OKLAHOMA NSF EPSCoR

2017 ANNUAL STATE CONFERENCE

FRIDAY, APRIL 7, 2017 * EMBASSY SUITES HOTEL * OKLAHOMA CITY, OK

Advancing Climate Research & Education in Oklahoma & the Nation

NSF

OKLAHOMA EPSCoR

OKLAHOMA STATE REGENTS FOR HIGHER EDUCATION
Improving our future by degrees

OKLAHOMA NSF EPSCoR
ANNUAL STATE CONFERENCE AGENDA

7:30 A.M. **Registration & Continental Breakfast**

OPENING SESSION (Ballroom C/D)

8:20 A.M. **Welcoming Remarks**
Ray Huhnke, Project Director & PI, Oklahoma NSF EPSCoR

OBSERVING SOCIAL SYSTEMS IN A CHANGING CLIMATE (Ballroom C/D)
Session Chair: Hank Jenkins-Smith, Co-Director, National Institute for Risk & Resilience, OU

8:30 A.M. **America's Two Climate Changes**
Dan M. Kahan, Professor of Law & Professor of Psychology, Yale Law School

9:10 A.M. **Signals, Noise, and Recognition of Changing Weather Patterns in Oklahoma**
Hank Jenkins-Smith, Co-Director, National Institute for Risk & Resilience, OU
Carol Silva, Director, Center for Risk & Crisis Management, OU

OBSERVING ECOLOGICAL SYSTEMS IN A CHANGING CLIMATE (Ballroom C/D)
Session Chair: Renee McPherson, Assoc. Professor, Dept. of Geography & Environmental Sustainability, OU

9:30 A.M. **Is Climate Change Forcing a Reinvention of Conservation?**
Stephen T. Jackson, Director, Dept. of the Interior Southwest Climate Science Center, U.S. Geological Survey; Professor, Dept. of Geosciences & Institute of the Environment, University of Arizona

10:10 A.M. **Measuring and Monitoring Biodiversity in a Changing World**
Ron Bonett, Assoc. Professor, Dept. of Biological Science, TU

10:30 A.M. **Break** *(15 minutes)*

OBSERVING ECOLOGICAL SYSTEMS IN A CHANGING CLIMATE (Ballroom C/D)
Session Chair: Tyson Ochsner, Assoc. Professor, Dept. of Plant & Soil Sciences, OSU

10:45 A.M. **From the Market to the Field: The Impact of Agricultural and Energy Linkages on Farmers' Choices**
Silvia Secchi, Assoc. Professor, Dept. of Geography & Environmental Resources; Director, Environmental Resources & Policy Ph.D. Program, Southern Illinois University

11:25 A.M. **Urban Forests: Interactions Between Human Decision-Making, Climate, and Landscape Function**
Heather McCarthy, Asst. Professor, Dept. of Microbiology & Plant Biology, OU

SOCIO-ECOLOGICAL DECISION SUPPORT IN A CHANGING CLIMATE (Ballroom C/D)
Session Chair: Tyson Ochsner, Assoc. Professor, Dept. of Plant & Soil Sciences, OSU

11:45 A.M. **Measuring and Predicting Drought in Oklahoma: A Decision-Support and Educational Model**
Jad Ziolkowska, Asst. Professor, Dept. of Geography & Environmental Sustainability, OU

- agenda continued on next page -

OKLAHOMA NSF EPSCoR
ANNUAL STATE CONFERENCE AGENDA

(Agenda, Continued)

LUNCHEON AND AFTERNOON POSTER SESSION

12:10 P.M. **Luncheon** (Included for all Registered Guests; Ballroom A/B)
Presentation: Update on EPSCoR Programs
Jerry Malayer, State Director, Oklahoma EPSCoR

1:20 P.M. **Poster Session and Judging** (Courtyard & Preconvene)

2:20 P.M. **Break** *(10 Minutes)*

HUMAN-NATURAL SYSTEMS INTEGRATIVE MODELING (Ballroom C/D)
Session Chair: Tracy Boyer, Assoc. Professor, Dept. of Agricultural Economics, OSU

2:30 P.M. **Agent-Based Models of Complex Socio-Ecological Systems: Deforestation, Household Vulnerability and Road-Building the Southwest Amazon**
Gregory A. Kiker, Assoc. Professor & Graduate Coordinator,
Dept. of Agricultural & Biological Engineering, University of Florida

3:10 P.M. **Modeling the Relationship Between Climate, Domestic Water Use, and Vegetation**
Jennifer Koch, Asst. Professor, Dept. of Geography & Environmental Sustainability, OU

3:30 P.M. **Simulating the Impacts of Social Coordination on Groundwater Sustainability and Agricultural Resilience**
Phil Alderman, Asst. Professor, Dept. of Plant & Soil Sciences, OSU

3:50 P.M. **Break** *(15 minutes)*

BROADER IMPACTS (Ballroom C/D)
Session Chair: Ray Huhnke, Project Director & PI, Oklahoma NSF EPSCoR, OSU

4:05 P.M. **Oklahoma Ecological Observatory: Its Contribution to the NASA GeoCarb Mission**
Xiangming Xiao, Professor, Center for Spatial Analysis, OU

4:25 P.M. **OneOklahoma Cyberinfrastructure Initiative**
Dana Brunson, Director, High Performance Computing Center; Asst. Vice President for Research Cyberinfrastructure, OSU

Henry Neeman, Director, Supercomputing Center for Education and Research; Asst. Vice President, IT-Research Strategy Advisor, OU

4:45 P.M. **Presentation of Poster Session Awards** (Ballroom C/D)

5:00 P.M. **Adjourn**

NSF Grant No. OIA-1301789

PRESENTERS
&
SESSION CHAIRS

DR. PHIL ALDERMAN

OK NSF EPSCoR RESEARCHER

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Dr. Phil Alderman grew up internationally as the child of a U.S. Air Force officer. The cross-cultural and cross-linguistic experiences of his childhood led him initially to pursue a BA in Linguistics from the University of Florida. However, through part-time work as an undergraduate research assistant, Dr. Alderman was exposed to simulation modeling and its potential for use in agricultural research. This interest led him to pursue an MS degree modeling physiological aspects of perennial grass regrowth and a Ph.D. performing integrated socioeconomic-biophysical modeling of soil fertility dynamics and household welfare in northern Ghana. After that, Dr. Alderman worked for nearly three years in the Global Wheat Program of the International Maize and Wheat Improvement Center (known by its Spanish acronym CIMMYT). While there, he collaborated closely with international wheat modeling efforts to research climate impacts and adaptation strategies for wheat. Since joining the Plant and Soil Sciences Department at Oklahoma State University, Dr. Alderman has continued to pursue interdisciplinary research into the agricultural impacts of climate variability. The goal of his research is to provide meaningful information and decision-support resources to enhance the resource use and resilience of agricultural systems in Oklahoma and around the world.

DR. RONALD BONETT

OK NSF EPSCoR RESEARCHER

Assoc. Professor
Dept. of Biological Science
The University of Tulsa, Tulsa, OK

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Dr. Ronald Bonett is an Associate Professor of Biological Science at the University of Tulsa. Dr. Bonett has a bachelor's degree and master's degree in biology, both from East Stroudsburg University (Pennsylvania). He received his doctorate degree in quantitative biology from the University of Texas Arlington in 2004, followed by postdocs at the University of California Berkeley and University of Michigan.

Dr. Bonett studies patterns and process of biodiversity, with an emphasis on complex life cycles of amphibians. His laboratory uses genetic and ecological analyses to test the factors that limit species distributions. The timing of amphibian development appears to be largely governed by hormonal systems and therefore his lab also conducts experiments to test how environmentally-induced hormone levels regulate life history strategies. Dr. Bonett has been working on biodiversity questions in Oklahoma for more than 15 years. The Ozark Plateau of northeastern Oklahoma is a unique network of subterranean and surface streams, which has played a major role in the life cycles and ecologies of associated fauna. Dr. Bonett and his students are currently evaluating how distributional limits of stream vertebrates and invertebrates can be used to understand hydrologic patterns and assess water quality in the Ozarks.

DR. TRACY BOYER

OK NSF EPSCoR CO-LEAD RESEARCHER

Assoc. Professor
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Oklahoma State University, Stillwater, OK

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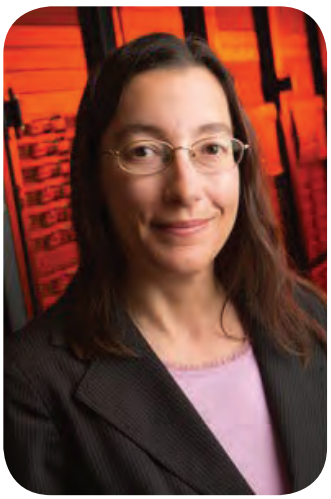
Tracy Boyer, Associate Professor of Agricultural Economics, has been at Oklahoma State University since 2003. She holds a doctorate in applied economics from the University of Minnesota focused on environmental and resource economics and a master's degree in public policy from the Humphrey Institute of Public Affairs at the University of Minnesota.

Dr. Boyer conducts research in the areas of environmental and resource economics focusing on valuing water and water-based amenities, soil and water conservation, adaptation to climate change, and estimating market demand for food and agricultural products.

She currently co-leads the ENVISION modelling team with Drs. McCarthy and Koch, focusing on water use and climate change in Oklahoma City. She teaches two classes on environmental and resource economics (AGEC 4503 and AGEC5503) at the senior undergraduate and graduate levels.



DR. DANA BRUNSON

OK NSF EPSCoR RESEARCHER

Asst. Vice President for Research Cyberinfrastructure
Director, High Performance Computing Center
Adjunct Assoc. Professor, Dept. Computer Science & Dept. Math
Oklahoma State University, Stillwater, OK

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Dana Brunson is Assistant Vice President for Research Cyberinfrastructure; Director, Oklahoma State University High Performance Computing Center (OSUHPCC); Adjunct Associate Professor, Department of Mathematics and Department of Computer Science; and Co-lead of the OneOklahoma Cyberinfrastructure Initiative (OneOCII).

Dr. Brunson earned her Ph.D. in mathematics at the University of Texas at Austin in 2005 and her M.S. and B.S. in mathematics from OSU. She is PI on OSU's 2011 and 2015 National Science Foundation (NSF) Major Research Instrumentation (MRI) grants for High Performance Compute clusters for multidisciplinary computational and data-intensive research. She is also Co-PI on Oklahoma's NSF Campus Cyberinfrastructure-Network Infrastructure and Engineering CC-NIE grant, "OneOklahoma Friction Free Network" (OFFN), a collaboration among OSU, OU, Langston University, and the Tandy Supercomputing Center of the Oklahoma Innovation Institute.

She and her counterpart at University of Oklahoma, Henry Neeman, have been appointed joint co-leads of the XSEDE Campus Engagement program, which includes the Campus Champions. Dr. Brunson also serves on Internet2's External Advisory Group on Researcher Engagement and Pittsburgh Supercomputing Center's Bridges external advisory board. She also collaborates with the Clemson-led Campus Research Computing Infrastructures Consortium.

DR. RAY HUHNKE

OK NSF EPSCoR PROJECT DIRECTOR & PI

Director, Biobased Products & Energy Center
Professor, Dept. of Biosystems & Agricultural Engineering
Oklahoma State University, Stillwater, OK

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Dr. Ray Huhnke is Director, Biobased Products and Energy Center for the Division of Agricultural Sciences and Natural Resources; Associate Director, Sun Grant Program - South Central Region; and Professor, Biosystems and Agricultural Engineering at Oklahoma State University (OSU). In July 2013, he assumed the role of project director for the current Oklahoma NSF EPSCoR Research Infrastructure Improvement project “Adapting Socio-ecological Systems to Increased Climate Variability.” He has been a Principal Investigator or Co-Principle Investigator on over $68 million in grants and contracts from federal, state, university and private sources. Dr. Huhnke has authored or co-authored over 85 journal articles, two patents, three book chapters, 10 educational videos, and nearly 300 technical papers and presentations. Recently, he was appointed to serve as a member of the joint U.S. Department of Agriculture (USDA) and U.S. Department of Energy (DOE) Biomass Research and Development Technical Advisory Committee. His leadership roles at OSU include serving as advisory board member on the university’s National Energy Solutions Institute and the Food-Energy-Water Nexus Council. Dr. Huhnke is a licensed professional engineer and fellow in the American Society of Agricultural and Biological Engineers.

DR. STEPHEN T. JACKSON

OK NSF EPSCoR EXTERNAL ADVISORY BOARD MEMBER

Director,
Dept. of the Interior Southwest Climate Science Center;
Professor,
Dept. of Geosciences & Institute of the Environment,
University of Arizona, Tucson, AZ

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Stephen T. Jackson is Director of the Department of the Interior Southwest Climate Science Center, a partnership between the U.S. Geological Survey and a multi-university consortium led by the University of Arizona. In this position, he works to foster effective engagement between researchers and resource-management decision-makers. He is also Adjunct Professor of geosciences and natural resources and environment at the University of Arizona. Before assuming his current position in 2012, he was at the University of Wyoming, where he was founding Director of the Program in Ecology and is now Professor Emeritus of Botany.

Jackson is currently a member of the Board of Reviewing Editors for Science and the Advisory Editorial Board for *Trends in Ecology and Evolution*, and has previously served on editorial boards for *Ecology, Ecology Letters, Frontiers in Ecology & Environment, Ecological Monographs, Ecosystems, Journal of Vegetation Science, Diversity & Distributions, Wetlands*, and *New Phytologist*. He is a past Fellow of the Aldo Leopold Leadership Program (2006), a Visiting Research Fellow at Merton College, University of Oxford (2012), and a Scholar in Residence at the Ucross Foundation (2012). He is an elected Fellow of the American Association for the Advancement of Science (2009) and the Ecological Society of America (2014). Jackson was awarded the 2011 George Duke Humphrey Distinguished Faculty Medal from the University of Wyoming, and the 2015 Excellence in Leadership Award from the U.S. Geological Survey. His research continues to utilize the past 25,000 years of earth history as a source of natural experiments to explore ecological responses to environmental changes of various kinds, rates, and magnitudes.

DR. HANK C. JENKINS-SMITH

OK NSF EPSCoR RESEARCHER

Professor, Dept. of Political Science
Co-Director, National Institute for Risk & Resilience
University of Oklahoma, Norman, OK

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Hank Jenkins-Smith earned his Ph.D. in political science and public policy from the University of Rochester (1985). He is a George Lynn Cross Research Professor in the University of Oklahoma Political Science Department and serves as Co-Director of the National Institute for Risk and Resilience. Professor Jenkins-Smith has published books, articles and reports on public policy processes, risk perception, national security, weather, and energy and environmental policy. He has served on National Research Council Committees focused on policies to transport spent nuclear fuel and dispose of chemical weapons. He currently serves as an elected member on the National Council on Radiation Protection and Measurement, and the American Political Science Association. His current research focuses on theories of the public policy process, with particular emphasis on the management (and mismanagement) of controversial technical issues involving high risk perceptions on the part of the public. In 2012 he and collaborators initiated a series of studies focused on social responses to the risks posed by severe weather. This work, funded by the National Science Foundation, continues with a panel survey of Oklahoma households to track perceptions of and responses to changing weather patterns. In his spare time, Professor Jenkins-Smith engages in personal experiments in risk perception and management via skiing, scuba diving and motorcycling.

DR. DAN M. KAHAN

Professor of Law
Professor of Psychology
Yale Law School, New Haven, CT

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Dan Kahan is the Elizabeth K. Dollard Professor of Law and Professor of Psychology at Yale Law School. He is a member of the Cultural Cognition Project, an interdisciplinary team of scholars who use empirical methods to examine the impact of group values on perceptions of risk and science communication. In studies funded by the National Science Foundation, Professor Kahan and his collaborators have investigated public dissensus over climate change, public reactions to emerging technologies, and public understandings of scientific consensus across disputed issues. Articles featuring the Project's studies have appeared in a variety of peer-reviewed scholarly journals including the *Journal of Risk Research, Judgment and Decision Making, Nature Climate Change, Science*, and *Nature*. The Project's current focus is on field research to integrate insights from the science of science communication into the craft of professional science communicators in various domains, including democratic decision-making, education, and popular engagement with science. Professor Kahan is a Senior Fellow at the National Center for Science and Civic Engagement, and a member of the American Academy of Arts and Sciences.

DR. GREGORY A. KIKER

OK NSF EPSCoR EXTERNAL ADVISORY BOARD MEMBER

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Dr. Greg Kiker works in the field of the simulated modeling of coupled human-natural systems, focusing on the integration of ecological, hydrological and management models, especially as regards “wicked problems.” Wicked problems are time-sensitive, have multivariate inputs, and often deal not only with causes/associations, but the impacts of the consequences of management decisions. Dr. Kiker has studied a variety of topics that have been integrated into coupled models, including invasive species, mercury dynamics, nutrient-transport, climate change, crop production, livestock/wildlife dynamics, ecosystem management, household decision-making, and risk analysis. Dr. Kiker has also worked in a variety of settings, especially on rangeland ecosystems. Current research includes ecosystem and hydrological modeling for south Florida and southern African ecosystems, and the simulation of beef cattle farming systems for ecological and enterprise sustainability. To further assist with ecosystem management, Dr. Kiker is researching food-ecology-water system integration into decision support and scenario analysis systems, and the implementation of decisions with uncertain information. He serves as the Graduate Coordinator as well, and thus brings a useful perspective to student research and education dynamics. Prior to his work at the University of Florida, Dr. Kiker was a Research Physical Scientist for the U.S. Army Corps of Engineers from 2002-2005, based at the Engineer Research and Development Center’s Environmental Laboratory at the Waterways Experiment Station, in Vicksburg, MS. He also won the UF Institute of Food and Agricultural Sciences International Achievement Award in 2011; was a Fulbright Scholar to South Africa in 1992 and 2012; and won the Robert E. Stewart Engineering-Humanities Award from the American Society of Agricultural Engineers in 1988.

DR. JENNIFER KOCH

OK NSF EPSCoR RESEARCHER

Asst. Professor

Dept. of Geography & Environmental Sustainability

University of Oklahoma, Norman, OK

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Dr. Jennifer Koch has been an Assistant Professor in the University of Oklahoma's Department of Geography and Environmental Sustainability since August 2014. Her primary research interest is the development of integrated approaches for modeling and simulation of land systems, with applications for natural resource management, conservation planning, and sustainability solutions. Dr. Koch received her Ph.D. in environmental systems engineering from the University of Kassel in 2010, where she implemented an application of the LandSHIFT modeling framework for the Jordan River region. She also completed a Diplom (Univ.) in geoecology from the University of Bayreuth in 2005, majoring in ecological modeling and agricultural ecology. Before joining the University of Oklahoma, she was involved in several inter- and trans-disciplinary research projects. The Forests, People, Fire project focused on interactions, dynamics and adaptation in fire-prone landscapes of the eastern Cascades of Oregon. The integrated water resources management project GLOWA Jordan River provided scientific support for sustainable water management in the Jordan River region. Since joining the University of Oklahoma, Dr. Koch has continued her research in interdisciplinary settings. Besides her involvement with Oklahoma EPSCoR, she is part of the NSF-funded NRT titled "Aeroecology as a test-bed for interdisciplinary STEM training." She is a member of an interdisciplinary team conducting research on resilience in the Rio Grande Basin.

DR. JERRY MALAYER

EPSCoR STATE DIRECTOR

Assoc. Dean for Research & Graduate Education,
Center for Veterinary Health Sciences;
Professor, College of Veterinary Medicine
Oklahoma State University, Stillwater, OK

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Jerry R. Malayer, Ph.D., is the Associate Dean for Research & Graduate Education in the Center for Veterinary Health Sciences at Oklahoma State University, where he has been on the faculty since 1994. He is a Professor in the Department of Physiological Sciences in the College of Veterinary Medicine, and an Adjunct Professor in the Department of Biochemistry and Molecular Biology in the Division of Agricultural Science and Natural Resources. Dr. Malayer received Bachelor's and Master's degrees from Purdue University, and the Ph.D. from the University of Florida in 1990. He was the recipient of a National Research Service Award Postdoctoral Fellowship from the National Institutes of Health under the mentorship of Professor Jack Gorski at the University of Wisconsin-Madison. He is a member of the American Association for the Advancement of Science, the Society for the Study of Reproduction, Sigma Xi, and Phi Zeta, the Honor Society of Veterinary Medicine. He has served on Editorial Boards and been a scientific reviewer for numerous professional journals and funding agencies including the National Science Foundation, Department of Homeland Security, Defense Department and the USDA. Dr. Malayer is a member of the Oklahoma Science and Technology Council and the Health Research Committee of the Oklahoma Center for the Advancement of Science and Technology. He is a founding member of the Scientific Steering Committee of the Oklahoma Center for Adult Stem Cell Research, Past Chair of the Research Committee of the Association of American Veterinary Medical Colleges, State Executive Director for Oklahoma EPSCoR, and currently serves as Vice-Chair of the Board of Directors of the Coalition of EPSCoR States. Dr. Malayer has been the recipient of the Pfizer Animal Health Award for Research Excellence, the Oklahoma A&M Regent's Distinguished Research Award, and the Oklahoma State University Graduate and Professional Student Association Award for Excellence in graduate student mentoring. In 2006, he was selected for the American Council on Education Fellows Program, and in 2007, he was recognized as a Distinguished Alumnus by Purdue University. Dr. Malayer's research focuses on mechanisms of inter-and intra-cellular communication, the role of steroid receptors in the control of gene expression, and molecular approaches in the development of diagnostic technologies.

DR. HEATHER McCARTHY

OK NSF EPSCoR RESEARCHER

Asst. Professor

Dept. of Microbiology & Plant Biology

University of Oklahoma, Norman, OK

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Dr. Heather McCarthy is an Assistant Professor of Plant Biology in the Department of Microbiology and Plant Biology at the University of Oklahoma. Her research interests include: plant physiological ecology, global change ecology, urban ecology, ecohydrology and coupled human-natural systems. Her research largely explores how trees and forests respond to environmental changes and, conversely, how they can be managed to moderate environmental changes. This research draws on physiological and ecosystem ecology to explore how plant water and carbon cycle processes respond to global change factors, including changes in water availability, extreme weather events, elevated atmospheric CO2, and urbanization. Dr. McCarthy received her B.S. in environmental science at Oregon State University and her Ph.D. in ecology at Duke University, after which she was a postdoctoral fellow in the Department of Earth System Science at the University of California, Irvine.

DR. RENEE McPHERSON

OK NSF EPSCoR CO-LEAD RESEARCHER

Assoc. Professor,
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Co-Director, South Central Climate Science Center
University of Oklahoma, Norman, OK

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Dr. Renee A. McPherson is Associate Professor of Geography and Environmental Sustainability at the University of Oklahoma (OU) and University Co-director of the South Central Climate Science Center. She also is an Adjunct Associate Professor of Meteorology at OU. Dr. McPherson holds a B.S. in mathematics and B.S.,, M.S., and Ph.D. in meteorology. Her research includes regional and applied climatology, mesoscale meteorology, severe local storms, land-air-vegetation interactions, surface observing systems, applied meteorology, and societal and ecological impacts of climate variability and change. She teaches classes in climatology and physical geography, advises graduate students in their research and education, and mentors undergraduate students who are interested in research opportunities. Formerly, she was State Climatologist of Oklahoma and Acting Director of the Oklahoma Climatological Survey.

Dr. McPherson oversees the Consortium-related activities of the South Central Climate Science Center as a co-governing partner of the U.S. Geological Survey (USGS). Activities include coordination with USGS Headquarters, our USGS Director, our Consortium (Texas Tech University, Oklahoma State University, Chickasaw Nation, Choctaw Nation of Oklahoma, Louisiana State University, and NOAA's Geophysical Fluid Dynamics Laboratory), the six Landscape Conservation Cooperatives within our region, and the seven other Climate Science Centers. She has been principal or co-investigator on over $40 million of grants and contracts from federal and state agencies, universities, private companies, or non-governmental organizations. Dr. McPherson is a member of Phi Beta Kappa, the American Meteorological Society, American Geophysical Union, Association of American Geographers, and the American Association of State Climatologists. She was co-recipient of the Innovations in American Government Award (Harvard University) and Environmental Achievement Award (U.S. Department of the Interior), and she received the Vice President for Research Norman Campus Outstanding Research Engagement Award.

DR. HENRY NEEMAN

OK NSF EPSCoR RESEARCHER
Director, OSCER
Asst. Vice President, IT - Research Strategy Advisor
Assoc. Professor, Engineering
Adjunct Assoc. Professor, Computer Science
University of Oklahoma, Norman, OK

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Henry Neeman is the founding Director of the OU Supercomputing Center for Education and Research (OSCER), Assistant Vice President for Information Technology-Research Strategy Advisor, Associate Professor of Engineering, and Adjunct Associate Professor of Computer Science at the University of Oklahoma (OU).

He received his BS in Computer Science and his BA in Statistics, with a minor in Mathematics, in 1987 from the University at Buffalo, State University of New York, his MS in CS from the University of Illinois at Urbana-Champaign (UIUC) in 1990 and his Ph.D. in CS from UIUC in 1996.

Prior to coming to OU, Dr. Neeman was a postdoctoral research associate at the National Center for Supercomputing Applications (NCSA) at UIUC, and before that served as a graduate research assistant both at NCSA and at the Center for Supercomputing Research and Development, also at UIUC.

Dr. Neeman and his counterpart at Oklahoma State University, Dr. Dana Brunson, have been appointed joint co-leads of the Campus Engagement program of the Extreme Science and Engineering Discovery Environment (XSEDE), the umbrella organization over the National Science Foundation's national supercomputing centers.

He also collaborates with the Advanced Cyberinfrastructure Research and Education Facilitators (ACI-REF) project led by Clemson University and serves on the steering committee of the Linux Clusters Institute, as well as on the National Science Foundation's Advisory Committee for Cyberinfrastructure, where he leads the Working Group for Learning and Workforce Development.

DR. SILVIA SECCHI

OK NSF EPSCoR EXTERNAL ADVISORY BOARD MEMBER

Assoc. Professor,
Dept. of Geography & Environmental Resources;
Director, Environmental Resources & Policy Ph.D. Program
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Dr. Silvia Secchi is an Associate Professor in the Department of Geography and Environmental Resources and the Director of the interdisciplinary Ph.D. program in Environmental Resources and Policy at Southern Illinois University Carbondale. She holds a Ph.D. in economics from Iowa State University. She is a natural resource economist by training, and her work typically combines methodologies from the social sciences, the natural sciences and engineering. She has published on the environmental impacts of agricultural land use change in the Corn Belt, particularly water quality and carbon, and the interplay between agricultural, conservation and energy policies in the region. She has also co-authored articles on farmers' attitudes towards conservation, multifunctional floodplain management and targeted reconnection, invasive species management, and mitigation and adaptation to climate change in the agricultural sector.

Dr. Secchi is also interested in the methodology, pedagogy and epistemology of interdisciplinary inquiry. In particular, she is interested in the mentoring and training of graduate students, fostering the creation of new knowledge in interdisciplinary teams, and promoting effective science and policy communication, both internally within teams, and externally when engaging with stakeholders, funders, and society at large.

Dr. Secchi has been Principal Investigator or co-Principal Investigator on over 20 competitive research grants, largely funded by Federal and State agencies (e.g. NSF, USDA, Iowa Department of Natural Resources), and stakeholder organizations such as The Nature Conservancy, for over $7 million.

DR. CAROL SILVA

OK NSF EPSCoR RESEARCHER

Director, Center for Risk & Crisis Management
Co-Director, National Institute for Risk & Resilience
University of Oklahoma, Norman, OK

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Carol L. Silva earned her Ph.D. in political science and public policy from the University of Rochester (1998). She was previously employed by the University of New Mexico's Institute for Public Policy, the Department of Political Science, and the George Bush School of Government and Public Service at Texas A&M University. She is currently a member of the faculty in the Department of Political Science at the University of Oklahoma, she also serves as the Director of the Center for Risk and Crisis Management and the Co-Director of the National Institute for Risk and Resilience.

Dr. Silva's current research encompasses the intersection of a set of theoretical and methodological social science issues. She studies social valuation generally, and more specifically the translation of values into public choice. The empirical underpinnings of the social valuation and risk perception research are grounded in applied survey research methodologies and public policy analysis. The specific topics of research interest include: risk perception, environmental politics and policy; science and technology policy; climate, weather and social science, contingent valuation methodology; policy analysis; cost benefit analysis; risk analysis and assessment.

DR. XIANGMING XIAO

OK NSF EPSCoR RESEARCHER

Professor, Dept. of Microbiology & Plant Biology
Director, Earth Observation & Modeling Facility
Assoc. Director, Center for Spatial Analysis
University of Oklahoma, Norman, OK

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Xiangming Xiao is a Professor of Ecology and Remote Sensing in the University of Oklahoma Department of Microbiology and Plant Biology (http://mpbio.ou.edu). He earned a B.Sc. in biology from Xiamen University, Xiamen, China (1982); M.Sc. in ecology from the Graduate College, the University of Science and Technology, Beijing, China (1987); and the Ph.D. in ecosystem science from Colorado State University, Fort Collins, Colorado, USA (1994). Prior to his position at OU, he worked at the Marine Biology Laboratory at Woods Hole, Massachusetts; the Joint Program on the Science and Policy of Global Change, MIT; and the University of New Hampshire. He currently serves as a Subject-Matter Editor of Ecological Applications journal, and a Review Editor of EcoHealth journal. He has authored or co-authored 200 peer-reviewed journal papers and book chapters (Google Citations 9579, h-index = 55, i10-index = 119). He teaches Environmental Remote Sensing, Computational Remote Sensing, and Field Methods in Geospatial Technologies courses at OU. Dr. Xiao has been involved in diverse research areas of geospatial technologies, land cover and land use changes, terrestrial carbon cycle, wild bird ecology, water quality, hydrology, and climate as well as ecology and epidemiology of infectious diseases (e.g., highly pathogenic avian influenza). For example, his work monitors croplands, grasslands, forests, plantations, water, and urban in the world. He developed the satellite-based Vegetation Photosynthesis Model (VPM) that estimates gross primary production of vegetation across the world. He has collaborated with many researchers from USA and more than 20 other countries. Dr. Xiao leads an effort in crowdsourcing and citizen science, and manages a data portal (http://www.eomf.ou.edu) with 1+ petabyte online data storage, including the Global Geo-Referenced Field Photo Library, where people share, visualize and archive geo-referenced photos from the fields. As PI or Co-I, Dr. Xiao has been involved in 61 projects receiving a total of ~$248 million from federal agencies (e.g., NIH, NSF, NASA, USDA, USGS, and NOAA) since 1994; many of them are multi-institution and interdisciplinary projects, including the NIH-funded avian influenza projects (2007-2012, 2013-2017, $5 million), the DOI-funded South-Central Climate Science Center (~$4 million, 2011-2016), the NSF-funded CyberCommons for Ecological Forecasting (~$6 million, 2009-2013), the NSF-funded adapting socio-ecological systems to increased climate variability project (~$20 million, 2013-2018), the USDA-funded beef cattle production and climate change project (~$10 million, 2013-2018) and the microbe-climate interactions in croplands and grasslands project ($3 million, 2016-2020), and the NASA Geostationary Carbon Cycle Observatory (GeoCarb) project ($166 million, 2017-2022). Dr. Xiao currently directs the EOMF, which has 15 to 20 research scientists, post-doctoral associates, graduate students, and visiting scholars, and is comprised of spatial ecology and epidemiology laboratory, remote sensing laboratory, and computing and visualization laboratory. It operates at annual expenditure of ~$1.2 to $1.5 million federal grants.

DR. JAD ZIOLKOWSKA

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POSTER SESSION
HIGHLIGHTING CLIMATE VARIABILITY RESEARCH

ABSTRACTS

Abstracts may be accessed online after the conference at:
www.okepscor.org/research/presentations/2017-epscor-presentations-abstracts

CLIMATE RESEARCH

No.	Presenter	University	Scientific Poster Title
1	Timothy A. Clay	University of Tulsa	Transcriptomic Signatures Reveal Biomarkers for Understanding Amphibian Stress
2	Kundan Dhakal	Oklahoma State University	Constructing Gridded Daily Oklahoma Mesonet Data for Agro-Hydrological Applications
3	Russell Doughty	University of Oklahoma	Responses of Irrigated and Non-Irrigated Croplands to Drought and Drought Recovery
4	Julia Earl	Oklahoma State University	Effects of Climate Variability and Wetland Characteristics on Water Temperature
5	Benjamin J. Gray	Oklahoma State University	Oklahoman's Conceptions of Resilience and the Importance of Preparedness and Social Capital
6	Alexander J. Hess	University of Tulsa	Utilizing Native Isopods to Assess the Connectivity and Quality of Oklahoma Groundwater
7	Leon Hounnou	Oklahoma State University	Socio-Ecological Modeling and Prediction
8	Lifen Jiang	University of Oklahoma	Response of Tallgrass Prairie to Drought
9	V. Gopal Kakani	Oklahoma State University	Spatially Explicit Modeling of Switchgrass Net Ecosystem Exchange in Oklahoma
10	V. Gopal Kakani	Oklahoma State University	Modeling Impact of Climate Variability and Change on Winter Wheat Production in Oklahoma
11	Ron Miller	Oklahoma State University	Progress on the Kiamichi ENVISION Model
12	Esther D. Mullens	University of Oklahoma	Multi-Model Projections of Climate Hazards Affecting Transportation in the South Central United States
13	Cynthia Sanders	College of the Muscogee Nation	Hydrologic Comparisons of Oklahoma Rivers
14	Rheinhardt Scholtz	Oklahoma State University	Fire Shows Promise in Reducing Woodland Expansion in an Experimental Rangeland Within Oklahoma, USA
15	Michael Stanton	University of Oklahoma	Ethnographic Research in the Canadian Watershed of NW OK
16	Tony VanWinkle	University of Oklahoma	Woody Encroachment and the Ethnography of Community Composition in the Lower Cimarron Watershed
17	Yun Zhao	Oklahoma State University	Land Use Patterns in Areas of Significant Water-Level Decline Within the High Plains Aquifer of NW Oklahoma

POSTER #1

TRANSCRIPTOMIC SIGNATURES REVEAL BIOMARKERS FOR UNDERSTANDING AMPHIBIAN STRESS

Timothy A. Clay[1], Michael L. Treglia[1,2], Michael A. Steffen[1,3], Ana Lilia Trujano-Alvarez[1], and Ronald M. Bonett[1]
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Global biodiversity is decreasing at an alarming rate and understanding the factors that negatively impact population health is fundamental to addressing this epidemic. Diverse biomarkers have been developed to monitor human physiology and health, yet relatively few of these methods have been applied to wildlife. Plasma glucocorticoids are often used as an indirect measure of physiological stress in vertebrates, but these measures can be extremely dynamic and impractical to measure in small organisms. However, many genes are the targets of glucocorticoids and therefore monitoring gene expression patterns may yield consistent long-term signatures of stress across different environmental conditions. We tested for transcriptomic differences in tail tissue of stream-dwelling salamanders chronically exposed to glucocorticoids and different temperatures. Transcriptomics resulted in the sequencing of over 2000 genes, of which 51 were differentially expressed when exposed to corticosterone, including several known to be involved in immune responses in model systems. Subsequent qPCR analysis of a subset of genes revealed that many genes are robust to variation found while sampling wild populations such as differences in temperature, age, life history, and tissue type. To our knowledge, this is the first time that transcriptomics has been applied to identify stress associated genes in an amphibian system. The identification of these genes could provide useful biomarkers for identification of wild populations experiencing chronic stress.

POSTER #2

CONSTRUCTING GRIDDED DAILY OKLAHOMA MESONET DATA FOR AGRO-HYDROLOGICAL APPLICATIONS

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Most process-based agro-hydrological models require meteorological datasets with good spatiotemporal coverages. The study utilized daily weather data from 1997–2014, obtained from the Oklahoma mesonet, with an objective of creating daily gridded weather datasets for agro-hydrological applications. Daily meteorological variables were interpolated across Oklahoma using geoprocessing tools with python as scripting language. Ordinary kriging (OK) and empirical Bayesian kriging (EBK), with and without the use of climate imprints (CI – 30 yr mean). Due to unavailability of climate imprint for solar radiation (SRAD), only OK and EBK methods were implemented for prediction. Cross-validation metrics for all interpolation approaches showed R2 values of 0.99 and 0.98 for maximum (TMAX) and minimum temperature (TMIN), with mean absolute error (MAE) ranging from ±0.45–0.50°C for TMAX and ±0.77–0.80°C for TMIN. Likewise, R2 values of 0.94 and 0.93 showed overall good prediction accuracy for SRAD with MAE values 1.00 MJ m-2 d-1 and 1.01 MJ m-2 d-1for EBK and OK respectively. However, for rainfall, CI methods and IO methods yielded R2 value of 0.67 and 0.66. We also observed notable seasonal variation in different cross-validation metrics. Similar level of accuracy was observed among EBK-IO and EBK-CI outperforming OK-CI and OK-IO. Based on computational time and ease of interpolation, our comparisons suggest that Ordinary Krigging with a relatively straightforward approach may be sufficient to meet the need of daily gridded weather data set specific to the study area. Reconstructing of serially seamless datasets from this study can be valuable for regional agricultural, hydrological, and climate variability and change studies.

POSTER #3

RESPONSES OF IRRIGATED AND NON-IRRIGATED CROPLANDS TO DROUGHT AND DROUGHT RECOVERY

Russell Doughty[1], Xiangming Xiao[1], Yuanwei Qin[1], Yao Zhang[1], Xiaocui Wu[1], Zhenhua Zou[1], Rajen Bajgain[1], Yuting Zhou[1], and Jeff Basara[2]
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Terrestrial vegetation is the largest sink of atmospheric carbon at an annual net rate of about 2.6 GtC/yr-[1]. Human management of Earth's land can impact the terrain's ability to sequester atmospheric carbon through land cover and land use change (LCLUC). Recent research has shown that climate variability is increasing in Oklahoma. Therefore, it is essential to understand how the cycling of carbon and water by managed lands is responding to drought and drought recovery at large spatiotemporal scales. Croplands cover approximately 29.4% of Oklahoma's total land surface and make up the state's largest proportion of human managed lands. The gross primary production of any plant or ecosystem is primarily reliant upon sunshine, temperature, precipitation, and available nutrients. For croplands, annual gross primary productivity is also determined by crop species, rotation, and irrigation. Using remote sensing satellite data, this study analyzes annual gross primary production and evapotranspiration of irrigated and non-irrigated croplands for Caddo County and the Washita River Watershed in western Oklahoma from 2000 through 2014. The results of the analysis illustrates that: 1) irrigation buffers croplands from the effects of drought, 2) farms can be heavily impacted by drought, despite access to water for irrigation, and 3) offers evidence why farmers with access to additional water resources during dry periods may not be as affected by drought as those who do not have access to additional water resources.

POSTER #4

EFFECTS OF CLIMATE VARIABILITY AND WETLAND CHARACTERISTICS ON WATER TEMPERATURE

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Wetlands produce a variety of ecosystem services, including water retention and storage, flood control, water purification, and provision of habitat for game and nongame species. Climate change's effects on precipitation and air temperature will likely alter the production of these services through changes water volume, hydroperiod (i.e., how long the wetland contains water), and water temperature. Water temperature in particular can alter ecosystem processes, water quality, and the survival and growth of aquatic organisms. Climate change is expected to alter the mean, variability, and extremes for air temperature, but it is unclear how this will translate to water temperature in wetlands. To investigate this, we deployed temperature sensors (ibuttons) in depressional wetlands to record surface and benthic temperatures in central Oklahoma. We wanted to characterize and examine the effects of wetland characteristics (e.g. size, depth, vegetation) on water temperature variability and extremes. As expected, preliminary results indicate that water buffers the more extreme changes in air temperature with greater buffering at the bottom of wetlands with increasing depth than surface water. Very shallow wetlands (< 5cm) have maximum temperatures that are 3°C cooler than air and minimum temperatures that are 4°C warmer than air, reducing the range in temperature at both extremes. Deeper wetlands (~30-50cm) buffer maximum temperatures more than shallow wetlands with temperatures that are 5°C cooler than air at depth but are similar to shallow wetlands in their minimum water temperatures. Surface water temperatures were much more similar to air temperature with maximums only 1°C cooler than the air. This work will help us understand the effects of climate change wetlands and the ecosystem services they provide.

POSTER #5

OKLAHOMANS' CONCEPTIONS OF RESILIENCE AND THE IMPORTANCE OF PREPAREDNESS AND SOCIAL CAPITAL

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The data analyzed in this study were drawn from semi-structured interviews with emergency planners, first responders, municipal employees, landowners, and others to understand their conceptions of resilience and the factors they think contribute to individual and community resilience. The interviews were collected in the Cimarron, North Canadian, and Washita watersheds and focused on these areas' responses to destructive weather events and earthquakes. Respondents identified preparedness and the ability to coordinate a network of relationships (i.e. effective use of social capital) as important factors in "bouncing back" from disasters. Using MSIS-Net survey data, we compared measures of preparedness and social capital between watersheds and statewide averages to assess opportunities to strengthen these important factors in advance of the next emergency.

POSTER #6

UTILIZING NATIVE ISOPODS TO ASSESS THE CONNECTIVITY AND QUALITY OF OKLAHOMA GROUNDWATER

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Understanding the distribution and connectivity of groundwater and its relationship to surface flow is critical for management and conservation. Aquifer borders typically follow the extent of drainage basins, but are not necessarily correlated with surface relief and can change with fluctuating water tables. This study aims to assess native groundwater isopod distributions as a method to delineate watershed boundaries, as a tool to identify surface-groundwater interactions, and as a possible indicator of water quality. Due to their abundance, ease of collection, and wide distribution, aquatic isopods provide an excellent utility for mapping watershed connectivity. DNA sequence data has become a powerful tool for assessing organism distributions and can provide high-resolution maps of habitat connectivity. Genetic differences between drainages and aquifers in both surface and subsurface populations can provide a biological map of geologic connectivity between watersheds and their local groundwater sources. The geographic genetic distribution of isopod diversity will likely mirror the hydrologic connectivity and discontinuity within the region. By developing distributional maps of both surface and subterranean species throughout Oklahoma, the limits of surface and sub-surface drainage systems can be delineated. Identification of species-level environmental limits can be used to evaluate their use as a tool for understanding water quality. Continued monitoring of isopod species composition and density could serve as an indicator of changing groundwater chemistry.

POSTER #7

SOCIO-ECOLOGICAL MODELING AND PREDICTION: ECONOMIC IMPACT OF CLIMATE CHANGE ON THE IMPLEMENTATION OF BEST MANAGEMENT PRACTICES IN THE FORT COBB WATERSHED

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Climate change and non-point source pollution had led to an excessive sediment loads in the Fort Cobb Watershed. To reduce the amount of the sediment loads, extensive conservation practices such as using no-tillage management and conversion of cropland to grassland have been implemented in the Fort Cobb Reservoir watershed (Becker and Steiner, 2011). However, the economic impact of climate change on the optimal spatial distribution of these BMPs to reduce net revenue to producers is unknown.

The objective of this study is to determine the most cost effective selection and location of best management practices (BMPs) for farmland to reduce soil erosion and the delivery of sediment and phosphorus to the reservoir under current and future climate scenarios. Detailed conservation practices will be simulated with the Soil and Water Assessment Tool (SWAT) to determine yields, erosion, and phosphorus loss for each practice by each land use unit and location in the watershed. Linear programming will be used to determine the cost minimizing choice of BMP(s) for each land use unit that meets sediment and phosphorus targets for the watershed and the impact of climate change on this cost minimizing choice. This work will help guide policymakers and farmers in decision-making for the future regarding water quantity used and water quality downstream in the recreation area of Fort Cobb Reservoir.

Key words: Watershed, Best Management Practices (BMPs), optimal choice, climate change, SWAT, linear programming.

References:

Becker and Steiner. 2011. “Integrated Science to Support the Assessment of Conservation Practices in the Fort Cobb Watershed, Southwestern Oklahoma.” Scientific Investigations Report 2010-5257.

POSTER #8

RESPONSE OF TALLGRASS PRAIRIE TO DROUGHT

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Future climate will be characterized by increased frequency and intensity of extreme events, such as severe droughts. These unprecedented climate extremes will impact ecosystem functioning. However, the existing observations and experiments are not adequate to fully evaluate impacts of future climate extremes on ecosystem functions. We conducted a drought experiment at Kessler Atmospheric and Ecological Field Station (KAEFS) of the University of Oklahoma in 2016. The experiment was set up to study responses of prairie ecosystems to altered precipitation, specifically drought impacts. The seven levels of precipitation treatment: 0%, 20%, 40%, 60%, 80%, 100%, and 150% of ambient precipitation and nested clipping subplots aim to look at how the alterations of precipitation will interact with clipping to affect prairie ecosystem structure and function. The clipping treatment is to mimic hay harvesting, one of the dominant land uses in this region. During the first year's measurements, most of the variables examined, such as aboveground net primary production and carbon fluxes, did not exhibit significant changes in response to precipitation treatments. However, belowground net primary production increased with the reduction of precipitation, but started to decrease from -80% treatment. In both clipped and unclipped plots, biodiversity was higher with water addition, and lower under water reduction. The response to precipitation treatments was typically greater than that of clipping. Clipping, rather than water condition, promoted specific root length at shallow (0-15cm) but not deeper soils (15-45cm). More interestingly, in clipped plots, after clipping in early fall, coverage, NDVI and plant height all showed significant decline with the reduction of precipitation. Our results provided insight on responses of tallgrass prairie to gradient reduction of precipitation, including drought.

POSTER #9

SPATIALLY EXPLICIT MODELING OF SWITCHGRASS NET ECOSYSTEM EXCHANGE IN OKLAHOMA

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Identification and development of carbon-neutral or carbon-negative alternative fuel is an urgent global priority to combat increasing atmospheric carbon dioxide (CO_2) concentration. Source-sink status of seasonal (April to October) spatial estimates of organic carbon available for storage in a switchgrass ecosystem in Oklahoma that is consistent from plot to regional scale was assessed. We used an empirical approach to calculate net ecosystem production (NEP) of switchgrass (*Panicum virgatum* L.) using detailed meteorological measurements at representative local sites, and analyzed its spatial and temporal patterns in potential switchgrass production sites in Oklahoma, USA. Estimates of NEE were based on the parameters inferred from half-hourly CO_2 flux measurements using eddy covariance technique. Approximation of potential switchgrass production area in Oklahoma was done reclassifying NASS Crop Data Layer in ArcGIS. Thirty-minute interval weather data for 120 weather stations across Oklahoma from 2008 to 2014 was processed from the Oklahoma Mesonet observations. Based on eddy covariance measurements, empirical models, a) rectangular hyperbolic light-response curve and b) temperature response functions were fitted to estimate gross ecosystem production (GEP) and ecosystem respiration (ER) on a seasonal scale. Seasonal average net ecosystem production (NEP) ranged from 2.3 t C ha^{-1}–6.9 t C ha^{-1}. Results based on a simple linear model analysis suggested that there were significant differences in NEP between years. The study indicates that this new scaling-up exercise involving high temporal resolution meteorological data may be useful tool for assessing spatiotemporal heterogeneity of the potential to sequester carbon in Oklahoma grasslands.

POSTER #10

MODELING IMPACT OF CLIMATE VARIABILITY AND CHANGE ON WINTER WHEAT PRODUCTION IN OKLAHOMA

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Winter wheat is grown in 2 M ha, about 75% of arable land, in Oklahoma. The variability in climate, latitudinal gradient in temperature and longitudinal gradient in precipitation and solar radiation, leads to average wheat yields of 3.5 Mg ha^{-1} in west to about 7.0 Mg ha^{-1} in east. Modeling the spatiotemporal variability in yield will help to understand the causes of yield variability, help to minimize yield gap, and develop options to improve wheat productivity and production in OK. We hypothesize that using environmental and climatic data from multiple geospatial data gateways, we can extrapolate results from field and plot based experiments to a regional scale in current and future climate scenario(s). Daily input climate data was developed from MESONET/DAYMET and CMIP5 for current and future climates, respectively. We derived soil data from gSSURGO and agronomic data from NASS Crop Data Layer and OSU wheat extension program. Crop-Model CERES-Wheat was calibrated using field studies with variety 'Duster' at Stillwater, OK and weather data from MESONET. Long-term daily weather data from Mesonet and DAYMET were used to simulate wheat yields from 1980-2015 in Oklahoma, and were compared with NASS wheat yields. Future wheat yields were simulated using downscaled daily weather data, from 2040-2060, derived from MarkSim Weather generator and CMIP5 projections, under RCP6.0 and RCP8.5, using four individual GCMs, ensemble of four GCMs, and ensemble of 17 GCMs used in CMIP5. Prediction accuracy (R^2) of NASS yield ranged from 0.3 to 0.8 depending on the production region in OK. Future climates resulted in 2-10% reduction in potential yield of cultivar 'Duster'. Further, adaptation options through breeding and agronomy can be explored along with crop models to improve wheat production in Oklahoma.

POSTER #11

PROGRESS ON THE KIAMICHI ENVISION MODEL

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Water use, climate change and economic development are important in every region of Oklahoma, but these processes and their interactions influence human and natural systems at an individual and local scale. The agent-based modeling (ABM) approach is valuable for its ability to integrate environmental and socioeconomic data into a coupled model of the complex feedbacks between human and natural systems. The Oklahoma EPSCoR project identified ENVISION as a platform to systematically integrate models of environmental and human processes developed by various research universities, organizations and agencies. Kiamichi watershed resident and stakeholder concerns include economic development, water export, water supply and stream habitat quality. In addition, these issues are likely to be influenced by climatic changes. This poster will show how these issues are being integrated into the ENVISION platform to describe changes in the Kiamichi watershed, and how stakeholder-driven scenarios can be inputted into the platform to predict outcomes that can serve as the foundation for informed decisions.

POSTER #12

COME RAIN OR SHINE: MULTI-MODEL PROJECTIONS OF CLIMATE HAZARDS AFFECTING TRANSPORTATION IN THE SOUTH CENTRAL UNITED STATES

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This work provides a future climate assessment for relevant climate hazards affecting the Department of Transportation's Region 6, in the South Central U.S. Expert input on key weather and climate hazards and their thresholds were established from a stakeholder survey. Two diverse statistically downscaled climate model datasets were used, for a total of 21 model projections, two couple model inter-comparisons (CMIP3, and CMIP5), and four emissions pathways (A1Fi, B1, RCP8.5, RCP4.5). Specific hazards investigated include winter weather, freeze-thaw cycles, hot and cold extremes, and heavy precipitation. Projections for each of these variables were calculated for the region, utilizing spatial mapping, and time series analysis at the climate division level.

The results suggest that cold-season phenomena such as winter weather, freeze-thaw, and cold extremes, decrease in intensity and frequency, particularly with the higher emissions pathways. Nonetheless, inter-model and downscaling method yields variability in magnitudes, with the most notable decreasing trends late in the 21st century. Hot days show a pronounced increase, particularly with greater emissions, producing average annual conditions by late 21st century analogous to the 2011 heatwave over the central Southern Plains. Return period frequencies of heavy precipitation show marked increases in frequency and magnitude, while the mean precipitation accumulations show much smaller, more regionally specific, and more inconsistent trends. Precipitation hazards (e.g., winter weather, extremes) diverge between downscaling methods and their associated model samples much more substantially than temperature, suggesting that the choice of global model and downscaled data is particularly important when considering region-specific impacts for precipitation.

These results are intended to inform region transportation professionals of the susceptibility of the area to climate extremes, and to be a resource for assessing and incorporating changing risk probabilities into their planning processes.

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POSTER #13

HYDROLOGIC COMPARISONS OF OKLAHOMA RIVERS

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Water is essential for all life. Function capacities of aquatic systems are a current concern. A hydrological comparison of selected water sites for the Deep Fork Creek, Neosho, Arkansas, and North Canadian. The movements of water and drought concerns were the major focuses of the inquiry. Infiltration analysis included use of plots and watershed data. The results indicate that sources from the Arkansas and Neosho indicate move evidence of soil erosion potentially due to water movement.

POSTER #14

FIRE SHOWS PROMISE IN REDUCING WOODLAND EXPANSION IN AN EXPERIMENTAL RANGELAND WITHIN OKLAHOMA, USA

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Woodland expansion is a global phenomenon that despite receiving attention in recent years remains poorly understood. Landscape change of this magnitude has had several impacts on landscape processes, such as influencing fire regimes, habitat for wildlife and hydrological processes. Furthermore, woodland expansion is evident over numerous landscape types, on several continents under various climates. It is therefore imperative we seek a salient solution to reduce or slow down further woodland expansion and associated landscape change. We aimed to quantify woodland expansion in an experimental rangeland in central Oklahoma, USA under three treatments: 1) herbicide, 2) herbicide + fire and 3) control only within areas classified as “open grassland” in 1974. Thereafter, we identified these same areas in 2010 with remotely sensed imagery (LiDAR) to a) quantify total encroachment and b) by size three classes: i) 1-2.5m, ii) 2.5-4.5m and iii) >4.5m. Main results show that of the total area classified as “open grassland” in 1974 (277.64 ha), 31% had experienced an increase in woody plants by 2010. The herbicide-only treatment was 44% encroached but when fire was included, encroachment was 24%. The control (no fire, no herbicide) experienced 61% encroachment. Each treatment experienced a similar rate of encroachment across height classes. The 1-2.5m height class encroachment average was 23.46±2.29%, the 2.5-4.5m height class encroachment average was 31.53±1.10 and the >4.5 m height class encroachment average was 45±3.5%. Given the low variation within each height class suggests that active treatments (herbicide and fire + herbicide) were equally ineffective at controlling further woodland expansion. Costly practices such as herbicide application therefore do not provide a practical solution to reduce further woodland expansion. However, in combination with fire, woodland expansion was still evident, but considerably lower than in herbicide only treatments. Therefore, we conclude that fire can reduce further encroachment.

POSTER #15

ETHNOGRAPHIC RESEARCH IN THE NORTH CANADIAN WATERSHED OF NORTHWESTERN OKLAHOMA

Michael Stanton
Center for Applied Social Research
University of Oklahoma, Norman, OK

This poster summarizes the preliminary findings of ethnographic fieldwork in the North Canadian Watershed of northwestern Oklahoma. While living, and working in the North Canadian Watershed, ethnographic research has provided a body of data built on a methodology combining information from in-depth interviews, participant observation, and archival research. The geographic focus of this research has been primarily in Woodward, Harper, and Beaver Counties, an area of the watershed following the North Canadian/Beaver River from Canton Lake, northwest to the town of Beaver. This research focuses on the socio-ecological impacts of changing land and resource use patterns over time and how those changes have shaped perceptions of risk and subsistence strategies within the watershed. Ranching/farming is the dominant industry practiced by many interviewees but, oil and gas extraction, and wind energy are also important industries in the region. There is a complex interaction among social and ecological issues in the region that include a downturn in the oil and gas industry, uncertainties in the future of wind energy, water availability and allocation, and the impacts of drought and wildfires in the region.

POSTER #16

FIRE, FENCES, AND FRAGMENTATION: WOODY ENCROACHMENT AND THE ETHNOGRAPHY OF COMMUNITY COMPOSITION IN THE LOWER CIMARRON WATERSHED

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Encroachment of eastern redcedar (*juniperus virginiana*) onto rangelands in Oklahoma's Lower Cimarron Watershed (and elsewhere) has become a major concern among landowners, resource managers, and scientists. While the ultimate cause of this "green glacier" is most often attributed to fire suppression following Euro-American settlement of the region, scientific explanations for subsequent contributing factors often revolve around climatic and/or edaphic conditions. Multi-level, in-situ ethnographic research, however, has revealed that socio-cultural changes in intimate management practices, local micro-economies, and occupancy patterns are a major driver of shifting species compositions, especially redcedar encroachment in formerly utilized rangeland and/or cropland. This poster summarizes these finding, demonstrating the ways that applied social science research contributes to interdisciplinary understandings of socio-ecological systems.

POSTER #17

LAND USE PATTERNS IN AREAS OF SIGNIFICANT WATER-LEVEL DECLINE WITHIN THE HIGH PLAINS AQUIFER OF NORTHWESTERN OKLAHOMA

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The US Geological Survey estimates that total water storage in the High Plains Aquifer has decreased by eight percent since 1950, with 25 percent of the aquifer experiencing saturated thickness declines of over 10 percent. Despite policy interventions and conservation efforts water loss continues as farmers and ranchers rely on the aquifer to sustain production while managing the pressures of a variable climate. Examining the six Northwestern Oklahoma counties located within the High Plains Aquifer, this research analyzes linkages between spatial patterns of water-level change and land use. While prior research on this location identifies agriculture as a primary driver of total aquifer drain, studies have yet to statistically examine spatial-temporal patterns of water-level change and geographic variation in land use patterns within those areas. Linking land use patterns and the ecological process of water-level change will facilitate engagement with policy makers and community members ultimately responsible for management of this depleting commons resource.

CLIMATE RESEARCH

The Oklahoma NSF EPSCoR Research Infrastructure Improvement Award No. OIA-1301789 (2013-2018), "Adapting Socio-Ecological Systems to Increased Climate Variability," is a multi-institutional collaborative project that includes researchers from Oklahoma State University, Samuel Roberts Noble Foundation, University of Oklahoma and University of Tulsa.

The knowledge gained from this project will be used to empower managers to effectively adapt social and ecological systems to climate variability, to educate Oklahomans about the expected consequences of regional environmental change, and as a foundation for future climate researchers' work.

ADAPTING SOCIO-ECOLOGICAL SYSTEMS TO INCREASED CLIMATE VARIABILITY

Oklahoma's unpredictable weather and large precipitation gradient work together to create a vulnerable and diverse landscape that is exceptionally well-suited for the climate-based research that Oklahoma NSF EPSCoR scientists are performing. Five study areas have been identified: North Canadian River watershed, Cimarron River watershed, Washita River watershed, Kiamichi River watershed, and the Oklahoma City metropolitan area.

The research team, representing more than a dozen disciplines and four institutions from across the state, is working to advance understanding of how socio-ecological systems can adapt sustainably to increased climate variability, especially as it relates to drought and water resource management.

An Integrated Approach

EPSCoR scientists are examining complex human, climate and natural resource systems while addressing three interlinked research focus areas: an observatory network, a modeling and prediction system, and a decision support system. The innovative project addresses each of the research objectives in tandem, as well as their collaborative interactions.

EPSCoR SCIENTISTS ARE FORGING NEW PATHS IN SOCIO-ECOLOGICAL RESEARCH.

DEFINING THE PROJECT

Oklahoma NSF EPSCoR's socio-ecological system research studies how humans and the environment interact with one another and how those relationships can adapt to changes in climate. As an example, drought conditions are expected to increase with climate variability. How will farmers' use of water resources change during times of drought compared to current use patterns? This and other important questions are being addressed through the EPSCoR RII award's research.

Photos courtesy of Oklahoma State University

RESEARCH OBJECTIVES

The Oklahoma NSF EPSCoR project is innovative in addressing each of the research objectives in tandem, as well as their interactions.

ADAPTING SOCIO-ECOLOGICAL SYSTEMS TO INCREASED CLIMATE VARIABILITY

Socio-Ecological Observatory

Establish a first-of-its-kind, statewide, socio-ecological observatory network designed to provide a systems-level understanding of the coupled human and natural system under a variable climate.

In addition to existing data that are being used in the Observatory, EPSCoR researchers are currently developing the following new datasets:

- Societal perceptions of climate and weather events from a first-of-its-kind longitudinal survey
- Streamflow diagrams
- Runoff and groundwater recharge from new micro-catchments
- High-resolution soil moisture maps from the new cosmic-ray neutron rover

Pictured left: Installing micro-catchments to aid in understanding runoff and groundwater recharge patterns

DECISION-SUPPORT SYSTEM

Create a decision-support system that provides researchers, educators and practitioners with data, models, tools and scenarios that are needed to explore and understand the social and ecological impacts of management and policy decisions.

Some cyber tools being developed:

- Water Data Portal www.oklahomawatersurvey.org
- Watershed-specific websites
- CyberCommons online access of research data
- New decision tools for water planning

Pictured above: Cosmic-ray neutron rover, currently in the testing stage, will be used to map soil moisture. Photo credit: Yohannes Tadesse Yimam

Pictured right: A surface flux tower is deployed to measure water and carbon exchanges between the atmosphere and land surface.

Photo credit: Jeff Basara, University of Oklahoma

Socio-Ecological Modeling and Prediction System

Develop a fully integrated modeling and prediction system based on Observatory data to predict future socio-ecological scenarios. Qualitative and quantitative approaches will be used to systematically examine insights from disciplinary and integrated perspectives.

FOR MORE PROJECT INFORMATION

VISIT WWW.OKEPSCOR.ORG OR CALL 405.744.9964

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STIMULATING OKLAHOMA

Oklahoma NSF EPSCoR research projects have led to the development of innovative scientific products, providing substantial social and economic benefits to the state. From nanotechnology-based infrared lasers to the current research focus of climate variability, EPSCoR researchers are performing cutting-edge science and making a difference in Oklahoma and the world.

EPSCoR outreach and education programs reached more than 14,000 Oklahomans in 2016. Individuals representing every group within the science, technology, engineering and math (STEM) pipeline were served to ensure that the state's emerging high tech businesses and research labs will have a highly qualified and diverse applicant pool to draw from in the foreseeable future.

NEW SCIENTIFIC RESEARCH FUNDING

Oklahoma NSF EPSCoR RII Track-1 Awards		New Funds Generated *Does not include NSF RII Award or State Funds*
2001-2008	$15,970,000	$ 50,000,000
2008-2013	$15,000,000	$ 70,500,000
2013-2016	$16,000,000	$330,538,000
Total	**$46,970,000**	**$451,038,000**

RADIATION MONITORING

1.8 MILLION PEOPLE PROTECTED
$104 MILLION GENERATED LAST YEAR

A radiation dosimeter that is now used in hospitals and nuclear facilities worldwide is the result of EPSCoR-initiated research. Last year more than 1.8 million workers were protected from radiation exposure by the monitoring device. The product generated over $104 million in revenue during fiscal year 2016.

GROUNDBREAKING BIOENERGY RESEARCH

Oklahoma NSF EPSCoR's groundbreaking cellulosic bioenergy research has the potential to generate the development of biorefineries, which are estimated to CREATE 135,000 NEW JOBS & GENERATE $13.6 BILLION/YR FOR THE ECONOMY

STATE-OF-THE-ART WEATHER PREDICTION

$12 MILLION/YR REVENUE & 63% GROWTH RATE

EPSCoR-funded weather research has led to the creation of a private company that is a global leader in state-of-the-science weather detection and forecasting services. The company, which has shown three-year growth of 63 percent and revenue of $12 million in 2015, provides industries, such as airlines, with accurate weather information that saves energy and raises profits.

The Oklahoma Experimental Program to Stimulate Competitive Research was established by the National Science Foundation in 1985 to strengthen Oklahoma's exploration and growth in science, technology, engineering and mathematics.

CYBER OKLAHOMA: A NATIONAL MODEL

Every researcher in Oklahoma has access to state-of-the-art supercomputing facilities through the OneOklahoma Cyberinfrastructure Initiative. Recognized as a national model for intrastate collaboration, the initiative has served over **100 institutions** and facilitated over **$200 million in external funding**.

GROWING TECH-BASED COMPANIES

The Oklahoma nanotechnology industry, which was underpinned by EPSCoR research, has grown to more than **20 companies**. Some other tech advances based on EPSCoR funding include: **120 new technologies** resulting in **18 new companies**; **34 patents granted**, and **9 copyrights issued** resulting in **9 products marketed.**

SUPPORTING STUDENTS & EDUCATORS

More than **32,400 K-12 students** have benefited from Oklahoma EPSCoR STEM education and outreach programs, while over **1,400 teachers** received training, support, and curriculum to enhance students' educations (2009-present). Oklahoma universities have benefited from the hiring of **25 new faculty members**; these important research and teaching posititions would not have been possible without EPSCoR support.

CURRENT ACTIVE OKLAHOMA EPSCoR/IDeA AWARDS

Program	Award	Amount	Type of Award	
NSF	EPSCoR	$24.0 Million	Research Infrastructure	1 Award
NIH	IDeA	$19.4 Million	INBRE	1 Award
NIH	IDeA	$89.2 Million	COBRE	9 Awards
NIH	IDeA	$20.3 Million	OSCTR	1 Award
NASA	EPSCoR	$ 3.6 Million	Research Infrastructure	4 Awards

TO LEARN MORE ABOUT OKLAHOMA EPSCoR RESEARCH, EDUCATION & OUTREACH

VISIT WWW.OKEPSCOR.ORG OR CALL 405.744.9964

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