Oklahoma NSF EPSCoR 2018 Annual State Conference

TUESDAY, APRIL 24, 2018 * EMBASSY SUITES HOTEL * OKLAHOMA CITY, OK

Adapting Socio-Ecological Systems to Increased Climate Variability

NSF Grant
OIA-1301789

Oklahoma NSF EPSCoR
2018 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)

8:30 A.M. **Extreme Weather Preparedness in Oklahoma: An Empirical Test of Social Vulnerability and Adaptive Capacity**
Joseph Holler, Asst. Professor, Dept. of Geography, Middlebury College

9:00 A.M. **Building Oklahoma's Ability to Explore and Understand the Social and Ecological Impacts of Management and Policy Decisions**
Peter Kedron, Asst. Professor, Dept. of Geography, OSU

9:20 A.M. **An Overview of Sociological Contributions to the Oklahoma NSF EPSCoR Project**
Duane Gill, Professor, Dept. of Sociology, & Director, Center for the Study of Disasters & Extreme Events, OSU

9:40 A.M. **Connecting Earth and Sky: Using Cultural Models to Understand and Communicate**
Benjamin Gray, Postdoctoral Fellow, Dept. of Sociology, OSU

10:00 A.M. **Networking Break** *(20 minutes)*

OBSERVING SOCIAL SYSTEMS IN A CHANGING CLIMATE, CONT. (Ballroom C/D)

10:20 A.M. **The Oklahoma M-SISNet: Where We've Been and Where We're Going**
Hank Jenkins-Smith, Professor, Politcal Science; Co-Director, Center for Risk & Crisis Management, OU
Joe Ripberger, Deputy Director for Research, Center for Risk & Crisis Management, OU
Carol Silva, Professor, Political Science; Director, Center for Risk & Crisis Management, OU

10:40 A.M. **Vulnerabilities and Resilience Across Oklahoma: A Summary of Findings From a Multi-Year, Socio-Ecological Assessment of Climate Change Threats to Communities in Four Watersheds in Oklahoma**
Jack Friedman, Research Scientist, Center for Applied Social Research, OU
Mike Stanton, Postdoctoral Fellow, Center for Applied Social Research, OU

OBSERVING ECOLOGICAL SYSTEMS IN A CHANGING CLIMATE (Ballroom C/D)

11:10 A.M. **Landscapes as Moderators of Thermal Conditions: Implications for Ecological Patterns and Processes**
Evan Tanner, Postdoctoral Fellow, Dept. of Natural Resource Ecology & Management, OSU

11:30 A.M. **Woody Plant Dynamics in Fragmented Landscapes of the Great Plains, USA**
Rheinhardt Scholtz, Postdoctoral Fellow, Dept. of Natural Resource Ecology & Management, OSU

- agenda continued on next page -

Oklahoma NSF EPSCoR
2018 Annual State Conference Agenda

(Agenda, Continued)

OBSERVING ECOLOGICAL SYSTEMS IN A CHANGING CLIMATE, CONT. (Ballroom C/D)

11:50 A.M. **Understanding Long-term Juniper Forest Encroachment into Grasslands in Oklahoma and the Consequences on Local Climate, Primary Production, and Evapotranspiration**
Jie Wang, Postdoctoral Fellow, Dept. of Microbiology & Plant Biology, OU

LUNCHEON (Included for all registered guests; Ballroom A/B)

12:10 P.M. **Networking Luncheon**

12:45 P.M. **Luncheon Speaker: Tim VanReken, Program Director, National Science Foundation**
NSF EPSCoR Update

SOCIO-ECOLOGICAL DECISION SUPPORT IN A CHANGING CLIMATE (Ballroom C/D)

1:30 P.M. **Progress and Prospects for Soil Moisture Monitoring and Applications in Oklahoma and Beyond**
Tyson Ochsner, Assoc. Professor, Dept. of Plant & Soil Sciences, OSU

1:50 P.M. **Impacts of Weather Variability on Soil Moisture and Groundwater in Oklahoma: Interactive Geospatial Analysis and Decision-Support Tools**
Jadwiga Ziolkowska, Asst. Professor, Dept. of Geography & Environmental Sustainability, OU

POSTER SESSION (Atrium)

2:10 P.M. **Poster Session Highlighting Climate Variability Research and Water-Related Modeling**

3:10 P.M. **Networking Break** *(15 minutes)*

3:25 P.M. **Posters Taken Down**

SOCIO-ECOLOGICAL INTEGRATED MODELING (Ballroom C/D)

3:30 P.M. **The Kiamichi Envision Model: Results and Utility**
Ron Miller, Postdoctoral Fellow, Dept. of Biosystems & Agricultural Engineering, OSU

3:50 P.M. **Perceptions of Academic and Government Expert Groups in Watershed Management: A Case of the Cimarron River Watershed, Oklahoma, USA**
Gehendra Kharel, Postdoctoral Fellow, Dept. of Natural Resource Ecology & Management, OSU

OUTREACH AND EDUCATION (Ballroom C/D)

4:10 P.M. **2017 Cameron University Engineering and Applied Mathematics Summer Academy: Student Enrichment and Engagement by the Engineering Design Process**
Sheila Youngblood, Asst. Professor, Dept. of Chemistry, Physics & Engineering, CU

4:30 P.M. **Adjourn**

OKLAHOMA EPSCoR

OKLAHOMA STATE REGENTS FOR HIGHER EDUCATION
Improving our future by degrees

NSF Grant No. OIA-1301789

Presenters' Bios

DR. JACK FRIEDMAN

Research Scientist in Cultural Anthropology
Center for Applied Social Research
University of Oklahoma, Norman, OK

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Dr. Jack R. Friedman (Ph.D. Duke University 2003) is a research scientist at the Center for Applied Social Research at the University of Oklahoma. Dr. Friedman is a cultural anthropologist who received training in psychological anthropology, economic/political anthropology, and medical anthropology. In addition, he has extensive experience designing, leading, and conducting research on topics related to environmental, ecological, and coupled natural-human systems, with a special focus on water limited environments and the impacts of climate change on socioecological systems. Dr. Friedman's research projects share a focus on understanding communities and individuals under stress – whether this is caused by economic collapse, political disorder, medical stressors, natural disasters, or environmental stressors. His expansive research experience includes conducting multi-year research projects on unemployment in Romania; mental health care and systems in California, Oklahoma, and Romania; tornadoes and meteorologists in the Great Plains and the Southeast; as well as work across four watershed in Oklahoma (as part of the 2013-2018 OK NSF EPSCoR) and across the full length of the Rio Grande/Rio Bravo.

DR. DUANE A. GILL

Regents Professor of Sociology
Director, Center for the Study of Disasters & Extreme Events
Oklahoma State University, Stillwater, OK

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Duane A. Gill is Regents Professor of Sociology and Director of the Center for the Study of Disasters and Extreme Events at Oklahoma State University. He was part of a research team that investigated impacts of the 1989 Exxon Valdez oil spill through a series of longitudinal studies spanning 24 years. He led an NSF-funded research project to document and understand impacts of the 2010 BP Deepwater Horizon oil spill in coastal Alabama. Dr. Gill collaborated on several studies of Hurricane Katrina and organized and led a Katrina Summit that brought together national and local disaster scholars to discuss research needs and approaches to the disaster. These research activities generally seek to understand community capacity to respond to and recover from disasters, as well as ways to enhance community preparedness and resilience. Dr. Gill is a Fulbright Scholar, having spent the 1998-99 academic year at the University of Bahrain and the Fall 2015 semester as a Visiting Research Chair in Native Studies at the University of Alberta in Canada.

DR. BENJAMIN GRAY

Postdoctoral Fellow
Dept. of Sociology
Oklahoma State University, Stillwater, OK

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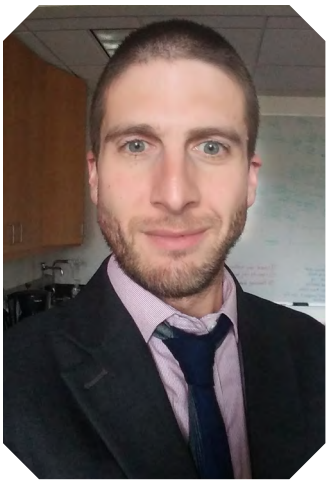
Dr. Benjamin J. Gray is a post-doctoral fellow in the Sociology Department at Oklahoma State University. He received his Bachelor's Degree in Anthropology from Rollins College in Winter Park, Florida and his Master's and Doctorate Degrees in Anthropology from the University of Kansas. Dr. Gray's training at Kansas benefitted from participating in the Kansas EPSCoR program.

Dr. Gray is an applied anthropologist who studies environmental decision making with an emphasis on the intersection of social, environmental, and technical factors. His dissertation research examined the ways that cultural values, irrigation technology, and the characteristics of the Ogallala Aquifer influenced farmers' decisions in southwest Kansas. At Oklahoma State University, his focus has expanded to include perspectives on how individuals and communities prepare for and respond to natural hazards. Using extensive interviews with officials responsible for disaster preparedness, response, and recovery, he is researching aspects of climate change denial and is participating in the design of decision-support tools that will assist officials in their efforts to encourage individuals to engage in emergency preparation. In collaboration with colleagues from the University of Oklahoma, Dr. Gray is also implementing a program to improve small and minority farmers' and ranchers' resilience to extreme weather events.



DR. JOSEPH HOLLER

Asst. Professor of Geography
Dept. of Geography
Middlebury College, Middlebury, VT

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I research social vulnerability and adaptation to global environmental change and natural hazards as a human geographer and geographic information scientist. I earned my Bachelor of Arts degree from Ithaca College in 2003, with majors in media studies, computer science, and anthropology/archeology. After graduation, I joined the U.S. Peace Corps in Tanzania to teach math and information technology in secondary schools. Completing two years of service, I sought opportunities to study the structural causes of poverty and environmental degradation I had observed. I enrolled in the Geography Doctoral Program and NSF IGERT Fellowship in Geographic Information Science (GIScience) at the University at Buffalo, where I integrated studies of GIScience, economic geography, and ecosystem conservation/restoration to study social adaptation to environmental change on Mount Kilimanjaro. I completed my degree in 2012 and started teaching human geography and GIS at the University of Mary Washington and Middlebury College, while working on summer research and teaching projects at Brown University. My current research interest is in modelling social vulnerability to natural hazards and environmental change by integrating geographic indices of social vulnerability with geographic data on exposure and micro-scale evidence of harm and adaptation.

DR. RAY HUHNKE

Oklahoma NSF EPSCoR Project Director & PI
Director, Biobased Products & Energy Center
Professor 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 2015, 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 or Co-Principal Investigator on nearly $70 million in grants and contracts from federal, state, university and private sources. Dr. Huhnke has authored or co-authored over 90 journal articles, two patents, three book chapters, over 60 educational videos and CDs, 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. HANK C. JENKINS-SMITH

Professor of Political Science
Director, Center for Energy, Security & Society
Co-Director, National Institute for Risk & Resilience and
Center for Risk & Crisis Management
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 has been employed as a policy analyst in the DOE Office of Policy Analysis (1982-83), and previously served on the faculty of Southern Methodist University, the University of New Mexico, and Texas A&M University. He is a George Lynn Cross Research Professor in the Department of Political Science, and serves as co-Director (with Dr. Silva) of the National Institute for Risk and Resilience. He is also the Director of the Center for Energy, Security and Society, and co-Director of the Center for Risk and Crisis Management.

Professor Jenkins-Smith has published books, articles and reports on public policy processes, risk perception, national security, and energy and environmental policy. He has served on National Research Council Committees focused on policies to transport spent nuclear fuel and disposal of chemical weapons, and he currently serves as an elected member on the National Council on Radiation Protection and Measurement and the American Political Science Association. In 2012, he gave several presentations to the Blue Ribbon Commission on America's Nuclear Future to assist in the Commission's deliberations on public acceptance of new initiatives in nuclear facility siting.

Dr. Jenkins-Smith's current research focuses on theories of the public policy process, with particular emphasis on the management (and mis-management) of controversial technical issues involving high-risk perceptions on the part of the public. He applies a variant of Cultural Theory (as advanced by anthropologist Mary Douglas and political scientist Aaron Wildavsky) to understand variations in public understanding and response to a range of societal risks, including climate change, nuclear technologies, natural disasters, radioactive materials, vaccines, and others. As part of this work he has fielded a series of national surveys since 1993 focusing on public understanding and preferences regarding nuclear security, accompanied by a more recent series (starting in 2006) focusing on energy, environmental issues, and nuclear materials management.

In his spare time, Professor Jenkins-Smith engages in personal experiments in risk perception and management via skiing, scuba diving and motorcycling.

DR. PETER KEDRON

Asst. Professor of Geography
Dept. of Geography
Oklahoma State University, Stillwater, OK

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Dr. Peter Kedron's research program focuses on understanding how geographic differences in economic activity are related to social and ecological aspects of regions. He also contributes to the development of new spatial analytical methods, with a current focus on technological recombination, cluster detection, and downscaling prediction. Within the Oklahoma NSF EPSCoR research project he is involved in the development of novel statewide socio-ecological observation, modeling, and decision-support systems designed to aid in the understanding of connections between humans and their environment. Dr. Kedron is also Co-PI on two NSF project grants examining the regional evolution of innovation and production in the U.S. biofuel sector (BCS 1338970), and the effect data composition and configuration have on the statistical biases associated with changes in spatial resolution (BCS 1561021).

DR. GEHENDRA KHAREL

Postdoctoral Research Fellow
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Oklahoma State University, Stillwater, OK

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Gehendra Kharel is a postdoctoral research associate in the Department of Natural Resource Ecology and Management at Oklahoma State University. He received his Ph.D. in Earth System Science and Policy from the University of North Dakota (2015), M.S. in City and Regional Planning from the University of Texas, Arlington (2010), and B.S. in Environmental Studies from the University of Nebraska, Omaha (2007). His research expertise and interests include coupled human-natural systems modeling, water resources management, and climate change adaptation and mitigation. Currently, he is working on the OK EPSCoR project (NSF Grant No. OIA-1301789) with the responsibilities of developing a coupled human-natural system model of the Cimarron River Watershed, Oklahoma, using the integrated modeling platform- ENVISION.

DR. RON MILLER

Postdoctoral Fellow
Dept. of Biosystems & Agricultural Engineering
Oklahoma State University, Stillwater, OK

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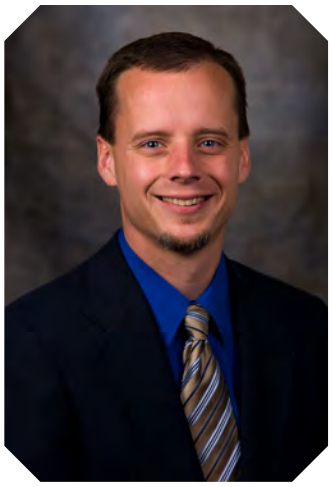
A Postdoctoral Research Fellow at Oklahoma State University, Dr. Ron Miller currently lives in Houston, Texas with his wife of 27 years, Marion Miller. His dissertation research concerned water movement in alluvial floodplains. Subsequent research projects have also included modeling the stability of composite gravel/soil streambanks, and the contribution of eroded bank soil to stream nutrient concentration. He's currently part of an interdisciplinary team working on a coupled human-natural systems model for the Kiamichi River watershed in southeast Oklahoma.



DR. TYSON OCHSNER

Assoc. Professor of Applied Soil Physics
Dept. of Plant and Soil Sciences
Oklahoma State University, Stillwater, OK

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Dr. Ochsner is a native of Chattanooga, Oklahoma. He earned a B.S. in Environmental Science at OSU in 1998. He then studied Soil Science and Water Resources at Iowa State University earning a M.S. in 2000 and a Ph.D. in 2003. From 2003 through 2008, he worked as a soil scientist for the USDA Agricultural Research Service in St. Paul, Minnesota. Since then, he has served as assistant and associate professor of applied soil physics in the Department of Plant and Soil Sciences at Oklahoma State University. The aim of Dr. Ochsner's soil physics work is to help people better understand and appreciate the soil, the soil water balance, and the surface energy balance so that we can more wisely manage and conserve the land and water with which we have been entrusted. His team's primary research focus is on multi-scale soil moisture monitoring and improved utilization of soil moisture data in agriculture, meteorology, environmental modeling, and drought adaptation.

DR. JOSEPH RIPBERGER

Asst. Professor of Political Science
Assoc. Director, National Institute for Risk & Resilience
Deputy Director for Research, Center for Risk & Crisis Management
University of Oklahoma, Norman, OK

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Joe Ripberger is an Assistant Professor of Political Science, an Associate Director at the National Institute for Risk & Resilience, and the Deputy Director for Research at the Center for Risk and Crisis Management at the University of Oklahoma. He received his Ph.D. in Political Science from the University of Oklahoma in 2012. Prior to his appointment in the Department of Political Science, he was a Postdoctoral Research Associate and then a Research Scientist at the Cooperative Institute for Mesoscale Meteorological Studies where he worked with the National Severe Storms Laboratory and the National Weather Service on severe weather policy.

Currently, his research focuses on risk and public policy with an emphasis on weather, climate, and water policy. He is working on a number of projects, including projects on climate variability and human adaptation in Oklahoma, social responses to changes in complex river systems, and a systematic assessment of the watch, warning, and advisory system in the United States. Joe teaches courses in research methods and public policy, including graduate courses on the analysis of political and administrative data. In his free time, he enjoys cycling, traveling, and cooking.

DR. RHEINHARDT SCHOLTZ

Postdoctoral Fellow
Dept. of Natural Resource Ecology & Management
Oklahoma State University, Stillwater, OK

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Rheinhardt Scholtz grew up in Cape Town, South Africa, where he attended the University of Cape Town and received his M.Sc. in Marine Biology. Upon receiving his Master of Science degree he took a job with the South African National Parks and moved to the savannas of Kruger National Park (northeast corner of South Africa bordering Zimbabwe and Mozambique). He worked there for just over three years, while completing his Ph.D. Working at the park, Marine science took a backseat and Scholtz engaged more with statistics and species distributions, focusing on woody plant species distribution and dynamics with respect to long-term effects of disturbance - fire and herbivory, specifically elephant herbivory.

After completing his Ph.D., Scholtz moved to Stillwater, Oklahoma to begin a post-doctoral program to improve understanding of woody plant dynamics and encroachment with Dr. Sam Fuhlendorf in the Oklahoma State University Department of Natural Resource Ecology and Management. The new exposure to North America's woodland expansion, compared to South Africa's controlled national park setting, has provided Scholtz with new experiences and research opportunities. Within Oklahoma and beyond, most land is privately owned and this adds an extra source of variance that was not a factor in Scholtz's research in South Africa. He states that working on the EPSCoR project has enabled extensive collaboration both in- and out- of the network. He and his co-researchers have produced a number of publications that have shed light on woody plant dynamics in the Great Plains. His talk today focuses on what this means for future woodland expansion in the entire region.

DR. CAROL SILVA

Professor of Political Science
Director, Center for Risk & Crisis Management
Co-Director, National Institute for Risk & Resilience and
Center for Energy, Security & Society
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 the Edith Kinney Gaylord Presidential Professor in the Department of Political Science at the University of Oklahoma, and serves as co-Director of the National Institute for Risk and Resilience. She is also Director of the Center for Risk and Crisis Management, and co-Director of the Center for Energy, Security and Society.

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. MIKE STANTON

Postdoctoral Research Fellow
Center for Applied Social Research
University of Oklahoma, Norman, OK

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Dr. Mike Stanton is an environmental social scientist with interests in bioregional political ecology focusing on agroecology, food security issues, and impacts of climate change on land and resource use. There is also a broader interest in sustainable systems development and bridging gaps in interdisciplinary studies within the humanities, social sciences, and natural sciences. As a post-doc researcher with the EPSCoR project, ethnographic fieldwork was conducted in the Kiamichi and North Canadian Watersheds. Much of the research in the Kiamichi region focused on the impacts of water issues; from flooding, to drought, to controversies over ownership and allocation, exploring the connections between different scales of analysis to better understand past and proposed changes in land and resource use. Research in the North Canadian Watershed included gathering data on various aspects of the region including local culture, history, economics, politics, hydrology, and ecology within the broader climate conditions affecting issues of risk and resilience. Future research focuses on the effects of globalized food systems and the problems related to the treadmills of production and consumption as the context for empowering communities transitioning to more sustainable regionally based socioecological systems.

DR. EVAN TANNER

Postdoctoral Fellow
Dept. of Natural Resource Ecology and Management
Oklahoma State University, Stillwater, OK

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Dr. Evan Tanner is currently a post-doctoral fellow at Oklahoma State University working under the direction of Dr. Sam Fuhlendorf. He received a Bachelor of Science degree in Forestry, Resource Management (2009) and a Master of Science degree in Wildlife and Fisheries Science (2012) from the University of Tennessee. His M.S. research focused on population ecology of northern bobwhite (Colinus virginianus) on reclaimed surface coal mines in western Kentucky. He received his Doctor of Philosophy degree in Natural Resource Ecology and Management from Oklahoma State University in 2015. His Ph.D. research focused on understanding how extreme weather events and future climate change influence population dynamics of northern bobwhite and scaled quail (Callipepla squamata) along the periphery of their distributions. Currently he is researching the spatio-temporal dynamics of thermal conditions in human influenced landscapes and how these dynamics impact ecological patterns and processes across multiple scales.

DR. TIM VANREKEN

Program Director, EPSCoR
National Science Foundation
Office of Integrative Activities
Alexandria, VA

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Tim VanReken is a Program Director with EPSCoR at the National Science Foundation, where he's worked since June 2014. His program responsibilities include RII Track-1, RII Track-4: EPSCoR Research Fellows, Workshop Opportunities, and Innovations at the Nexus of Food, Energy and Water Systems (INFEWS). Dr. VanReken holds a B.S. from the University of Florida and a Ph.D. from Caltech, both in Chemical Engineering. He held a postdoctoral position at the National Center for Atmospheric Research before joining WSU in 2007.

DR. JIE WANG

Postdoctoral Fellow
Dept. of Microbiology & Plant Biology
Center for Spatial Analysis
University of Oklahoma, Norman, OK

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Dr. Jie Wang is a Postdoctoral Research Associate in Ecology and Remote Sensing at the University of Oklahoma. Jie's study focuses on understanding the changes of grasslands in structure, function, and services to improve grassland conservation and sustainability. Her research is conducted at various spatial and temporal scales using a variety of remote sensing approaches and ecosystem models. She has taken part in projects to examine juniper woody plant encroachment into grasslands in Oklahoma over the last several decades using optical and SAR satellites. This work examined the dynamics of juniper forest encroachment into native grasslands in Oklahoma using a combination of Phased Array type L-band Synthetic Aperture Radar (PALSAR) mosaic data (from 2010) and Landsat images (from 1984-2010). The historical maps of juniper abundance and distribution were generated representing distinct five-year periods. The resultant maps were further used to study the impacts of juniper forest encroachment on grassland ecosystem including gross primary production, evapotranspiration, and land surface temperature. This study found that (1) juniper forests have expanded linearly in time over 1984-2010; (2) juniper forests had notable spatial clusters in the expansion process, varying significantly between counties; (3) juniper encroachment could increase the gross primary production (GPP), evapotranspiration (ET), and greenness-related vegetation indices and regulate the local land surface temperature.

DR. SHEILA YOUNGBLOOD

Asst. Professor of Engineering
Dept. of Chemistry, Physics & Engineering
Cameron University, Lawton, OK

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Dr. Sheila Youngblood is an Assistant Professor of Engineering in the Department of Chemistry, Physics, and Engineering at Cameron University in Lawton, Oklahoma. She is the primary contact for all engineering students at CU. Her passion is to encourage students of southwest Oklahoma to pursue higher education through the use of enrichment opportunities. Dr. Youngblood is the co-director of CU Engineering and Applied Mathematics Summer Academy for high school students, It's MathE – a middle school enrichment experience, and CU Empowering Women in Leadership and STEM Conference. Her research is pedagogy in an engineering classroom and water quality. Before joining CU in August 2010, she worked for the USDA-NRCS in Oklahoma, Kentucky, and Texas as a civil engineer for approximately 10 years. Her university teaching experience began in 2001 and spans multiple states and university systems from Research 1 to community college to private university and finally a regional university setting. She received her Ph.D. from Oklahoma State University in Biosystems and Agricultural Engineering, and also holds a Master's degree from University of Kentucky and B.S. from OSU.

DR. JAD ZIOLKOWSKA

Asst. Professor of Environmental Economics
Dept. of Geography & Environmental Sustainability
University Oklahoma, Norman, OK

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Jadwiga R. Ziolkowska is an Assistant Professor and Environmental Economist in the Department of Geography and Environmental Sustainability at the University of Oklahoma, and Manager of the Water-Energy-Food Institute (WEFI). Before joining OU, Jad was a post-doctoral scholar at University of California at Berkeley; an EU Marie Curie Fellow in the 7th Framework Program; and a researcher at University of Texas at Austin. She received her Ph.D. and habilitation, both in agricultural economics, from Humboldt University of Berlin. She published three books and authored more than 40 peer-reviewed journal publications and book chapters. Jad is specialized in policy evaluation and decision-making support in the field of natural resource, environmental, bioenergy, agricultural economics, and sustainable resource management. Her current research focus is on optimizing water management systems, desalination, biofuels, and socio-economic implications of drought.

Poster Session: Abstracts

Abstracts may be accessed online after the conference at:
www.okepscor.org/research/presentations/epscor-2018-state-conference

CLIMATE RESEARCH

No.	Presenter	University	Scientific Poster Title
1	Timothy Clay	University of Tulsa	Transcriptomic Signatures Reveal Biomarkers for Understanding Amphibian Stress
2	Russell Doughty	University of Oklahoma	Resistance, Resilience, and Sensitivity of Gross Primary Production of Forests and Grasslands to Drought in the Ouachita Highlands of Oklahoma, USA
3	Benjamin Hemingway	Oklahoma State University	Unmanned Aircraft Systems for Severe Weather: Determining Sampling Scales
4	Alex Hess	University of Tulsa	Life History Shifts and Distributional Patterns of Aquatic Isopods
5	Jamey Jacob	Oklahoma State University	CLOUD-MAP: Collaboration Leading Operational UAS Development for Meteorology and Atmospheric Physics
6	Lindsay King	Oklahoma State University	Examining Hazard Vulnerability in Oklahoma Using Components of the Social Vulnerability Index
7	Emily Lenhardt	University of Oklahoma	Analyzing the Evolution of Winter Storm Environments
8	Shana Mashburn	University of Oklahoma	Making Hard-to-Access Water Data in Oklahoma Readily Available to the Public
9	Kaitlyn McNiel	Oklahoma State University	Back to the Future: Using Tree Rings from the 1950s to Predict Present-Day Tree Mortality in the Cross Timbers of Oklahoma
10	Dolly Na-Yemeh	University of Oklahoma	Importance of Environmental Weather Monitoring for Emergency Management in Oklahoma
11	Narayan Nyaupane	Noble Research Institute	How do the Economics of Perennial Summer Dormant Tall Fescue and Annual Wheat Forage Grazing Systems Compare in the Southern Great Plains in Relation to Climate Variation?
12	Christopher Petrin	Oklahoma State University	Infrasound from May 11, 2017 Tornado in Perkins, Oklahoma
13	Khaled Sallam	Oklahoma State University	From Produced Water to Fresh Water: Energy's Perspective
14	Monique Sellers	Oklahoma Mesonet	Improving the Quality and Reliability of the Oklahoma Rainfall Archive
15	Patricia Torquato	Oklahoma State University	Does Anisohydric Behavior/Traits Assist Eastern Redcedar (*Juniperus Virginiana*) to Successfully Encroach into the Cross Timbers?
16	Zhenhua Zou	University of Oklahoma	The Spatial-Temporal Dynamics of Open Surface Water Bodies in CONUS During 1984-2016

POSTER #1

TRANSCRIPTOMIC SIGNATURES REVEAL BIOMARKERS FOR UNDERSTANDING AMPHIBIAN STRESS

Timothy A. Clay[1], Michael A. Steffen[1,2], Michael L. Treglia[1,3], Carolyn D. Torres[1], Ana Lilia Trujano-Alvarez[1], and Ronald M. Bonett[1]

[1]Dept. of Biological Science, University of Tulsa, Tulsa, OK; [2]Current Address - Dept. of Biological Sciences, University of New Hampshire, Durham, NH; [3]Current Address - The Nature Conservancy, New York, NY

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Global biodiversity is decreasing at an alarming rate and understanding the factors that negatively impact populations 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 to assess stress in vertebrates, but these hormones can be extremely dynamic and impractical to quantify in small organisms. However, many genes are differentially expressed in response to physiological stressors, offering a potentially rich source of informative biomarkers for stress. We tested for transcriptomic differences in tail tissues of stream-dwelling salamanders chronically exposed to the stress hormone corticosterone at different temperature regimes. We found significant transcriptional differences that were unique in response to temperature or corticosterone. Several of the differentially expressed genes are known to be involved in immune and stress responses in model systems. Furthermore, additional experiments show that their expression patterns were robust to differences in age, life history, and tissue regeneration. Our study suggests that transcriptomic patterns harbor stressor specific signatures that can be highly informative for monitoring the health of wild populations.

POSTER #2

RESISTANCE, RESILIENCE AND SENSITIVITY OF GROSS PRIMARY PRODUCTION OF FORESTS AND GRASSLANDS TO DROUGHT IN THE OUACHITA HIGHLANDS OF OKLAHOMA, USA

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The land cover of the Ouachita Highlands of Oklahoma was once ~99% shortleaf pine forest (*Pinus echinata*). Today, the region is ~70% forest, of which ~42% is evergreen, ~54% is deciduous, and ~4% is mixed forest. The non-forest cover (~30%) is predominately grassland (~60%). The remaining evergreen forest is now composed of loblolly pine plantations (*Pinus taeda*) and shortleaf pine. Currently, it is unknown how the dramatic reduction in forest cover and change in forest species composition has affected the region's resistance, resilience, and sensitivity to drought. Using remote sensing satellite data, this study analyzes the resistance, resilience, and sensitivity of gross primary production (GPP) of commercial pine plantation, evergreen Ouachita National Forest, deciduous forest, and grasslands to drought from 2010-2016. Sensitivity to drought was assessed during the summer (May-August), the growing season (March-November), and annually. The results of the analysis indicated that, regardless of the temporal window used for sensitivity analysis: 1) deciduous forest and grasslands were less resistant but more resilient and sensitive to drought than evergreen forest; and 2) the evergreen Ouachita National Forest was more resistant, resilient, and sensitive to drought than commercial pine plantation. Further research is needed to better understand why drought impacts evergreen Ouachita National Forest and commercial pine plantation differently. The differences may be attributed to genotype, stand age, stand density, species diversity, management practices, fire regime, or any combination thereof. Nevertheless, the results of our study provided insight into how land use and land cover change have affected the resistance, resilience, and sensitivity of the Ouachita Highlands to drought and how vegetation may respond to drought in the future. Such information is vital to the successful development and implementation of sustainable natural resource management practices, especially given that this region is undergoing enhanced climate variability.

POSTER #3

UNMANNED AIRCRAFT SYSTEMS FOR SEVERE WEATHER: DETERMINING SAMPLING SCALES

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The lowest portion of the Earth's atmosphere, known as the atmospheric boundary layer (ABL), plays an important role in the formation of weather events. Meteorological measurements, such as temperature and relative humidity, are key to understanding the exchange of energy in the ABL and its role in the formation of severe local storms. Small unmanned aircraft systems (sUAS) provide a versatile, dynamic platform that can fill the spatio-temporal gaps left by other weather surveillance techniques, but little research has been conducted on the optimal vertical sampling scales to capture these data. While forces influencing the spatial variation of thermodynamic variables in the ABL obey deterministic governing equations, their signals are not repeatable, which necessitates the use of statistics for comparison. Autocorrelations provide fundamental insights about the size and distribution of coherent structures within a turbulent flow and are thus appropriate for determining sampling scales using sUAS. A measure of autocorrelation frequently used in the geographic sciences is the variogram. Variogram analysis provides insight into the distance over which spatial autocorrelation dissipates (i.e., the data become incoherent), providing a measure of the optimal spatial separation between measurements. We found that optimal sampling scales for vertical measurements of temperature taken from sUAS were about 5 m for early morning flights prior to atmospheric mixing. Once mixing had occurred, more frequent sampling was needed (~3 m) to capture the structure. The optimal sampling scales for RH were slightly smaller, with range values of approximately 1.5–2 m after mixing had occurred.

POSTER #4

LIFE HISTORY SHIFTS AND DISTRIBUTIONAL PATTERNS OF AQUATIC ISOPODS

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Understanding the distribution and connectivity of groundwater and its relationship to surface flow is critical for resource management and conservation. As dispersal of freshwater organisms are limited by hydrological networks, the geographic and evolutionary history of aquatic organisms can provide new insights into the associated hydrological systems. This is particularly useful in the study of groundwater, where connectivity is not necessarily correlated with surface relief and can change with fluctuating water tables. Due to their abundance, aquatic life history, and the ease of distinction between surface and subterranean species, isopods present a potentially powerful tool for assessing hydrological hypotheses. The geographic genetic distribution of isopod diversity will likely mirror connectivity and discontinuity within the region under study. This study uses genomic data to reconstruct an evolutionary history of native isopods and examine patterns of dispersal across physiogeographic regions and between surface and subterranean habitats. Our analyses have supported repeated colonization events from the Ouachita Mountains to the Ozark Plateau. The evolutionary history of the group suggests multiple transitions to the surface from groundwater habitats, a rarely observed phenomena in subterranean organisms.

POSTER #5

CLOUD-MAP: COLLABORATION LEADING OPERATIONAL UAS DEVELOPMENT FOR METEOROLOGY AND ATMOSPHERIC PHYSICS

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CLOUD-MAP is a 4 year, 4 university partnership funded by the National Science Foundation RII EPSCoR grant to develop capabilities that will allow meteorologists and atmospheric scientists to use unmanned aircraft as a common, useful everyday tool following recognized needs as outlined in a 2009 NRC Report:

> *The vertical component of...mesoscale observations is inadequate. Assets required to profile the lower troposphere above the near-surface layer... are too limited in what they measure, too sparsely or unevenly distributed, sometimes too coarse in vertical resolution, sometimes limited to regional areal coverage, and clearly do not qualify as a mesoscale network of national dimensions. Likewise, vertical profiles above the Earth's surface are inadequately measured in both space and time...*

Unmanned Aircraft Systems (UAS) are a potential solution to this problem as they are well suited for the lower atmosphere, namely the lower boundary layer that has a large impact on the atmosphere and where much of the weather phenomena begin.

The CLOUD-MAP team is examining numerous systems including both fixed wing and rotary wing solutions predominantly focused on atmospheric boundary layer measurements. Multiple field campaigns have been conducted over the 3 years the project has been underway with . In June 2016 over 100 paricipating team members from the 4 partner institutions and other collaborating agencies. Selected sites included the Oklahoma State University Unmanned Aircraft Flight Station, the Marena Mesonet, the Kessler Ecological Field Station, and the US Department of Energy Atmospheric Radiation Monitoring Climate Research Facility Southern Great Plains site. Over multiple periods, the team has conducted thousands of individual flights and logged hundreds of total flight hours focused on gathering comprehensive, accurate, and relevant atmospheric data. The exercises are also designed to evaluate operational considerations of a large, multi-institutional teams and effectiveness of various technological systems.

This work is supported by the National Science Foundation under Grant No. 1539070.

POSTER #6

EXAMINING HAZARD VULNERABILITY IN OKLAHOMA USING COMPONENTS OF THE SOCIAL VULNERABILITY INDEX

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A population's vulnerability to a hazard is not fixed solely based on their proximity to a dangerous event. Instead vulnerability to a hazard is the product of the complex combination of the socio-economic, institutional, and environmental systems that affect a group of people and the disruption of those systems by a hazardous event. Traditionally, socially-focused place-based assessments of vulnerability have facilitated risk management and mitigation practices through the weighted aggregation of localized indicators of social system function. Despite the complexity of system interactions and variation in hazard types, resulting social vulnerability indices commonly abstract from specific hazard and environmental conditions. However, different hazards are likely to place different pressures on different socio-economic and institutional systems in different environments. Using the well-established Social Vulnerability Index (SoVI) as a starting point, this work examines hazard vulnerability in 77 Oklahoma counties. We estimate and decompose county-level SoVI in an attempt to identify population- and system-specific susceptible to hazards. Surveys of individuals throughout the counties in Oklahoma reveal self-reported levels of preparedness for hazards, their thoughts on climate change, and overall self-awareness of the factors that leave them vulnerable to hazards. Our assessment has implications for the allocation of government resources and residential preparation measures.

POSTER #7

ANALYZING THE EVOLUTION OF WINTER STORM ENVIRONMENTS

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When it comes to weather induced destruction and devastation, many in the South Central U.S. first think of tornadoes and thunderstorms. However, impacts due to winter precipitation can be equally as damaging, especially in terms of transportation and power outages. Research has been done to categorize types of winter precipitation and better understand typical lower atmosphere profiles associated with each type. However, it is still not clear as to how the spatial and temporal variability of these different profiles can be forecasted ahead of a system moving in and bringing precipitation. When people do not know if precipitation will come down as rain, ice pellets, snow, or freezing rain, they are not able to adequately prepare for safe travel and operations during the event.

This project addresses the formation and development of winter precipitation, specifically in regards to the evolution of vertical profiles of the atmosphere ahead of a precipitation event. Five case studies of winter weather events were chosen from the state of Oklahoma. Data including surface temperature, pressure, total precipitation, and geopotential height will be analyzed from the North American Regional Reanalysis (NARR), Oklahoma Mesonet, and University of Wyoming sounding data for each event. These events will be compared and analyzed in order to better understand the development of winter precipitation events over Oklahoma and which patterns and trends lead to specific outcomes at the surface. Identifying important trends and variables will provide a better basis from which to sample pre-storm environments using unmanned aircraft systems (UAS) capabilities in the future.

POSTER #8

MAKING HARD-TO-ACCESS WATER DATA IN OKLAHOMA READILY AVAILABLE TO THE PUBLIC

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As a researcher, do you find yourself looking for water data and end up going to three different websites to get the data you need? There is currently an abundance of water data in Oklahoma that is collected for a single purpose/agency, but not easily accessible for others. The Oklahoma Water Survey is developing a procedure to receive/harvest, evaluate and synthesize publicly available water data that are not easily accessible, and provide those datasets via the Oklahoma Water Survey website (OKH2O.org). These data could include water-use data, municipal wastewater discharge data, municipal drinking water-quality data, municipal dry-weather flow data, produced water spills, aquifer water levels, aquifer water-quality data, and other water data. A quality assurance/quality control methodology has also been developed for evaluating these data.

The basic methodology has been developed to test our technique for retrieving and distributing annual municipal wastewater discharge data in Oklahoma from the EPA's Integrated Compliance Information System website. While National Pollution Discharge Elimination System's (NPDES) facility sites names and permitted discharge amounts are easily available from the Oklahoma Department of Environmental Quality's website, the discharge data associated with meeting regulatory requirements are currently not available. Python scripts are currently in development to download this data automatically on an annual basis to share with the public in a more usable format through the OWS website data page. A further proof-of-concept example will also be presented on this poster for data from submitted an outside source (yet to be determined), such as dry-weather stormwater sampling data, managed reservoir data, or academic researcher data.

The Oklahoma Water Survey requests your feedback on types of data that you would like to see more accessible, or if you have a dataset that you would like to be made available through our system.

POSTER #9

BACK TO THE FUTURE: USING TREE-RINGS FROM THE 1950s TO PREDICT PRESENT-DAY TREE MORTALITY IN THE CROSS TIMBERS OF OKLAHOMA

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Tree mortality is escalating in global forests, often driven by drought, heat, and biotic attack. As climate change continues to alter ecosystems for all trees, identifying signals aiding in prediction of tree mortality events is urgently needed. We developed a model using past (1950s) data to predict potential suitability in the present day for codominance of post oak (*Quercus stellata*) and blackjack oak (*Quercus marilandica*) in the Cross Timbers of Oklahoma. To test model predictions, we took increment cores (n=12) of post oak from six sites predicted suitable, and six sites predicted unsuitable, throughout the Cross Timbers ecoregion to test model predictions. Using standard dendrochronological techniques, we cross-dated, measured ring widths, and built site-level chronologies to derive ring-width index (RWI), a proxy for annual growth, at each site. Here, we present our findings for growth, comparing RWI for the total ring-width, earlywood ring-width, and latewood ring-width. We found an increase in mean sensitivity (a measure of year-year variability) as well as series intercorrelation (agreement between trees at a site) in the latewood ring width index, compared to total and earlywood chronologies. We demonstrate the value of building latewood chronologies to determine growth response by comparing site predictions from our model among earlywood, latewood, and total RWI. We set out to identify a growth response to validate our ecological niche model of co-doiminant Cross Timbers oaks. Constructing latewood chronologies for our sites significantly amplified the growth signal compared to using total ring-width chronologies. Latewood chronologies of ring-porous species (such as the oaks of our study) provide a promising path forward to investigate what sites may be most sensitive to increases in tree mortality in the future.

POSTER #10

IMPORTANCE OF ENVIRONMENTAL WEATHER MONITORING FOR EMERGENCY MANAGEMENT IN OKLAHOMA

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The availability of timely and high-quality data provided by mesonets creates opportunities for educated and effective decision-making processes and policy design. An important aspect of the development and usage of mesonet data is in their wide variety of applications in environmental and emergency management agencies, water managers, farmers, energy producers and distributors, the transportation sector, the commercial sector, media, and the general public. These developments are particularly important for emergency management decision-making because the “local scale” of mesonet observations intrinsically allows forecasters to pinpoint the locations of fronts and other boundaries, for convective initiation and wind shifts, among others.

This research is focused on the Oklahoma Mesonet’s OK-First that has been used for many years to support decision-making in the face of many natural and manmade disasters in the state.

Specifically, the purpose of this research is to quantitatively evaluate benefits provided by the OK-First, while also identifying future societal needs, challenges and possible solutions. This research will apply a focused survey with Emergency Managers to derive primary data, while the Mesonet weather information will be used directly as the secondary data source.

The results of this research will quantify economic benefits of the OK-First to the state of Oklahoma and help address specific weather-related needs for future emergency management programs.

Keywords: Mesonet, Emergency Managers, Environmental Weather Monitoring, Oklahoma

POSTER #11

HOW DO THE ECONOMICS OF PERENNIAL SUMMER DORMANT TALL FESCUE AND ANNUAL WHEAT FORAGE GRAZING SYSTEMS COMPARE IN THE SOUTHERN GREAT PLAINS IN RELATION TO CLIMATE VARIATION?

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Grazing annually established cool season cereal pastures with stocker cattle is an important economic activity in the southern Great Plains. Utilization of summer dormant perennial tall fescue has been proposed as an environmentally friendly alternative to conventional annual clean till established cereal pastures such as wheat and rye. The objective was to evaluate the expected net returns of three systems that utilize summer dormant tall fescue, one system that utilizes tall fescue and cereal wheat, and a conventional system that utilizes cereal wheat. Data were collected for each system for four production years (2013/14 – 2016/17) from a completely randomized designed stocker cattle grazing study located near the community of Ardmore in south-central Oklahoma. Enterprise budgeting techniques were used to estimate the expected costs, revenues and net return for each pasture, year and system. Random effects ANOVA models were used to compare animal and economic performance measures across the systems. The results suggest that net returns for the summer dormant tall fescue systems were breakeven with the conventional annually produced cereal wheat grazing system. The results were most sensitive to small differences between systems in grazing days, value of gain, life expectancy of tall fescue, and tall fescue seed price.

POSTER #12

INFRASOUND FROM MAY 11, 2017 TORNADO IN PERKINS OKLAHOMA

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On May 11, 2017 at 2013 UTC an EF0 tornado formed near Perkins, OK, which had a path length of 0.1 miles and a damage path width of 50 yards. There were reports of a possible second tornado, but it was never confirmed because the storm was rain wrapped and radar could not see near ground level. Approximately 19 km NNW of the tornado is the Oklahoma State University 3-microphone infrasonic array. Infrasound is sound below human hearing. Tornado-producing storms emit infrasound up to 2 hours before tornadogenesis, which can be detected up to 160 km away. The infrasonic monitoring is part of the Collaboration Leading Operational UAS Development for Meteorology and Atmospheric Physics (CLOUD-MAP) project, an NSF EPSCoR funded multi-university collaboration focused on the development and implementation of unmanned aerial systems (UAS) and their integration with sensors for atmospheric measurement. A strong infrasonic signal began ~10 minutes before the tornado touched down and existed during the entire life of the tornado. A second nearly identical signal was received during the period coinciding with the unconfirmed second rain-wrapped tornado. This poster shows that the received signals conform to established criteria for source identification (concomitancy, characteristic signature, and coherence) with the exception of directionality due to cross-talk contamination between two of the microphones preventing the identification of signal bearing angle. In addition, tornado properties will be estimated from the infrasonic signal and compared with available observations. [This work was supported by NSF Grant 1539070.]

POSTER #13

FROM PRODUCED WATER TO FRESH WATER: ENERGY'S PERSPECTIVE

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Despite being a blue planet (oceans cover 71% of earth's surface), many regions on earth suffer from the scarcity of fresh water due to a combination of population growth and climate change. Furthermore, the interdependency of energy and water sectors due to recent development of hydraulic fracturing technologies caused further demand on already-stretched water resources. There is a current need to develop cheap water treatment facilities for produced water resulting from oil and gas production facilities. Today the water desalination technologies are still expensive and an energy-intensive endeavors compared to re-injection in disposable wells. In this poster paper an engineer's perspective of different desalination methods are presented including membrane and non-membrane based systems to compare their energy demands. The role of renewable-energies is emphasized.

POSTER #14

IMPROVING THE QUALITY AND RELIABILITY OF THE OKLAHOMA RAINFALL ARCHIVE

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The Oklahoma Mesonet, a joint project between the University of Oklahoma and Oklahoma State University, is a dense network of environmental monitoring stations spanning all 77 counties in Oklahoma. Since 1994, the Mesonet has collected over 5 billion observations and has provided critical information to decision makers including farmers, ranchers, emergency managers, weather forecasters, and researchers. In 2008 several Mesonet sites were officially integrated into the Cooperative Observer Program network further enhancing the national climate data archive. On occasion, the rainfall data for a station can become interrupted or incomplete due to rain gauge obstruction, mechanical failure, or other unknown issues. Manual and automated quality assurance procedures are routinely employed to identify potential data quality issues. In the event that data is found to be erroneous, a quality flag is applied to prevent the data from being included in graphical products and the climate archive. Through funding received from NSF-EPSCoR, the Mesonet was able to deploy a second co-located automated Met One tipping bucket rain gauge at each of the 120 sensing stations across the state beginning in 2014. The utilization of dual rain gauges has minimized interruptions to rainfall observations when sensor issues occur. Additionally having a duplicate rain gauge at each site has improved data quality monitoring, decreasing the time required to identify and analyze data issues, and enabling timely response by field technician staff. Improvements to network data quality and reliability continue to enhance situational awareness directly impacting short-term forecasts and decisions while also supporting climate research and drought monitoring.

POSTER #15

DOES ANISOHYDRIC BEHAVIOR/TRAITS ASSIST EASTERN REDCEDAR (*JUNIPERUS VIRGINIANA*) TO SUCCESSFULLY ENCROACH INTO THE CROSS TIMBERS?

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Eastern redcedar (*Juniperus virginiana*) is known to have successfully encroached into the oak-dominated Cross Timbers, changing the composition and dynamics of this ecoregion. The overall objective of this study was to understand the inter- and intraspecific interactions between eastern redcedar and post oak (*Quercus stellata*) for oak-redcedar mixed forests in the Cross Timbers of north-central Oklahoma. Our specific objective was to understand how xylem water potential (Ψ), net photosynthetic rate (P_n), and water use efficiency (WUE) of eastern redcedars and oaks differ among pure oak, pure eastern redcedar, and mixed oak-eastern redcedar stands. P_n, predawn water potential (Ψ_p), midday water potential (Ψ_m), and soil water volumetric content were measured in 24 trees among the three different stands during the 2017 growing season. When soil moisture was low, we found that oaks growing with eastern redcedars had significantly less negative Ψ_p compared with oaks growing in pure stands. The P_n of oaks declined during summer with high temperatures but was always greater than that of eastern redcedars which maintained a relatively constant rate throughout the year. The P_n, WUE, Ψ_p, and Ψ_m of eastern redcedar in the mixed stand were not significantly different from those in the pure eastern redcedar stand. In the mixed stand, P_n and WUE of oaks were significantly greater than those of eastern redcedars, and Ψ_p and Ψ_m of oaks were less negative than those of eastern redcedars with low soil moisture. Our results suggest that eastern redcedars influence Ψ of oaks mixed stands, and that physiological performance of eastern redcedar did not differ in pure vs mixed stands. Moreover, eastern redcedar exhibits anisohydric behavior with a decline in Ψ to sustain P_n during dry periods. These traits may allow eastern redcedar to successfully encroach into the forest midstory under prolonged water-limited conditions in this sub-humid region.

POSTER #16

THE SPATIAL-TEMPORAL DYNAMICS OF OPEN SURFACE WATER BODIES IN THE CONUS DURING 1984-2016

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Open surface water bodies are important sources for water withdrawals in the Contiguous United States (CONUS). The inter-annual variability and changing trends of surface water body areas have various impacts on the human society and ecosystems. This study made use of all Landsat 5, 7, and 8 surface reflectance archives (~370,000 images) during 1984-2016 and a water index- and pixel-based approach to detect and map open surface water bodies in the cloud-based platform of Google Earth Engine. This study generated the dataset of annual and 33-year water body frequency maps at the spatial resolution of 30 m. The year-long water body area were calculated for each of the last 33 years and their inter-annual variations during 1984-2016 were analyzed through anomaly analysis, while their changing trends were analyzed through linear regressions by states, watersheds and 0.5-degree grid cells. These datasets and trend analysis would be useful for water resource managers and stakeholders in water resource planning and management.

OKLAHOMA EPSCoR

RESEARCH

EPSCoR researchers are performing cutting-edge science and making a difference in Oklahoma and the world. Our environmental research provides important answers about the changing planet, while ground-breaking cellulosic bioenergy research has the potential to generate the development of biorefineries, which are estimated to create 135,000 new jobs and generate $13.6 billion/yr.

PRODUCTS

Significant research products have been developed through Oklahoma EPSCoR, including a radiation dosimeter that protects over a million workers annually and raises an est. $100 million/yr. in revenue. Another company that got its start with EPSCoR provides important weather detection and forecasting services to industries such as airlines - raising profits, saving energy, and promoting safety.

EDUCATION

More than 42,900 K-12 students and teachers have benefited from Oklahoma EPSCoR STEM education, outreach, and training programs (2009-present), including an innovative statewide Girl Scouts STEM initiative; EPSCoR support has added more than 25 new faculty positions to Oklahoma universities. These programs and positions would not have been possible without EPSCoR funding.

CURRENT ACTIVE OKLAHOMA EPSCoR/IDEA AWARDS

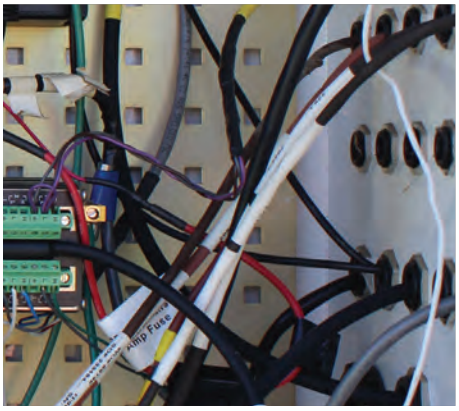
Program	Award	Amount	Type of Award	Total Awards
NSF	EPSCoR	$20.0 Million	Research Infrastructure	1 Award
NIH	IDeA	$19.7 Million	INBRE	1 Award
NIH	IDeA	$75.5 Million	COBRE	8 Awards
NIH	IDeA	$20.3 Million	OSCTR	1 Award
NASA	EPSCoR	$ 2.4 Million	Research Infrastructure	3 Awards

NEW RESEARCH FUNDING

Oklahoma NSF EPSCoR RII Track-1 Awards		New Funds Generated*
2001-2008	$16 Million	$ 50.0 Million
2008-2013	$15 Million	$ 70.5 Million
2013-2017	$20 Million	$331.6 Million
Total	**$51 Million**	**$452.1 Million**

Does not include:
NSF RII Award or State Funds

LEADING THE WAY



ENVIRONMENT

Through EPSCoR support, state-of-the-art data loggers (pictured above) and new rain gauges were installed at each of the Mesonet's 120 environmental monitoring stations in 2016. Original gauges, purchased in 1992, were refurbished to serve as a backup system. The newly installed equipment has reduced missing rainfall data by more than 11 percent.

CYBERINFRASTRUCTURE

In 2018 a University of Oklahoma astrophysics team discovered the first planets outside the Milky Way. The discovery was possible due to supercomputing developed through EPSCoR. The OneOklahoma Cyberinfrastructure Initiative, a national model for intrastate collaboration, serves over 100 institutions and has facilitated over $273 million in external funding.

TECHNOLOGY

The Oklahoma nanotechnology industry, which was underpinned by EPSCoR research, has grown to more than 20 companies. Other significant 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.

NSF EPSCoR FOR OKLAHOMA

Oklahoma NSF EPSCoR outreach and education programs reached over 21,800 Oklahomans in 2017. 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.

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