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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:	LTERR: Long-Term Research on Grassland Dynamics- Assessing Mechanisms of Sensitivity and Resilience to Global Change
PD/PI Name:	John M Blair, Principal Investigator Sara G Baer, Co-Principal Investigator Walter K Dodds, Co-Principal Investigator Anthony Joern, Co-Principal Investigator Jesse B Nippert, Co-Principal Investigator
Recipient Organization:	Kansas State University
Project/Grant Period:	11/01/2014 - 10/31/2020
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Submitting Official (if other than PD\PI):	John M Blair Principal Investigator
Submission Date:	10/15/2017
Signature of Submitting Official (signature shall be submitted in accordance with agency specific instructions)	John M Blair

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 third year (2016-2017) 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: We continued watershed-level fire experiments, and associated data collection and synthesis efforts that are central to our “core” LTER studies. This includes maintaining watershed-level manipulations of fire frequencies (1, 2, 4 and 20 year fire return intervals), seasonal timing of fires (spring, summer, autumn and winter), and experiments to assess the potential for altered fire regimes to reverse trajectories of land-cover change (the Fire Reversal experiment). Fire and grazing studies address multiple LTER core areas, including primary productivity, nutrient cycling, population and community dynamics, and disturbance. These whole watershed fire and grazing treatments are focal areas for a number of ongoing LTER data collection efforts (e.g., soil, water, plant and consumer sampling, remote sensing and GIS observations, flux tower and associated sensor network measurements, and groundwater and stream monitoring networks, and provide unique research opportunities for undergraduate and graduate students, as well as scientists from other institutions. We provide an overview of research findings from our 4 thematic research areas, with more details provided in the attached 'Findings' pdf.

Studies of land-use and land-cover change area integral components of LTER VII and were key areas of active research during the past year. We continued to assess the interactive effects of fire and ungulate grazers (bison and cattle) on tallgrass prairie dynamics, using data from two large-scale grazing studies. Studies of native ungulate grazers includes 10 watersheds (approx 960 ha total) with different fire frequencies (1, 2, 4 and 20 year fire return intervals) grazed by a bison. Studies of ecological responses to alternative cattle grazing practices include traditional annual burning and season-long grazing, and an alternative patch-burn grazing system designed to enhance spatial and temporal heterogeneity for conservation goals. A key outcome from the previous year came from Welti's 2017 dissertation. She showed that network structure (modularity and generalism) varied with fire and grazing, and robustness (a measure of network stability) and was greatest in bison-grazed compared to not-grazed watersheds. We have continued research focused on the drivers and impacts of woody plant encroachment. Key findings from the past year have shown that transitions from grassland to shrubland are often preceded by early indicators or warning signs (Ratajczak et al. 2017a) and can become difficult to reverse due to self-reinforcing feedbacks. This insight led to a new theoretical framework that describes ecological thresholds in terms of both the intensity and duration of “pulsed” drivers that must be exceeded before state changes become difficult to reverse (Ratajczak et al. 2017b). This framework was applied to state changes at other LTER sites using data from experiments (CDR, JRN) and computer simulations (NTL) (Ratajczak et al. 2017b).

Long-term KNZ datasets also capture interactions with the stochastically variable climate that characterizes the Central Plains. In 2016-17, we continued several climate-related experiments (EDGE, DroughtNet), and we ended the long-term RaMPs project. We altered the long-term irrigation plots experiment by imposing a 66% reduction in growing season rainfall in a subset of plots with a history of either ambient or supplemental water. This new treatment structure will allow us to address the resilience of grasslands once a forcing factor is removed (25 years of supplemental water). We initiated the "ShRaMPs" experiment [Shrub Rainfall Manipulation Plots]. These large rainout shelters were built over existing shrub islands. ShRaMPs will examine the interactions of reduced rainfall amount and fire frequency (1-yr or 4-yr) on shrub dynamics and ecosystem state. In addition, we continued experiments to evaluate responses to changing nutrient availability (ChaNGE, Ghost Fire), and collected more data from grazing lawns studies to assess mechanisms of formation and maintenance of this potential alternative grassland state.

Recent restoration activities include continued sampling in the Sequential Prairie Restoration experiment, continued data collection associated with the riparian Woody Plant Removal experiment, as well as additional research on the roles of heterogeneity, invasive species and local plant adaptation for grassland restoration states. In an effort started in 2015-16, we continued to evaluate ecological barriers to native species recovery following eradication of a regionally-important invasive C4 grass species.

In Feb. 2017, KNZ funded a meeting of junior investigators to compile and synthesize KNZ datasets from disparate experiments on the effects of altered nutrient availability, climate variability, and consumers. KNZ has 8 long-term N addition experiments initiated at different times and locations, collectively representing 93 yrs of enrichment. We found that plant communities consistently transition to an altered state after ~6 yrs of N addition, despite differences in site and climate. This appears to be due to the lifespan of the dominant grasses, rather than climatic or trophic drivers. Further studies into whether alteration in other resources (e.g., water) results in the same temporal community dynamics are ongoing.

We continued to disseminate our results to the broader ecological science community, the general public, and local and regional land managers. KNZ data and case studies continued to be used in ecology courses and texts, and KNZ scientists were proactive in synthesis of KNZ data. The KNZ program and associated long-term experiments directly and indirectly support numerous post-doctoral, graduate and undergraduate researchers from across the country, including LTER- and site-based REU students. The KNZ SLTER and Konza Environmental Education Program (KEEP) provided on-site educational activities and outreach to K-12 students, and training via teachers' workshops. We also provided educational opportunities on for adults through a Master Naturalist program and by Konza Docent training. Through our relationship with The Nature Conservancy, and interaction with the local Flint Hills Discovery Center, we hosted or enabled several public outreach events.

The major accomplishment of KNZ IM during 2016-17 included the implementation, redesign, and launch of the new KNZ website based on Drupal Ecological Information Management System (DEIMS). The KNZ website represents a big step toward our goal of having an information management framework where all data products are integrated. Advantages of KNZ new website provided better data and content management, improved metadata with robust searching and data access, and new features and functionality on image gallery and publication access. Our structured metadata allows linking datasets, publications and personnel and better search capabilities, compatible with the LTER Network Information System. The EML-export system automatically generates PASTA-compliant attribute level EML files with all LTER KNZ dataset. We migrated all KNZ old web and database content into a MySQL database with links from the new website. In addition, we migrated all spatial data (GIS datasets and KML files) into the new website. The website now provides access to 127

projects with 289 datasets online. We updated all KNZ LTER-supported/related publications, thesis and dissertations (total of 1728 publications online), searchable by key word, author, year, and publication type.

This year, the KNZ IM program edited and updated our metadata and procedural protocols to ensure any changes in technique or structure of our datasets are accurately reported. Our updated data catalog (metadata) and methods manual (techniques) are available online. We also created a LAMP Ubuntu server on two virtual machines to support our production server and the development of the new KNZ website.

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 2016-17.

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 2016-17.

* 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 19th 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 2016 (most recent year with complete data) was 1,500.

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 100 who are currently active). Additionally, KEEP offers training in ecological principles and the natural history of plants and animals of Kansas via the Kansas Master Naturalist program to area adults interested in volunteering as naturalists at over 50 sites around the state. Certification as a Kansas Master Naturalist requires 40 hrs. of training and 30 hrs. of volunteering. This program, run through KEEP with the participation of many Konza scientists, is offered every 3 yrs. Additionally, we have another partnership with the Flint Hills Discovery Center (Manhattan, KS) to co-host visiting school groups. Last year we hosted 2,300 students who experienced the tallgrass prairie of KNZ through an activity other than an SLTER event.

The Konza LTER program continues to emphasize quality graduate student training. During the 2016-17 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 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, University of Nebraska, and others. In 2016-17, 10 theses/dissertations were completed that included data and research from the Konza Prairie (typically, as the primary data source), including 5 from non-KSU graduate students.

KNZ also offers research experiences for a large number of undergraduate students. In the summer of 2017, we supported 2 LTER REU students [mentored by Co-Is Alice Boyle (KSU) and Gwen Macpherson (KU)], and contributed additional mentoring and logistical support to the KSU/Konza REU site program. Summer 2017 was the 22nd year that Konza Prairie and the Division of Biology at K-State have offered a 10-week site-based summer REU program, co-led by KNZ Co-I Jesse Nippert. Participants in the site-based program included 11 students, including 6 that did KNZ LTER-related research and worked with KNZ researchers as mentors. In addition to these REU students, the Konza LTER program provides hands-on research opportunities for ~12-15 undergraduate research assistants each year. In addition to undergraduate students, KNZ 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 that students 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, 3 of our long-term junior faculty accepted academic faculty positions, including Sally Koerner (UNC-Greensboro), Meghan Avolio (Johns Hopkins Univ.), and Kim La Pierre (Smithsonian Environmental Research Center). Current active postdocs include Kevin Wilcox (USDA-ARS Fort Collins), Zak Ratajczak (U Wisconsin-Madison), and Ellen Welti (Oklahoma). 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).

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

Konza LTER results are disseminated to the scientific community via publications in the 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 web sites. 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 ecology courses at Kansas State University, the University of Kansas, University of Arizona, Colorado State University, and University of Oklahoma, among others. In addition, KNZ findings are increasingly utilized in undergraduate ecology texts and supplementary teaching materials. For example, KNZ long-term studies are 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 (<http://www.gpfirescience.org/>) and the Tallgrass Prairie and Oak Savanna Fire Science Consortium (<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 (e.g., Blair, Briggs, Joern, Hartnett) serve as scientific consultants for a regional cultural and natural history center, the 'Flint Hills Discovery Center' in Manhattan, KS.

In 2017, KNZ scientists and graduate students participated in numerous public outreach events designed to enhance understanding and LTER science and dissemination of important findings. Several KNZ researchers as Science Communication Fellows at Sunset Zoo. 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](#). In 2017, KNZ PhD students Rory O'Connor and Kent Connell presented results on topics including the role of fire in grasslands and importance of plant-microbe interactions. KNZ investigators also presented research findings at local Science Café meetings, as well as 'Science on Tap' at the Sunset Zoo (2016-17 presentations by KNZ graduate students Rory O'Connor and Bryan Frenette). Our local art museum (Beach Museum of Art) has a Prairie Studies Initiative (<http://beach.k-state.edu/praiiestudies>). KNZ scientist Blair, Briggs, and Joern have acted as consultants, participants, and speakers in many Prairie Studies outreach events. In 2017, KNZ investigator and KPBS Director John Briggs gave a public lecture on the threats causing large-scale transformation of tallgrass prairie grasslands to savanna-like ecosystems. The lecture was part of the National Resource and Environmental Sciences Science Seminar. Research conducted by several KNZ investigators was featured in an article within 'SEEK', Kansas State University's research magazine. The article highlighted KNZ's work in conserving one of the most diminished ecosystems in North America. 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 year of our funding (Year 4 of LTER VII: 2017-18), we will: 1) complete the collection, processing, and online data integration of samples collected in 2017; 2) continue data processing, data error checking and the entry of data into the KNZ LTER database and the LTER Network Information System; 3) continue to refine, update, and grow the new DEIMS-based KNZ website and database; 4) continue to ensure data quality and improvements to QA/QC on streaming data;

perform data aggregation and synthesis to meet requirements for the LTER NIS; 5) continue to publish novel scientific results based on KNZ LTER data and experiments; 6) continue to support the educational development and training of graduate and undergraduate students; 7) initiate year 1 data collection for new experiments, as specified in the LTER VII proposal, and 8) participate in broader LTER network level activities including the Spring Science Council and the Fall All-Scientists Meeting.

Supporting Files

Filename	Description	Uploaded By	Uploaded On
KNZ LTER Activities 2017.pdf	Highlights of KNZ Activities 2017	John Blair	10/14/2017
KNZ Ann_report_Findings 2017.pdf	Selected findings for the 2017 KNZ annual report	John Blair	10/14/2017

Products

Books

Book Chapters

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

Jumpponen, A, Herrera, J, Porrás-Alfaro, A, Rudgers, J (2017). Biogeography of root-associated endophytes. *Biogeography of Mycorrhizal Symbiosis* 230. Springer International Publishing. Cham. 195. Status = PUBLISHED; Acknowledgement of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1007/978-3-319-56363-3.

Romaní, AM, Chauvet, E, Febria, C, Mora-Gómez, J, Risse-Buhl, U, Timoner, X, Weitere, M, Zeglin, L (2017). The Biota of Intermittent Rivers and Ephemeral Streams: Prokaryotes, Fungi, and Protozoans. *Intermittent Rivers and Ephemeral Streams Ecology and Management* Elsevier. 161. Status = PUBLISHED; Acknowledgement of Federal Support = Yes ; ISBN: 9780128038352.

Inventions

Journals or Juried Conference Papers

Alan K. Knapp and Avolio, M.L. and Beier, C. and Carroll, C.J.W. and S.L Collins and Dukes, J.S. and Fraser, L.H. and Griffin-Nolan, R.J. and Hoover, D.L. and Jentsch, A. and Loik, M.E. and Phillips, R.P. and Post, A.K. and Sala, O.E. and Slette, I.J. and Yahdjian, L. and M.D. Smith (2017). Pushing precipitation to the extremes in distributed experiments: recommendations for simulating wet and dry years. *Global Change Biology*. 23 1774-1782. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/gcb.13504

Alan K. Knapp and Ciais, P. and M.D. Smith (2017). Reconciling inconsistencies in precipitation productivity relationships: implications for climate change. *New Phytologist*. 214 41-47. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/nph.14381

Biederman, L. and Mortensen, B. and Fay, P.A. and Hagenah, N. and Knops, J. and Kimberly La Pierre and Laungani, R. and Lind, E. and McCulley, R. and Power, S. and Seabloom, E. and Tognetti, P. (2017). Nutrient addition shifts plant community composition towards earlier flowering species in some prairie ecoregions in the U.S. Central Plains. *PLOS ONE*. e0178440. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1371/journal.pone.0178440

Biederman, L., Mortensen, B., Fay, P., Hagenah, N., Knops, J., La Pierre, K., Laungani, R., Lind, E., McCulley, R., Power, S., Seabloom, E., Tognetti, P. (2017). How do nutrients change flowering in prairies?. *Environmental Science Journal for Teens* . Status = PUBLISHED; Acknowledgment of Federal Support = Yes

Brookfield, A. and G. L. Macpherson and Covington, M. (2017). Effects of changing meteoric precipitation patterns on groundwater temperature in karst environments. *Groundwater*. 55 227-236. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/gwat.12456

- Brunsell, N.A., E.S. van Vleck, M. Nocchi, Z. Ratajczak, J.B. Nippert (). Assessing the roles of fire frequency and precipitation in determining woody encroachment in central U.S. grasslands. *Journal of Geophysical Research - Biogeosciences*. . Status = ACCEPTED; Acknowledgment of Federal Support = Yes
- Dendy, S. P. and Tong, B. and Alexander, H. A. and Fay, P. A. and Murray, L. and Xing, Y. and Garrett, K. A. (2017). A long-term study of burning effects on a plant pathogen in tallgrass prairie. *Plant Pathology*. 66 1308{\textendash}131. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1111/ppa.12678
- Denton, Elsie M. and Dietrich, John D. and Smith, Melinda D. and Knapp, Alan K. (2017). Drought timing differentially affects above- and belowground productivity in a mesic grassland. *Plant Ecology*. 218 317 - 328. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1007/s11258-016-0690-x
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Williams, E. J. and Boyle, W. A. (). Patterns and correlates of within-season breeding dispersal: a common strategy in a declining grassland songbird. *The Auk: Ornithological Advances*. . Status = ACCEPTED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes

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Licenses

Other Conference Presentations / Papers

Winnicki S. K., and W. A. Boyle (2017). *Complex drivers of Grasshopper Sparrow (*Ammodramus savannarum*) nest success*. American Ornithological Society. East Lansing MI. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Santos, H.T., Alves, J.D.N., Reis, M.G., Santos, E. (2017). *Evapotranspiration spatial variability in a grassland*. Brazilian Conference of Agrometeorology. Juazeiro-Petrolina, Brazil. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Stropes, K., Santos, E., Kluitenberg, G., Nippert, J. (2016). *In situ measurements of isotopic exchange using tunable diode laser spectroscopy in a tall-grass prairie ecosystem*. 32nd Conference on Agricultural and Forest Meteorology, 22nd Symposium on Boundary Layers and Turbulence and 3rd Conference on Biogeosciences. Salt Lake City, UT. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Boyle W. A., and D. Sullins (2017). *Isotopic evidence of long-distance breeding dispersal in a migratory grassland bird*. Ecological Society of America. Portland OR. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Alves, J.D.N., Santos, E., Ribeiro, A (2017). *Partitioning the CO2 net flux in a grassland ecosystem*. Brazilian Conference of Agrometeorology. Juazeiro-Petrolina, Brazil. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Other Products

Other Publications

Hope, AG, Greiman, SE, Tkach, VV, Hoberg, EP, Cook, JA (2016). *Shrews and their parasites: small species indicate big changes*. <http://www.arctic.noaa.gov/Report-Card>. Status = PUBLISHED; Acknowledgement of Federal Support = Yes

Patents

Technologies or Techniques

Thesis/Dissertations

Wilcox, K.R. .. *Assessing Grassland sensitivity to global change*. (2015). Colorado State University. Acknowledgement of Federal Support = Yes

Gray, J.E.. *Climate change impacts on population dynamics in tallgrass~prairie: implications for species codominance*. (2017). Colorado State University. Acknowledgement of Federal Support = Yes

Verheijen, B.H.F.. *Demographic responses of grassland songbirds to rangeland management in the tallgrass prairie*. (2017). Kansas State University. Acknowledgement of Federal Support = Yes

Veach, A.M.. *Dynamics of microbial community structure and function in a tallgrass prairie ecosystem*. (2015). Kansas State University. Acknowledgement of Federal Support = Yes

Raynor, E.J.. *Ecological hierarchy of foraging in a large herbivore: the plains bison perspective in tallgrass prairie*. (2015). Kansas State University. Acknowledgement of Federal Support = Yes

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

Duell, E.B.. *Elevated temperatures and drought favor invasive grasses over native species*. (2015). Oklahoma State University. Acknowledgement of Federal Support = Yes

Zaiger, K. *Environmental extremes drive plant and soil community dynamics of native and disturbed grasslands*. (2016). Oklahoma State University. Acknowledgement of Federal Support = Yes

Williams, E.J. *Grasshopper sparrows on the move: patterns and causes of within-season breeding dispersal in a declining grassland songbird*. (2016). Kansas State University. Acknowledgement of Federal Support = Yes

Carson, Christine. *Grassland soil microbial responses to long-term management of N availability*. (2017). Kansas State University. Acknowledgement of Federal Support = Yes

Commerford, J.L. *Investigating North American grassland biogeography throughout the Holocene*. (2016). Kansas State University. Acknowledgement of Federal Support = Yes

Ricketts, A.M. *Of mice and coyotes: Mammalian Responses to Rangeland Management Practices in Tallgrass Prairie*. (2016). Kansas State University. Acknowledgement of Federal Support = Yes

Alves, J.D.N.. *Partitioning the CO₂ 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

Bachle, Seton. *Physiological and morphological responses of grass species to drought*. (2017). Kansas State University. Acknowledgement of Federal Support = Yes

Zahner, A.. *Plant Responses to Grazer-Mediated Habitat Alterations in Tallgrass Prairie*. (2016). Kansas State University. Acknowledgement of Federal Support = Yes

Scott, D.A.. *Recovery of whole soil conditions through restoration from agriculture and its role in mediating plant-plant competition*. (2015). Southern Illinois University Carbondale. Acknowledgement of Federal Support = Yes

Gómez, Jesús Enrique. *Role of spatial and temporal vegetation heterogeneity from fire-grazing interactions to the assembly of tallgrass prairie spider communities*. (2017). Kansas State University. Acknowledgement of Federal Support = Yes

Mino, LA. *Soil characteristics and ecosystem-level effects of woody species encroachment in tallgrass prairie*. (2016). Oklahoma State University. Acknowledgement of Federal Support = Yes

Rawitch, M. J.. *Stream CO₂ 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 the KNZ documents, databases, and publications.

Participants/Organizations

What individuals have worked on the project?

Name	Most Senior Project Role	Nearest Person Month Worked
Blair, John	PD/PI	4
Baer, Sara	Co PD/PI	2
Dodds, Walter	Co PD/PI	2
Joern, Anthony	Co PD/PI	2
Nippert, Jesse	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

Name	Most Senior Project Role	Nearest Person Month Worked
Sullivan, Pam	Co-Investigator	1
Whiles, Matt	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
Lemoine, Nate	Postdoctoral (scholar, fellow or other postdoctoral position)	1

Name	Most Senior Project Role	Nearest Person Month Worked
Ratajczak, Zak	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Veach, Allison	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Welti, Ellen	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Wilcox, Kevin	Postdoctoral (scholar, fellow or other postdoctoral position)	1
Haukos, Jill	Other Professional	12
Rhodes, Jennifer	Other Professional	9
Xia, Yang	Other Professional	12
Bachle, Seton	Graduate Student (research assistant)	6
Black, Sarah	Graduate Student (research assistant)	1
Bonjour, Sophia	Graduate Student (research assistant)	1
Carter, Tiffany	Graduate Student (research assistant)	1
Chaves Rodriguez, Francis	Graduate Student (research assistant)	12
Connell, Kent	Graduate Student (research assistant)	12
Duell, Eric	Graduate Student (research assistant)	1
Felton, Andrew	Graduate Student (research assistant)	12
Frennette, Bryan	Graduate Student (research assistant)	12
Gray, Jess	Graduate Student (research assistant)	1
Griffin-Nolan, Robert	Graduate Student (research assistant)	1
Gunnip, James	Graduate Student (research assistant)	12
Higgs, Sophie	Graduate Student (research assistant)	12
Hoffman, Ava	Graduate Student (research assistant)	1
Manning, George	Graduate Student (research assistant)	1

Name	Most Senior Project Role	Nearest Person Month Worked
Mino, Laura	Graduate Student (research assistant)	1
Moley, Priscilla	Graduate Student (research assistant)	1
O'Conner, Rory	Graduate Student (research assistant)	12
Rivera-Zayas, Johanie	Graduate Student (research assistant)	1
Santos, Marshall	Graduate Student (research assistant)	1
Scott, Drew	Graduate Student (research assistant)	4
Slette, Ingrid	Graduate Student (research assistant)	1
Verheijen, Bram	Graduate Student (research assistant)	12
Vilonea, Leena	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)	12
Hadle, Jacob	Non-Student Research Assistant	3
Kuhl, Amanda	Non-Student Research Assistant	12
O'Neal, Patrick	Non-Student Research Assistant	3
Ramundo, Rosemary	Non-Student Research Assistant	12
Taylor, Jeff	Non-Student Research Assistant	12
Grieger, Samantha	Research Experience for Undergraduates (REU) Participant	1
Savage, Darrien	Research Experience for Undergraduates (REU) Participant	1
Spangler, Ellis	Research Experience for Undergraduates (REU) Participant	1

Full details of individuals who have worked on the project:

John M Blair

Email: jblair@ksu.edu

Most Senior Project Role: PD/PI

Nearest Person Month Worked: 4

Contribution to the Project: Dr. Blair is the Konza Prairie LTER lead PI and project director. Provides overall LTER project leadership and coordination. 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

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

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 will assess the impacts of riparian land-cover change on grassland streams.

Funding Support: None

International Collaboration: Yes, Brazil

International Travel: No

Anthony Joern

Email: ajoern@ksu.edu

Most Senior Project Role: Co PD/PI

Nearest Person Month Worked: 2

Contribution to the Project: Konza LTER VII Co-PI. Provides expertise on insect population and community studies; plant-herbivore-predator interactions; long-term consumer population dynamics; responses of insect herbivores to fire and grazing; temporal dynamics in ecological studies. Oversees the Konza LTER long-term grasshopper abundance dataset, and studies on the role of insect herbivores and climate change in mesic grasslands. Is co-leading the patch-burn grazing study, and assessing impacts of fire-grazing interactions on spatial patterning. Co-Director of the KSU Institute for Grassland Studies (with D. Hartnett).

Funding Support: None

International Collaboration: No

International Travel: No

Jesse B Nippert

Email: nippert@ksu.edu

Most Senior Project Role: Co PD/PI

Nearest Person Month Worked: 2

Contribution to the Project: Dr. Nippert is a Co-PI on the Konza LTER VII project, and 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 woody 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: None

International Collaboration: Yes, South Africa

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: None.

International Collaboration: No

International Travel: No

John M Briggs

Email: jbriggs1@k-state.edu

Most Senior Project Role: Co-Investigator

Nearest Person Month Worked: 1

Contribution to the Project: Konza LTER investigator and Director of the Konza Prairie Biological Station (the primary research site for the Konza LTER program). Dr. Briggs oversees studies of grass-shrub interactions and the causes and

consequences of woody plant encroachment into grasslands. Directs research into patterns and controls of ANPP in grasslands, as well as studies of the relationship between ANPP and species richness. Also provides expertise in database management, GIS and remote sensing studies.

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

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

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

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

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

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

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

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

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

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

International Collaboration: Yes, South Africa

International Travel: No

Sally Koerner

Email: sally.koerner@duke.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

Kimberly LaPierre

Email: lapierre.kimberly@gmail.com

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

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

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

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: None.

International Collaboration: No

International Travel: No

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

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

International Collaboration: No

International Travel: No

Pam Sullivan

Email: plsullivan@ku.edu

Most Senior Project Role: Co-Investigator

Nearest Person Month Worked: 1

Contribution to the Project: As an ec hydrologist, 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

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

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

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

International Collaboration: No

International Travel: No

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

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

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

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**John Harrington Jr.****Email:** jharrin@ksu.edu**Most Senior Project Role:** Faculty**Nearest Person Month Worked:** 1**Contribution to the Project:** Dr. Harrington is 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 is leading many of the new social science related initiatives within our LTER program, and has been representing 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.).**Funding Support:** None.**International Collaboration:** No**International Travel:** No**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**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

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**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**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**Trisha Moore****Email:** tlcmoore@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**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

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

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

Brett Sandercock

Email: bsanderc@ksu.edu

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 gasland management impacts

Funding Support: None.

International Collaboration: No

International Travel: No

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; directs site-based REU program.

Funding Support: None.

International Collaboration: No

International Travel: No

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**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**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**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**Allison Veach****Email:** amveach@ksu.edu**Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)**Nearest Person Month Worked:** 1

Contribution to the Project: Grassland microbial ecologist working with Lydia Zeglin; working with soil microbial taxonomic and functional group turnover in response to climate change.

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

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

Kevin Wilcox

Email: wilcoxkr@rams.colostate.edu

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

Nearest Person Month Worked: 1

Contribution to the Project: Univ. Oklahoma Post-Doctoral Scholar. Working with Luo. Ecosystem modeler linking community level processes with ecosystem function.

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: 9

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: 6

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

Funding Support: None

International Collaboration: No

International Travel: No

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

Funding Support: None

International Collaboration: No

International Travel: No

Sophia Bonjour

Email: sophia.bonjour@siu.edu

Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 1

Contribution to the Project: Student with Matt Whiles at Southern Illinois University studying stream heterogeneity and food webs.

Funding Support: None

International Collaboration: No

International Travel: No

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**Francis Chaves Rodriguez****Email:** fachaves@rams.colostate.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 12**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:** 12**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**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:** 12

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

Bryan Frenette

Email: frenette@k-state.edu

Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 12

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

Jess 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

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

James Gunnip

Email: jguinnip@k-state.edu

Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 12

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

Sophie Higgs

Email: sahiggs@k-state.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 12

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

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

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

Laura Mino

Email: laura.mino@okstate.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: MS student (Advisor, Gail Wilson) working on mycorrhizal interactions in invasive and encroaching woody plant species.

Funding Support: None.

International Collaboration: No
International Travel: No

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

Rory O'Conner

Email: rory9@ksu.edu

Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 12

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

Johanie Rivera-Zayas

Email: johanie@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

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

Drew Scott

Email: dascott@siu.edu

Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 4

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

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

Bram Verheijen

Email: bramverheijen@ksu.edu

Most Senior Project Role: Graduate Student (research assistant)

Nearest Person Month Worked: 12

Contribution to the Project: PhD student (Advisor, Brett Sandercock) working on a 3-year study at Konza Prairie LTER site to test the potential benefits of patch-burn grazing for grassland vertebrates.

Funding Support: None.

International Collaboration: No

International Travel: No

Leena Vilonea

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

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

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**Sarah Winnicki****Email:** skwinnicki@ksu.edu**Most Senior Project Role:** Graduate Student (research assistant)**Nearest Person Month Worked:** 12**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**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**Funding Support:** None**International Collaboration:** No**International Travel:** No**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**Patrick O'Neal****Email:** poneal@ksu.edu**Most Senior Project Role:** Non-Student Research Assistant**Nearest Person Month Worked:** 3**Contribution to the Project:** Fire/bison management and field technician.

Funding Support: None

International Collaboration: No

International Travel: No

Rosemary Ramundo

Email: ramundo@ksu.edu

Most Senior Project Role: Non-Student Research Assistant

Nearest Person Month Worked: 12

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

Funding Support: None.

International Collaboration: No

International Travel: No

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

Samantha Grieger

Email: sammig@ksu.edu

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

Nearest Person Month Worked: 1

Contribution to the Project: Advisor: Dr. David Hartnett

Funding Support: None

International Collaboration: No

International Travel: No

Year of schooling completed: Junior

Home Institution: Kansas State University

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

Darrien Savage

Email: dsavage@ksu.edu

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

Nearest Person Month Worked: 1

Contribution to the Project: Advisor: Dr. Alice Boyle. He studied the vegetation structure around nests of three grassland songbirds; how do nest site selection differ from random points in different landuses, and what were the consequence of vegetation structure on nest success?

Funding Support: None

International Collaboration: No
International Travel: No
Year of schooling completed: Junior
Home Institution: Kansas State University
Government fiscal year(s) was this REU participant supported: 2017

Ellis Spangler

Email: ellis.spangler@ku.edu

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

Nearest Person Month Worked: 1

Contribution to the Project: Advisor: Dr. Gwen Macpherson

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: 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 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.

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.

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.

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.

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.

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.

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.

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 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.

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.

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.

What other collaborators or contacts have been involved?

Nothing to report

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 2016-2017 funding period, the KNZ program produced or contributed to 78 publications: 49 refereed journal articles (including 8 currently in press), 3 book chapters (including 1 in press), and 10 dissertations and theses. These publications cover topics ranging from the ecophysiology of individual organisms to regional patterns of productivity to consequences of global change in grasslands. Within the past year, Konza LTER scientists continued to publish high-quality articles in disciplinarily focused areas (e.g., *Freshwater Science*, *Global Change Biology*, and *New Phytologist*), general ecology (*Ecology*, *Ecological Monographs*, *Journal of Ecology*, *Functional Ecology*) and high-impact general science journals (e.g., *BioScience*, *Nature Climate Change*, *Nature Geoscience*, *PNAS*). Several syntheses of long-term KNZ research were published in 2017, including a *Journal of Ecology* article based on a long-term measurement of transect- and watershed-level plant species composition changes in woody plant cover under alternate fire and grazing treatments (Ratajczak et al. 2017a), and in *The Auk*, an analysis of long-term measurements of abundance, richness and species composition of birds under contrasting fire and grazing treatments (Williams and Boyle *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 LTER data were used in several recent multi-site or synthetic efforts, including: temperature sensitivity of litter composition (Follstad-Shah et al. 2017), drivers of ecosystem regime shifts (Ratajczak et al. 2017b), and grassland responses to climate change (Hufkens et al. 2016). Konza Prairie is also an active node in the Nutrient Network (NutNet), and KNZ scientists have contributed to several NutNet publications in the 2016-2017 funding period.

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. We also collaborated with Steve Holbrook (U Wyoming) to facilitate NSF-supported work on Konza to use geophysical tools to image the subsurface across different lithologies in the US. 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) 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.

Konza Prairie has also become a research platform for several collaborative teams of ecologists 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 operation 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 from the EPA CASTNet program in sampling concentrations of selected airborne particles and using these to model dry deposition rates, and in 2006, two new seismographs were installed on the site to facilitate ongoing geologic research by USGS scientists and their collaborators.

What is the impact on the development of human resources?

In 2017, several KNZ investigators and students were recognized for their contributions to ecological science. Melinda Smith (CSU) was chosen as an Ecological Society of America fellow. She was elected for her seminal contributions to understanding environmental drivers of grassland community structure through field experiments, cutting-edge genomics, and collaborative synthesis. KNZ Co-PI, Walter Dodds, was a 2017 recipient of the Society for Freshwater Science Award of Excellence. The Award of Excellence is an honor bestowed for outstanding contributions to benthic science. KNZ PhD student, Rory O'Connor won first place for his PhD oral paper presentation by the Society for Range Management. His presentation was entitled "Browsing Impacts Resprouting Shrub Physiology in a Woody Encroached Grassland." Lastly, KNZ PhD student, Kent Connell, was an NSF Graduate Student Research Fellowship Award Winner in 2016-17.

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 support of the local REU program (details provided in the 'Accomplishments' section of this report). Indirectly, we support the development of undergraduates via the use of 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 2016-2017 funding period, the site was used by graduate students from the University of Kansas, University of California-Santa Cruz, Southern Illinois University, Colorado State University, Oklahoma State University, and University of Nebraska. We also hosted field trips for students from many regional colleges and universities, and in the last year we 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 Konza LTER site continues to be used in conjunction with the NSF-funded Girls Researching Our World (GROW) program (www.ksu.edu/grow/), with several KSU scientists and students leading educational activities for 7th and 8th 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 ft²) 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) 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 round. The 4,650-ft² Hulbert Center houses a library/conference room, administrative offices, 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 support from an NSF Field Stations and Marine Laboratories (FSML) grant, Kansas NSF EPSCoR, the Kansas Agricultural Experiment Station, KSU, and private foundations, major site improvements and building renovations have ensured that KNZ remains a modern biological station. These include new housing for visiting students and scientists (included above), an on-site meeting and conference center, and improved Internet capabilities. 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 ft²) with a seating capacity of ~100 persons fully equipped with A/V equipment and wireless internet. An additional large multi-purpose room (1,850 ft²) 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 (802.11abg) that provide 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 enclosed by 16.4 km of "New Zealand" fence, 98 small (25-m²) 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 plan and implementation of prescribed burning of watersheds and experimental plots, and the 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 2017, KPBS Director Dr. John Briggs received a NSF Award to upgrade the corral area, build additional working pens, provide easier access for researchers using the perimeter fence, and additional remote scales to increase the frequency of measurements to document seasonal dynamics of body weight. 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 (updated in 2012 to Sutron Constant Flow Accubar® bubble gages and recorders with wireless connectivity), 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 a 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 and cross-site studies. KPBS is also a core site for National Ecological Observatory Network (NEON), which is now fully built-out and operational (completed during the 2014-15 cycle). NEON will provide additional unique measurement capabilities and data at KPBS, which will complement many KNZ LTER studies.

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, Lipodomics Center, Gene Expression and Microarray Facility, a BioSafety Level 3 Facility for invasive species and infectious disease studies, etc.). 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, several gas chromatographs with electron capture, flame ionization and thermal conductivity detectors, a Nikon compound microscope with epifluorescence and video imaging capabilities, 4 LiCor 6400 Portable Photosynthetic Systems, 2 LiCor 8100 systems dedicated for soil CO₂ 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 in 3 watersheds. Cold storage facilities for holding samples are available, as are sample preparation rooms for drying and grinding plant and soil samples. Climate controlled greenhouse space is available on the KSU campus. In addition, other "typical" laboratory instruments (balances, microscopes, etc.) are available in individual investigator laboratories.

What is the impact on institutional resources that form infrastructure?

KNZ investigators continue to support grassland research through the local (KSU) Grasslands Institute and through hosting relevant society meetings (e.g., the Second America's Grasslands Conference).

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 upcoming year, we will continue to add new projects and datasets to the KNZ database; we will continue to improve on our newly launched DEIMS-based website; continue to update a variety of metadata and procedural protocols to ensure any changes in technique or structure of our datasets are accounted for; continue to ensure data quality, perform data aggregation and synthesis 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.

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, such as the Konza Prairie Biennial Visitors' Day. In July 2017, KNZ investigators organized and hosted the Grassland Restoration Network workshop (Dr. Sara Baer was the workshop host). The workshop disseminated results from experiments at KNZ with relevance to managing and restoring grasslands. Participants (>60) included representatives from The Nature Conservancy, Texas Wildlife and Parks, Kansas Wildlife and Parks, Nebraska Game and Parks Commission, Cook County Forest Service in Illinois, US Fish and Wildlife, Missouri Botanical Garden, Missouri Department of Conservation, Minnesota Department of Natural Resources, USDA Forest Service and regional park districts.

In addition, the Konza LTER Program is increasingly called upon to provide data relevant to resource management and regulatory policy. Dr. John Briggs (KPBS Director) and Dr. John Blair (KNZ PI) regularly provide outreach and tours to state and national policy-makers and law-makers. In the Fall 2017, Dr. Briggs participated on the '12th Annual Kansas Conservation Tour' with Sen. Jerry Moran. 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 have advised EPA Region 7 staff and scientists on the ecological benefits of fire in maintaining native tallgrass prairie habitat and diversity and contributed important long-term data to guide the development of the Flint Hills regional smoke 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 and advised groups, including the EPA, Natural Resources Conservation Service, the Kansas Farm Bureau, The Nature Conservancy Grassland Committee, and others.

KNZ scientist 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 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 recent interaction with the Kansas Beef Council. This agency was excited to learn about and promote the role of frequent fire to their members, and they returned with an unmanned aerial vehicle and produced a video highlighting the importance of burning for Flint hills rangelands (www.youtube.com/watch?v=YUQICauCIDI), which has informed ~300,000 people about the role of KNZ research.

Locally, Konza scientists continue to serve as consultants for the Flint Hills Discover 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 streamwater 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 CO2 loading.

In 2017, KNZ scientists and graduate students participated in numerous public outreach events designed to enhance understanding and LTER science and dissemination of important findings. Several KNZ researchers as Science Communication Fellows at Sunset Zoo. 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](#). In 2017, KNZ PhD students Rory O'Connor and Kent Connell presented results on topics including the role of fire in grasslands and importance of plant-microbe interactions. KNZ investigators also presented research findings at local Science Café meetings. KNZ investigator and KPBS Director John Briggs gave a public lecture on the threats causing

large-scale transformation of tallgrass prairie grasslands to savanna-like ecosystems. The lecture was part of the National Resource and Environmental Sciences Science Seminar.

KNZ research conducted by several investigators was featured in an article within *SEEK*, Kansas State University's research magazine. The article highlighted KNZ's work in conserving one of the most diminished ecosystems in North America. KNZ was also featured, along with several other LTER sites, in *Discover* magazine's article "Diary of a Changing Planet", and KNZ research featured prominently in the 2017 USDA Technical Report "Considering Forest and Grassland Carbon in Land Management". Lastly, KNZ investigator, Gwen Macpherson, and her students were featured in *G-Hawker*, a University of Kansas alumni magazine. The article, entitled "Taking the Measure," discussed her three-decade research project on groundwater chemistry at KNZ.

The Prairie Studies Initiative at Kansas State University is a collaborative network of faculty, staff, and university departments interested in the past, present, and future of the prairie, especially the tallgrass prairies of Kansas. The Initiative is working to develop programs to raise awareness at Kansas State University about the value, importance, and challenges of the prairie, as well as to spur innovative scholarship related to the prairie among faculty, staff, and students at K-State. The Prairie Studies Initiative also serves as an important platform for engagement between science and art. During the Spring burns in 2017, KNZ hosted KSU Art Professor Erin Wiersma. Wiersma used char from the 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. Wiersma and her art were featured in the fall issue of the KSU *SEEK* research magazine as well as a current exhibition at the Robischon Gallery in Denver.

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.