for LTER VIII in 2020. Several KNZ staff were added in the past year. After being with KNZ since 1984, our long-time analytical chemist Rosemary Ramundo retired in Jan. 2018. She had provided key roles beyond laboratory analyses including mentoring graduate students in analyses and providing supervision to undergraduate technicians. Courtney Tobler was hired to replace Rosemary. We also hired Mark Sandwick to serve as our experimental projects coordinator. Mark provides technical field assistance for any KNZ investigator needing help with experiment construction, datalogger operation, or time-sensitive measurements. Several of our 'long-term postdocs' were hired into permanent jobs in the past year. These include Koerner, Avolio, Wilcox, and La Pierre. These 4 continue to establish new projects at KNZ, contribute to synthesis locally, syntheses via the network -- through the NCEAS LTER Synthesis grants, and in international networks including NutNet and DroughtNet. KNZ also saw several departures within the last year from individuals that have left a large impact on the program. Tony Joern and John Briggs both retired. Both have been key to KNZ's success. In addition, Brett Sandercock left KSU to pursue a new academic position in Norway. Sandercock's faculty line was replaced with Dr. Andrew Hope (small mammal ecologist) in August, 2018. Hope is quickly assimilating into the program. Faculty searches to replace Joern and Briggs are underway. Dr. Abby Langston joined the group of new investigators at KNZ during the past year. Abby is a geomorphologist in Geography at KSU with research interests on landscape evolution and modeling.

The infrastructure of KPBS and long-term data associated with KNZ were integral to the success of several new extramural awards funded during 2017-18. KNZ PI's Knapp and Smith received a \$498,500 award from the USDA NIFA-AFRI program. This research will examine the impacts of increased climate variability on forage production in semi-arid grasslands including the shortgrass steppe and Konza Prairie. KNZ PI Boyle received \$542,060 from the NSF-DEB Population and Community Ecology cluster. Alice's new research will investigate the drivers of population change in grassland bird species. KNZ PI's Nippert, Zeglin, and Wilcox received a \$998,261 award from the DOE-BER program. This project will build from the KNZ ShRaMPs project to study the interaction of drought and fire frequency on carbon cycling at multiple soil depths and in grassland versus shrubland communities. The data generated will be used to model the carbon balance of grasslands across broader regional gradients. KNZ PI's Dodds, Zeglin, Rice, and Jumpponen received funding from the NSF-EPSCoR program on a large multi-institution project (~ \$20,000,000) to investigate linkages among microbiomes of aquatic communities, plants, and soil systems across the regional precipitation gradient in Kansas. Konza Prairie and the KNZ infrastructure is a key site used for the grant objectives. The major project goals involve the development of a

mechanistic understanding of microbiome-mediated ecosystem functions, predicting ecosystem responses to changes in precipitation and land-use patterns, and identifying ways to select for and utilize microbiomes to produce desired characteristics.

**Specific Objectives:** These specific objectives are derived from goals and activities included in our original KNZ LTER VII proposal.

1. Maintain and expand core long-term experiments and data sets to better understand how natural and anthropogenic drivers (fire, grazing, climatic variability, nutrient availability and grassland restoration) affect grassland states and dynamics at multiple levels of ecological organization.
2. Evaluate the long-term rates, trajectories and underlying mechanisms/constraints of grassland response to altered drivers; with focus on drivers that past research has identified as most influential on ecological states.
3. Test complementary conceptual and theoretical models of ecosystem change over time, and identify mechanisms and feedbacks that support or differentiate directional, non-linear and threshold trajectories of change.
4. Measure grassland resilience to and recovery from altered drivers, identify feedbacks that support or constrain resilience and recovery, and understand whether recovery can be facilitated based on ecological principles.
5. Determine which abiotic and biotic factors regulate community assembly and ecosystem state changes in restored prairie.
6. Lead and participate in synthesis and cross-site research activities, to evaluate the fundamental controls on ecosystem resistance and resilience to changes in key drivers, both within and among different grasslands and biomes.
7. Continue to update KNZ LTER database to meet requirements for the LTER Network Information System. Provide up-to-date, accurate LTER data to KNZ investigators and to the broader scientific community as quickly and efficiently as possible.
8. Continue KNZ education and outreach activities to achieve our broader impact goals. Continue and expand on-site science activities and enlist new classes and students. Provide opportunities for undergraduate research experiences and continue to support graduate student research and training. Contribute LTER data to address relevant environmental issues (e.g., prescribed fires and air quality, land-use and water quality). Expand science and art interactions as a novel way of increasing awareness of and interest in grassland ecology and grassland conservation.

**Significant Results:** Please see the supporting .pdf files, which provide detailed information on the activities and findings of individual research projects which have contributed to the overall progress of LTER VII in 2017-2018.

**Key outcomes or Other achievements:** Please see the supporting .pdf files, which provide detailed information on the activities and findings of individual research projects which have contributed to the overall progress of LTER VII in 2017-2018.

**\* What opportunities for training and professional development has the project provided?**

The Konza LTER program provides training and professional development opportunities at many levels, including K-12 teachers, undergraduate and graduate students, post-doctoral scientists from a number of different institutions, junior tenure-

earning faculty members, and professional research staff. Below we summarize some of the recent and continuing opportunities provided by the KNZ program.

The Konza Prairie Schoolyard LTER (SLTER) program is in its 20th year as a science education program for K-12 teachers and their students, built around the successful Konza Prairie LTER program. The Konza Prairie SLTER program aims to educate students about ecology and global change, with emphasis on regional grasslands, by engaging students and teachers in realistic and relevant science-based activities focused on long-term data collection at our LTER site. These activities were designed to give students an understanding of ecology, provide them the opportunity to collect and interpret their own data. K-12 teachers who wish to bring their classes to Konza Prairie and to experience the Schoolyard LTER activities must first participate in a Summer Teachers' Workshop. This week-long program introduces the teachers to each of the activities offered by KEEP and, at the completion of the workshop, allows them to tailor an educational experience specific to the needs of their students. The teachers who complete the program qualify to bring their classes to Konza for no charge and have their bus transportation costs paid. This agreement stands for the rest of the teachers' professional careers. These educators have become important partners in the Konza Environmental Education Program and many return annually. We have trained 101 area teachers since our program began in 1998. The number of SLTER student participants in 2017 (most recent year with complete data) was 1,100.

The Konza Environmental Education Program (KEEP) has partnered with the Manhattan/Ogden KS School District 383 to be a ready source of informal science education – specifically addressing core science concepts that are easily experienced during a Konza visit. To meet this need we train volunteer docents that assist in public education and outreach activities. New docents are added to the program annually and receive 40 hours of training on the history and ecology of the tallgrass prairie as well as an overview of research being conducted at Konza. Experienced docents are regularly apprised of new research programs and the progress of existing research and become ambassadors of science to the community. The KEEP program has trained over 300 docents (about 60 who are currently active). Additionally, we partner with the Flint Hills Discovery Center (Manhattan, KS) to co-host visiting school groups. Last year we hosted a total 2,700 area students who participated either in a SLTER activity or a natural history activity.

The Konza LTER program continues to emphasize quality graduate student training. During the 2017-2018 funding period, we provided stipends and other forms of non-financial support (vehicle use, site use, analytical laboratory use, attendance at regional/national meetings) for > 20 students, including many from non-KSU as well as KSU graduate students. We continue to foster graduate research involving students attending Colorado State University, University of Kansas, Southern Illinois University, Oklahoma State University, and others. In 2017-2018, 12 theses/dissertations were completed that included data and research from the Konza Prairie.

KNZ also offers research experiences for a large number of undergraduate students. In the summer of 2018, we supported one LTER REU student, Dylan Smith [mentored by Co-PI Alice Boyle (KSU)]. Using data collected during this REU experience, Dylan will be supported by KNZ LTER to begin his master's research in January 2019. In addition to the REU student, the Konza LTER program provides hands-on research opportunities for ~12-15 undergraduate research assistants each year. KNZ also supports and provides professional development opportunities for our professional research staff members, including training in the use of field and laboratory equipment, training in health and safety protocols, training in prescribed fire practices, and other relevant professional development.

KNZ has a strong history of providing mentoring and research training for recent PhD's and junior faculty members. Several former PhD students that completed dissertation projects on Konza are now post-docs or junior faculty at other institutions but continue to participate in, and in many cases, lead KNZ research activities. Within the past year, one of our postdocs, Kevin Wilcox, accepted an academic faculty position at the University of Wyoming. Current active postdocs include Bram Verheijen (KSU), Ellen Welti (Oklahoma), Gabriel de Oliveira (KU), Nate Lemoine (CSU), and Zak Ratajczak (Wisconsin-Madison). The KNZ program also provides resources and mentoring to new tenure-earning faculty members. In our current funding cycle, this includes assistant professors in Biology at KSU (Lydia Zeglin, Michi Tobler, Andrew Hope) and Agronomy at KSU (Eduardo Santos), as well as support for Pam Sullivan (Geography at KU), Sally Koerner (UNC-Greensboro), Meghan Avolio (Johns Hopkins), Kevin Wilcox (University of Wyoming), and Kim La Pierre (Smithsonian Environmental Research Center).

#### **\* How have the results been disseminated to communities of interest?**

Konza LTER results are disseminated to the scientific community via publications in peer-reviewed literature, through presentations at professional meetings and workshops, through seminars by KNZ scientists and students, through social media (Twitter, Facebook, Researchgate), and via the KNZ and KPBS websites. In addition, KNZ scientists have participated in a broad range of activities that go beyond the scientific community. For example, KNZ data and findings are used in a

number of undergraduate and graduate courses at Kansas State University, the University of Kansas, University of Arizona, Colorado State University, University of Oklahoma, among others. In addition, KNZ findings are increasingly utilized in undergraduate ecology texts and supplementary teaching material. For example, KNZ long-term studies were used to demonstrate the role of fire and grazing in grasslands in 'General Ecology, 2nd edition' by D.T. Krohne, and as an example of the importance of long-term research in the 'Ecology' text by Cain et al. KNZ studies on top-down regulation of plant community structure are featured in an introductory undergraduate biology text ('Life. The Science of Biology, 7th edition' by Purves, Sadava, Orians and Heller) and KNZ data and findings are highlighted in several upper-level and graduate texts including 'Freshwater Ecology' (W.K. Dodds), 'The Ecology of Plants' (Gurevitch, Scheiner and Fox), and 'Biogeochemistry. An Analysis of Global Change' (W.H. Schlesinger).

Data and insight from the Konza LTER program is being used by resource managers for effective land stewardship. Currently, our research concerning the role of seasonal burning and fire intensity on woody encroachment is being used to inform the Great Plains Fire Science Exchange ([www.gpfirescience.org](http://www.gpfirescience.org)) and the Tallgrass Prairie and Oak Savanna Fire Science Consortium ([www.tposfirescience.org](http://www.tposfirescience.org)). Both of these non-profit groups focus on conservation issues and land management of Midwestern grasslands. In addition, many of the Konza investigators serve as scientific consultants for a regional cultural and natural history center, the 'Flint Hills Discovery Center' in Manhattan, KS.

In the interest of increasing the reach of our environmental education program to classrooms around the world, KEEP is working to develop online curriculum utilizing LTER data. We currently have two separate activities that ask students to look at bison weight data and answer specific questions about what the data are telling them. The activities ask students to graph the data and make predictions about future bison weights indicating how environmental conditions might affect the data. Additional online curriculum is in development and will reflect the story arc of The Autumn Calf children's book from the SLTER book series.

In 2018, KNZ scientists and graduate students participated in numerous public outreach events designed to enhance understanding of LTER science and dissemination of important findings. Several KNZ researchers served as Science Communication Fellows at the Sunset Zoo in Manhattan, KS. Sunset Zoo's Science Communication Fellowship (SCF) program supports a network of certified researchers, professionals, graduate students and post-graduate students working together to connect the community to science and elevate the understanding of research taking place in the region. SCF is part of the national Portal to the Public Network. KNZ investigators also presented research findings at local Science Café meetings, as well as 'Science on Tap' at Tallgrass Taphouse. Several KNZ investigators participate in the Kansas Science Communications Initiative, which is teaching scientists how to better communicate their findings to the public. KNZ graduate students at KSU were instrumental in the creation of a blog entitled Science Snapshots (<https://sciencesnapshots.com>), where students post entries covering other student's research. Our local art museum (Beach Museum of Art) has a Prairie Studies Initiative (<http://beach.k-state.edu/prairiestudies>). KNZ scientist, Blair, has acted as consultant, participant, and speaker at many Prairie Studies outreach events. Several other broader impacts and scientific extensions from the Konza LTER Program are discussed in further detail in the 'Broader Impacts' section of this annual report.

#### \* What do you plan to do during the next reporting period to accomplish the goals?

During the next funding cycle (Year 5 of LTER VII: 2018-19), we will: 1) complete the collection, processing, and online data integration of the current year sample collection; 2) continue to update and error-check the online data associated with KNZ LTER database and LTER network information management system; 3) continue to improve our data accessibility and search options within our online database; 4) continue to support the development of new research projects initiated by new KNZ faculty including Pam Sullivan (KU), Meghan Avolio (Johns Hopkins), Sally Koerner (UNC-Greensboro), Kim La Pierre (Smithsonian), Andrew Hope (KSU), and Kevin Wilcox (Wyoming); 5) promote educational training and inclusion of undergraduate researchers within site science; 6) promote training and development of graduate student researchers at KNZ as well as in synthesis activities of the broader LTER network; 7) continue to provide leadership and participation in LTER network level activities including the 2019 Spring Science Council, and other committees including the education and IM working groups.

#### Supporting Files

Filename	Description	Uploaded By	Uploaded On
2018_Activities.pdf	2017-2018 KNZ LTER Activities	Jesse Nippert	10/11/2018
2018_Findings.pdf	2017-2018 KNZ LTER Findings	Jesse Nippert	10/11/2018

## Products

### Books

#### Book Chapters

Baer, SG, Birge, H (2017). Soil ecosystem services: an overview. *Managing Soil Health for Sustainable Agriculture* . Status = ACCEPTED; Acknowledgement of Federal Support = Yes ; Peer Reviewed = Yes

### Inventions

#### Journals or Juried Conference Papers

Alfaro, Matilde and Sandercock, Brett K. and Liguori, Luciano and Arim, Matias (2018). Body condition and feather molt of a migratory shorebird during the non-breeding season. *Journal of Avian Biology*. 49 jav-01480. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/jav.01480

Allen, George H. and Pavelsky, Tamlin M. and Barefoot, Eric A. and Lamb, Michael P. and Butman, David and Tashie, Arik and Gleason, Colin J. (2018). Similarity of stream width distributions across headwater systems. *Nature Communications*. 9 . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1038/s41467-018-02991-w

Baer, SG, Gibson, DJ, Johnson, LC (). Restoring grassland in the context of climate change. *Grasslands and Climate Change* . Status = ACCEPTED; Acknowledgment of Federal Support = Yes

Brunsell, N.A., E.S. van Vleck, M. Noss, Z. Ratajczak, J.B. Nippert (2017). Assessing the roles of fire frequency and precipitation in determining woody encroachment in central U.S. grasslands. *Journal of Geophysical Research - Biogeosciences* . Status = PUBLISHED; Acknowledgment of Federal Support = Yes

C. M. Carson, A. Jumpponen, J. M. Blair and L. H. Zeglin (). Plant and environmental heterogeneity differentially mediate soil bacterial and fungal responses to long-term changes in grassland management. *Fungal Ecology* . Status = UNDER\_REVIEW; Acknowledgment of Federal Support = Yes

Carson, Christine M. and Lydia H. Zeglin (2018). Long-term fire management history affects N-fertilization sensitivity, but not seasonality, of grassland soil microbial communities. *Soil Biology and Biochemistry*. 121 231 - 239. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1016/j.soilbio.2018.03.023

Elson, A. and D.C. Hartnett (2017). Bison increase the growth and reproduction of forbs in Tallgrass Prairie. *American Midland Naturalist* . Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

Fulgoni, J. N., D. M. Larson, K. E. Jackson, M. R. Whiles, and W. K. Dodds. (). Ecological Impacts and Recovery of Headwater Prairie Streams with Patch-Burn Grazing.. *Ecological Applications* . Status = SUBMITTED; Acknowledgment of Federal Support = Yes

Griffin-Nolan, Robert J. and Bushey, Julie A. and Carroll, Charles J. W. and Challis, Anthea and Chieppa, Jeff and Garbowski, Magda and Hoffman, Ava M. and Post, Alison K. and Slette, Ingrid J. and Spitzer, Daniel and Zambonini, Dario and Ocheltree, Troy W. and Tissue, David T. and Knapp, Alan K. (2018). Trait selection and community weighting are key to understanding ecosystem responses to changing precipitation regimes. *Functional Ecology*. 32 1746 - 1756. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/1365-2435.13135

Griffin-Nolan, Robert J. and Carroll, Charles J. W. and Denton, Elsie M. and Johnston, Melissa K. and Collins, Scott L. and Smith, Melinda D. and Knapp, Alan K. (2018). Legacy effects of a regional drought on aboveground net primary production in six central US grasslands. *Plant Ecology*. 219 505 - 515. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1007/s11258-018-0813-7

Gui, W., Ren, H., Liu, N., Zhang, Y., Cobb, A.B., Wilson, G.W.T., Sun, X., Hu, J., Xiao, Y., Zhang, F., Yang, G. (). Plant functional group influences arbuscular mycorrhizal fungal abundance and hyphal contribution to soil CO<sub>2</sub> efflux in temperate grasslands. *Plant and Soil* . Status = ACCEPTED; Acknowledgment of Federal Support = Yes

Hautier, Yann and Isbell, Forest and Borer, Elizabeth T. and Seabloom, Eric W. and Harpole, W. Stanley and Lind, Eric M. and MacDougall, Andrew S. and Stevens, Carly J. and Adler, Peter B. and Alberti, Juan and Bakker, Jonathan D. and Brudvig,



Lars A. and Buckley, Yvonne M. and Cadotte, Marc and Caldeira, Maria C. and Chaneton, Enrique J. and Chu, Chengjin and Daleo, Pedro and Dickman, Christopher R. and Dwyer, John M. and Eskelinen, Anu and Fay, Philip A. and Firn, Jennifer and Hagenah, Nicole and Hillebrand, Helmut and Iribarne, Oscar and Kirkman, Kevin P. and Knops, Johannes M. H. and Kimberly J. La Pierre and McCulley, Rebecca L. and Morgan, John W. and P{a}rtel, Meelis and Pascual, Jesus and Price, Jodi N. and Prober, Suzanne M. and Risch, Anita C. and Sankaran, Mahesh and Schuetz, Martin and Standish, Rachel J. and Virtanen, Risto and Wardle, Glenda M. and Yahdjian, Laura and Hector, Andy (2018). Local loss and spatial homogenization of plant diversity reduce ecosystem multifunctionality. *Nature Ecology & Evolution*. 2 50-56. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1038/s41559-017-0395-0

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## Licenses

## Other Conference Presentations / Papers

## Other Products

## Other Publications

## Patents

## Technologies or Techniques

## Thesis/Dissertations

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Welti, Ellen A. R.. *Ecological networks of grassland plants and arthropods*. (2017). Kansas State University. Acknowledgement of Federal Support = Yes

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Carson, Christine. *Grassland soil microbial responses to long-term management of N availability.* (2018). Kansas State University. Acknowledgement of Federal Support = Yes

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Alves, J.D.N.. *Partitioning the CO<sub>2</sub> net flux into assimilation and respiration components, and estimating water use efficiency in a grassland ecosystem.* (2017). Federal University of Vicosa. Acknowledgement of Federal Support = Yes

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Rawitch, M. J.. *Stream CO<sub>2</sub> degassing: Review of methods and laboratory validation of floating chambers.* (2016). University of Kansas. Acknowledgement of Federal Support = Yes

Adams, T.J.. *The role of soil heterogeneity in the recruitment of new species and interactions with grasshoppers (Acrididae) and Katydid (Tettigoniidae) in restored prairie.* (2017). Southern Illinois University, Carbondale. Acknowledgement of Federal Support = Yes

## Websites

Konza LTER project website

<http://lter.konza.ksu.edu/>

This is the main website for the KNZ LTER project, and includes links to KNZ documents, databases, and publications.

## Participants/Organizations

### What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Nippert, Jesse	PD/PI	4

<b>Name</b>	<b>Most Senior Project Role</b>	<b>Nearest Person Month Worked</b>
Baer, Sara	Co PD/PI	2
Blair, John	Co PD/PI	2
Dodds, Walter	Co PD/PI	2
Avolio, Meghan	Co-Investigator	1
Boyle, Alice	Co-Investigator	1
Briggs, John	Co-Investigator	1
Brunsell, Nathaniel	Co-Investigator	1
Collins, Scott	Co-Investigator	1
Gido, Keith	Co-Investigator	1
Hartnett, David	Co-Investigator	2
Hope, Andrew	Co-Investigator	1
Horne, Eva	Co-Investigator	1
Jensen, William	Co-Investigator	1
Jumponnen, Ari	Co-Investigator	1
Knapp, Alan	Co-Investigator	2
Koerner, Sally	Co-Investigator	1
LaPierre, Kimberly	Co-Investigator	1
Macpherson, Gwendolyn	Co-Investigator	2
Olson, KC	Co-Investigator	1
Rice, Charles	Co-Investigator	1
Santos, Eduardo	Co-Investigator	1
Smith, Melinda	Co-Investigator	2
Sullivan, Pam	Co-Investigator	1
Whiles, Matt	Co-Investigator	1

<b>Name</b>	<b>Most Senior Project Role</b>	<b>Nearest Person Month Worked</b>
Wilcox, Kevin	Co-Investigator	1
Wilson, Gail	Co-Investigator	1
Zeglin, Lydia	Co-Investigator	1
Zolnerowich, Gregory	Co-Investigator	1
Ferguson, Carolyn	Faculty	1
Goodin, Douglas	Faculty	1
Greer, Mitch	Faculty	1
Harrington Jr., John	Faculty	1
Hutchinson, Stacy	Faculty	1
Johnson, Loretta	Faculty	1
Kaufman, Donald	Faculty	1
Mather, Martha	Faculty	1
Mayfield, Mark	Faculty	1
Moore, Trisha	Faculty	1
Ocheltree, Troy	Faculty	1
Ransom, Michel	Faculty	1
Ricketts, Drew	Faculty	1
Sandercock, Brett	Faculty	1
Snyder, Bruce	Faculty	1
Tobler, Michi	Faculty	1
Todd, Timothy	Faculty	1
de Oliveria, Gabriel	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Lemoine, Nate	Postdoctoral (scholar, fellow or other postdoctoral position)	1

<b>Name</b>	<b>Most Senior Project Role</b>	<b>Nearest Person Month Worked</b>
Ratajczak, Zak	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Veach, Allison	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Verheijen, Bram	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Welti, Ellen	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Haukos, Jill	Other Professional	12
Rhodes, Jennifer	Other Professional	12
Xia, Yang	Other Professional	12
Bachle, Seton	Graduate Student (research assistant)	1
Bartmess, Michael	Graduate Student (research assistant)	1
Black, Sarah	Graduate Student (research assistant)	1
Broderick, Caitlin	Graduate Student (research assistant)	1
Carter, Tiffany	Graduate Student (research assistant)	1
Chaves Rodriguez, Francis	Graduate Student (research assistant)	1
Connell, Kent	Graduate Student (research assistant)	6
Duell, Eric	Graduate Student (research assistant)	1
Eckhoff, Kathryn	Graduate Student (research assistant)	1
Felton, Andrew	Graduate Student (research assistant)	1
Fralick, Kasey	Graduate Student (research assistant)	1
Frennette, Bryan	Graduate Student (research assistant)	6
Fulgoni, Jessica	Graduate Student (research assistant)	1
Gray, Jesse	Graduate Student (research assistant)	1
Griffin-Nolan, Robert	Graduate Student (research assistant)	1



<b>Name</b>	<b>Most Senior Project Role</b>	<b>Nearest Person Month Worked</b>
Gunnip, James	Graduate Student (research assistant)	6
Higgs, Sophie	Graduate Student (research assistant)	1
Hoffman, Ava	Graduate Student (research assistant)	1
Manning, George	Graduate Student (research assistant)	1
Mino, Laura	Graduate Student (research assistant)	1
Moley, Priscilla	Graduate Student (research assistant)	1
Norwood, Brock	Graduate Student (research assistant)	1
O'Conner, Rory	Graduate Student (research assistant)	6
Rivera-Zayas, Johanie	Graduate Student (research assistant)	1
Santos, Marshall	Graduate Student (research assistant)	1
Scott, Drew	Graduate Student (research assistant)	1
Shaffer, Monica	Graduate Student (research assistant)	3
Siders, Adam	Graduate Student (research assistant)	1
Slette, Ingrid	Graduate Student (research assistant)	1
Vilonen, Leena	Graduate Student (research assistant)	1
Wedel, Emily	Graduate Student (research assistant)	1
Wiggam-Ricketts, Shelly	Graduate Student (research assistant)	1
Wilson, Luci	Graduate Student (research assistant)	1
Winnicki, Sarah	Graduate Student (research assistant)	1
Zaricor, Marissa	Graduate Student (research assistant)	1
Hadle, Jacob	Non-Student Research Assistant	3
Kuhl, Amanda	Non-Student Research Assistant	12
O'Neal, Patrick	Non-Student Research Assistant	1
Ramundo, Rosemary	Non-Student Research Assistant	2

Name	Most Senior Project Role	Nearest Person Month Worked
Sandwick, Mark	Non-Student Research Assistant	9
Taylor, Jeff	Non-Student Research Assistant	12
Tobler, Courtney	Non-Student Research Assistant	9
Bonjour, Sophia	Research Experience for Undergraduates (REU) Participant	1
Smith, Dylan	Research Experience for Undergraduates (REU) Participant	1
Sprangler, Ellis	Research Experience for Undergraduates (REU) Participant	1

#### Full details of individuals who have worked on the project:

##### Jesse B Nippert

**Email:** nippert@ksu.edu

**Most Senior Project Role:** PD/PI

**Nearest Person Month Worked:** 4

**Contribution to the Project:** Dr. Nippert is the Konza Prairie LTER lead PI and project director. Provides overall LTER project leadership and coordination. He contributes expertise in plant ecology and ecophysiology, and plant responses to environmental variability and change. Dr. Nippert oversees the application of environmental sensor networks to assess spatial variability in microclimate, and plant responses on core LTER watersheds at the Konza Prairie LTER site. He is responsible for wood plant encroachment studies, and also directs the KSU Stable Isotope Mass Spectroscopy Laboratory, and provides expertise on the application of stable isotopes to ecological studies.

**Funding Support:** DOE: Using root and soil traits to forecast woody encroachment dynamics in mesic grasslands

**International Collaboration:** Yes, South Africa

**International Travel:** No

##### Sara G Baer

**Email:** sgbaer@siu.edu

**Most Senior Project Role:** Co PD/PI

**Nearest Person Month Worked:** 2

**Contribution to the Project:** Dr. Baer is a project co-PI and provides expertise on grassland restoration, particularly with respect to plant community dynamics and long-term changes in ecosystem properties and processes. She is responsible for directing research on grassland restoration ecology at the Konza site, including recovery of ecosystem properties in restored grasslands, and the influence of genotypic differences in cultivars and native vegetation on ecological processes in restored grasslands. Dr. Baer oversees the new Restoration Chronosequence study as part of the LTER VII project. Supported with a subcontract to Southern Illinois University.

**Funding Support:** NSF LTREB: The role of ecological heterogeneity in a long-term grassland restoration experiment. Provides partial support for a related restoration experiment initiated with non-LTER funds.

**International Collaboration:** No

**International Travel:** No

**John M Blair****Email:** jblair@ksu.edu**Most Senior Project Role:** Co PD/PI**Nearest Person Month Worked:** 2

**Contribution to the Project:** Konza LTER investigator and Director of the Konza Biological Station (the primary research site for the Konza LTER program) (became director in July 2018). Research expertise in ecosystem ecology and terrestrial biogeochemistry; soil ecology, including decomposition, soil nutrient cycling, litter/soil/plant nutrient dynamics; effects of climate change and other disturbances on ecosystem processes; ecology of soil invertebrates; and restoration ecology.

**Funding Support:** None**International Collaboration:** No**International Travel:** No**Walter K Dodds****Email:** wkdodds@ksu.edu**Most Senior Project Role:** Co PD/PI**Nearest Person Month Worked:** 2

**Contribution to the Project:** Konza LTER Co-PI. Dr. Dodds provides leadership for the Konza LTER aquatic research group. Research expertise in aquatic ecology; phycology; nutrient cycling and retention in streams; groundwater chemistry; watershed-level hydrologic export; water quality. Dr. Dodds is also leading the riparian vegetation removal study as part of the LTER VII funding cycle. This study assess the impacts of riparian land-cover change on grassland streams.

**Funding Support:** NSF EPSCoR MAPS**International Collaboration:** Yes, Brazil**International Travel:** No**Meghan Avolio****Email:** meghan.avolio@gmail.com**Most Senior Project Role:** Co-Investigator**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former Ph.D. student at Yale University (Advisor: Melinda Smith). Research on grassland plant communities, mycorrhizae, climate change, nitrogen deposition, and genetic structure of plant communities. Currently an assistant professor at John Hopkins University

**Funding Support:** None.**International Collaboration:** No**International Travel:** No**Alice Boyle****Email:** aboyle@ksu.edu**Most Senior Project Role:** Co-Investigator**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in bird ecology and physiology; particular interest in reproduction, dispersal and energetics.

**Funding Support:** NSF: What are the environmental causes of population variability of highly mobile animals.

**International Collaboration:** No

**International Travel:** No

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**John M Briggs**

**Email:** jbriggs1@k-state.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former Konza LTER investigator and Director of the Konza Prairie Biological Station (the primary research site for the Konza LTER program). Dr. Briggs oversaw studies of grass-shrub interactions and the causes and consequences of woody plant encroachment into grasslands. Directed research into patterns and controls of ANPP in grasslands, as well as studies of the relationship between ANPP and species richness. Also provided expertise in database management, GIS and remote sensing studies. Dr. Briggs retired from KSU in July 2018.

**Funding Support:** NSF Impacts of Spatially Heterogeneous Nitrogen to Grazer Distribution and Activity: Effects on Ecosystem Function in Tallgrass Prairie

**International Collaboration:** No

**International Travel:** No

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**Nathaniel Brunsell**

**Email:** brunsell@ku.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in ecosystem and global C and water flux measurement and modeling; coordinates collection and analysis of data from the Ameriflux towers located on Konza Prairie.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Scott Collins**

**Email:** scollins@sevilleta.unm.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in grassland ecology and plant community ecology; ecological analyses of spatial and temporal dynamics; ecological responses to disturbance; analysis of species distribution and abundance; local-regional interactions; productivity-diversity relationships.

**Funding Support:** NSF Savannah Convergence Project

**International Collaboration:** Yes, South Africa

**International Travel:** No

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**Keith Gido**

**Email:** kgido@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Provides expertise in aquatic ecology; stream communities and ecosystems; the effects of fish on stream ecosystem properties such as primary productivity, nutrient cycling, community structure (species richness and diversity), decomposition and transport of particulate organic matter (POM); impacts of altered hydrologic regimes on

stream ecosystems. Oversees the LTER experimental stream facility. Coordinates regional assessments of stream fish communities.

**Funding Support:** NSF Macrosystem Project: Scale, Consumers, and Lotic Ecosystem Rates (SCALER): from decimeters to continents NSF Dissertation Research: Forecasting Global Warming Effects on Developmental Performance of Prairie Stream Fishes along the River Continuum.

**International Collaboration:** Yes, Australia

**International Travel:** No

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**David C Hartnett**

**Email:** dchart@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 2

**Contribution to the Project:** Expertise in grassland plant population ecology; the role of belowground bud banks in grassland communities; plant mycorrhizal interactions in grasslands; plant-herbivore interactions; fire ecology. Also involved in ILTER activities, and Co-Director of the Institute for Grassland Studies.

**Funding Support:** None.

**International Collaboration:** Yes, Botswana

**International Travel:** No

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**Andrew Hope**

**Email:** ahope@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in mammalogy; particularly phylogeography, speciation and climate impacts on evolutionary mechanisms of community assembly.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Eva Horne**

**Email:** ehorne@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Research in behavioral ecology of grassland reptiles; responses of reptile and amphibian populations to fire and grazing. Dr. Horne also assists with administration of the Konza Prairie Biological Station, and coordination of research permits and projects at the site.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**William Jensen**

**Email:** wjensen1@emporia.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Dr. Jensen is an Associate Professor at Emporia State University. He is studying the effects of patch-burn grazing on brood parasitism of Dickcissel nests in the Flint Hills tallgrass prairie, and is responsible for collecting data on avian consumer responses to the patch-burn grazing experiment..

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Ari Jumponen**

**Email:** ari@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise on fungal ecology, particularly mycorrhizae and other endophytic fungi; diversity of soil microbial communities; application of molecular methods to characterize soil microbial communities.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Alan Knapp**

**Email:** alan.knapp@colostate.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 2

**Contribution to the Project:** Provides research expertise in grassland ecology, plant ecology, physiological ecology, global change studies, plants-herbivore interactions, invasive species ecology. Dr. Knapp also provides leadership for LTER studies of plant productivity and responses to climatic variability and climate change, and conducts multi-site research involving SGS and KNZ LTER sites. Supported by a subcontract to Colorado State University.

**Funding Support:** NSF Savannah Convergence Project USDA Foundational research for managing forage production in semi-arid grasslands: preparing for a future with increased climate variability

**International Collaboration:** Yes, South Africa

**International Travel:** No

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**Sally Koerner**

**Email:** sally.koerner@uncg.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Dr. Koerner is an assistant professor at the University of North Carolina Greenboro. Her research interests include ecology (community, ecosystem and plant ecology); drivers of biodiversity across spatial scales and through time.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Kimberly LaPierre**

**Email:** lapierrek@si.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former PhD student from Yale University. Dr. La Pierre is currently a principal investigator, senior scientist at the Smithsonian Environmental Research Center. Her research areas consists of animal plant interactions, biodiversity, climate change, ecology, ecosystem function, ecosystem services, global change, herbivores, insects, invasive species, nutrient pollution, plant ecology, and terrestrial ecology.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Gwendolyn Macpherson**

**Email:** glmac@ku.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 2

**Contribution to the Project:** Expertise in hydrogeology; subsurface hydrology; long-term studies of groundwater flux and biogeochemistry at Konza LTER site. Supported by a subcontract to the University of Kansas.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**KC Olson**

**Email:** kcolson@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** KC Olson is a professor of animal science, who brings expertise on the physiology and management of cattle in mesic grasslands. Dr. Olson is an active participant in the new patch-burn grazing study, and will oversee assessment of animal performance as a management-related aspect of this LTER study.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Charles Rice**

**Email:** cwrice@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in soil microbial ecology; responses of grassland microbial communities to fire, grazing climatic variability; soil C and N dynamics; denitrification in grasslands; effects of management on soil C sequestration. Contributor and author for IPCC AR4.

**Funding Support:** NSF EPSCoR MAPS

**International Collaboration:** No

**International Travel:** No

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**Eduardo Santos**

**Email:** esantos@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Micro-meteorology and measurements of carbon and water fluxes from grassland. Expertise in eddy flux techniques and stable isotope analyses.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Melinda Smith**

**Email:** melinda.smith@colostate.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 2

**Contribution to the Project:** Associate Professor at Colorado State University conducting research on plant population and community dynamics at Konza Prairie, and the impacts of climate change. Directs site-based activities related to the multi-site Nutrient Network (NutNet) project.

**Funding Support:** NSF Savannah Convergence Project USDA Foundational research for managing forage production in semi-arid grasslands: preparing for a future with increased climate variability

**International Collaboration:** No

**International Travel:** No

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**Pam Sullivan**

**Email:** plsullivan@ku.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** As an ecohydrologist, Dr. Sullivan is interested in investigating the interactions between climate, vegetation and geology on freshwater resources over different temporal and spatial scales.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Matt Whiles**

**Email:** mwhiles@zoology.siu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in invertebrate ecology; research focused on assessment of patterns and controls of secondary productivity in grassland streams; ecology of soil invertebrates in grasslands. Participant in new riparian vegetation removal experiment. Supported by subcontract to Southern Illinois University.

**Funding Support:** NSF Macrosystem Project: Scale, consumers, and Lotic Ecosystem Rates (SCALER): from decimeters to continents Missouri Department of Conservation Grant: Biotic integrity of prairie streams as influenced by patch burn grazing and riparian protection

**International Collaboration:** No

**International Travel:** No

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**Kevin Wilcox**

**Email:** wilcoxkr@gmail.com

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1



**Contribution to the Project:** New professor at University of Wyoming. Research focuses on global change and land use impacts on plant community dynamics, primary productivity, and biogeochemical cycles.

**Funding Support:** DOE: Using root and soil traits to forecast woody encroachment dynamics in mesic grasslands

**International Collaboration:** No

**International Travel:** No

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**Gail Wilson**

**Email:** gail.wilson@okstate.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Gail Wilson provides expertise on the role of mycorrhizal fungi in grasslands, and is responsible for long-term studies of the impacts of mycorrhizal fungi on plant community dynamics and on soil structure and C storage in grasslands. She is supported with subcontract to Oklahoma State University.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Lydia Zeglin**

**Email:** lzeglin@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Provides expertise in molecular microbial ecology; taxonomic and functional diversity of soil and stream microbiota in the context of ecosystem N and C cycles.

**Funding Support:** Kansas NSF EPSCoR First Award: Microbial mechanisms of drought tolerance and the implications for grassland soil carbon storage DOE: Using root and soil traits to forecast woody encroachment dynamics in mesic grassland

**International Collaboration:** No

**International Travel:** No

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**Gregory Zolnerowich**

**Email:** gregz@ksu.edu

**Most Senior Project Role:** Co-Investigator

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in grassland insect biodiversity and insect systematics, particularly of parasitic wasps. Dr. Zolnerowich oversees the KSU Museum of Entomological and Prairie Arthropod Research, and provides expertise on electronic databasing of biological collections.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Carolyn Ferguson**

**Email:** ferg@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in plant systematics, plant population biology, and plant-pollinator interactions. Dr. Ferguson oversees the KSU Herbarium, and also provides expertise on electronic databasing of biological collections. Dr. Ferguson is also PI of GK-12 grant, which includes students and faculty scientists from the Konza LTER program.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Douglas Goodin**

**Email:** dgoodin@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Provides expertise on remote sensing of ecological data, including patterns of plant productivity and spatial distributions of grazing and fire effects; research on climatology in the Central Plains (Dr. Goodin serves on the LTER Climate Committee); research on the impacts of burning on air quality.

**Funding Support:** NSF: Impacts of Spatially Heterogeneous Nitrogen to Grazer Distribution and Activity: Effects on Ecosystem Function in Tallgrass Prairie

**International Collaboration:** No

**International Travel:** No

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**Mitch Greer**

**Email:** mjgreer@fhsu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in grassland ecology and range management.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**John Harrington Jr.**

**Email:** jharrin@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Dr. Harrington was a Professor of Geography with expertise in climatology and climate change, land-use/land-cover change, and natural resource applications of remote sensing and GIS. Dr. Harrington led many of the new social science related initiatives within our LTER program, and represented the KNZ LTER program at numerous LTER Network social science planning and cross-site activities (valuation of ecosystem services, impacts of land-cover change, etc.). Dr. Harrington retired from KSU in May 2018.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Stacy Hutchinson**

**Email:** sllhutch@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Dr. Hutchinson is a Professor of Biological and Agricultural Engineering, and has assumed responsibility for overseeing the water addition treatments and soil moisture monitoring in the long-term Irrigation Transect Experiment at the Konza site. This was previously the responsibility of Dr. Jim Koelliker until his retirement in 2010

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Loretta Johnson**

**Email:** johnson@k-state.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Provides research expertise in plant ecology, plant-soil interactions, and ecological genomics. Oversees a long-term water x N amendment experiment at Konza Prairie, and a cross-site study of the impacts of climate on success of local vs. non-local ecotypes of dominant grasses.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Donald Kaufman**

**Email:** dwkaufman@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Research focus is on the ecology of small mammals, and temporal and spatial dynamics of consumer populations in grasslands.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Martha Mather**

**Email:** mmather@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in fish ecology and management with focus on Great Plains taxa.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Mark Mayfield**

**Email:** markherb@ksu.edu

**Most Senior Project Role:** Faculty

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in plant systematics.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Trisha Moore**

**Email:** tlmoore@ksu.edu  
**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in environmental engineering with a focus on ecohydrology and water and carbon cycling.

**Funding Support:** None

**International Collaboration:** No  
**International Travel:** No

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**Troy Ocheltree**

**Email:** Troy.Ocheltree@colostate.edu  
**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in range ecology; particularly plant-water relations.

**Funding Support:** None

**International Collaboration:** No  
**International Travel:** No

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**Michel Ransom**

**Email:** mdransom@ksu.edu  
**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in pedogenesis and soil mineralogy.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Drew Ricketts**

**Email:** arickett@ksu.edu  
**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former PhD student (advisor, Brett Sandercock) working with small mammal responses to patch burn grazing. Currently, assistant professor of Wildlife and Outdoor Management at Kansas State University.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Brett Sandercock**

**Email:** brett.sandercock@nina.no

**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in bird ecology and conservation; particular interest in prairie chickens, shorebirds and grassland management impacts

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Bruce Snyder**

**Email:** basnyder@ksu.edu

**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in arthropod diversity and ecology; particular interest in earthworms.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Michi Tobler**

**Email:** tobler@ksu.edu

**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Dr. Tobler studies the adaptation and speciation, fish biology, and extreme environments.

**Funding Support:** None

**International Collaboration:** No  
**International Travel:** No

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**Timothy Todd**

**Email:** nema@ksu.edu

**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Expertise in nematode ecology; particularly plant-nematode interactions and soil food web dynamics.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Gabriel de Oliveria**

**Email:** gabrieloliveira@ku.edu

**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)  
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Postdoc of Nate Brunsell

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Nate Lemoine**

**Email:** lemoine.nathan@gmail.com

**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Working with Melinda Smith on the influence of trophic interactions on plant community structure and function responses to climate change.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Zak Ratajczak**

**Email:** zaratajczak@gmail.com

**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former PhD student working with Jesse Nippert. Research area involves woody encroachment.

**Funding Support:** NSF Postdoctoral Fellowship - Tipping points and ecosystem resilience

**International Collaboration:** No

**International Travel:** No

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**Allison Veach**

**Email:** veacham@ornl.gov

**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Postdoc at Oak Ridge Laboratory. Research focuses on quantifying the variation in microbial community structure and its significance to ecosystem health.

**Funding Support:** Kansas NSF EPSCoR First Award: Microbial mechanisms of drought tolerance and the implications for grassland soil carbon storage

**International Collaboration:** No

**International Travel:** No

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**Bram Verheijen**

**Email:** bramverheijen@ksu.edu

**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Postdoc research associate with Dr. Dave Haukos at KSU.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Ellen Welti****Email:** welti@ou.edu**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former PhD student (Advisor, Tony Joern) working on mechanisms of food web stability. Currently is a postdoc at University of Oklahoma.

**Funding Support:** None**International Collaboration:** No**International Travel:** No**Jill Haukos****Email:** jhaukos@ksu.edu**Most Senior Project Role:** Other Professional**Nearest Person Month Worked:** 12

**Contribution to the Project:** Director of the Konza Education Program (KEEP). Jill directs the K-12 education program, including the Konza Prairie SLTER program and serves as the KNZ LTER education representative for LNO activities. Jill also oversees the Konza docent program and some of the public outreach activities.

**Funding Support:** Konza Prairie Biological Station**International Collaboration:** No**International Travel:** No**Jennifer Rhodes****Email:** jenniferrhodes@ksu.edu**Most Senior Project Role:** Other Professional**Nearest Person Month Worked:** 12

**Contribution to the Project:** Program coordinator and event planner.

**Funding Support:** None**International Collaboration:** No**International Travel:** No**Yang Xia****Email:** yangx@ksu.edu**Most Senior Project Role:** Other Professional**Nearest Person Month Worked:** 12

**Contribution to the Project:** LTER Information Manager. Responsibilities include data management, database design and implementation, and overseeing KNZ LTER computer network activities.

**Funding Support:** None.**International Collaboration:** No**International Travel:** No**Seton Bachle****Email:** sbachle@ksu.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 1

**Contribution to the Project:** MS Student with Jesse Nippert. Studies drought tolerance of grasses.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Michael Bartmess**

**Email:** mbartmes@k-state.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: John Blair

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Sarah Black**

**Email:** sarah.black@siu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Graduate student of Dr. Sara Baer. Studies insect communities in restored tallgrass prairie and if/how herivory shapes plant community.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Caitlin Broderick**

**Email:** cbrods21@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: John Blair

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Tiffany Carter**

**Email:** tcart508@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Dr. Charles Rice

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Francis Chaves Rodriguez****Email:** fachaves@rams.colostate.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 1**Contribution to the Project:** PhD student (Advisor, Melinda Smith) studying the influence of species diversity and dominance on community structure and ecosystem function.**Funding Support:** None.**International Collaboration:** No**International Travel:** No**Kent Connell****Email:** rkconnell@k-state.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 6**Contribution to the Project:** PhD student. Works with John Blair. Kent studies microbial dynamics and regulation of biogeochemical cycling.**Funding Support:** None**International Collaboration:** No**International Travel:** No**Eric Duell****Email:** eric.duell@okstate.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 1**Contribution to the Project:** Advisor: Dr. Gail Wilson. Research focus: plant ecology, grassland ecology, global change ecology**Funding Support:** None**International Collaboration:** No**International Travel:** No**Kathryn Eckhoff****Email:** kathryn.d.eckhoff@siu.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 1**Contribution to the Project:** Advisor: Sara Baer**Funding Support:** None**International Collaboration:** No**International Travel:** No**Andrew Felton****Email:** felton12392@gmail.com**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Melinda Smith) studying climate effects on plant community structure and function.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Kasey Fralick**

**Email:** fralickk@siu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Matt Whiles

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Bryan Frenette**

**Email:** frenette@k-state.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 6

**Contribution to the Project:** Ph.D. Student. Advised by Keith Gido. Studies trophic dynamics in grassland streams.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Jessica Fulgoni**

**Email:** jfulgoni@siu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student at SIU. She is examining the effects of patch-burn grazing on macroinvertebrate assemblages.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Jesse Gray**

**Email:** Jesse.Gray@colostate.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Melinda Smith) studying trait-mediated effects of diversity at different scales and consequences for ecosystem function.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Robert Griffin-Nolan**

**Email:** robertgn13@gmail.com

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Alan Knapp) working on plant physiological responses to drought and ecosystem drought sensitivity.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**James Gunnip**

**Email:** jguinnip@k-state.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 6

**Contribution to the Project:** Ph.D. student that works with Dr. Walter Dodds. James studies stream biogeochemistry.

**Funding Support:** None

**International Collaboration:** No  
**International Travel:** No

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**Sophie Higgs**

**Email:** sahiggs@k-state.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** MS Student that works with Dr. Walter Dodds. Sophie studies stream biogeochemistry.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**Ava Hoffman**

**Email:** avamariehoffman@gmail.com

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Melinda Smith) working on how the ecology and genetics of dominant species influence ecosystem function.

**Funding Support:** None.

**International Collaboration:** No  
**International Travel:** No

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**George Manning**

**Email:** gmanning4@siu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Sara Baer) working on the role of inter-annual environmental variability on the development and trajectory of restored prairie plant communities.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Laura Mino**

**Email:** lamino@k-state.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Ari Jumpponen) working on mycorrhizal interactions in invasive and encroaching woody plant species.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Priscilla Moley**

**Email:** pmoley@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Dr. Lydia Zeglin

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Brock Norwood**

**Email:** bnorwood027@gmail.com

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Dr. Gwen Macpherson

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Rory O'Conner**

**Email:** rory9@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 6

**Contribution to the Project:** PhD student (Advisor, Jesse Nippert) working on the mechanisms of woody plant establishment in grasslands.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Johanie Rivera-Zayas**

**Email:** johanie@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student. Advisor: Dr. Charles Rice

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Marshall Santos**

**Email:** marshallvictor@hotmail.com

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Adviser: Dr. Eduardo Santos

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Drew Scott**

**Email:** dascott@siu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** MS student (Advisor, Sara Baer) working on development of soil aggregate structure and consequence for seed germination and biomass of plant functional groups during prairie restoration.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Monica Shaffer**

**Email:** mshaffer@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 3

**Contribution to the Project:** Advisor: David Hartnett

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Adam Siders**

**Email:** adam.siders@siu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Adam is a PhD student in the lab of Matt Whiles. He is studying the effects of extreme drought on aquatic invertebrate communities living in isolated pools in a perennial prairie stream.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Ingrid Slette**

**Email:** ingrid.slette@gmail.com

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Alan Knapp) working on historical effects of climate change on grassland carbon cycling.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Leena Vilonen**

**Email:** lvilonen@colostate.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Dr. Melinda Smith

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Emily Wedel**

**Email:** erwedel@k-state.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: David Hartnett

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Shelly Wiggam-Ricketts**

**Email:** wiggie@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** PhD student (Advisor, Greg Zolnerowich) working on effects of fire regime on grassland pollination dynamics.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Luci Wilson**

**Email:** lucir@okstate.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Graduate student of Dr. Gail Wilson, studying natural resources ecology and management

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Sarah Winnicki**

**Email:** skwinnicki@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Former REU student, current MS Student (mentored by Alice Boyle). Studied Grasshoper Sparrow mating and cooperative care influence on aggregation.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Marissa Zaricor**

**Email:** mzaricor@ksu.edu

**Most Senior Project Role:** Graduate Student (research assistant)

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Jesse Nippert

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Jacob Hadle**

**Email:** hadle@ksu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 3

**Contribution to the Project:** Field Technician. No longer working at KSU

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Amanda Kuhl**

**Email:** akuhl@ksu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 12

**Contribution to the Project:** Research assistant and field crew leader.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Patrick O'Neal**

**Email:** poneal@ksu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Fire/bison management and field technician.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Rosemary Ramundo**

**Email:** ramundo@ksu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 2

**Contribution to the Project:** Former LTER analytical lab supervisor, research coordinator. Rosemary retired in January 2018.

**Funding Support:** None.

**International Collaboration:** No

**International Travel:** No

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**Mark Sandwick**

**Email:** mark.sandwick@siu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 9

**Contribution to the Project:** Field Technician.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Jeff Taylor**

**Email:** jht@ksu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 12

**Contribution to the Project:** Field technician.

**Funding Support:** None.



**International Collaboration:** No  
**International Travel:** No

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**Courtney Tobler**

**Email:** ctobler@ksu.edu

**Most Senior Project Role:** Non-Student Research Assistant

**Nearest Person Month Worked:** 9

**Contribution to the Project:** LTER analytical lab supervisor, research coordinator.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

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**Sophia Bonjour**

**Email:** sbonjour@asu.edu

**Most Senior Project Role:** Research Experience for Undergraduates (REU) Participant

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Lead researcher and coordinator with the Grimm Lab at Arizona State University

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

**Year of schooling completed:**

**Home Institution:**

**Government fiscal year(s) was this REU participant supported:**

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**Dylan Smith**

**Email:** xenocide@k-state.edu

**Most Senior Project Role:** Research Experience for Undergraduates (REU) Participant

**Nearest Person Month Worked:** 1

**Contribution to the Project:** Advisor: Alice Boyle Research focus on brown-headed Cowbirds

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

**Year of schooling completed:** Other

**Home Institution:** Kansas State University

**Government fiscal year(s) was this REU participant supported:** 2018

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**Ellis Sprangler**

**Email:** ellis.spangler@ku.edu

**Most Senior Project Role:** Research Experience for Undergraduates (REU) Participant

**Nearest Person Month Worked:** 1

**Contribution to the Project:** REU student of Dr. Gwen Macpherson. Ellis worked on installation of dust collectors and sampling the dust.

**Funding Support:** None

**International Collaboration:** No

**International Travel:** No

**Year of schooling completed:** Junior

**Home Institution:** University of Kansas

**Government fiscal year(s) was this REU participant supported:** 2018, 2017

### What other organizations have been involved as partners?

Name	Type of Partner Organization	Location
Colorado State University	Academic Institution	Fort Collins, CO
Department of Energy	Other Organizations (foreign or domestic)	USA
University of Kansas	Academic Institution	Lawrence, KS
Kansas State University	Academic Institution	Manhattan, KS
NOAA	Other Organizations (foreign or domestic)	USA
Oklahoma State University	Academic Institution	Stillwater, OK
Southern Illinois University at Carbondale	Academic Institution	Carbondale, IL
State of Kansas	State or Local Government	Kansas
The Nature Conservancy	Other Nonprofits	Kansas
US EPA	Other Organizations (foreign or domestic)	USA
USGS	Other Organizations (foreign or domestic)	USA

### Full details of organizations that have been involved as partners:

#### Colorado State University

**Organization Type:** Academic Institution

**Organization Location:** Fort Collins, CO

#### Partner's Contribution to the Project:

Collaborative Research

**More Detail on Partner and Contribution:** Dr. Alan Knapp (Biology Department, Colorado State University) collaborates on many aspects of the Konza LTER program. His research includes studies of grassland ecology, responses to climatic variability and climate change, and the ecology of plant invasions. Knapp's LTER research is supported by a subcontract to Colorado State University, which also provides support for students participating in cross-site research that utilizes the Konza Prairie LTER site and database. Dr. Melinda Smith is an LTER collaborator and participates in several aspects of Konza LTER research, including studies of plant community dynamics, the ecology of plant invasions, genomic responses of plants to climate change, and comparisons of the ecology of North American and South African grasslands. Dr. Smith and her students also oversee the NutNet project at Konza as a part of a multi-site study of the effects of nutrient amendments and herbivory on herbaceous community and ecosystem dynamics. The Konza LTER program provides a subcontract to CSU and logistical support for these studies.

## Department of Energy

**Organization Type:** Other Organizations (foreign or domestic)

**Organization Location:** USA

**Partner's Contribution to the Project:**

Financial support

In-Kind Support

Collaborative Research

**More Detail on Partner and Contribution:** The Konza LTER program provides partial support for two CO2 flux towers, which are part of the Ameriflux network of net C exchange measurement sites. DOE provides some financial and logistical support for tower operations and data processing.

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## Kansas State University

**Organization Type:** Academic Institution

**Organization Location:** Manhattan, KS

**Partner's Contribution to the Project:**

In-Kind Support

Facilities

**More Detail on Partner and Contribution:** KSU owns a portion of the Konza Prairie Biological Station, and provides access and use of the field site and associated on-site facilities. KSU also provide campus lab facilities, and computer server and network support through a partnership between the KNZ LTER program and the KSU Physics Computer Support Center, where KNZ network servers are housed. KSU provides support for operation of the Environmental Chemistry Laboratory in Bushnell Hall, which is used for LTER water sample analyses. KSU also provides support in the form of available assistantships for graduate students conducting KNZ research.

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## NOAA

**Organization Type:** Other Organizations (foreign or domestic)

**Organization Location:** USA

**Partner's Contribution to the Project:**

Facilities

Collaborative Research

**More Detail on Partner and Contribution:** Konza Prairie is part of the U.S. Climate Reference Network (USCRN). USCRN is a network of climate stations developed as part of a National Oceanic and Atmospheric Administration (NOAA) initiative. Its primary goal is to provide future long-term homogeneous observations of temperature and precipitation that can be coupled to long-term historical observations for the detection and attribution of present and future climate change.

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## Oklahoma State University

**Organization Type:** Academic Institution

**Organization Location:** Stillwater, OK

**Partner's Contribution to the Project:**

Collaborative Research

**More Detail on Partner and Contribution:** The Konza LTER program provides a subcontract to Oklahoma State University to support collaborative research with Dr. Gail Wilson. Dr. Wilson's research focuses primarily on the role of mycorrhizae in grasslands, and the the ecology of *Bothriochloa bladhii* (Caucasian bluestem), an important invasive grass species.

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## Southern Illinois University at Carbondale

**Organization Type:** Academic Institution

**Organization Location:** Carbondale, IL

**Partner's Contribution to the Project:**

Collaborative Research

**More Detail on Partner and Contribution:** Collaborative Konza LTER research is supported by subcontracts to SIU collaborators: (1) Dr. Matt Whiles and students to support research on stream invertebrate ecology and soil macroinvertebrate ecology; (2) Dr. Sara Baer and students to support research on grassland restoration ecology.

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## State of Kansas

**Organization Type:** State or Local Government

**Organization Location:** Kansas

**Partner's Contribution to the Project:**

Financial support

Facilities

**More Detail on Partner and Contribution:** The state of Kansas provides an operating budget for Konza Prairie Biological Station personnel and general site maintenance.

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## The Nature Conservancy

**Organization Type:** Other Nonprofits

**Organization Location:** Kansas

**Partner's Contribution to the Project:**

Facilities

Collaborative Research

**More Detail on Partner and Contribution:** Konza Prairie Biological Station is a Nature Conservancy site, established on land purchased by The Nature Conservancy and managed by the Division of Biology at KSU. Konza LTER scientists interact with TNC scientists and officers on a broad range of management-related issues, including grassland conservation, restoration ecology, and grazing management.

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## US EPA

**Organization Type:** Other Organizations (foreign or domestic)

**Organization Location:** USA

**Partner's Contribution to the Project:**

Facilities

Collaborative Research

**More Detail on Partner and Contribution:** The US EPA jointly operates a CASTNet (Clean Air Standards and Trends Network) and AMoN (ammonia monitoring) site located at the Konza Prairie LTER site. The Konza Prairie LTER program provides site support and the EPA provides analytical services and compiles data on atmospheric nutrient concentrations and dry deposition rates, and tropospheric ozone concentrations. The EPA Region 7 office also supports a collaborative modeling project, which is using Konza LTER data to build linked models of hydrology and biogeochemistry that can be used to assess the effects of alternate land-use scenarios in the Flint Hills region. This project is led by Dr. Bob McKane (EPA) in collaboration with KNZ scientists.

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## USGS

**Organization Type:** Other Organizations (foreign or domestic)

**Organization Location:** USA

**Partner's Contribution to the Project:**

Facilities

Collaborative Research

**More Detail on Partner and Contribution:** The USGS collects and provides data on the hydrology and chemistry of Kings Creek, a USGS benchmark stream located on the Konza Prairie LTER site, and the Konza LTER program facilitates the transfer of these data to the Hydro-DB database. The Konza LTER site is also a part of the USArray component of the USGS EarthScope project- a continental-scale seismic observatory.

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## University of Kansas

**Organization Type:** Academic Institution

**Organization Location:** Lawrence, KS

**Partner's Contribution to the Project:**

Collaborative Research

**More Detail on Partner and Contribution:** Dr. Gwen Macpherson (Dept of Geology) and her students conduct collaborative research on groundwater hydrology and chemistry as part of the Konza Prairie LTER program. We also provide a subcontract and logistical/technical support to Dr. Nathaniel Brunsell (Dept of Geography), who oversees flux tower operations at the Konza site. Dr. Brunsell's research addresses the role of land-use/land-cover change land surface heterogeneity in vegetation, moisture, soil type, topography on water and energy fluxes from local to regional scales. This research uses a combination of field measurements, remote sensing and numerical modeling, and is integrated with flux tower studies at the Konza LTER site.

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### What other collaborators or contacts have been involved?

Nothing to report

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## Impacts

### What is the impact on the development of the principal discipline(s) of the project?

The Konza Prairie LTER Program is a comprehensive, interdisciplinary research program designed to contribute to synthetic activities and conceptual and theoretical advances in ecology, and to further an understanding of ecological processes in grasslands. Examples of specific recent contributions to the discipline of ecology are provided in the attached 'Konza LTER Findings' file. Here we summarize in more general terms the contributions of the Konza LTER program to the advancement of ecology. Konza LTER scientific findings continue to be published in a broad range of high-quality journals.

In the 2017-2018 funding period, the KNZ program produced or contributed to 75 publications: 53 refereed journal articles (including 18 currently in press) and 12 dissertations and theses. These publications cover topics ranging from riparian tree removal altering streams to consequences of global change in grasslands to effects of regional droughts. Within the past year, Konza LTER scientists have continued to publish high-quality articles in disciplinary focused areas (e.g. *Chemical Geology, Plant and Soil, and Environmental and Experimental Botany*), general ecology (e.g., *Ecology, Journal of Ecology, and Functional Ecology*), and high-impact general science journals (e.g., *BioScience, Nature Geoscience, and Nature Communications*). Several syntheses of long-term KNZ research were published in 2018, including a *Soil Biology and Biochemistry* article based on 30 year fire cessation effects on soil bacterial and fungal community composition and a paper documenting stream responses to woody plant removal (Larson, et. al. *in press*).

In addition to site-based science, KNZ scientists made substantial contributions to multi-site, collaborative ecological research, and the widespread use of KNZ LTER data and resources by the broader ecology community. For example, KNZ

ILTER data were used in several recent multi-site or synthetic efforts, including: grassland arthropods respond to nutrient additions through increased body size (Lind et. al. 2018), a synthesis of short- and long-term studies of belowground bud bank ecology on tallgrass prairie (Harnett et. al. *in review*), and an integration of data from herbivore grazing exclosures in grassland experiments worldwide (Koerner et. al. *In press*). Konza Prairie is also an active node in the Nutrient Network (NutNet), and KNZ scientists have contributed to several NutNet publications in the 2017-2018 funding period (described in details in the attached Activities document).

### **What is the impact on other disciplines?**

The Konza Prairie LTER program and our core research experiments attract numerous scientists from a broad spectrum of scientific disciplines beyond ecology. For example, KNZ supports long-term collaborations with several physical scientists from the University of Kansas: Gwen Macpherson (Geology, KU) is a hydrogeochemist whose research includes long-term studies of groundwater chemistry sampled via permanent wells located on Konza Prairie. Dr. Pamela Sullivan (Geography, KU) began additional subsurface geochemistry research at Konza in 2016 and is continuing to develop a site-based program on Konza. Sullivan's work focuses on the interface of freshwater resources – changing climate – vegetation dynamics, and she is collaborating with Macpherson, Blair, and Nippert. Dr. Andrea Brookfield (Kansas Geological Survey) is a geohydrologist with an emphasis on groundwater modeling. Brookfield has begun collecting data at Konza, attending annual meetings, and making regular contributions. An atmospheric scientist from the University of Kansas (Nate Brunsell, Geography) oversees KNZ flux tower research, uses Konza sites to study the effects of surface heterogeneity on land atmosphere interactions, and is employing a Large Aperture Scintillometer (LAS) to measure sensible heat fluxes over longer path lengths that span Konza watersheds with ongoing C flux measurements. Dr. Eduardo Santos (Agronomy, KSU) also focuses on land-atmosphere interactions. KNZ is supporting Santos's use of stable isotopes to partition C fluxes on grazed and ungrazed watersheds. The work by Brunsell and Santos compares plot-based vegetation measurements with data from eddy covariance stations and satellite-derived estimates of surface energy fluxes. Two hydrologists from Biological and Agricultural Engineering (Dr. Stacy Hutchinson and Dr. Tricia Moore) maintain and contribute to the 'Irrigation Transect Experiment'. Contributions by Hutchinson and Moore have provided numerous training opportunities for Biological and Agricultural Engineering and Hydrology students. Dr. Abby Langston joined the group of new faculty investigators at KNZ during the past year. Abby is a geomorphologist in Geography at KSU with research interests on landscape evolution and modeling.

Konza Prairie has also become a research platform for several collaborative teams of ecologist and molecular biologists that are part of the KSU Ecological Genomics Initiative. Many of these interdisciplinary teams are using the Konza LTER site and associated long-term experiments to address questions related to the genetic mechanisms underlying plant and animal responses to environmental constraints. The KNZ LTER patch-burn grazing experiment is being done in collaboration with Dr. KC Olson, a grazing animal nutritionist that is using the experiment to assess the impacts of alternate grassland management practices on animal nutrition and animal health. Other contributions to disciplines outside the traditional realm of ecology include the potation of flux towers at the Konza site, which has provided data used by micrometeorologists, climatologists, remote sensing scientists and modelers. We also collaborate with atmospheric chemists and modelers with the EPA CASTNet program in sampling concentrations of selected airborne particles and use these to model dry deposition rates.

### **What is the impact on the development of human resources?**

The Konza Prairie LTER VII program makes significant contributions to human resource development in science, engineering and technology. Our program has a long history of undergraduate training and exposure to scientific research for local KSU students. Amanda Kuhl (KNZ Research Assistant) mentors > 10 students year-round that assist in the collection and measurement of the long-term productivity plots on KNZ. In addition, training of undergraduates includes REU support. Indirectly, we support the development of undergraduates via the use of the Konza LTER data in ecology classes and text books. As documented elsewhere in this report, we also train numerous graduate students and provide valuable experience in interdisciplinary research and the synthetic use of long-term datasets. In addition to supporting KSU graduate students, the Konza Prairie LTER site is widely utilized by graduate students from other institutions. During the 2017-2018 funding period, the site was used by graduate students from the University of Kansas, Southern Illinois University, Colorado State University, Oklahoma State University and the University of Nebraska. We also hosted field trips for students from many regional colleges and universities, and in the last year hosted a summer student training field trip organized by Haskell Indian Nations University. The Konza Environmental Education program, and the Konza Prairie Schoolyard LTER Program, provide formal and informal research experiences and science education to public groups, children and K-12 teachers. Finally the Kona LTER site continues to be used in conjunction with the NSF-funded Girls Researching Our World (GROW) program ([www.ksu.edu/grow](http://www.ksu.edu/grow)), with several KSU scientists and students leading educational activities for 6th-12th grade girls.

## What is the impact on physical resources that form infrastructure?

The Konza LTER program provides a research platform for scientists and students from around the world. The 3,487-ha Konza Prairie Biological Station (KPBS), located in the Flint Hills of NE Kansas, is the core research site for the KNZ program. In addition to providing the watershed-level fire and grazing treatments, agricultural fields, restored prairie, stream network and weirs, KPBS includes several buildings in the headquarters area that support LTER research. The on-site Ecology Laboratory (2,400 ft<sup>2</sup>) includes (1) a wet/dry lab with sinks, fume hood, refrigerators, balances, etc., (2) two large multi-purpose work rooms with bench space and sinks for processing samples, drying ovens, refrigerators and freezers, and equipment storage, and (3) and a large researchers' shop equipped with a variety of tools and field supplies. Other station buildings include a fire station and maintenance building, a large storage building for equipment, and a residence occupied by the site foreman year around. The 4,650-ft<sup>2</sup> Hulbert Center houses a library/conference room, administrative office, classroom and teaching laboratory (used primarily for K-12 activities), reference herbarium and animal collections, and a kitchen and dormitory-style housing for 15 visitors. Two small guest cottages (each with 2-bedrooms, living room, bath, kitchen, and laundry facilities), can accommodate up to 5 persons/cottage. A larger cottage, built in 2012, can accommodate up to 12 guests, expanding the capacity of on-site accommodations to 37 visiting researchers.

With funding from an NSF-FSML grant and additional support from KSU and a private donor, an historic limestone barn at the KPBS headquarters was transformed into a multipurpose meeting facility for on-site conferences, workshops, and educational programs. The historic stone barn was renovated in 2008 and has the Cortelyou Lecture Hall (1,750 ft<sup>2</sup>) with a seating capacity of ~100 persons fully equipped with A/V equipment and wireless internet. An additional large multi-purpose room (1,850 ft<sup>2</sup>) is designed as flexible space for varied uses including additional meeting space, workshops, scientific posters and other research displays, social gatherings, and education programs for large groups. All lab and office buildings at KPBS have T1 Internet connectivity to the KSU campus. In addition, there is a wireless link to KPBS from campus with multiple wireless access points (802.11 abg) that provides coverage to >60% of the 3,487-ha site.

Other LTER infrastructure, maintained by KPBS, includes the outside perimeter fence (29.8 km), the interior bison management area closed by 16.4 km of "New Zealand" fence, 98 small (25-m<sup>2</sup>) grazing exclosures, 11.7 km of fence for cattle research, 26.4 km of access roads and 61 km of fireguards separating the experimental watershed units. KPBS maintains several general-purpose vehicles on-site, as well as specialized equipment (tractors, fire trucks, mowers, soil augers, etc.). KPBS makes staff and equipment available to assist with KNZ research activities, including mowing fireguards, installing equipment, soil coring, etc. KPBS staff also coordinates the fire management of bison and cattle herds for KNZ grazing treatments. The headquarters area includes a corral and handling facilities for managing the bison herd (hydraulic chute, electronic scales, etc.), which is essential for LTER grazing studies. In late 2017, then-KPBS director, Briggs received a NSF Award to upgrade the corral area. In 2018, KPBS and KNZ staff redesigned and improved our bison handling facility. The changes will provide a safer working environment for our staff, reduce stress on our bison, and allow greater ease and flexibility in conducting bison-related research. Other field equipment and instrumentation on-site includes the main KNZ weather station, a network of 11 rain gauges, two eddy flux towers for quantifying ecosystem-level C and water vapor flux, four weirs and associated stream gauging equipment, 46 wells for measuring groundwater levels and chemistry, numerous TDR probes, neutron access tubes and tension lysimeters for soil water measurements. Related equipment co-supported by other programs includes USGS stream monitoring station, 2 seismometers (USGS), an aerosol and ozone monitoring facility (CASTNet), and a NOAA Climate Reference Network (CRN) weather station. These facilities add significantly to data for LTER research and education programs, and for regional cross-site studies. KPBS is also a core site for National Ecological Observatory Network (NEON), which is fully-built-out and operational. NEON provides additional unique measurement capabilities and data at KPBS, which will complement many KNZ LTER studies.

For annual measurements of above-ground primary productivity, KNZ has historically relied upon usage of large drying ovens located at the North Farm (supported by the Dept. of Agronomy, KSU). During the winter, 2018, we were notified that this rented space would no longer be available due to increased demand within the College of Agriculture. Since this time, we initiated the process to build our own large biomass drying oven on-site. By Sept., 2018 we completed construction of a 900 ft<sup>3</sup> walk-in drying oven using a modified shipping container. Temperatures within the large drying oven are regulated by a small home furnace powered using propane. Stand-alone shelving allows for the large amounts of biomass to be dried concurrently. The project was coordinated by Jennifer Rhodes (Project Coordinator) and Patrick O'Neal (KPBS Site Manager).

In addition to facilities at KPBS, a wide-range of modern laboratory facilities are available on the nearby KSU campus, approximately 15 km from KPBS (e.g., Analytical Chemistry Labs, Stable Isotope Lab, Center for Ecological Genomics, Core Sequencing and Genotyping Facility). The majority of core LTER laboratory space and analytical equipment are located in Bushnell Hall (Biology), including space and equipment for preparing plant, soil and water samples for analysis (drying ovens,

grinders, shaker tables, block digestors, vacuum filtration systems). Bushnell Hall also houses an extensive collection of prairie plant specimens in the KSU Herbarium, and these specimens are now electronically databased and georeferenced. Some specific equipment and facilities available for LTER research are located within other Departments (Agronomy, Biological and Agricultural Engineering, Plant Pathology, Geography), reflecting the interdisciplinary nature of our research. Some major analytical instruments available for KNZ investigators include: 2 Alpkem autoanalyzers (FlowSolution IV) for liquid samples, Carlo-Erba 1500 automated C/N analyzer for solid samples, Shimadzu TOC 500 analyzer for dissolved C, a Hitachi U2900 automated dual-beam spectrophotometer, 4 LiCor 6400 Portable Photosynthetic Systems, 2 LiCor 8100 systems dedicated for soil CO<sub>2</sub> flux measurements, a LiCor 1600 null-balance porometer for stomatal conductance, and 3 pressure chambers (PMS model 1000) for measuring plant water potential, 4 Tektronix cable testers (model 1502B) coupled to Campbell CR10 data loggers for TDR soil moisture measurements, 2 Troxler (model 3221) neutron probe gauges for soil moisture determinations, and several Trimble GPS units. Eight multi-parameter sondes (YSI 6000) are used for monitoring oxygen and temperature for 3 watersheds.

### **What is the impact on institutional resources that form infrastructure?**

KNZ investigator and new KSU faculty, Andrew Hope, hosted the American Society of Mammalogist 98th annual meeting at KSU on June 25-29, 2018. The attendance was 375 mammalogists with 242 research presentations. Attendance had world-wide representation, particularly from the US, Canada, Central, and South America. Social events included a society picnic at Konza Prairie Biological Station, and the opening social at the Flint Hills Discovery Center. Associate Dean for Research, College of Arts and Sciences, Kristin Corwin welcomed the ASM to Manhattan. All poster and oral presentations were held in the Student Union Building.

Konza related research presented at ASM included two posters from the Hope Lab:

1. Isotopic trophic niche dynamics of small mammal communities reveal spatiotemporal complexity across an experimental prairie woodland mosaic. Bia Gragg, Jesse Nippert, Andrew Hope.
2. Nematode assemblages provide a first glimpse of mammal-helminth community dynamics within the central Great Plains. Agustin Jimenez-Ruiz, Andrew Hope.

### **What is the impact on information resources that form infrastructure?**

KNZ resources are used to support the hardware and software associated with the KNZ website and data portal. In the 2017-2018 funding cycle, we continued to add new projects and datasets to the KNZ data portal; we continued to improve our DEIMS-based website; continued to update a variety of metadata and procedural protocols to ensure any changes in technique or structure of our datasets were accounted for; continued to ensure data quality, perform data aggregation and synthesis to meet requirements for the LTER Network Information System; provided up-to-date, accurate LTER data to KNZ investigators and to the broader scientific community as quickly and efficiently as possible.

In order to gain access to advanced feature and more modern technological capabilities for KNZ IMS, we replaced our aging operating server system (2012 R2). A new windows server 2016 Hyper-V cluster was purchased and replaced using LTER support. These infrastructure upgrades including domain controller, switches, storage, 15 virtual machines, and all hardware have been replaced as of September 2018. Software has been upgraded on all physical servers, HyperV modes, domain controllers, and management machines.

### **What is the impact on technology transfer?**

Nothing to report.

### **What is the impact on society beyond science and technology?**

The KNZ LTER program contributes to increased public awareness of ecological and environmental issues (e.g., biodiversity conservation, habitat loss, ecosystem services, restoration ecology, etc.) through outreach and public education activities. our research concerning the role of seasonal burning and fire intensity on woody encroachment is being used to inform the Great Plains Fire Science Exchange ([www.gpfirescience.org](http://www.gpfirescience.org)) and the Tallgrass Prairie and Oak Savanna Fire Science Consortium ([www.tposfirescience.org](http://www.tposfirescience.org)). Both of these are non-profit groups focusing on conservation issues and land management of Midwestern grasslands.



In addition, the Konza LTER Program is increasingly called upon to provide data relevant to resource management and regulatory policy. Dr. John Briggs (retired KPBS Director) and Dr. John Blair (active KPBS Director) regularly provide outreach and tours to state and national policy-makers and law-makers. Because of the widespread use of prescribed fire for both grassland conservation and agricultural goals, KNZ research on ecological responses to contrasting long-term fire regimes and different seasons of fire has taken on new importance. At the regional level, KNZ scientists advise EPA Region 7 staff and scientists on the ecological benefits of fire in maintaining native tallgrass prairie habitat and diversity and contribute long-term data to guide the development of the Flint Hills regional smoke and management plan. The issue of smoke management coupled with concerns about woody plant expansion have provided KNZ investigators an opportunity to interact with land managers, producers, and private organizations in linking basic research with management goals. The KNZ Season of Fire Experiment provides 22-years of data from watersheds burned at different times of the year (Spring, Summer, Fall, and Winter). Most prescribed burning in the Flint Hills takes place during a small window in April. We now have data showing that burning can be done other times of year in ungrazed watersheds with little adverse effect on plant productivity or desirable species. KNZ investigators have interacted with and advised groups, including the EPA, Natural Resources Conservation Service, the Kansas Farm Bureau, The Nature Conservancy Grassland Committee, and others. In December 2017, the EPA published an article about smoke management during burns and how it effects air quality, using KNZ's on-going 22 year burn research. (<https://www.epa.gov/sciencematters/novel-air-measurement-technology-supports-smoke-management-practices-prescribed-burns>)

KNZ scientists frequently share long-term KNZ research and results with numerous groups involving private landowners, which is important, as 97% of the land in Kansas is privately owned. These frequent interactions between scientist and the land managers/owners open direct line of communication, create trust in the scientific process, and have long-term positive conservation impacts. A good example is our November 2017 interaction with the Tallgrass Legacy Alliance. They brought ~ 40 ranchers to tour Konza Prairie and discuss burn management with Dr. John Briggs.

Locally, Konza scientists continue to serve as consultants for the Flint Hills Discovery Center, and we participate in Kansas Agricultural Experiment Station public education events by providing information on the ecological consequences of various grassland management practices (e.g., fire frequency and grazing). KNZ scientists have been instrumental in the development of a management plan for the Nachusa Grasslands Nature Conservancy Site in Illinois. Baer, Blair, and Scott Collins have met with Nachusa staff and provided input on the development of a science and management plan. In the international arena, Konza scientists have provided information on grassland management to scientists and park resource managers from South Africa, Botswana, China, Australia, and Hungary, with many of these visits focusing on resource management issues of public concern. The Konza Prairie LTER database is also being used to address other issues relevant to regulatory policy. Long-term data on Konza Prairie stream water quality provides a baseline for regional water quality in the absence of agricultural practices or other disturbances. LTER data on soil chemistry is also being incorporated into ongoing studies to evaluate the potential of grassland management practices to increase soil C sequestration to offset atmospheric CO<sub>2</sub> loading.

In 2018, KNZ scientists and graduate students participated in numerous public outreach events designed to enhance understanding of LTER science and dissemination of important findings. Several KNZ researchers served as Science Communication Fellows at the Sunset Zoo in Manhattan, KS. Sunset Zoo's Science Communication Fellowship (SCF) program supports a network of certified researchers, professionals, graduate students and post-graduate students working together to connect the community to science and elevate the understanding of research taking place in the region. SCF is part of the national Portal to the Public Network. KNZ investigators also presented research findings at local Science Café meetings, as well as 'Science on Tap' at Tallgrass Taphouse. Several KNZ investigators participate in the Kansas Science Communications Initiative, which is teaching scientists how to better communicate their findings to the public. KNZ graduate students at KSU were instrumental in the creation of a blog entitled Science Snapshots (<https://sciencesnapshots.com>), where students post entries covering other student's research. Our local art museum (Beach Museum of Art) has a Prairie Studies Initiative (<http://beach.k-state.edu/prairiestudies>). KNZ scientist, Blair, has acted as consultant, participant, and speaker at many Prairie Studies outreach events.

Konza Prairie hosted numerous artists during 2018, including author, J. Drew Lanham, and artist Erin Wiersma. Wiersma uses char from fires (rubbed by hand or in-place on the landscape) to create large-scale drawings. Her process melds her personal experiences on the landscape with the essence of the fire, growth patterns, and site geology/topography. An article regarding Wiersma's work was featured on the LTER website (<https://lternet.edu/stories/after-the-burn-making-art-out-of-grassland-fires/>).

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## Changes/Problems

**Changes in approach and reason for change**

Nothing to report.

**Actual or Anticipated problems or delays and actions or plans to resolve them**

Nothing to report.

**Changes that have a significant impact on expenditures**

Nothing to report.

**Significant changes in use or care of human subjects**

Nothing to report.

**Significant changes in use or care of vertebrate animals**

Nothing to report.

**Significant changes in use or care of biohazards**

Nothing to report.