OSU Sustainability Research (Adapted from FY15 Research Abstracts)

Sustainability research explores environmental aspects combined with an examination of social and/or economic factors; addresses a sustainability challenge; or furthers our understanding of the interconnectedness among environmental, social and economic systems. N = 103

Department(s)	Title, Abstract, & Sponsors	Principal Investigator Project Director
Architecture	**Deployable Greenhouse for Food Production on Long-Duration Exploration Missions** The project is to design, develop, build and test a deployable greenhouse system for the X-Hab Academic Innovation Challenge. Goals of the project include the short-term goal of an interdisciplinary senior design project to design, build and evaluate a horizontally oriented habitat and a long-term goal to develop capabilities in education, research, and outreach in the field of space habitat design. This will include both technical engineering and outreach efforts. Faculty with diverse specialties from across the schools at OSU will participate in the project with the goal of developing technology and designs to facilitate human habitation in outer space. Sponsor: National Space Grant Foundation for NASA	Steve O'Hara, Mechanical & Aerospace Eng.: Jamey D. Jacob, Industrial Eng. & Management: J. Cecil, Biosystems and Agricultural Engineering: Paul Weckler, Ning Wang
Botany	**The Genetic Regulation of Tillering in Panicoid Grasses** Panicoid grasses contain many species of economic and ecological importance, such as maize, sorghum, switchgrass and millets. Biomass and grain production in these species is primarily determined by the branching pattern of the plant, particularly the number of tillers (basal branches) that initiate and elongate over the lifetime of the plant. In this project, we aim to identify the genes controlling tillering in these grasses, as well as how the genetic network is impacted by environmental factors such as shading.	Andrew Doust
Botany	**Resolving the Phylogeny of North American Milkweeds Through the Application of Massively Parallel Sequencing Technology** The resolution of systematic relationships among milkweed species will result in an enhanced understanding of their evolutionary history, and contribute to an improved classification of the genus. Furthermore, these results will provide a robust foundation for studies of milkweed floral diversity, pollination biology and biogeography. Milkweeds have served as a model system for the evolution of plant defenses against herbivory, and results from this research will contribute to a better understanding of how plants, including crops, co-evolve with their pests. The methods developed here achieve a savings in cost, time, and effort and will be directly applicable to phylogenetic, population genomic and ecological genomic studies of animals, fungi and plants.	Mark Fishbein
Botany	**The Role of Chloroplast Gene Expression in Plant Growth and Development** Chloroplasts play a central role in plant metabolism and in supporting plant growth and development. Most chloroplast proteins are encoded by the nuclear genome and imported into the chloroplast. A few proteins are encoded by the chloroplast genome itself. In Arabidopsis, interfering with chloroplast gene expression causes defects in photosynthesis and results in embryo lethality. This project will examine molecular factors responsible for the embryo lethality encountered in the absence of chloroplast translation and examine variations in sensitivity to a loss of chloroplast translation found among natural accessions of Arabidopsis.	David Meinke

Botany	**Synthesis on Pollen Limitation and Terrestrial Biodiversity (sPLAT)** The majority of flowering plants rely on pollinators for their reproduction and human perturbations to the environment disrupt plant-pollinator interactions and lead to widespread pollen limitation of plant reproduction. Such effects are expected to be most pronounced in regions with high terrestrial plant biodiversity, where competition for pollinators is strongest. We will quantitatively synthesize hundreds of pollen supplementation experiments and provide a global assessment of how regional factors and human perturbations correlate with the magnitude of pollen limitation.	Janette Steets
Chemistry	**A Nanostructured Energy Harvesting and Storage System for Space and Terrestrial Applications** The ultimate goal of the proposed research is the final fabrication and characterization of a nanostructured photovoltaic system connected to nanostructured batteries in order to form a novel, self-sustaining energy storage system. Sponsor: NASA	Allen Apblett Nick Materer
Chemistry	**Catalysts for Biofuel Production from Cellulosic Materials** Biomass has the potential to offset our demand for exported oil. Production of ethanol from lignocellulose has the advantage that feedstock is abundant, diverse, and inexpensive when compared to other potential sources such as corn and cane sugars. However, the production of ethanol from cellulosic materials requires a greater amount of processing because the lignocellulose must be converted to sugars and then fermented to ethanol. Hydrogen bronze regent will be investigated as a potential water-soluble catalyst for hydrolysis of cellulose. It is possible that these materials can be used to develop an efficient process for conversion of cellulose into sugars. Sponsor: East Central University/EPSCOR Summer 2012 ROA Grant of Dane Scott	Allen Apblett Nicholas Materer
Chemistry	**Fundamental Research on the Biological Stability of Future Naval Fuels and Implications for the Biocorrosion of Metallic Surfaces.** The Navy has experienced problems with biodiesel, because it accelerates corrosion of steel fuel ballast tanks that are compensated for content reduction with seawater. Since such problems may be due to the susceptibility of fuel components to biodegradation by microbes that form corrosive biofilms, this interdisciplinary investigative team seeks to explore the fundamental mechanisms of fuel-induced biocorrosion, including connections between the chemical composition of the fuel and acceleration of biocorrosion. The research will provide a basis for assessing the biological stability of alternate fuels and their impact on biocorrosion and will lead to better tools for monitoring and mitigating corrosion	Joseph M. Suflita (OU); Deniz F. Aktas, Iwona B. Beech, Irene A. Davidova, Kathleen E. Duncan, Mark A. Nanny, Jan Sunner (OU)
Chemistry	**Development of Non-Destructive Methods for Analysis of Unconventional Reservoir Solids** This project focuses on the development of new experimental techniques to investigate complex matrix elements in unconventional energy reservoir deposits. Solid-state nuclear magnetic resonance method development is an integral part of the project, as well as its implications for improved petrophysical and petrochemical understanding in these increasingly important energy resources.	Jeffery L. White

Chemistry	**Center for Interfacial Reaction Engineering** The Center for Interfacial Reaction Engineering (CIRE) was created in response to the US Department of Energy's recommendation to focus research on reducing dependence on foreign oil by promoting the use of diverse, domestic, and sustainable energy resources. CIRE is a multidisciplinary/multi-institutional effort that includes researchers from the three major Oklahoma research universities and leverages expertise in diverse areas related to catalysis, nanoscience, colloidal and interfacial science, and thermodynamics. The research is directly relevant to biomass conversion and catalytic upgrading, reactions in biphasic solvent systems containing polar and non-polar species, and subsurface conversion in oil reservoirs at the water/oil interface.	Jeffery L. White
Civil and Environmental Engineering	**Sustainability and Training Materials for In-Place Recycling** Studies have shown in-place recycling to be a sustainable, cost-effective procedure for rehabilitation of hot mix asphalt pavements. The intent of this project is to develop a sustainability calculator that will document the sustainability benefits of in-place recycling compared to traditional maintenance and rehabilitation techniques and to develop interactive training materials that will serve as a Basic Recycling Primer for in-place recycling. The sustainability calculator will be made available for local agencies and the training materials developed will be provided to the Transportation Curriculum Coordination Council, which will develop an interactive web based training course. Sponsor: University of Oklahoma for the Southern Plains Transportation Center for US Department of Transportation, Asphalt Recycling & Reclaiming Association	Phil Lewis Stephen Cross
Civil and Environmental Engineering	**Alternative Cementitious Materials for Development of the Next Generation of Sustainable Transportation Infrastructure** As part of a collaboration with Georgia Tech on a Federal Highway Administration project, OSU is responsible for completing freeze thaw durability testing of the materials, mCT and mXRF scans of laboratory and field based samples to investigate deterioration, and surveys of several different sites where ACMs have been used to evaluate their performance. Samples will be taken from these sites and evaluated with mCT and mXRF as needed. Sponsor: Georgia Institute of Technology for Federal Highway Administration	Tyler Ley Paul Tikalsky
Geography	**FY14-15 Oklahoma Wind Power Initiative** This project is a continuation of a decade and a half of cooperative wind power research with Scott Greene at the University of Oklahoma. The project probes the geographic aspects of wind resources and the geography of development. In this year we completed work studying the impacts of modeled future wind climates on two wind farms in western Oklahoma. We assessed the quickly-changing scenario of public and legislative pushbacks to the buildout of the Oklahoma wind industry. Several public talks and two professional presentations were made. Sponsor: Oklahoma State University	Steve Stadler

Geography	**Dean's Incentive Grant: Development of Hyperspectral Vegetation Indices for MonitoringSecond-Generation Biofuel Crops (FY 2014-2015)** As oil prices continue to rise and energy security becomes paramount, there is a pressing global need to develop reliable sources of alternative renewable energy. Considerable efforts are currently being directed toward research and development of second-generation biofuels, which can be manufactured from various types of plants, such as switchgrass (Panicum virgatum L.), but far less is known about the biophysical and biochemical composition of these sources than their first-generation predecessors (e.g., corn and soybeans).This research develops a new hyperspectral index to indicate the chlorophyll content in two second- generation bioenergy crops: switchgrass (Panicum virgatum L.) and sorghum (Sorghum bicolor) using imaging spectroscopy techniques.	Amy Frazier
Geography	**FY14-15 Oklahoma Wind Power Initiative** This project is a continuation of a decade and a half of cooperative wind power research with Scott Greene at the University of Oklahoma. The project probes the geographic aspects of wind resources and the geography of development. In this year we completed work studying the impacts of modeled future wind climates on two wind farms in western Oklahoma. We assessed the quickly-changing scenario of public and legislative pushbacks to the buildout of the Oklahoma wind industry. Several public talks and two professional presentations were made.	Steve Stadler
Geology	**Commercial Scale CO2 Injection and Optimization of Storage Capacity** A major commercial CO2 storage pilot program is underway in the southeastern United States in which CO2 is being captured from a 25-megawatt flue-gas slipstream and injected into a deep saline formation. This research focuses on geological characterization of the Cretaceous- age Paluxy Formation, which is the storage target in this pilot. The principal objective is to use advanced reservoir characterization techniques to determine the feasibility of scale-up to a full 750-megawatt carbon capture and storage program.	Jack Pashin
Geology	**US-Egypt Cooperative Research: Imaging the Geometry of the Kharga Basin (New Valley Oasis) and its Groundwater Capacity** This project investigates the subsurface geometry of the Kharga Basin hosting the Nubian Sandstone Aquifer (NSA) in Egypt. Currently, ~99% of Egypt's 85 million population lives along the Nile Valley and Delta. The future supply of the Nile water is uncertain because of the increase demand by other countries and effects of climate change. The NSA is a potential groundwater source. The objectives include: (1) determining the subsurface geometry of NSA, (2) mapping and characterizing the faults as potential conduits of groundwater flow and, (3) developing a geoscientific GIS database that would aid in resource planning and management.	Estella Atekwana, Mohamed Abdelsalam, Jeffrey Byrnes, Priyank Jaiswal

Geology	**REU Site: Evaluating the Effectiveness of Stream Restoration Projects Based on Natural Channel Design Concepts Using Process-Based Investigations** This Research Experience for Undergraduates (REU) project integrates Hydrologic, geosciences, and biological research at the Cow Creek Stream Rehabilitation Site located on the OSU campus and includes other stream restoration sites in Oklahoma, to evaluate natural channel design approaches through process-based scientific investigations with the goal of developing the science for a new stream restoration paradigm. Oklahoma is distinct in that it is highly rural with a large percentage of Native Americans and first generation college students. The proposed REU program has unique opportunities to recruit from these populations in combination with national recruitment.	Andrew Dzialowski, Mark Fishbein, Todd Halihan
Integrative Biology	**Implications of grassland management practices for monarch butterfly conservation in the southern Great Plains.** The monarch butterfly decline has been attributed to several factors, including habitat fragmentation, loss, and degradation (including milkweed loss), overutilization, and disease/predation, as well as climate change, weather extremes, invasive species, and pesticides. The Oklahoma-Texas region has been identified as critical for conservation efforts in the southern Great Plains, with an emphasis on milkweed and nectar resource availability. This project evaluates the availability of resources in the southern Great Plains to support the migration and reproduction of monarchs during the spring and fall, as well as monarch use of these resources	Kristen Baum
Integrative Biology	**Assessment of grassland habitat quality and management practices for pollinators in the southern Great Plains.** Pollinators play an important role in grasslands, as well as most managed and natural ecosystems. Concerns over pollinator declines have increased in recent years, especially with the identification of colony collapse disorder in managed honey bee colonies, and documented declines in native bee communities, as well as the decline in the monarch butterfly population. Pollinator declines have been attributed to several factors, including habitat fragmentation and loss, invasive species, and pesticides. This project evaluates the status of native bee communities and monarch butterflies on National Park Service lands, including an assessment of resource availability in the context of management practices.	Kristen Baum
Integrative Biology	**The Interaction of Pollinators and Pest Management Strategies in Increasing Production in a 1st Generation Biofuel Crop.** This project evaluates the effect of winter canola (Brassica napus) pest management strategies on bee communities and canola productivity in Oklahoma, where winter canola is grown as a rotational crop with winter wheat. Specifically, we are evaluating the effect of two new narrow- spectrum insecticides, flonicamid and sulfoxaflor, on the abundance and species richness of native bees, winter canola seed set, and field-level production. Results are being compared with fields treated with broad-spectrum insecticides (synthetic pyrethroids), as well as fields with and without managed honey bee colonies.	Kristen Baum

Integrative Biology	**Terrestrial Connectivity across the South Central United States: Implications for the Sustainability of Wildlife Populations and Communities.** Connectivity is an important component of the landscape for sustaining wildlife populations and communities, especially given that habitat fragmentation, modification, and loss have been implicated in the decline of almost all threatened and endangered species. We are using graph theory to predict patterns of terrestrial connectivity for species in the South Central United States. We also are evaluating the implications of predicted land use change across the study area.	Kristen Baum, Mona Papeş
Integrative Biology	**Development of landscape GIS models for the prediction of wetland condition in Oklahoma** An important goal of wetland managers is to determine how anthropogenic alterations of the landscape affect wetland condition. One approach to determining the relationships between landscape and condition is to sample a large number of wetlands that have been exposed to varying levels of disturbances. However, field-based monitoring and assessment programs can be expensive and laborious so that only a proportion of the total sites can be assessed at one time. At broad scales, predictive tools may allow for the estimation of wetland condition in the absence of field-based sampling events. The goal of the proposed research is to develop a series of models that use landscape-level parameters to predict the condition of Oklahoma wetlands.	Andrew Dzialowski, Mona Papeş
Integrative Biology	**Assessment of created shallow water habitats in the lower Missouri River** The Missouri River has experienced significant alterations over the past 100 years. Of particular concern has been the loss of shallow water habitat (SWH), which is defined by the U.S. Fish and Wildlife Service as having depths less than 1.5 m and velocities less than 0.61 m/sec. In response, the U.S. Army Corps of Engineers created roughly 1393 ha of SWH on the lower Missouri River (from Sioux City, Iowa downstream to the confluence with the Mississippi River) over the past 15 years. An important goal of these efforts is to determine if the created habitat is providing habitat to native fishes. In this project, I am working with the USACE to assess this important habitat by looking at potential fish prey items including zooplankton and macroinvertebrates.	Andrew Dzialowski
Integrative Biology	**Remote sensing of water quality and harmful algae in Oklahoma's lakes** Harmful algal blooms (HABs) negatively impact water quality, lake aesthetics, and human health. Therefore, lake managers need tools that allow them to monitor and manage HABs. The purpose of this one-year project is to provide a proof-of-concept demonstration of the use of satellite-based imagery to quantify water quality and HAB abundances across space (horizontal variation) and time (annual and seasonal variation) in two of Oklahoma's most important lakes, Lake Texoma and Grand Lake. This project will provide the foundation for the development of a state-of-the-art remote sensing-based tool for providing efficient, near-real time, low-cost remote monitoring for targeting limited resources for in-situ monitoring while allowing greater coverage of lakes for public health protection in Oklahoma.	Andrew Dzialowski

Integrative Biology	**Probabilistic monitoring of select Oklahoma reservoirs** Zooplankton and phytoplankton have the potential to serve as ecological indicators of lake and reservoir health. In this project we are identifying plankton from Oklahoma reservoirs that are collected as part of the Oklahoma Water Resources Board's (OWRB) routine Beneficial Use Monitoring Program (BUMP). We are assessing relationships between plankton and associated water quality data in order to develop tools that can be used to better manage and study Oklahoma reservoirs. Specifically, we are looking for plankton taxa that are associated with different water quality conditions (e.g. harmful algal blooms, high levels of turbidity). Combined, the results from this study should allow us to better manage, understand, and monitor reservoirs throughout the state.	Andrew Dzialowski
Integrative Biology	**Long-term changes in zebra mussel veligers in Kansas reservoirs** While invasive zebra mussels have been well studied in natural lakes, much less is known about their population dynamics and ecological impacts in turbid, eutrophic reservoirs that are characteristic of the south central United States. We have been studying the dynamics of zebra mussel veliger populations in a series of Kansas reservoirs since 2004. This long-term data set should provide managers with important information that can be used to monitor and manage zebra mussel infestations.	Andrew Dzialowski
Integrative Biology	**Liolaemus Lizard Species as Storytellers on the Effects of Climate Change in Temperate South America** Because of global warming, many plants and animals around the world have moved upwards in mountainous areas in an attempt to find the same cooler habitat in which they previously lived. This can, in turn, invoke changes to their ecology that sometimes affect them negatively. Such an upward shift in elevational range has never been studied in lizards of the southern temperate zone. We are looking for such a phenomenon in the lizard fauna of the Andes in central Chile, comparing sites we studied 30 years ago plus natural history museum records, and additionally evaluating possible negative conservation effects.	Stanley Fox, Enrique Santoyo-Brito
Integrative Biology	**Ecosystem Services Provided by Playa Wetlands Relative to USDA Programs** Ecosystem services are the values that society receives from the natural environment. As part of a national assessment, an OSU team is evaluating the services provided by playa wetlands in the High Plains and how those services are influenced by USDA conservation programs and practices. Some of the services provided by playas include biodiversity provisioning, pollinator capacity, groundwater recharge, floodwater storage, contaminant filtration, and recreation. Practices are being evaluated in Texas, New Mexico, Oklahoma, Kansas, Colorado, and Nebraska in over 300 playas. Some USDA programs (NRCS and FSA) enhance certain services a well as hamper others.	Loren M. Smith, Scott T. McMurry

Integrative Biology	**Influence of land use and the Conservation Reserve Program on native invertebrate pollinator communities in Southern High Plains** Numerous studies have documented that invertebrate pollinator services are critical to the world economy. Our objective was to determine how the predominant land uses in the Southern High Plains of Texas (native grassland, Conservation Reserve Program, and agricultural) affect invertebrate pollinator diversity and more specifically, if CRP land hosts a diverse pollinator population given it consists primarily of non-native upland grasses. We are also examining how wetlands contribute to pollinator diets. Playa wetlands are the keystone ecosystem in the Southern High Plains, and although only 3% of the land base, they are a refuge of relative floral diversity in an otherwise intensively cultivated landscape. Initial results indicate that land use has a profound influence on composition and diversity of SHP pollinators. The floral diversity wetlands provide is important to pollinators in this landscape and is highly influenced by hydroperiod.	Loren M. Smith, Scott T. McMurry
Integrative Biology	**Genomic resources for the conservation and management of bald eagles** Although the bald eagle appears to have escaped extinction, our knowledge of many aspects of its biology is so deficient that it is difficult to develop proper management plans for this ecologically and culturally important species. Increasing our understanding of the biology and partitioning of genetic variation within and among populations of bald eagles is critical for their proper management. The ultimate goal of this project is the establishment of a long-term, non- invasive genetic monitoring program for bald eagles and the development of a national database of genotypes based on Single Nucleotide Polymorphisms (SNPs; single base substitutions or deletions within a sequence of DNA occurring with a population frequency greater than 1%).	Ronald Van Den Bussche, Meredith Hamilton
Integrative Biology	**Genomic analysis of the golden eagle.** Our knowledge of the biology of the golden eagle is so deficient that it is difficult to develop proper management plans for this ecologically and culturally important species. Moreover, this species is currently experiencing negative population pressures due to lead poisoning and wind farms. The initial objective of this project is to completely sequence and annotate the genome of the golden eagle can compare this annotated genome to the sequenced and annotated genomes of other raptors. The ultimate goal would be to develop a long-term, non-invasive genetic monitoring program for golden eagle and the development of a national database of genotypes based on Single Nucleotide Polymorphisms (SNPs; single base substitutions or deletions within a sequence occurring with a population frequency greater than 1%).	Ronald Van Den Bussche, Meredith Hamilton

Integrative Biology	**Genomic Resources for the conservation and management of bald and golden eagles.** The first step in any conservation or management program should be the delineation of biologically relevant boundaries across the species range. This step is critical as it informs the wildlife managers, biologists, and policy makers of the boundaries they are attempting to conserve or manage and sets the biological foundation for future decisions. Unfortunately, the existence of discrete genetic boundaries, if they exist, have not been evaluated for either bald or golden eagle. This project continues the previous work in my laboratory on bald and golden eagles by developing standardized suites of genetic markers (single nucleotide polymorphism, SNPs) on species-specific SNP Chips	Ronald Van Den Bussche, Meredith Hamilton
Integrative Biology	**Using environmental DNA (eDNA) to assess the presence of cave-fish and crayfish population in caves of the Ozark Highlands.** The goal of the project is to use eDNA to verify the presence of cave organisms while developing the foundation for monitoring methods that may be used in the future to document abundance. The proposed project will support recovery and monitoring efforts of the Fish and Wildlife Service and various conservation partners and hel inform conservation decisions. The objectives of the project are to (1) develop species-specific DNA mini-barcodes makers for cavefish and several crayfish species and (2) perform eDNA surveillance of caves using these established markers.	Shannon Brewer, Ronald Van Den Bussche
Civil and Environmental Engineering	**Sustainability and Training Materials for In-Place Recycling** Studies have shown in-place recycling to be a sustainable, cost-effective procedure for rehabilitation of hot mix asphalt pavements. The intent of this project is to develop a sustainability calculator that will document the sustainability benefits of in-place recycling compared to traditional maintenance and rehabilitation techniques and to develop interactive training materials that will serve as a Basic Recycling Primer for in-place recycling. The sustainability calculator will be made available for local agencies and the training materials developed will be provided to the Transportation Curriculum Coordination Council, which will develop an interactive web based training course.	Phil Lewis, Stephen Cross
Civil and Environmental Engineering	**Monitoring Extreme Loading and Climate Impact on Infrastructure** To address climate impact and traffic overload on concrete infrastructure, evaluation and monitoring guidelines will be developed using sensing technologies such as acoustic emission monitoring capable of qualifying and quantifying material damage and locating zones in distress. Climatological profiles will be created for critical infrastructure regions of Oklahoma using climatological data from Oklahoma Mesonet. The effects of exposure combinations on concrete properties will be continuously monitored and analyzed using AE and ultrasonic techniques. Signature wave parameters that may be characteristic of temperature change, moisture change or microstructural changes will be determined and implemented towards the creation of new monitoring guidelines.	Julie Hartell, Phil Lewis, Tyler Ley, Yongwei Shan

Civil and Environmental Engineering	**Use of a Novel Controlled Release Surface Curing Agent for Bridge Decks** The project involves a novel curing technique that can be rapidly applied to the surface of fresh concrete and not cause deformations in the concrete surface. The research is expected to show that the material has equal or better curing performance than typical wet curing methods and is sustainable and safe for the environment. Project objectives include: 1) Develop a field application method for the novel curing material; 2) Develop specifications for the quality control and usage of the novel curing material; 3) Work with contractors in Oklahoma to implement this technology in the field and evaluate the effectiveness	Tyler Ley, Kelvin Wang, Julie Ann Hartell
Civil and Environmental Engineering	**Biosand Methods for Drinking Water** The project will develop methods for optimizing the process required for constructing and operating biosand water filters. Experiments will be conducted at OSU and tested in Honduras. The research will support efforts of a pilot facility, currently employing two people and building two filters per week. If successful, this work will speed up the production process without compromising the efficacy of the filters, allowing the facility to construct at least ten filters a day. It will also allow for better operations of the filters. These results can easily translate to other biosand operations working with limited resources in developing countries.	Greg Wilber
Civil and Environmental Engineering	**Biology and Engineering for a Sustainable Tomorrow** This program is part of the Oklahoma State Regents for Higher Education's Summer Academies for Mathematics, Science, & Multidisciplinary Studies. The program will introduce the importance of biology and engineering in everyday life and will expose students to the future technologies that exist at their interface. Students will participate in design and experimentation involving critical issues that rely on both science and engineering, including water quality, renewable energy development, ecosystem balance, and environmental remediation. The academy will host 50 students per year at Oklahoma State University during two different summer sessions.	Gregory G. Wilber
Electrical and Computer Engineering	**Development of High Efficiency Nanostructured Thermoelectric Generators for Industrial Waste Heat Recovery** Over the past six years, the investigators have developed advanced nanostructured thermoelectric materials at lab scale that can work efficiently for applications from room temperature to 1100 C. The purpose of this OCAST accelerated research program is to scale up the method of synthesis of such efficient material structures and package them to form thermoelectric generators that can be employed at different locations appropriate for industrial applications. OSU will lead the material research and innovation. Marlow Industries will lead the packaging of the thermoelectric modules, and Amethyst Research Inc. will lead the hydrogenation optimization and commercialization steps	Jerzy Krasinski
Electrical and Computer Engineering	**Thermoelectric energy harvesting devices for structural components** The product of this project will be stabilized, thick film, nanostructured thermoelectric energy harvesting devices with high figure of merit based on bismuth telluride alloys that can be attached to any structural component to take advantage of the temperature difference between any two surfaces of the structure in service and generate power from waste heat. Attachment of thick film thermoelectric devices to structural components is a simpler and cost- effective method and an enabling technology compared to thin film thermoelectric devices.	Daryoosh Vashaee

Electrical and Computer Engineering	**Scalable Rapid Solar Hydrogen Production via Photo-Bio-Chemical Hydrolysis** In this project, scientists from the Helmerich Advanced Technology Research Center combine their expertise to implement a bio-mimetic photo-thermal electrolyzer that, if successful, can result in a significant leap forward in solar hydrogen technology. The approach relies on Drs. Vashaee and Tayebi's recent discovery that certain hybrid organic/inorganic particles are capable of splitting water molecules when the particles are dispersed in water. The system consists of semiconducting particles coated with their recently synthesized bio-compatible additives. This concept has the potential to place Oklahoma in a position to contribute effectively in the potentially large market of solar hydrogen industry.	Daryoosh Vashaee, Jerzy Krasinski
Mechanical and Aerospace Engineering	**EnergyPlus Whole-Building Modeling and Simulation Software Development** EnergyPlus is a key part of DOE's building energy-efficiency strategy. In its ongoing program implementation and technical management efforts, the National Renewable Energy Laboratory (NREL) requires the assistance of OSU to provide technical support for new features development and for software defects resolutions.	Dan Fisher
Mechanical and Aerospace Engineering	**Development of a Load-Based Method of Test for Light Commercial Unitary HVAC** This project aims to develop a new method of testing for assessing the performance of advanced unitary equipment for light commercial HVAC applications. The PI will develop a new test protocol that measures a comprehensive energy performance figure of merit for advanced Roof Top Units versus its energy input at various outside conditions and at various indoor thermal loading conditions. The system energy efficiency enhancements due to economizer effectiveness, variable speed fans, fan cycling, variable speed compressor systems and condenser pre-cooling will be measured in a system level method of test as opposed to individual component level method of test.	Lorenzo Cremaschi
Mechanical and Aerospace Engineering	**Surface and Airborne Monitoring Technology for Detecting Geologic Leakage in a CO2- Enhanced Oil Recovery Pilot, Anadarko Basin, Texas.** Ensuring safe and economically viable CO2-enhanced oil recovery programs is imperative for the commercial and environmental success of carbon capture and storage programs. This research project is deploying advanced geological characterization and monitoring techniques that are designed to ensure safe and permanent geological storage of CO2 while substantially reducing the costs of near-surface and airborne monitoring programs. This project features the deployment of miniaturized CO2 and CH4 sensors in surface monitoring arrays as well as unmanned aerial vehicles	Jack Pashin
Mechanical and Aerospace Engineering	**Optimally Controlled Air-Conditioning Equipment for Sustainable Building Systems** The objective of this project is to develop and deploy optimal supervisory and process control algorithms in all of AAON's equipment. To achieve this goal a simulation testbed will be developed that merges a detailed physics based building model with a detailed, physics based vapor compression system model. This will allow development of both process and predictive supervisory control schemes that take into account such factors as building thermal mass and changing weather.	D.E. Fisher, L. Cremaschi, J.D. Spitler

Mechanical and Aerospace Engineering	**OSU Support for REF Puma Endurance Solar Enhancement (PESE) Project** This subcontract involves assisting Design Intelligence Incorporated, LLC (DII) in the design and development of "solar wing" upgrades for the Puma unmanned aerial vehicle. DII was awarded a subcontract from MicroLink Device, Inc. (MLD), to provide power-conditioning electronics and develop a new design and process for producing "solar wings" for the Puma using MLD's proprietary flexible solar cell technology. As part of this effort, DII requires research and development assistance from OSU in the design and development of the wing molds, the new wing design, and development of the manufacturing and production processes required to produce wings.	Jamey Jacob
Mechanical and Aerospace Engineering	**Comparison of the Energy Performance and Capacity of an Air Conditioning System that Uses Low GWP Refrigerants** The overall scope of this research is to study the energy efficiency and cooling performance of an air conditioning (AC) system that uses new low GWP refrigerants manufactured by DuPont. OSU will conduct the performance tests in its large scale climate control chamber and will experimentally measure the energetic coefficient of performance (COP), cooling capacity, evaporator and condensers heat transfer capacity, and the refrigerant thermodynamic state points for the vapor compression cycle. A commercially available air-source AC system will be used in these experiments.	Lorenzo Cremaschi
Mechanical and Aerospace Engineering	**Development, Optimization and Support of the EnergyPlus Central Plant Simulation** This proposal includes a 5 year plan to provide critical support to a broad EnergyPlus program development effort led by Florida Solar Energy Center. The Oklahoma State University research team provides model development and implementation expertise in the EnergyPlus zone, system and central plant simulations. The proposal is organized by the following tasks: project management and maintenance, development and user support and training.	Daniel E. Fisher
Biomedical Sciences	**Impact of Environmental Toxins on Biological Systems** These projects examine low-level heavy metal and/or pesticide exposure on: 1) neural development, measured by changes in dopamine transporter [expression, trafficking, and function], dopamine release/uptake and the activity/function of the D1-like and D2-like dopamine receptors and 2) toxin-related estrogenic activity (metalloestrogens such as cadmium and organochlorine pesticides) and their impact on the development of breast cancer. We are examining intracellular mechanisms (p53, caspase, etc.) which are responsible for the regulation of cell grow and differentiation and how environmental agents can alter the cell cycle leading to abnormal growth and tumor development	David R. Wallace
Biomedical Sciences	**Bacterial Remediation of Environmental Triclosan** Triclosan is an antiseptic biocide which is incorporated into a wide variety of personal and health care products. Widespread use has resulted in its presence in the environment. We have shown that methylation acts to obviate its antibacterial properties. The purpose of this research is to investigate the relationship between triclosan and bacteria present in municipal waste water streams in an effort to better understand the mechanistic bases underlying intrinsic and acquired resistance, biologic methylation and availability, and potential approaches for bioremediation.	Franklin R. Champlin, Michelle A. DeGear

School of Applied Health and Educational Psychology (SAHEP)	**Fiscal 2015 RMP/GIS Project for Oklahoma State Parks** This project will integrate the use of a statewide Geographic Information System (GIS) in the sponsor's programs by developing a centralized database to effectively serve as a library for geo-referenced infrastructure, facility, visitor, natural resources, financial, inventory, tourism, and other data. It will facilitate management of extensive digital data sets, transfer of data, and cooperation with outside agencies and the public. It will also identify and procure remote sensing data and integrate the GIS with remote sensing and better manage data internally as well as provide data to the public in a visual format. The purpose and scope of the resource management plan (RMP) is to provide background information, identify the policies and goals governing the management of individual state parks and their incorporated resources, summarize the plan's components, and provide descriptive and historical information of the project. The RMP provides the basis for management of the continuing public demand to utilize Oklahoma's state parks. The ultimate purpose of the RMP project over a number of years is to establish a management framework for the conservation, protection, enhancement, development, and use of the physical and biological resources in all of the state parks in Oklahoma.	Lowell Caneday, Nicky Wu
COE Research Office	**Coyle Schools Whole Kids Foundation Project** Coyle schools fundraised for years to purchase a greenhouse. Their dream is becoming a reality in December 2014. Our goal is to provide hands-on learning experience for not only the 50 students in the Agricultural Education Courses (AECs) and Future Farmers of America Chapter, but begin a culture of garden involvement throughout the school of 297 children, many of which are low income. These funds would help to: 1) Expand the reach of our garden to students outside of AECs; 2) Increase sustainability through the creation of a rainwater collection system; 3) Increase potential crop yields (to supplement our salad bar and to be used in fundraisers). Coyle is focusing on sustainability to create a solid base as they plan to expand their garden in coming years to be a source of food for the school and community, which has little access to fresh fruits and vegetables. Conserving water is only part of sustainability. The children and community must be involved and excited by the garden to keep it alive.	John Romans
Agricultural Economics	**Resiliency of Socio-Economic Behavior and Policies to Protect Natural Resources and the Environment under Climate Variability in Oklahoma and the U.S.** The general objectives of the proposed research project are to study the resilience of economic institutions to address natural resource and environmental issues of policy interest to Oklahoma and the nation, and to contribute to developing the theoretical and empirical literature on managing change and risk for managing natural resourcessuch as land, water, and ecosystemsin the face of changing temperature and water regimes and to analyze the determinants of adoption of conservation and environmental mitigation practicesfor shaping sustainable and resilient water and land management policies, pricing, and institutions.	Tracy Boyer

Animal Science	**Dietary Manipulation to Reduce Nutrient Excretion and Gaseous Emissions from Swine** The swine industry represents a major source of agricultural income in Oklahoma and the United States. Concerns over water and air quality associated with swine production facilities are topics of considerable debate. Therefore, methods to reduce the amount of nutrients and odors produced from swine facilities are needed. The first line of defense against nutrient excretion and gas generation is source control or the nutrients entering via the diet. The goal of this research is to determine the effects of dietary strategies on nutrient excretion and gaseous emissions from swine facilities.	Scott Carter
Animal Science	**Assessment of farm management practices and environmental conditions to optimize pig and cattle welfare** As the human population grows, new strategies and technologies will be needed to maximize beef and pork production; however, the beef and swine industries will be challenged if components of sustainability and animal welfare are not enhanced. The welfare component of sustainable food production (1) has not been assessed for the use of technologies in livestock, (2) will need to address the lack of pain relief for on-farm practices, and (3) must advance knowledge on adaptability to climate change. Thisresearch will provide the information needed to optimize the welfare and sustainable stewardship of livestock in Oklahoma.	Michelle Calvo Lorenzo, Megan Rolf, Scott Carter, Clint Krehbiel, Chris Richards, Sara Place, Chris Richards, Udaya Desilva, Deborah VanOverbeke
Animal Science	**Enhancing livestock efficiency and sustainability through genetics** The long-term goal of this research is to explore opportunities for implementation of genomic technologies for novel traits while simultaneously working towards elucidating the links between genetic variants and the underlying biology that results in productivity differences between animals. Simultaneously, this research will allow investigation of how genetics interacts with environmental factors in beef cattle production. The expected outcomes from this research include the creation of a DNA bank on novel traits impacting beef sustainability, opportunities to enhance understanding of how genomics can be used to improve livestock sustainability in genetic evaluation systems, and identification of areas of livestock sustainability that will be efficient and effective targets for genetic solutions.	Megan Rolf
Animal Science	**Assessment of sustainable cattle systems** Cattle release enteric methane (CH4) emissions from their mouth that result due to fermentation processes in their stomach (rumen). Capturing and measuring these emissions is of interest, because CH4 is a greenhouse gas and represents a loss of feed energy. We have constructed and tested a ventilated head box system to measure CH4 emissions from cattle. Animal training and sampling protocol will be developed from the results of the test for use in all future studies. The research addresses NIFA's priority science area of Climate Change, specifically the challenge of mitigating and adapting to climate change.	Sara Place

Animal Science	**Enteric methane emissions measurement system for grazing beef and dairy cattle** The long-term goal of this project is to purchase a GreenFeed system (C-Lock, Inc., Rapid City, SD) to measure enteric methane emissions from grazing beef and dairy cattle. The GreenFeed system will be combined with other resources at Oklahoma State University to conduct production systems-based evaluations of beef and dairy sustainability (e.g. comparing different grazing methods and forages farmers and ranchers can practically adopt). The GreenFeed system will enhance OSU's ability to obtain funding for and conduct interdisciplinary research projects to improve the production efficiency of US beef and dairy cattle systems (i.e. produce more with less environmental impact), and to train graduate and undergraduate students in sustainable cattle systems research	Sara Place
Biosystems and Agricultural Engineering	**Engineering Solutions for Agricultural Air Quality Issues** This project will address current and future critical air quality issues facing U.S. agricultural production operations and processing facilities and establish a highly interactive research program that addresses agricultural air quality compliance-related issues, with an emphasis on particulate matter. The objectives are: 1) Develop scientifically sound agricultural air quality emission factors, 2) Develop and evaluate abatement technologies and/or management practices for controlling agricultural emissions, and 3) Develop and evaluate technologies and/or methodologies for measuring, characterizing, and classifying agricultural emissions. This proposed project incorporates an established national working group with the expectation to address the current and future air quality issues in the state of Oklahoma	Michael Buser
Biosystems and Agricultural Engineering	**Investigation of the Long-term Viability of Rainwater Harvesting for Supplementing Water Supplies and Stormwater Management in Oklahoma** This project will: 1) investigate the occurrence and potential for soil accumulation of organic compounds in rooftop runoff, 2) characterization of the first flush from rooftop runoff, 3) redesign and automate the rainwater harvesting first flush diverter, 4) investigate the impacts of widespread rainwater harvesting on in-stream flows in rivers and streams in Oklahoma, 5) design a web-based tool that utilizes Oklahoma Mesonet data for optimal, site-specific designing of rainwater harvesting systems, and 6) investigation of the effects of climate change on rainwater harvesting system design in Oklahoma. The results will be presented in refereed journal articles, in extension fact sheets, at state and national conferences, and communicated to the public at extension workshops.	Jason Vogel
Biosystems and Agricultural Engineering	**Utilization of the Eastern Redcedar for Biofuel Production** This project seeks to develop technologies to convert Eastern redcedar into biofuels, particularly ethanol and butanol. Pretreatment processes to breakdown lignin and hemicellulose and remove volatile oil in the wood are being developed and compared with one another based on sugar yields. Enzymatic hydrolyses of pretreated wood and fermentations of the sugars produced to produce butanol and ethanol are also being tested. The effects of the oil on hydrolysis and fermentation are being studied as well. Results from the supported research are being disseminated through research journals, undergraduate and graduate courses, meetings with Oklahoma government officials, and presentations at international meetings.	Mark Wilkins

Biosystems and Agricultural Engineering	**Development of advanced thermochemical conversion technology through devolatization and co-pyrolysis of biomass feedstocks with natural gas** This year, we focused on pyrolysis of eastern redcedar, a native invasive species of Oklahoma. Pyrolysis, thermal conversion of solid biomass into liquid fuel intermediate, solid char and gaseous products, is one promising approach to use redcedar. The objective of this study was to investigate effects of eastern redcedar wood zones (heartwood and sapwood), pyrolysis temperature (450 and 500 °C) and pyrolysis types on distribution and composition of pyrolysis products. In fast pyrolysis conditions, the products were dominated by anhydrous sugars, phenols and guaiacols. The total yield of lignin-derived compounds from heartwood was higher than sapwood at 500 °C but not significantly different at 450 °C. In slow pyrolysis conditions, acetic acid and furfural were the two most abundant species in bio-oil.	Ajay Kumar
Biosystems and Agricultural Engineering	**Improving Gasification Conversion Systems in the Production of Bioenergy, Biofuels, and Bioproducts** The overall goal of this project is to address key issues that limit commercial application of OSU developed biomass gasification technologies. The primary issues are gasifier scale-up, materials handling and producer gas cleaning. Because a company is interested in using the OSU patented downdraft gasifier in a self-contained renewable electricity generation unit, the initial research focus will be on gasifier scale-up. As gasifier reactor size increases, input and outputs also increase. For most feedstock inputs, this increase provides an opportunity to increase feedstock particle size, which should decrease the degree of preprocessing and corresponding power, saving time and reducing costs.	Raymond L. Huhnke
Biosystems and Agricultural Engineering	**Development and Testing of Filter Media to Improve Water Quality in Urban and Agricultural Stormwater Runoff** Pollutants in stormwater runoff continue to be a significant cause of the degradation of rivers and streams in the US. Bioretention cells, which filter stormwater before it reaches streams, are an increasing popular technology to address the problem. This project seeks to quantify long- term pollutant sorption and transformations in bioretention cell filter media. In addition, it will identify and quantify the performance of new filter media additivesthat will increase filter media sorption and/or transformations of pollutants.	G. Brown
Biosystems and Agricultural Engineering	**Development of Intelligent Sensing and Control Systems for Field and Laboratory Phenotyping Applications to Enhance Sustainable Crop Production Systems** In most plant phenotyping work, individual plant-level data acquisition is required with high throughput, high resolution, and high accuracy to characterize morphological and physiological features. This research is to develop a real-time, accurate, high capacity tool for characterizing plant phenotypic features. The developed system should mechanize and automate the data collection, analysis, and processing and provide user-friendly tools for data management and visualization.	Ning Wang

Biosystems and Agricultural Engineering	**Integrated Systems Research and Development in Automation and Sensors for Sustainability of Specialty Crops** Research has focused on reducing N inputs while maintaining production levels. The major factors affecting the growth of pecan include pests (insects and diseases), climate, temperature, soil moisture, nut volume, and crop load. Pecan weevil damage can be so bad at times that Oklahoma pecans are severely discounted even to the point where no price is offered. Therefore, efficient and cost-effective pest management strategy has always been a focus for pecan researchers and growers. The ultimate goal of the research is to provide a cost- effective tool to improve pecan production management, to keep the high quality of pecan produces, and to keep sustainability of pecan production.	Ning Wang
Biosystems and Agricultural Engineering	**The Science and Engineering for a Biobased Industry and Economy** This project will develop methods to use plant biomass to produce alcohols that can be used as both fuels and as chemical feedstocks. Pretreatment technologies using plant-degrading fungi are being developed to make biomass more amenable to enzymatic hydrolysis while reducing the environmental impact of biofuel and biochemical production. Also, various fermentation organisms are being employed to consume sugars produced from enzymatic hydrolysis of plant biomass and produce various products that are of value to the energy and chemical sectors, such as ethanol, n-butanol and hexanol. Results from the supported research are being disseminated through research journals, undergraduate and graduate courses, and presentation at international meetings.	Mark Wilkins
Department of Entomology and Plant Pathology	**Development of Disease Resistant Wheat and Studies of Selected Wheat Diseases** Nearly 1,500 wheat lines were tested for reaction to wheat soilborne mosaic/wheat spindle streak mosaic. Oklahoma lines (707) also were tested for reaction to powdery mildew, tan spot, and barley yellow dwarf. Results were provided to wheat breeding programs to facilitate variety development. 'Bentley' winter wheat was released by Oklahoma State University. Other testing/research evaluated and found that: 1) foliar fungicides control wheat disease and protect yield; 2) application of foliar fungicides to disease-resistant wheat varieties does not increase yield, test weight, or relative chlorophyll content in the absence of disease, but does prevent flecking and subsequent chlorophyll loss.	Robert M. Hunger, Kris Giles, Tom Royer
Department of Entomology and Plant Pathology	**Ecology, Biology, and Pest Control of Wood-Destroying Subterranean Termites** Field studies of environmental effects of subterranean termites on soil fertility and aeration, rainwater percolation rates, CO2 and CH4 emissions to the atmosphere, plant diversity, and feeding preferences on The Tallgrass Prairie Preserve in NW Oklahoma are underway. Experimental Use Permit studies examining new technology termiticide application equipment and techniques are being conducted. Accurate determination of termiticide active ingredient residues in gravel foundation fills and soils surround buildings are in progress.	Brad Kard

Department of Entomology and Plant Pathology	**Integrated Arthropod Management in Oklahoma's Grain and Row Crops.** We will develop sustainable, integrated approaches to arthropod management in wheat, canola, cotton and other row crops grown Oklahoma by: 1) determining the distribution and incidence of established and emerging arthropod pests and their impact on yields using registered and novel insecticides and or evaluation of new transgenic events, 2) determining effective oversprays for managing Heliothine escapes in transgenic cotton and their impact on yield, 3) developing sampling plans in concordance with current damage thresholds and adjusting them as necessary, and 4) identifying, evaluating, and disseminating IPM tactics in row crops and small grains for producer adoption.	Tom Royer, Randy Bowman
Robert M. Kerr Food and Agricultural Products Research and Technology Center	**Advanced Processing Techniques for Biobased Product Development** Biomass can be thermally converted to bio-oil, combustible gases and bio-char by pyrolysis in the absence of oxygen. The objective of this research project is to optimize a microwave- assisted pyrolysis (MAP) process that will produce bio-oil from algal biomass. The direct conversion of the electromagnetic energy into heat at the molecular level makes microwave an efficient technology for biomass pyrolysis. Biomass from Oklahoma native algae strains grown on waste water is used as feedstock for MAP. The target bio-oil can be refined into fuels with energy content and functional properties similar to petroleum based fuels or converted other bio-products. Adaptation of the pyrolysis oil as feedstock for bio-product manufacturing will not require substantial changes to the existing fuel production, use and distribution infrastructure	Nurhan Turgut Dunford
Horticulture and Landscape Architecture	**Improved Vegetable Crop Development Through Sustainable Cultural Practices** The research will develop sustainable cultural systems for Oklahoma vegetable crops. Specifically, strategies will be identified to effectively manage pest populations in urban vegetable gardens with minimal insecticide use by encouraging natural enemies, and to enhance pollination services by increasing pollinator diversity and abundance. The research also will determine continuous production periods that could meet market demand for selected Oklahoma vegetable crops, including sweet corn and eggplant.	Brian Kahn

Horticulture and Landscape Architecture	**Development of Integrated Resource Management Systems for Turfgrass Culture in Oklahoma** Seeds of native prairie grasses, big bluestem (Andropogon gerardii Vitm.), indiangrass (Sorghastrum nutans (L.) Nash), little bluestem (Schizachyrium scoparium (Michx.) Nash), blue grama (Bouteloua gracilis (HBK) Lag. Ex Steud.), sideoats grama (Bouteloua curtipendula (Michx.) Torrey), and one grass native to the cross timbers area, river oats (Chasmanthium latifolium (Michx.) Yates) were collected at the end of the 2011, 2012, and 2014 growing seasons. The seeds collected in 2011 were germinated in a growth chamber after receiving various cold stratification periods. Only river oats and big bluestem germinated. Both of these species germinated with all cold stratification periods, but the nonstratified control seeds did not germinate. The seeds of all species collected in 2012 except river oats were exposed to a heat treatment (10 second soak in 80oC water) or no heat treatment then cold stratified for different time periods. Seeds in all species except indiangrass germinated regardless of heat treatment as long as cold stratification was provided. Hulls of half of the river oats seeds were removed and seeds with or without hulls were cold stratified for various time periods. Cold stratified seeds germinated regardless of stratification period.	Janet C. Cole
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Horticulture and Landscape Architecture	**Investigations of Turfgrass Drought Resistance** Turfgrasses and other landscape plants serve an important role in society, yet improvements could be made to develop drought resistant turfgrass varieties and increase turf grass water use efficiency in Oklahoma. The goal of this project is to promote urban environmental sustainability and efficient use of water through the development, commercialization, marketing, and use of drought resistant bermudagrass varieties for Oklahoma and the U.S. transition zone and to increase knowledge pertaining to bermudagrass drought resistance. The objectives of this project are to: 1.) Test and select several experimental bermudagrass genotypes for improved drought resistance; and 2.) Further the understanding of bermudagrass abiotic stress tolerance or resistance through transcriptomics.	Justin Moss
Human Sciences	**Animal Production Systems: Synthesis of Methods to Determine Sustainability** Food demand and specifically the demand for animal protein is expected to increase. However, the quantity and quality of available land, fresh water, and energy resources are declining. Furthermore, consumers increasingly want to know how their food is produced. Consumer preferences create demand for different production practices with respect to food safety, nutrition, animal welfare, environmental protection and retail practices. The goals of this project are to engage collaborators from a broad range of disciplines, including facility management and design; facilitate organization, synthesis, and integration of systems research; and interpret the impacts to animal-production systems.	Paulette Hebert, Mihyun Kang
Natural Resource Ecology and Management	**Coordination and Report of Research Efforts Related to Fisheries, Rangeland, and Wildlife Resources in Natural Resource Ecology and Management** This project will coordinate the conduct and reporting of grants awarded to Natural Resource Ecology and Management investigators that are supported by OAES for the purpose of exploring novel approaches to current issues related to natural resources, ecology, and conservation issues. It is intended that the results of these grants will lead to more extensive research in areas that require preliminary data to stimulate creative approaches to address the sustainable management and conservation of fisheries, forestry, rangeland, and wildlife resources	M. Keith Owens
Natural Resource Ecology and Management	**Improving Sportfish Management in Southern Reservoirs** The overall goal of this research is to provide knowledge necessary for the wise management of sportfish populations in lake and reservoir systems in the U.S. Specifically, the objectives are: 1) to assess commonly used fisheries gears to quantify bias and compare alternative sampling strategies to develop the best available fish population assessment approaches, and 2) provide knowledge needed to effectively manage catfishes, an understudied group of sport fish.	Daniel E. Shoup
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Natural Resource Ecology and Management	**Assessing Functions and Ecosystem Services Provided by the Wetlands Reserve Program in Oklahoma** This project seeks to improve our understanding of the effectiveness of Oklahoma WRP wetlands to provide functions and services. Objectives will be to: 1) use HGM to classify WRP wetlands throughout Oklahoma, 2) assess functional attributes of WRP wetlands and compare those attributes to natural wetlands, 3) develop functional models of WRP wetlands, and 4) create a long-term data set of biological and abiotic attributes of WRP wetlands that can be used to track development of WRP wetlands	Craig A. Davis
Natural Resource Ecology and Management	**Carbon Sequestration in Oklahoma Forests & Probable Response to Climate Change** A significant amount of atmospheric carbon has been stored in forests in the US, much of which would have otherwise been released to the atmosphere with potentially deleterious effects with regard to global warming. Carbon storage is not necessarily incompatible with production of forest products since the end use of timber affects carbon storage. Management of southern forests in general and Oklahoma forests in particular is significant for economies and for the potential for climate change. Climate change may affect many aspects of forest growth and hence forest management. This project will collect data which will provide a more complete picture of carbon storage for certain Oklahoma forest types & analyze potential responses to future climate change.	Thomas B. Lynch
Natural Resource Ecology and Management	**Statistically Rigorous Carbon Stock Predictions Following Forest Restoration in the Southern U.S.** It is important to expand natural resource policy discussion to how forest management influences carbon sequestration. This project's goals are to integrate carbon budgets into decision support tools relevant to ecosystem management of southern pine-oak forests, develop models of below-ground carbon dynamics, and provide statistically valid and defendable estimates of carbon pools and changes under alternate forest management practices at multiple scales.	Duncan S. Wilson
Natural Resource Ecology and Management	**Sun Grant Program** The objective of the Sun Grant Program (SGP) is to address national energy needs through coordinated regional research, education, and Extension activities that are focused on agriculture and forest-based renewable energy. The SGP – South Central Region will develop a regional competitive grants program designed to address the bioenergy research priorities of the Department of Agriculture (USDA) in the context of regional biogeographical conditions and resources.	M. Keith Owens, Raymond Huhnke
Natural Resource Ecology and Management	**Impacts of Regional Bioenergy Systems on Water Availability and Quality** An opportunity exists in the Great Plains to supply feedstock for a vibrant cellulosic biofuel industry while also enhancing ecosystems services, in particular, water supply. This research will determine the impact of harvesting eastern redcedar on water yield at the watershed scale, as compared to recovering and intact native grasslands. It will also determine how planting switchgrass after eastern redcedar harvest affects water quantity and quality and compare to recovering and intact native grasslands.	Rodney E. Will, Jr.

Natural Resource Ecology and Management	**Ecologically-based Invasive Plant Management of Forages in Oklahoma** Biological invasion by non-native plants is a major cause of native ecosystem loss. This research will focus on further assessment of basic ecological characteristics invasive plant species exhibit. This knowledge will be applied to the development of appropriate management practices for controlling invasive plants.	Karen R. Hickman
Natural Resource Ecology and Management	**Restoration and Maintenance of Forest Health of South Central United States Bottomland Hardwoods** This research will determine the original composition and structure of bottomland hardwood forests in south-central North American, the changes in land use that lead to their current condition and the cultural treatments to restore the integrity and health of floodplain ecosystems. The expected benefit of the proposed research is new knowledge and management tools for restoration and maintenance of bottomland hardwood forests.	Stephen Hallgren
Natural Resource Ecology and Management	**Silviculture of Forest and Woodland Communities in Oklahoma in Relation to Productivity and Water Use** Loblolly pine is the most important commercial tree species in the United States and the world. While extensive pine plantation research has focused on maximizing productivity through the addition of nutrients and control of competing vegetation, less is known regarding the potential impact of changes in climate on southern pine productivity and how reduced precipitation may interact with nutrient availability. To address this issue, we will determine the effects of reduced water availability and increased nutrient availability on loblolly pine plantation growth, carbon sequestration, water use and physiology by measuring plantation response to a 30% decrease in through fall and fertilization.	Rodney E. Will, Jr.
Natural Resource Ecology and Management	**Conservation of Rangelands and Wildlife on a Changing Landscape** If native rangelands are to fully meet the expectations of society, it will require fundamental and substantial change in the principles of the discipline of rangeland management, and ultimately to its application at the landscape level. Objectives have been developed that will evaluate the relative importance of several of the principles over the next several years. Specific objectives include: 1) evaluate the response of economically and ecologically important wildlife populations to heterogeneous landscapes as influenced by agricultural management, fire, energy development and global change, and 2) evaluate vegetation responses as fuel for fires, forage for livestock and habitat for important wildlife populations to agricultural management, fire, energy development and global change.	Samuel Fuhlendorf
Natural Resource Ecology and Management	**Improving Oklahoma Rangelands through Understanding Above- and Below-ground Linkages** The research project will examine above- and belowground linkages of rangeland ecosystems with a goal of improving rangeland quality throughout Oklahoma, the central U.S., and worldwide. Specifically, this project includes 3 major objectives to further assess: 1) ecosystem level implications of woody plant encroachment, 2) sustainable management for biofuel production, and 3) successful restoration following invasion by non-native grasses.	Gail Wilson

Plant and Soil Sciences	**Land Application and Beneficial Re-use of Industrial and Agricultural by-products** Since October of 2014, a P removal structure that was previously constructed has continued to be monitored. This structure was built on a poultry farm in Eastern OK, and has removed around 60% of the dissolved P that has entered into it. Multiple efforts are being made throughout the U.S. and this has resulted in collaborations in OH, IN, VT, WV, PA, NY, WI, and MD. We have developed the first version of the design software for the P removal structures, known as PhROG: Phosphorus Removal Online Guidance. Oklahoma State University has licensed this software to the Maryland Department of Agriculture for construction of 30 structures, and is currently licensing a company in Ohio. The software and tutorials can found at www.phrog.okstate.edu. This also led to many presentations and popular press articles.	Chad Penn
Plant and Soil Sciences	**Assessment of the Carbon Sequestration Potential of Common Agricultural Systems on Benchmark Soils across the Southern Region Climate Gradient** This project will generate essential, scientifically based field data to support accurate projections of and provide guidance for soil C sequestration potentials across the climate gradient of the southern US. Collected data and findings will be made available via the internet and accessible through the group's website, which will facilitate dissemination of information generated. The group project stimulates common understanding, shared research, and provides an educational platform among southern US academic institutions and government partners. Data collected, between 2009-2012 from an on-farm soil carbon sequestration assessment, was compiled and utilized by the Oklahoma carbon program to validate carbon sequestration estimates for no-till. Furthermore, data collected between 2011-2013 to evaluate the stability of carbon analysis as a function of sample collection technique was used to develop a sampling protocol for the Oklahoma carbon program. This data has been presented at regional meetings to provide data for the far western portion of the southern region and is currently being developed into manuscripts.	Jason Warren, Tyson Ochsner
Plant and Soil Sciences	**Plant Genetic Resources Conservation and Utilization** The purpose of this regional project is to conserve genetic resources and associated information for a broad spectrum of crop species and to transfer related information to plant breeders and researchers in the Southern Region. In the last reporting period, 133 plant accessions maintained at the USDA ARS Plant Genetic Resources Conservation Unit at Griffin, GA were distributed to organizations or individuals in Oklahoma, according to the plant germplasm distribution record. This represents about 20 percent more accessions sent to OK than the previous year. The accessions were distributed in 39 requests. The requested plant germplasm in 2014 included peppers (Capsicum annuum, P. pubescens and P. chinense) (8 accessions), sorghum plants (Sorghum bicolor and S. propinquum) (84 accessions), Panicum species (virgatum, amarum, capillare, coloratum, hallii, repens, trichanthum, and virgatum var. cubense) (15 accessions), Pennisetum glaucum (1 accession), peanuts (Arachis hypogaea) (3 accessions), watermelon (Citrulus lanatus) (3 accessions), Vigna unguiculata plants (3 accessions), and some other warm-season grasses. Receivers of the plant accessions include researchers at Oklahoma State University and USDA-ARS laboratories, and residents in the state.	Yanqi Wu

Plant and Soil Sciences	**Managing Plant Microbe Interactions in Soil to Promote Sustainable Agriculture** Near the root surface termed the rhizosphere is one of the most microbially active regions on earth. Billions of bacteria from tens of thousands of species inhabit the rhizosphere. These are fed by plant produced photosynthetic carbon to support or detract from plant biomass accumulation. These organisms are essential for protecting plants from disease, extracting nutrients from soil substrates, and producing plant growth promoting compounds. Potential pathogens also inhabit the rhizosphere causing disease in susceptible varieties. Here we develop the experimental, statistical and bioinformatics procedures to identify the organisms that support and detract from plant productivity. Using next generation sequencing of rhizobacterial DNA, a refined experimental wheat growth design, a novel and powerful nonparametric statistical approach, we have been successful in distinguishing positive vs negative organisms from the tens of thousands microbes (Applied and Environmental Microbiology 78: 4434- 4446). We have identified quantitative criteria to judge the productivity of the microbial system under a given soil system. We are currently developing approaches to enhance soil-plant productivity through application of specific microbial inoculums and substrates in a long term study. We will use plant productivity, our quantitative criteria referred to above and an analysis of the overall microbial community structure to gauge our progress. The work will pave the way for a better understanding of the long term contribution of the microbial community to plant productivity and in the development of tools and technology for characterizing and improving plant productivity and agricultural sustainability.	Michael Anderson, Hailin Zhang
Plant and Soil Sciences	**Soil Health in Soil Conservation Management Systems** Much of Oklahoma's soil resources are degraded due to a century of tillage and the resulting loss of topsoil. With this loss of topsoil; soil organic matter and nutrients have been lost as well as the healthy biological and physical characteristics of the native soil system. This project is aimed at identifying production systems that provide economically viable alternatives to conventional production that result in improved soil health through utilization of no-till management and improvements in crop diversity. This effort will focus but not be limited to the extensive integrated crop/livestock production complex currently dominated by dual purpose wheat grazed by cattle. This project will utilize long-term no-till rotations currently in place to assess soil health. It will use newly established research plots to evaluate crop/livestock production systems that promote diversity and crop health while providing economically viable alternatives to the monoculture/conventional wheat based system. This project will improve the diversity of cropping systems in the region, thereby making them more resilient to drought and economic volatility while improving soil health.	Jason Warren, Hailin Zhang, Brian Arnall

Plant and Soil Sciences	**Effect of Management Practices on Soil Microbial Community and Enzyme Activity in Relation to Ecosystem Health and Function** Microbiological and biochemical reactions in soils govern transformations of soil elements, including nutrients and amendments. We continue to evaluate the impact of human activities and land use and management on ecosystem health and function, and to further our understanding on the role of enzyme activities and microbial community in agricultural production and ecosystem health and function. Our intent is to address fundamental questions that bridge research and application and to promote the use of beneficial microorganisms in agricultural production and bioremediation of contaminated soil and water, which will potentially lead to enhanced environmental health and sustainability.	Shiping Deng
Design, Housing and Merchandising	**Making Climate Change a Functioning Thread in the Baccalaureate Curriculum: Transforming Fiber, Textiles and Clothing Education** A three-year project to accelerate integration of climate change concepts and other environmental issues into fiber, textile, and clothing (FTC) curricula via professional development programs has concluded. In 2014, a roundtable gathering of nineteen industry, environmental science, and FTC education professionals was conducted to assist in creating the professional development program scope and content. A comprehensive set of environmental science competencies have been identified and the professional development program materials are currently being finalized to facilitate teaching and learning in sustainability.	Cosette Armstrong
Department of Economics and Legal Studies	**Incentives for Cost Reduction and Cost Padding in Electricity Markets with Overlapping "Green" Regulations.** We examine overlapping regulations in electricity markets. Using an example based on a stylized model of a competitive energy market, we study cost-reduction and cost-padding incentives by "green-energy" producers in an electricity market employing an emissions tax and the simultaneous use of a green quota for the generation portfolio and a fair rate-of- return constraint implemented via a system of feed-in tariffs. We show inter alia that when subsidies are phased out, exploitation of the green technologies full cost-reduction potential is a Nash Equilibrium but emissions will increase. In addition, green-energy producers can engage in collusive cost padding to increase profits even as they satisfy the policymaker's desired green quota.	Kevin Currier

Department of Finance	**The Market's Reaction to Unexpected, Catastrophic Events: the Case of Oil and Gas Stocks and the Gulf Oil Spill** On April 20, 2010 the United States Coast Guard received a report of an explosion and fire aboard Transocean's Deepwater Horizon offshore drilling rig. At the time of the explosion the Deepwater Horizon was being leased to British Petroleum (BP) and was drilling an exploratory well in the Gulf of Mexico. Eleven workers were killed and another seventeen were injured in the explosion. Despite BP's efforts, the oil flowed into the Gulf of Mexico at a rate of up to 60,000 barrels per day. The resulting spill exceeded the Exxon Valdez oil spill as the worst oil spill in U.S. history. While this disaster has far reaching effects on the market value of BP, the more interesting question is what valuation effects might exist for other oil and gas firms. These effects could arise due to the increase in perceived risk for all offshore drilling and the likelihood of an increase in the regulation of offshore drilling. Because the new information was released piecemeal over time and has the potential to affect a number of firms simultaneously, we use Gibbon's (1980) multivariate regression model methodology (MVRM). This methodology allows us to test whether significant abnormal returns occur on days where new information is released. Further, we are able to test whether the market reaction was the same for each firm or whether the market differentiated between firms. We find evidence of abnormal returns for the majority of the information dates in our investigation. Further, our results reject the notion that the market reaction was the same for all oil and gas firms, leading to the conclusion that the market did differentiate between firms.	David A. Carter, Betty J. Simkins
Department of Finance	**Investor Attention and the Neutrality of Corporate Social Responsibility** Abstract: In this study we investigate the effect of ESG (Environmental, Social and Governance) factors and investor attention on the higher moments of a firm's stock returns. Our preliminary results show that minimizing exposure to "concern" factors lowers a firm's exposure to crash risk.	Betty Simkins
Department of Management	**Amateur baseball in Minnesota: Examining the role of sport organizations as social anchors in rural American communities** Business researchers continue to explore the economic, environmental, and social sustainability of organizations and the communities where they are located. While businesses and organizations sometimes serve as social anchors in large, metropolitan cities, they may have a greater impact on smaller and more rural communities. Sport organizations have the capacity to build social capital and develop community identity. In certain regions of the United States the tradition of amateur baseball has served as a meeting place and source of civic pride for many rural communities since the 1800s. The purpose of this study is to gain insight into the role that amateur baseball teams play in rural communities. Using Social Anchor Theory, I seek to explore the community impact and learn about the perspectives of key stakeholders in a few rural communities in the northern United States.	Bryan Finch

Department of Marketing	**The Interplay of Industry and Company Reputation** Despite its obvious importance to managers and interest among scholars, there is little empirical work on the influence of industry reputation on a specific company's reputation (and vice versa). In addition, no one to date has considered the potential role of industry reputation as a context for the evaluation of company reputation or as a moderator on the influence of company reputation on company performance outcomes. This project seeks to address these issues using a combination of secondary and primary data.	Tom Brown
Department of Management Science and Information Services	**Analysis of Social Media Interactions** We model the stochastic nature of social media interactions, especially as it relates to discussion about specific brands and products. The models help understand reactions to original postings.	Ramesh Sharda, Amir Hassan Zadeh