OSU Sustainability Research (Adapted from FY14 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 = 120

Department(s)	Title, Abstract, & Sponsors	Principal Investigator Project Director
Botany	**Development and Characterization of Sorghum Population with Resistance to Greenbug and Cold Stress** Objectives of the research were to develop a sorghum population with enhanced greenbug resistance, cold tolerance, and brown midrib genes. All desired traits will be combined into a breeding line under the background of the elite sorghum cultivar using a gene pyramiding breeding approach and marker-assisted selection. Together with development of breeding lines and selection tools, this research will contribute to the development of new cultivars and hybrids to meet the demand of sorghum production. Sponsors: U.S. Department of Agriculture, Agricultural Research Service, Oklahoma Sorghum Commission	Linda Watson Yinghua Huang
Chemistry	**Development of a Robust Field Technique to Quantify the Air-Void Distribution in Fresh Concrete** Concrete can suffer frost damage when subjected to moisture and freezing temperatures. Frost-durable concrete can be produced if a specialized surfactant is added during mixing to stabilize microscopic air-voids. To investigate this process the research team is using a micro computed tomography scanner (CT) to observe the in-situ 3D air-void system in fresh concrete. This new technique allows the research team to non-destructively examine the response of the air voids to pressure. Research is also being performed to determine the underlying chemistry that yields stable air-void /cement interfaces and the best approaches for air-entrainment. Sponsor: Oklahoma Transportation Center/United States Department of Transportation	Allen Apblett Tyler Ley
Chemistry	**Suppression of ASR Through Aggregate Coatings** Many highways, runways, parking lots and bridges are suffering from premature deterioration due to alkali silica reaction (ASR) that takes place between the alkalis contributed primarily by the cement and a reactive form of silica from specific silicon-containing rocks or minerals in the aggregates utilized in concrete production. This produces an alkali/silica gel that, in the presence of sufficient moisture, will expand and produce stresses that damage the concrete. The research has the aim of developing cost-effective pretreatment processes for problematic aggregates that will eliminate the alkali silicate reaction. Sponsor: Oklahoma Transportation Center/United States Department of Transportation	Allen Apblett Nicholas Materer Tyler Ley

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 (PV) system connected to nanostructured batteries in order to form a novel, self-sustaining energy storage system. The nanostructuring for the batteries will be done by using a nanostructured substrate. Nanostructured PV consisting of inorganic nanorods will be fabricated by high temperature solution growth methods. Nanorods will be "decorated" with quantum dots synthesized by standard chemical methods. The inherent nanostructuring will greatly enhance the PV system while simultaneously enhancing the electron and ion conduction kinetics of the battery. The combined effect will result in nanobatteries that can be charged more readily by the photovoltaic system and can have increased capacity. Sponsor: NASA	Allen Apblett Nick 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. Sponsor: Office of Naval Research	Joseph M. Suflita (OU); Deniz F. Aktas, Iwona B. Beech, Irene A. Davidova, Kathleen E. Duncan, Mark A. Nanny, and Jan Sunner (OU); Recep Avci, Zhiyong Suo, and Xinghong Yang (Montana State University); Anthony M. Dean (Colorado School of Mines); Margaret A. Eastman (OSU)
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	**"Black" Photoactive Materials for Organic Solar Cells: Eumelanin-Based Polymers** The search for alternative fuels to power the future and alleviate human effects on the environment is a daunting task. Solar energy is foremost of these renewable energy sources due to its potential for providing nearly 750 terawatts of power per year (about 40 more times the human power usage). The proposed research presents the design and synthesis of well- defined, soluble eumelanin-based polymers as “black” light absorbing electron donor materials in polymer solar cells. The novel plastics offer the advantage of harnessing more solar radiation than the current materials therefore enhancing polymer solar cell performance. The proposed project has the potential to create economical, lightweight and flexible alternatives to harvest and convert solar energy into electricity. Sponsor: Oak Ridge Associated Universities (ORAU)	Toby Nelson
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. Sponsor: Department of Energy	Jeffrey L. White (OSU); Daniel Resasco (OU)
Computer Science	**Advancement of a whole-chain, stakeholder driven traceability system for agricultural commodities: beef cattle pilot demonstration** Whole-chain traceability is essential to a safe, market-driven food supply. Most product tracing systems (including regulations) are designed and implemented as "one up/one down" systems rather than "whole chain" systems. This project will build the foundation for a traceability and marketing system for GS1 (GTIN) item-level labeling. The goal is to develop and implement a pilot internet-based stakeholder-driven traceability and marketing system for food products that provides a method to limit and remedy food safety outbreaks and biosecurity breaches. In addition, the system will enable marketing information, value-added details, and quality standards criteria, and a feedback opportunity for consumers to rate or improve product quality. The system will allow users to access data whenever and wherever it is needed. Of particular interest to our work will be content-based security in the whole supply chain food traceability system, since trust plays an integral part if the system is to be adapted by the many stake-holders in the whole supply chain. The proposed system will allow stakeholders to maintain granular privacy control over access to data. This is critical, since the ability to trace food through a supply chain depends on private firms sharing product information with competitors as well as collaborators. If they are not assured of privacy control over information, they may refuse to participate in the system. An "open source" community of users and developers will be initiated to maximize ease of adoption of "whole chain" systems by the agricultural and food industry. Sponsors: USDA, National Integrated Food Safety Initiative	Johnson Thomas Blayne Mayfield

Computer Science	**Capacity Infrastructure Model** Capacity Infrastructure Model (CIM) software project for Smart Energy Source (http://www.smartenergysource.com) is a collaborative effort between OSU, Central Rural Electric Coop (CREC), Tri-County Electric Coop (TCEC), and Guernsey Engineering. The CIM software will integrate data from diverse applications across a variety of energy partners, and disperse the data to support decisions that improve energy efficiency and reliability, support energy-related research, and provide educational opportunities to scientists and engineers in training. Energy Research Operations Center (EROC) in the Henry Bellmon Research Center (HBRC) on the OSU campus is also part of the project. The EROC will be tightly integrated – via data, audio, and video – with the Smart Energy Source (SES) Systems Operations Center (SOC). The EROC will facilitate research and education through NESI (the National Energy Solutions Institute). It also is envisioned that the EROC will someday serve as a backup facility for the SES SOC, enabling SES to continue full operation in case of a disaster at the SES SOC. Sponsor: CREC	Blayne Mayfield
Geography	**Land System Vulnerability and Resilience to Drought: A Multi-Scalar, Comparative Analysis of Public and Private Lands in the American West** Oklahoma's Cimarron County and New Mexico's Union County are important cattle producers. Yet, threats from drought, changing cattle market conditions, invasive species that compete with natural grasses, and governmental policies, which alter agro-business through public land leases and environmental regulations, make land users vulnerable to environmental change. The region is in the midst of extreme drought. Land managers must make decisions based on complex economic and policy influences albeit based, in part, on past experiences (e.g. 1930's Dust Bowl). This human-environment study explores land use in terms of land users' vulnerability and resiliency in the region through a mixed-methods approach. Sponsor: NSF/IMEE	Jacqueline Vadjunec; Todd Fagin (University of Oklahoma); Brenda Phillips (University of Ohio-Chillicothe)
Geology	**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. Sponsor: U.S. Department of Energy	Jack Pashin, Devon Energy Chair of Basin Research
Geology	**Biogeophysics for Optimized Mitigation of Hydrocarbon Contaminated Soils: From Theoretical Developments, Laboratory Experiments to Field Validation** This is a collaborative project between Oklahoma State University, Rutgers University, and Western Michigan University. The objective is to investigate to quantitatively characterize biological, geochemical and physical processes contributing to detectable biogeophysical signals at sites impacted with hydrocarbons. Major outcomes of our proposed project will include (1) an enhanced understanding of the underlying fundamental mechanisms of microbially induced biogeophysical signals, (2) the development of a new class of petrophysical models for interpreting biogeophysical data from hydrocarbon contaminated environments and (3) an understanding of the	Estella Atekwana Eliot Atekwana

	limitations of the use of biogeophysical techniques at sites contaminated with contaminants of concern to Chevron. Sponsor: Chevron Technology Company	
Geology	**Effects of Near-Term Sea-Level Rise on Coastal Infrastructure** The primary objective of this interdisciplinary project is to develop models for quantifying the potential impact and risk to coastal systems and infrastructure from near-term sea-level rise and the attendant increases in hurricane activity over the next century. Specific objectives include: 1) examining both the direct and indirect effects of sea-level rise on coastal facilities, 2) developing guidelines for using existing technologies for reducing sea-level rise impacts and risks to coastal systems and infrastructure, and 3) developing new mitigation methods to achieve additional impact and risk reduction. Sponsor: DOD Strategic Environmental Research and Development Program.	Joseph Donoghue
Microbiology and Molecular Genetics	**Biofuel production from lignocellulosic biomass using of members of the anaerobic fungi (Phylum Neocallimastigomycota): A dual bioprospecting and strain development strategy.** The overall goal of this project is to isolate members of the anaerobic fungi (Phylum Neocallimastigomycota), and to explore their utility and potential use as bioconversion agents in biofuel research. Multiple anaerobic fungal strains will be isolated, their physiological characteristics and metabolic potential characterized, and the genome and transcriptome of the most promising isolates will be sequenced using high-throughput sequencing approaches. In addition, various schemes to improve alcohol production and alcohol tolerance in these strains will be explored. Sponsor: National Science Foundation EPSCoR program	Mostafa Elshahed
Microbiology and Molecular Genetics	**Development of a customized enzyme cocktail for corn stover and switchgrass saccharification.** The goal of this proposal is to utilize an anaerobic fungal isolate (Orpinomyces sp. strain C1A) as a source of novel potent enzymes that customized for corn stover saccharification. We will identify, synthesize, clone, and express the most abundant RNA transcripts belonging to ten different cellulose and hemicellulase enzymes in a suitable expression host. The efficacy of these enzymes preparations will be tested on treated and untreated corn stover, and the optimal enzyme cocktail for corn stover saccharification will be identified. The work will be conducted with a clear aim towards patenting, commercialization, and utilization in existing and future second-generation bioenergy plants. Sponsor: Department of Transportation SUN Grant Initiative	Mostafa Elshahed Noha Youssef

Microbiology and Molecular Genetics	**Understanding Early Time Biogeophysical Signals of the Microbial Degradation of Crude Oil from the BP Spill in Saline Marshlands** This is a collaborative project between Oklahoma State University and Rutgers University. The major goal of this project was to characterize microbiological processes contributing to detectable electromagnetic (EM) geophysical signals during crude oil transformations in-situ in salt marshes of Louisiana that were impacted with the BP oil spill. In an attempt to monitor natural degradation processes in hydrocarbon impacted beach sediments, an autonomous resistivity monitoring system was deployed on Grand Terre, LA. Over the course of approximately 18 months, a progressive decrease in the resistivity of the DH spill impacted region was observed. Microbial diversity survey revealed the presence of hydrocarbon degrading organisms throughout the test site. However, hydrocarbon degradation activity was much higher in the DH-impacted locations compared to non-impacted locations suggesting the presence of active hydrocarbon degraders, supporting biodegradation processes. The resistivity data, supported by the microbiological evidence, suggest that resistivity can be used to monitor the long-term fate of hydrocarbon contaminants. Sponsor: National Science Foundation	Babu Fathepure, Estella Atekwana (OSU); Lee Slater (Rutgers-Newark)
Microbiology and Molecular Genetics	**Discovery of Novel Lignin-Degrading Genes in Bacteria Using Metagenomic and Proteomic Approaches for Enhanced Biomass Conversion to Biofuel** The primary goal of this project was to identify novel lignin degrading genes in bacteria that can be used in the bioconversion of plant biomass to biofuel. We have enriched several bacterial consortia that degrade lignin in plant biomass. To gain better insights into the microbial communities and their metabolic capacity, metagenomic analysis of an enrichment culture was performed. In-Silico analysis revealed the presence of a variety of lignin degrading as well as cellulose degrading genes in the metagenome suggesting biomass degrading potential of the enrichment cultures. In addition, several strains of bacteria that degrade lignin as the sole source of carbon were isolated and their physiology and genetic potential to degrade lignin is being studied Sponsor: SunGrant (US Department of Transportation)	Babu Fathepure Rolfe Prade Patricia Canaan
Physics	**Oklahoma EPSCoR Research Infrastructure Improvement Track-1 Award: Adapting Socio- ecological Systems to Increased Climate Variability** The project focuses on how the coupled socio-ecological systems are impacted by drought, including water supply and drought buffering capacity, as well as many other social, ecological and agricultural systems that are strongly affected by changing precipitation patterns. To address this, the proposed project will: 1) develop an observatory network to quantify climate variability in Oklahoma, 2) improve the integrative and predictive understanding of interactions and interdependence among climate, ecological, economic, and social systems, and 3) develop decision support tools that are based on the integrated knowledge of coupled ecological, social, economic, and climatic systems. Sponsors: National Science Foundation, State of Oklahoma	James P. Wicksted; Alicia J. Knoedler (University of Oklahoma)

Zoology	**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. Sponsor: DOI USGS South Central Climate Science Center	Kristen Baum, Mona Papeş; Samuel Fuhlendorf, Kris Giles (CASNR); Daniel Saenz (USFS); Norman Elliott (USDA)
Zoology	**Fungicide toxicity studies** Fungicide use in agricultural systems has increased dramatically over the past several years. Yet little is known about toxicity to resident wildlife, such as amphibians, using agricultural fields. This project investigates the toxicity of a commonly used fungicide to various amphibian species, with particular attention to testing regimes that mimic environmentally realistic exposures, such as direct overspray, traversing contaminated soil, consuming contaminated food, and others. These include both laboratory and field investigations to assess exposure and effects. Sponsor: BASF	Scott McMurry Jason Belden Loren Smith
Chemical Engineering	**Multi-Scale Fouling Characterization of Fermented/Hydrolyzed Sweet Sorghum** Biofuel process streams are fouling intensive fluids that carry biological agents, dissolved solids, biomass, and other proteinaceous substances. Very little information is available about the fouling mechanisms of these fluids on either a laboratory or industrial production scale. This project will focus on the fouling characteristics of fermented sweet sorghum. The goal of the project is to develop a fundamental and applied understanding of the fouling characteristics of fermented/hydrolyzed sweet sorghum in bioethanol recovery equipment. Sponsor: South Central Sun Grant Program for U.S. Dept. of Transportation	Rob Whiteley
Chemical Engineering	**Center for Interfacial Reaction Engineering** Knowledge of the phase behavior and the thermophysical properties of organic mixtures encountered in biomass and petroleum conversion processes is essential to the proper design, operation and optimization of such processes. The project will build upon the research team's previous work in order to further develop theory-framed, structure-based phase behavior models for biphasic catalytic systems and identify improved organic solvents to optimize product separation in these systems. Completion of this research will provide the required modeling capability to develop effective bi-phasic catalytic processes for upgrading and refining of complex feed stocks including bio-oils. Sponsor: University of Oklahoma for Department of Energy	Brian Neely, Clint Aichele; J. White (Arts and Sciences)
Civil and Environmental Engineering	**Determining the Long Term Performance of Petroleum Storage Tank Foundations through the Use of Case Studies** The aim is to build a database of past tank foundation performance that can be interrogated to determine the successful characterization of varying types of foundations and double bottom repairs in different environments. The team proposes to use owner inventory, construction and inspection records of tank foundations in combination with historical weather and soil information, and geotechnical reports for the existing foundations and combine this information into a single database. This database can be investigated to determine which foundations perform best in different situations. Another focus will be to	Tyler Ley; Wade Brorsen (DASNR)

	determine the expected life of a double bottom tank foundation repair. Sponsor: American Petroleum Institute, International Liquid Terminals Association	
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. Sponsor: U.S. Environmental Protection Agency	Greg Wilber
Civil and Environmental Engineering	**SusChEM: Collaborative Research: A Multi-Scale Environmental and Kinetics Study on the Pyrolysis of Sustainable Biomass Feedstock** This collaborative study between Tennessee Technological University and OSU looks at the kinetics and socio-economic broader impacts of biomass pyrolysis. The investigators will introduce a Multiple Variable Control Volume Reactor to independently control the particle- related and homogenous-related transport phenomena and associated reactions, making it possible to independently observe the two processes. In a serious of experiments, model compounds and whole biomass will be studied in an effort to understand the extent to which pyrolysis occurs within condensed phase intermediates and the homogeneous gas phase. The PIs will also introduce a new multi-scale modeling platform based on kinetic cellular automaton. Sponsor: National Science Foundation	Tyler Ley
Civil and Environmental Engineering	**Surface and Airborne Monitoring Technology for Detecting Geologic Leakage in a CO2- Enhanced Oil Recovery Pilot, Anadarko Basin, Texas** OSU, with the cooperation of the Southwest Regional Carbon Sequestration Partnership (SWP), will develop and implement new near-surface and airborne monitoring technologies. The research will focus on the design and deployment of a dense grid of shallow subsurface and surface sensors in combination with low-altitude airborne detection of CO2 and CH4. These technologies will be deployed in the Farnsworth Oil Unit in the Anadarko Basin of the northeastern Texas panhandle, where the SWP and Chaparral Energy, LLC, are conducting CO2- enhanced oil recovery experiments. Sponsor: Department of Energy	Tyler Ley; Peter Clark (Chemical Engineering); Jamey Jacob, Girish Chowdhary (MAE); Jack Pashin, Nicholas Materer (College of Arts & Sciences)
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. Sponsor: Oklahoma State Regents for Higher Education	Gregory G. Wilber; Danielle Bellmer, G. Kakani (Division of Agricultural Sciences & Natural Resources)

Civil and Environmental Engineering	**Investigating the Use of Algaecides for Removal of Geosmin and Methylisoborneol** Drinking water treatment utilities face a number of significant challenges. Among these is the emergence of public concerns regarding a variety of trace-level organic compounds. These include compounds released by algae and aquatic microbes (such as geosmin, 2- methylisoborneol, and cyanotoxins), pharmaceutical and personal care products (PPCPs, which include hormones, antibiotics, analgesics, surfactants, and other chemicals) and other organic substances. Given the concerns about these contaminants, efforts are underway to better understand how these compounds can be efficiently controlled. This collaborative research project will contribute significantly to this effort, focusing on the chemical control of these trace contaminants. Sponsor: Water Research Foundation	Gregory G. Wilber Dee Ann Sanders John N. Veenstra
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. Sponsor: Oklahoma Center for the Advancement of Science and Technology	Daryoosh Vashaee; Ranji Vaidyanathan (Materials Science and Engineering)
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. Sponsor: Oklahoma Center for the Advancement of Science and Technology	D. Vashaee, J. Krasinski; Lobat Tayebi (Materials Science and Engineering); Ken Ede (Graduate College)
Electrical and Computer Engineering	**Control and Operation of Large-Scale Wind Farms in the Power System** OSU is responsible for: 1) Modeling of large-scale wind farms for power system operation: constructing mathematical models of large-scale wind farms for power system operation, 2) Assessing the efficacy and practicality of the controller developed by the OU group, aimed at seamlessly controlling both the active and reactive power outputs of large-scale wind farms in both the maximum power tracking and power regulation modes, 3) Derivation of dynamic output characteristics of large-scale wind farms: evaluating the dynamic output characteristics of large-scale wind farms, operating under the controller, 4) Facilitating collaboration between OU/OSU and power companies. Sponsor: University of Oklahoma for the National Science Foundation	R.G. Ramakumar

Industrial Engineering and Management	**Black Ice Detection and Road Closure Control System for Oklahoma** A major obstacle to widely implement the black ice detection and warning system is that current sensors specific for black ice detection are too expensive. Typically they cost more than $1,000 per unit. So, it is economically impractical to adopt existing ice sensors for black ice detection across Oklahoma. To tackle this challenge, an objective of this project is to develop a functionally competent and economically feasible sensing system for black-ice detection by using regular temperature, humidity, and light sensors, which are much more viable in terms of cost with less than $100 per unit, to replace expensive ice sensors. Sponsor: Oklahoma Department of Transportation for the Federal Highway Administration	Tieming Liu, Satish Bukkapatnam; Hongbo Yu (Arts & Sciences); Ning Wang (DASNR); Yang Hong, Jeff Basara (University of Oklahoma)
Industrial Engineering and Management	**Industrial Assessment Center Program** The mission of the IAC is to assess energy, waste, and productivity practices with the purpose of enhancing the management of the same within the client's enterprise and to share best practices with other IACs, while educating and training the next generation of energy, waste, and productivity professionals. The IAC will focus on IOFs and small and medium-sized manufacturers located within Oklahoma, Kansas, western Missouri, western Arkansas, eastern New Mexico, and beyond, as coordinated by our field managers. The latest technology will be employed to perform assessments that focus on energy, waste, and productivity issues in the clients' facilities. Sponsor: Department of Energy	William J. Kolarik
Materials Science and Engineering	**RDIP: Interns for absorbed natural gas composite tanks** Undergraduate interns will be trained to develop non-cylindrical type of all composite adsorbed natural gas storage vessels for passenger cars for CleanNG LLC. The technology will be based on technologies being developed by CleanNG and OSU under a currently funded NSF Phase I STTR project as well as a concurrent OARS accelerated project. The technology to be developed will also be partially based on adsorbent technologies being developed by the PI and the mentor as well as those being developed at Oak Ridge National Laboratory. The interns will work on a project that could revolutionize the natural gas vehicle industry. Sponsor: Oklahoma Center for the Advancement of Science and Technology	Ranji Vaidyanathan
Materials Science and Engineering	**STTR Phase 1: All-composite Storage for Absorbed Natural Gas** CleanNG LLC, with a team from OSU and Oak Ridge National Laboratory, will develop and manufacture innovative, low-pressure, all-natural, liner-less, all-composite storage tanks (MagmaCel). The gas fuel will be stored using a high-surface area carbon material for adsorption of the gaseous fuel, while the construction of the tank will allow it to carry natural gas in a non-cylindrical tank. The activated carbon material will be based on carbon-based materials including activated carbon and carbon fibers with high adsorption capability, while the fiber and matrix systems for the composite tank will be fabricated from low-cost carbon fibers and natural resin systems. Sponsor: CleanNG, LLC for National Science Foundation	Ranji Vaidyanathan; D. Vashaee (Electrical and Computer Engineering)

Materials Science and 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. Sponsor: Oklahoma Center for the Advancement of Science and Technology; Amethyst Research, Inc.	Ranji Vaidyanathan; Daryoosh Vashaee (Electrical and Computer Engineering)
Mechanical and Aerospace Engineering	**Surface and Airborne Monitoring Technology for Detecting Geologic Leakage in a CO2- Enhanced Oil Recovery Pilot, Anadarko Basin, Texas** OSU, with the cooperation of the Southwest Regional Carbon Sequestration Partnership (SWP), will develop and implement new near-surface and airborne monitoring technologies. The research will focus on the design and deployment of a dense grid of shallow subsurface and surface sensors in combination with low-altitude airborne detection of CO2 and CH4. These technologies will be deployed in the Farnsworth Oil Unit in the Anadarko Basin of the northeastern Texas panhandle, where the SWP and Chaparral Energy, LLC, are conducting CO2- enhanced oil recovery experiments. Sponsor: Department of Energy	Jamey Jacob, Girish Chowdhary; Peter Clark (Chemical Engineering); Tyler Ley (Civil Engineering); Jack Pashin, Nicholas Materer (College of Arts & Sciences)
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. Sponsor: Oklahoma Center for the Advancement of Science and Technology	D.E. Fisher L. Cremaschi J.D. Spitler
Mechanical and Aerospace Engineering	**Performance Analysis of HVAC Systems in the ASHRAE Headquarters Building** In 2008, the ASHRAE Headquarters Building in Atlanta underwent major renovation. Of interest are the new HVAC systems, particularly a ground source heat pump system that serves the second floor and a variable refrigerant flow system that serves the first floor. In addition, a dedicated outdoor air system provides filtered and conditioned outdoor air to maintain indoor air quality. The objectives of this work are to compare the performance of the two heating/cooling systems, explain the reasons for the differences, and do this with sufficient rigor so that the comparisons and explanations can be published in peer reviewed literature. Sponsor: The Geothermal Exchange Organization	Jeffrey 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. Sponsor: Design Intelligence Incorporated, LLC	Jamey Jacob
Mechanical and Aerospace Engineering	**Next Generation Green and Sustainable Manufacturing in Oklahoma – NPDC Support** The OSU Applications Engineering Program will provide engineering support to the OSU New Product Development Center (NPDC) as part of the National Institute of Standards and Technology's (NIST) "Next Generation Green and Sustainable Manufacturing in Oklahoma" grant by serving as liaison between the NPDC and its manufacturing clients. Sponsor: New Produce Development Center for the Oklahoma Alliance for Manufacturing Excellence, Inc. for the National Institute of Standards and Technology	Daniel E. Fisher; D. Thomas (Division of Agricultural Sciences and Natural Resources)
Mechanical and Aerospace Engineering	**Measurements of Pipe Insulation Thermal Conductivity** Mechanical insulation systems are installed around cold pipes to limit the heat gain and to prevent moisture condensation on the pipe wall surface. Insulation jackets, vapor retarders, and vapor sealing of the joints and fittings are normally adopted to create a barrier to the moisture ingress into permeable insulation. However, experience shows that mechanical pipe insulation systems are not completely vapor tight and inevitably moisture accumulates in permeable insulation. This research involves measuring the thermal conductivity of six pipe insulation systems at below-ambient temperature and in wet condensing conditions with moisture ingress allowed into the insulation material. Sponsor: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.	Lorenzo Cremaschi
Mechanical and Aerospace Engineering	**Phase II DOE SBIR Program - Vortical-flow, Direct-Contact Heat Exchanger for Geothermal Cooling** Advanced Cooling Technologies, Inc. is developing a Vortical-flow, Direct-contact Heat Exchanger for HVAC systems, particularly those coupled with Ground-Source Heat Pumps (GSHP), under a Department of Energy SBIR program. OSU will support this effort by providing expertise on GSHP systems and conducting testing. In support of Phase II of the program, OSU will provide the following: Consultation regarding component design for GSHP systems and systems-level considerations; Information regarding testing requirements for design of the VDHX prototypes; Testing of 2 VDHX prototypes with a GSHP or simulated system; Modeling and energy analysis study of GSHP with integrated VDHX. Sponsor: Advanced Cooling Technologies, Inc. for Department of Energy	Jeffrey D. Spitler Lorenzo Cremaschi

Mechanical and Aerospace Engineering	**Development of a Biomimetic Composite Scaffold to Promote Vascular Network Growth** The proposed project is important to the success of the tissue engineering field because after the successful completion of this project we will have developed a method to rapidly fabricate vascular networks within complex composite biocompatible biomimetic scaffolds. The proposed research has relevance to public health because we will gain the ability to tissue engineer multiple products with incorporated vascular networks and facilitate chronic wound healing. Sponsor: National Institutes of Health	D.A. Rubenstein, W. Yin; P. Lloyd (Veterinary Medicine)
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. Sponsor: E.I. du Pont de Nemours and Company	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. Sponsor: University of Central Florida for United States Department of Energy - National Renewable Energy Laboratory	Daniel E. Fisher
New Product Development Center	**Next Generation Green and Sustainable Manufacturing in Oklahoma** The overarching objective of the project is to improve the top line growth, viability, profitability, and global competitiveness of Oklahoma manufacturers. This project will accelerate manufacturers' realized capacity to absorb new, and when appropriate, green technology. Manufacturers that successfully complete the new product development process will increase their capacity to continuously improve and produce new products, processes, and services that are better adapted to evolving market opportunities, address environmental issues, and enhance their global competitiveness. Sponsor: Oklahoma Alliance for Manufacturing Excellence, Inc. for NIST	Robert Taylor; Daniel Tilley (Division of Agricultural Sciences and Natural Resources)
Biomedical Sciences	**Effects of Trace Environmental Pollutants on CNS Activity** These studies examine the effects of low-level heavy metal (mercury, methylmercury, manganese, lead, arsenic, cadmium, and aluminum) exposure on the dopaminergic function in cell culture and whole animal. The indices/biomarkers used to measure the activity/function of the dopaminergic system, include dopamine transporter expression, trafficking, and function as well as dopamine release and uptake and the activity/function of the D1-like and D2-like dopamine receptors. Low-level exposure to heavy metals may not cause overt CNS effects until much later. These studies have implications in forensic analysis and determining the potential cause of CNS damage. Sponsor: Intramural Funding	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. Sponsor: Intramural Funding	Franklin R. Champlin Michelle A. DeGear
School Of Applied Health And Educational Psychology (SAHEP)	**Development of "Run2B", a Youth Running Club** City park and recreation departments offer a variety of sports and activities for both youth and adults. However, many of these activities are primarily team based, and those who enjoy individual sports sometimes lack the opportunity and organizational support to participate as they would wish. Therefore, the primary purpose of this proposal is to outline a new, youth- oriented running program to be adopted by the Stillwater Parks and Recreation Department. The development of such a program would provide an alternative option for those who prefer individual sports and activities, and teach a lifelong activity that directly addresses the growing obesity epidemic amongst youth in Oklahoma. The secondary purpose of this proposal is to develop a template for other parks and recreation departments and schools wishing to start a similar running club. The challenges and successes of this proposed running club can be applied to others seeking to being their own club, and it is expected that the experiences derived from Run2B will be both published academically, but also presented at the 2014 OAHPERD annual conference. Sponsor: Oklahoma Association for Health, Physical Education, Recreation and Dance (OAHPERD)	Tim Baghurst Tyler Tapps
Veterinary Pathobiology	**Animals in the 2012 Oklahoma Wildfires** The Oklahoma wildfires of 2012 affected many rural areas whose residents' livelihoods rely on animal agriculture. This collaborative study with OSU's Department of Political Science and the Center for the Study of Disasters and Extreme Events and the University of North Carolina's Institute for the Environment interviewed residents affected by wildfire to obtain information about warnings, responses and disaster preparations involving animals. The intent of the study is to identify means by which animal owners and emergency professionals can mitigate animal- related losses in rapid-onset disasters such as wildfire. Sponsor: Natural Hazards Center	Tamara Gull; Dana Greene (University of North Carolina); Brenda Phillips, Dave Neal (OSU CSDEE)
Agricultural Economics	**Biobased Energy Research and Information Exchange Committee** The objectives of the Biobased Energy Research and Information Exchange Committee are: a) to exchange information, strengthen partnerships and facilitate the coordination of research and educational efforts relating to renewable and bio-based energy, and b) to strengthen partnerships between research and extension professionals, industry partners, end users, government agencies, policy makers and other effected parties. The committee will be open to individuals in any region. The committee will have a multidisciplinary focus encompassing extension and research professions in fields of agronomy and plant science, agricultural and biosystems engineering, agricultural economics and agribusiness, animal and poultry science, environmental science, family and consumer science and other related disciplines to examine the social, scientific, technical and economic issues	Phil Kenkel

	associated with using biological sources for energy. (2637) Sponsor: Oklahoma Agricultural Experiment Station	
Agricultural Economics	**Economic and Environmental Impacts of Oklahoma Agricultural Production Systems** The overall purpose of this research is to identify those new agricultural technologies and techniques that would best enhance the productivity and profitability of Oklahoma production agriculture while maintaining a proper balance with environmental concerns and the sustainability of the natural resource base. Given the complexities involved in the adoption and extension processes, this research will conduct comprehensive economic evaluations of new technological developments within the Oklahoma agricultural sector. (2678) Sponsor: Oklahoma Agricultural Experiment Station	Jeffery D. Vitale
Agricultural Economics	**Modeling for TMDL Development, and Watershed Based Planning, Management and Assessment** This study will develop tools (standards, framework, or protocol) to link the physical modeling with the economic aspects of watershed planning and management and to develop tools with social scientists and other project partners to help accelerate implementation of watershed planning and management through behavior change. The research will also facilitate usability of watershed management planning models. (2704) Sponsor: Oklahoma Agricultural Experiment Station	Art Stoecker
Agricultural Economics	**Economics of Integrated Pest Management for Stored Products and Food Processing Facilities** The general objective of the proposed research is to improve the ability of the grain marketing system to respond to increased pesticide regulations and to consumer demands for wholesome, insect-free foods. The specific objectives are: 1) Estimate costs and risks associated with chemical-based and IPM pest-control strategies in stored grain facilities, 2) Identify economically optimal insect-management strategies for grain storage managers under alternative situations, 3) Describe the structural, operational, and other insect-related characteristics of various types of grain and food processing facilities, and 4) Estimate costs and risks associated with chemical-based and IPM pest-control strategies in grain and food processing facilities. (2720) Sponsor: Oklahoma Agricultural Experiment	Brian Adam
Agricultural Economics	**Sustainable Communities: Identifying, Analyzing and Measuring the Economic, Environmental and Social Resources in Rural Communities** The overall objectives of this research project are to develop indicators of sustainability for use by local communities; perform quantitative analysis to validate linkages between components of sustainability models and evaluate local institutions and dynamics influence on sustainability goals. (2768) Sponsor: Oklahoma Agricultural Experiment Station	Dave Shideler
Agricultural Economics	**Assessing the Impacts of Farm, Food, Conservation, and Energy Policies on the Economy and the Environment** The specific objectives of this research project include: Analyze the impacts of government policies on the agricultural and general economy. The analysis may include current policies found in the 2008 Farm Act and Energy, Independence and Security Act of 2007, as well as options for future policies related to farm commodities, conservation, food safety, nutrition, renewable fuels, and GHG emissions; determine the effectiveness of farm policies contained in the 2008 Farm Act that are designed to manage risk. Particular	Jody Campiche

	attention will be given to the interaction of the commodity policies in the 2008 Farm Bill and the economy-wide impacts of these programs during each year of sign-up; and disseminate results in appropriate professional outlets as well as Cooperative Extension programs. (2774) Sponsor: Oklahoma Agricultural Experiment Station	
Agricultural Economics	**Economics of Horticultural and other Alternative Crops in Oklahoma** The overall objective of the project is to determine for Oklahoma researchers and farmers the economic and financial feasibility of horticultural crops, and other alternative crops under various production strategies. (2787) Sponsor: Oklahoma Agricultural Experiment Station	Meritt Taylor
Agricultural Economics	**Economics of Oklahoma Crop and Livestock Production Systems and Land Use** The overall objective of this project is to determine the economic consequences of agricultural crop and livestock production alternatives for Oklahoma. Impacts of alternative practices and systems on expected net returns, variability of returns, and input requirements will be determined. In addition, compatibility of the alternative production practices and enterprises with conventional practices and enterprises, resources, and institutional constraints, and potential external costs will be considered. Specific objectives are to: 1) Determine the economic and institutional feasibility, producer impacts, with respect to expected net return, production and financial risk, and rate of return on resources, of alternative crop and livestock production systems compared to existing ones, and 2) Determine environmental tradeoffs between alternative and contemporary crop and livestock production systems. (2824) Sponsor: Oklahoma Agricultural Experiment Station	Francis Epplin
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 resources such as land, water, and ecosystems in the face of changing temperature and water regimes and to analyze the determinants of adoption of conservation and environmental mitigation practices for shaping sustainable and resilient water and land management policies, pricing, and institutions. Specific objectives are 1) to estimate the value non-market uses and preservation of ecosystem resources under differing management and uncertainty assumptions with a focus on water resources; examine the effects of risk perception, adaption to changing climate, and time discounting on willingness to pay for environmental improvements across communities. 2) examine the tradeoffs in welfare and spatial outcomes from differing management assumptions for land and water uses. 3) analyze the determinants of adoption and willingness to pay for different water and land conservation products and methods. (2852) Sponsor: Oklahoma Agricultural Experiment Station	Tracy Boyer

Agricultural Economics	**Marketing and Delivery of Quality Grains and BioProcess Coproducts** Consumers are increasingly demanding high-quality, safe wholesome foods. At the same time, environmental and safety restrictions have reduced the availability of certain chemicals to control insects. As biological and chemical scientists and entomologists are developing alternative methods of insect control, there is a need for economic analysis and optimization to identify the most cost-effective of these alternatives so that increases in food costs can be minimized. Sponsor: Oklahoma Agricultural Experiment Station (2879)	Brian Adam
Animal Science	**Utilization of Distillers Dried Grains in the Horse** Despite the fact that Distillers Dried Grains with Solubles (DDGS) has been widely accepted in both ruminant and non-ruminant diets, there is very little information available concerning its use in equine diets. In an effort to meet energy needs while limiting the incidence of carbohydrate overload, fibrous energy sources such as soybean hulls and beet pulp have been added to the diet with much success. Opportunities exist to explore the use of DDGS not only as a low starch energy source, but also as a high quality substitute for soybean meal. (2651) Sponsor: Oklahoma Agricultural Experiment Station	Steven Cooper David Freeman
Animal Science	**Assessment of farm management practices and environmental conditions to optimize pig and cattle welfare** The state of Oklahoma ranks 8th in total swine numbers and 5th in the number of pigs produced in the US (OK Pork Council, 2012). Oklahoma is also the fourth leading beef producing state (USDA ERS, 2013). Combined, the beef and pork industries account for 62.3% of the total value of the State's multibillion agricultural sector (USDA, 2007). These important sectors of food production, however, have been scrutinized as public concerns have increased regarding the well-being of animals raised for human consumption. With this increased level of public concern, legislative enforcement of the management of farmed animals in other states has exemplified the importance of consumer involvement (i.e., Proposition 2 in California, 2008). As human populations continue to grow, management strategies to maximize meat production (such as the use of growth-promoting technologies) may become common place tools in sustainable food production that can allow producers to stay competitive in their markets and increase meat production. However, the beef and swine industries will continue to be challenged if all major components of sustainability are not addressed, or if standards of animal welfare are not enhanced. Animal handling, care, and routine management practices will need to be continuously re-evaluated and refined in order to optimize animal well-being and gain consumer trust. The animal welfare component of sustainable food production, which also elicits emotional responses from the general public, (1) has not been assessed for the use of beta-adrenergic agonists in livestock, (2) will need to address the problem of providing pain relief for painful on-farm practices in a feasible manner for commercial operations, and (3) must advance knowledge on the best management practices for transportation of livestock. Altogether, these three components of animal well-being will be evaluated through the proposed experiments to bridge the gap of knowledge and generate scientific data on the use of controversial products or practices that are currently unknown or questioned by suppliers, producers, and consumers alike. The studies proposed herein have the potential to impact producer knowledge and priorities, as well as the scientific literature of swine and cattle welfare, which altogether is important for	Michelle Calvo Lorenzo, Scott Carter, Clint Krehbiel, Deborah VanOverbeke, Chris Richards, Megan Rolf, Sara Place; John Gilliam, Douglas Step (Veterinary Medicine); Phil Lewis (Biosystems & Ag Engineering)

	enhancing the welfare standards of pork and beef production. By assessing current practices and developing alternative tools, research in the three aforementioned aspects of animal well-being will prove to be very valuable to producers and consumers, as well as to the overall goal of enhancing sustainable production systems with long-term viability and success. More specifically for the state of Oklahoma, the proposed research will provide knowledge and data needed to optimize the well-being of livestock managed and transported in Oklahoma operations in order to foster the sustainable stewardship of animals and increase animal production efficiencies. These goals are linked to the vision of OSU's Division of Agricultural Sciences and Natural Resources, which is dedicated to making science- based information relevant to improving the quality of life for the people of Oklahoma. Furthermore, these studies support the 2012 Farm Animal Integrated Research priorities of meeting increased global demands for meat, milk, and eggs with environmentally sustainable and socially accepting manners that improve and sustain animal agriculture. (2876) Sponsor: Oklahoma Agricultural Experiment Station	
Animal Science	**Assessment of sustainable cattle systems** Cattle release enteric methane (CH4) emissions out of their mouth that result from 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 the potential energy in the feed the animal consumes. In this pilot study, we will use head boxes made of clear polycarbonate plastic, which the animal places its head in, to measure CH4 emissions from Holstein dairy heifers. An animal training and sampling protocol will be developed from this study for using the head box system in any future studies. Furthermore, there is little to no data on enteric CH4 emissions from grazing stocker cattle on native grass or wheat pastures in US production systems. A study will be conducted to quantify enteric CH4 emissions from cattle grazing dormant winter and early summer native range or winter wheat pasture and their subsequent individual finishing performance, feed efficiency, water intake, and enteric CH4 emissions. Heat stress in cattle is both an economic and animal well-being issue for the US beef industry. Annual US beef industry losses from heat stress are estimated to be $369 million and a large proportion of those losses occur in states such as Oklahoma that have large cattle populations and high summer temperatures (St-Pierre et al., 2003). Using shade structures in feedlot housing systems has been shown to improve animal performance (e.g. gain-to-feed ratio) and well-being (Mitloehner et al., 2001, Mitlohner et al., 2002, Gaughan et al., 2010), and has the potential to improve profitability, especially in areas that experience hot summers (e.g. the Southern Great Plains). The impacts of heat stress abatement strategies, such as shade, on feedlot economics and feed nitrogen use efficiency of the feedlot is an unexplored research topic. A study will be conducted to determine if shade use can simultaneously impact animal well-being, N use efficiency, and the economics of finishing beef cattle. The research will provide valuable insights to the cattle feeding industry on how a practical heat stress mitigation technique (i.e. shade) may simultaneously affect the well-being of cattle, the environmental impact of beef per unit of production, and feedlot economics. The proposed work will address the National Institute of Food and Agriculture's priority science area of Climate Change, and specifically address the challenges of mitigating and adapting to climate change and keeping	Sara Place

	American agriculture competitive while ending world hunger. (2903) Sponsor: Oklahoma Agricultural Experiment Station	
Biosystems and Agricultural Engineering	**Biofuels and Bioproducts from Biomass-Generated Synthesis Gas** This project will enhance and critically assess syngas utilization in various reactors to identify reactor designs that increase the alcohol (primarily ethanol) productivity and syngas utilization during the fermentation process. Specific objectives are to: 1) Design and construct a trickle bed reactor (TBR) for syngas fermentation and optimize its operating conditions, 2) Explore methods to enhance the gas-liquid mass transfer rate in a continuous stirred tank reactor (CSTR) and determine its optimum operating conditions, and 3) Developed mathematical models for alcohol production from syngas in the TBR and CSTR reactors. Data collected from this project will be useful in designing large scale bioreactors and process development. (2758) Sponsor: Oklahoma Agricultural Experiment Station	Hasan Atiyeh
Biosystems and Agricultural Engineering	**Development and Evaluation of Low Impact Development Technologies** There are four general objectives for this research: 1) Quantify, in a form suitable for engineering design, any flow volume and peak reductions in LID technology including bioretention cells, permeable pavements and vegetative waterways, 2) Quantify long-term pollutant sorption and transformations in LID filter media. Pollutants of concern are not limited to nitrate, phosphate, heavy metals and organic pesticides, 3) Identify and quantify new filter media additives that will increase filter media sorption and transformations of pollutants, and 4) Based on the results, create and publish engineering guidelines for LID design, construction and maintenance. These objectives are broad, and may not be fully met. (2779) Sponsor: Oklahoma Agricultural Experiment Station	Glenn Brown
Biosystems and Agricultural Engineering	**The Science and Engineering for a Biobased Industry and Economy** Challenges faced by gasification technology include difficulty in gasifying biomass materials with low bulk density and low energy density at high efficiency, low quality of syngas generated form biomass materials, and difficulty in conditioning syngas. This project will investigate fundamental and applied research in biomass gasification to solve these challenges. It is expected that new gasifier design, optimized gasification conditions, and new low-cost gas conditioning system will be developed to bring these technologies closer to commercialization. It is also expected that new fundamental knowledge will be gained through this project about biomass gasification, syngas conditioning and syngas application. (2820) Sponsors: Oklahoma Agricultural Experiment Station, USDA/NIFA	Ajay Kumar
Biosystems and Agricultural Engineering	**The Science and Engineering for a Biobased Industry and Economy** To address the issue of balance in gaseous substrates with inventory of microbial cells in syngas fermentation, various reactor designs are investigated with regards to gas utilization (including mass transfer assessment), cell growth, and product formation. Also, developing novel microorganisms to produce ethanol, butanol and other biobased products as well as modeling syngas fermentation are investigated. Bioprocess and microbe development will allow us to optimize the syngas fermentation, guide in reactor design and process scale-up to reduce biofuels production cost for a potential use on a commercial scale. Most importantly, this will also enhance our energy security and provides additional environmental and economic benefits. (2821) Sponsors: Oklahoma Agricultural Experiment Station, USDA/NIFA	Hasan Atiyeh

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. (2822) Sponsor: Oklahoma Agricultural Experiment Station	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. (2832) Sponsor: Oklahoma Agricultural Experiment Station	Jason Vogel
Biosystems and Agricultural Engineering	**Precision Seeding Systems** This project focuses on improving traditional corn planter performance has been on plant spacing and emergence uniformity. More precise seed placement should improve uniformity of spacing, thus reducing competition. Current OSU research has shown that controlled leaf orientation in corn can lead to increased grain yields. We propose to develop and test a precision planter prototype capable of planting various grades of hybrid corn seed and that will result in consistent across-the-row leaf orientation. When leaves are symmetrically oriented across the row, light interception is increased, plant populations can be increased, and maize grain yields increase. (2842) Sponsors: Oklahoma Agricultural Experiment Station, USDA/NIFA	Randy Taylor
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. (2845) Sponsor: Oklahoma Agricultural Experiment Station	Mark Wilkins

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. (2884) Sponsors: Oklahoma Agricultural Experiment Station, USDA/NIFA	Ning Wang
Biosystems and Agricultural Engineering	**Stream/Riparian Zone Interactions: Sediment and Nutrient Transport to Streams** Conjunctive management of surface and ground water has become increasingly important as water supply and water quality issues intensify. The goal of this research is to improve our understanding of surface and ground water interactions and the impact of this interaction on contaminant fate and transport. This research will improve the understanding of the role of subsurface water in the erosion of soil on steep streambanks, gullies, and embankments, and (2) improve our understanding of the role of vegetation on erosion and stability of hillslopes. Controlling sediment loading to surface water is important for the protection of human health and freshwater ecosystems; this sediment loading must be addressed through improved scientific understanding of riparian management strategies. (2895) Sponsors: USDA/NIFA, NSF, US EPA	Garey Fox
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. (2898) Sponsor: Oklahoma Agricultural Experiment Station	Mark Wilkins
Entomology and Plant Pathology	**Development of Disease Resistant Wheat and Studies of Selected Wheat Diseases** Wheat lines (1,675) from public and private breeding programs located primarily in the Central/Southern Plains were tested for reaction to the wheat soilborne mosaic/wheat spindle streak mosaic virus complex. Oklahoma lines (702) also were tested for reaction to powdery mildew, tan spot, septoria and barley yellow dwarf. Results were provided to breeders to facilitate variety development. Other testing evaluated: (1) foliar fungicides to control wheat disease and protect yield; (2) the effectiveness of applying foliar fungicides to foliar disease- resistant wheat varieties; (3) a procedure to determine reaction of wheat varieties to common root rot/spot blotch caused by Bipolaris	Robert M. Hunger, Kris Giles, Tom Royer; Brett Carver, Art Klatt, Jeff Edwards, Liuling Yan (Plant & Soil Sciences)

	sorokiniana. (1871) Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Wheat Research Foundation, Multiple Chemical Companies	
Entomology and Plant Pathology	**Integrated Pest Management of Wheat and Canola Insect Pests** The primary objective is to develop management programs for insect pests in wheat and canola. Specifically, the research evaluated: 1) the distribution and impact of insect pests in Oklahoma winter wheat systems, 2) the relationship aphids and grain yields in Oklahoma, 3) new binomial sequential sampling plan for aphids in canola, 4) the relationship among aphids, host plants, and natural enemy biology, 5), current insect management plans for wheat and canola production systems in Oklahoma, and 6) the ecology of aphidophagous natural enemies in simple and diverse wheat agroecosystems. (2334) Sponsor: Oklahoma Agricultural Experiment Station	Kristopher Giles
Entomology and Plant Pathology	**Biology, Ecology, and Integrated Management of Turfgrass Diseases** All turfgrasses grown in Oklahoma can be damaged by a variety of diseases and pests. Objectives are to characterize the biology and ecology of important turfgrass pathogens and pests and to develop appropriate integrated management strategies for these turfgrass pests. The genetic diversity of several fungi and insect turfgrass pests are currently being investigated. Additional efforts include characterization of disease response for grasses that differ genetically in disease resistance. Current integrated pest management approaches used for turfgrass in Oklahoma are being evaluated and modified as needed. (2833) Sponsor: Oklahoma Agricultural Experiment Station	Nathan Walker Stephen Marek Eric Rebek
Entomology and Plant Pathology	**Ecological Factors and Pest Control of Wood-Destroying Subterranean Termites** Field studies of environmental effects of subterranean termites on soil fertility, aeration, percolation, CO2 and CH4 emissions, plant diversity, carbon sequestration, feeding preferences, and rainwater infiltration on The Tallgrass Prairie Preserve in Oklahoma are underway. Damage resistance studies of wire insulation against termites is identifying durable products. The ability of termites to degrade dead eastern red cedar trees is providing information weed tree recycling. Studies of termiticide residues in gravel, and of improved termite management products are in progress. (2899) Sponsor: Oklahoma Agricultural Experiment Station	Brad Kard
Robert M. Kerr Food and Agricultural Products Research and Technology Center	**Advanced Processing Techniques for Biobased Product Development** Biofuels are essential and strategic components of a secure economy and diversified energy policy. Developments in the biofuels industry will certainly play a critical role in replacing fossil fuels. The main objective of this project is to develop new processes that will convert low value feedstocks such as lignocellulosic biomass, animal fat and frying oils to biofuels. The effect of various processing parameters on the overall economics of conversion of animal fat and vegetable oils to biodiesel will be examined. This study will allow us to determine the most economic process for feedstock preparation and the technical and economical optimization of biodiesel production from various sources. Advanced imaging techniques will be used to understand reaction pathways involved in the lignocellulosic biomass hydrolysis. Low value biomass such as wheat and barley straw and sorghum stover will be examined as feedstocks for ethanol production. Recovery of high value products from biofuel production by-products will improve the feasibility of the overall process. (2894) Sponsor: Oklahoma Agricultural Experiment Station	Nurhan 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. (2026) Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Department of Agriculture, Food & Forestry, Southern Sustainable Agriculture Research & Education Program	Brian Kahn
Horticulture and Landscape Architecture	**Develop Environmentally Friendly Procedures to Monitor and Enhance Turfgrass Quality** The research determines the effects of selected products and techniques for filtering and/or reducing nutrient runoff from turfgrass. The research pursues the selection of a shade-tolerant bermudagrass cultivar(s) and rapid techniques for the selection of potential shade tolerant grasses. (2392) Sponsors: Oklahoma Agricultural Experiment Station, United States Golf Association, Oklahoma Turfgrass Research Foundation	Greg Bell, Dennis Martin, Justin Moss; Yanqi Wu, Chad Penn (Plant and Soil Sciences)
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. (2723) Sponsor: Oklahoma Agricultural Experiment Station	Justin Moss
Human Sciences	**Food Systems, Health, and Well-being: Understanding Complex Relationships and Dynamics of Change** While the importance of food to health and well-being is clear, the specific ways in which food systems contribute to individual and community health are not well understood. This is a complex issue, which requires improving food systems as well as changing mindsets and behaviors of individuals within the food system. The purpose of this project is to investigate these complex relationships, involving key stakeholders in analyzing and addressing problems and solutions. Our goal is to increase understanding of food and nutrition practices and systems and to facilitate food-related institutional, community, family, and individual behavioral changes that can improve health and well-being. (2829) Sponsor: Oklahoma Agricultural Experiment Station	Stephany Parker

Human Sciences	**Do Gut-Mediated Benefits of Fruits and Vegetables Prevent Obesity and its Effects on Bone** Nationwide, the prevalence of obesity is on the rise, and Oklahoma is no exception. Excess adipose tissue is not only a risk factor for cardiovascular diseases, but also increases the risk of skeletal fracture. The mechanism through which obesity alters bone is considered a cytokine- driven process. Recent reports have suggested a role for the gut mucosal immune system in the pathogenesis of obesity and bone loss. This project is investigating how various dietary factors alter the gut immune response and ultimately impact distal organ system such as the bone. (2867) Sponsor: Oklahoma Agricultural Experiment Station	Brenda Smith
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, to facilitate organization, synthesis, and integration of systems research, and to interpret the impacts to animal-production systems. (2900) Sponsor: Oklahoma Agricultural Experiment Station	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. (2610) Sponsor: Oklahoma Agricultural Experiment Station	M. Keith Owens
Natural Resource Ecology and Management	**Silviculture of Forest and Shrub Communities in Oklahoma in Relation to Productivity and Ecosystem Services** Oklahoma has a forest products industry with associated annual revenue of over 1.8 billion. Higher demand for forest products is predicted to drive stumpage prices upwards between 8 and 82% by 2040. To increase yield and optimize management prescriptions, a better understanding of the biology of managed forest stands is needed. Additionally, forests and trees in Oklahoma provide important ecosystem services such as wildlife habitat, water quality, and carbon sequestration. Understanding how silvicultural manipulations can be used to meet objectives related to ecosystem services is critical. The goal of this research is determine silvicultural practices that will improve economic value of traditional forest products and to enhance ecosystem values. (2665) Sponsor: Oklahoma Agricultural Experiment Station	Rodney E. Will, Jr.

Natural Resource Ecology and Management	**Ecophysiological Investigations of Loblolly Pine Plantation Forests in Oklahoma** New forest management practices must be developed to meet the Nation's expected demand for timber, while providing other forest benefits (clean water, wildlife habitat and recreational opportunities). These practices must be based on a sound understanding of forest biology, to include knowledge of key processes that drive forest production. This project focuses on mechanisms controlling carbon, nutrient and water vapor fluxes at the tree and forest stand level, and in response to silvicultural treatments. Results will lead to the development of forest management practices designed to increase forest productivity and sustain forest ecosystems in a changing physical and chemical climate. (2683) Sponsor: Oklahoma Agricultural Experiment Station	Thomas C. Hennessey
Natural Resource Ecology and Management	**Improving Multi-functionality and Resiliency of Central U.S. Rangelands** The goal of this study is to produce knowledge necessary to sustain multifunctional agricultural production management systems in rangelands of the central U.S. The objectives are: 1) to build on the science of patch-burn grazing, assessing the impacts on multifunctionality and system resilience, 2) to assess ecological and socioeconomic barriers to implementation of fire and grazing technologies including patch-burn grazing, and 3) to assess management options and ecosystem services provided by novel plant communities (i.e., tallgrass prairie invaded by tall fescue and juniper woodland subjected to stand-replacing fire). (2746) Sponsor: Oklahoma Agricultural Experiment Station	David M. Engle
Natural Resource Ecology and Management	**Role of Rangeland Heterogeneity in Biodiversity, Riparian Stability, Livestock Production, and Landowner Landscape Preference** Traditional management of rangelands has predominantly focused on maintaining dominant forage species and reducing variability. This has led to homogenization of rangelands and loss of biodiversity. The goal of this study is to optimize the biodiversity, agricultural productivity, and riparian stability of privately owned rangeland by focusing on heterogeneity achieved through the fire-grazing interaction. (2763) Sponsors: USDA AFRI, Oklahoma Agricultural Experiment Station	Samuel D. Fuhlendorf
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. (2798) Sponsors: Oklahoma Agricultural Experiment Station, Oklahoma Cooperative Fish and Wildlife Research Unit, USDA Natural Resource Conservation Service, Oklahoma Conservation Commission, Oklahoma Water Resources Board	Craig A. Davis
Natural Resource Ecology and Management	**Understanding Plant-soil Microbial Processes to Enhance Soil Carbon Sequestration in Bioenergy Feedstock Production** The Energy Independence and Security Act of 2007 mandates increased reliance on biofuels to reduce our dependency on foreign oil. It has been suggested that prairie grasses can provide a sustainable, low-input biofuel feedstock, while at the same time sequestering large amounts of soil carbon (C). We have studied the importance of mycorrhizas to prairie ecosystems, as	Gail W.T. Wilson; Yanqi Wu (Plant and Soil Sciences); R. Michael Miller (Argonne National Library); Nancy C. Johnson

	well as their contribution to belowground C storage for over 25 years. We wish to apply this ecological knowledge towards the development of sustainable practices for biofuel feedstock production. (2808) Sponsors: USDA AFRI, Oklahoma Agricultural Experiment Station	(Northern Arizona University)
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. (2843) Sponsors: Oklahoma Agricultural Experiment Station, USDA Forest Service, Southern Research Station	Thomas B. Lynch
Natural Resource Ecology and Management	**Resilience and Vulnerability of Beef Cattle Production in the Southern Great Plains under Changing Climate, Land Use and Markets** This research project has two long-term goals. The first is to better understand vulnerability and enhance resilience of Southern Great Plains beef-grazing systems in a world of increased climate variability, dynamic land use, and fluctuating markets through introduction of diversified forages, improved management, multiple marketing options, strategic drought planning, and improved decision support systems for evaluation of alternative options. The second is to safeguard and strengthen production and ecosystem services while mitigating greenhouse gas emissions in the Southern Great Plains. (2857) Sponsors: Oklahoma Agricultural Experiment Station, USDA AFRI, OSU Department of Animal Science, OSU Department of Plant and Soil Sciences, OSU Department of Nutritional Sciences, OSU Department of Biosystems and Agricultural Engineering, USDA ARS, Oklahoma Climatological Survey, Kansas State University, Samuel Roberts Noble Foundation, Inc., Tarleton State University, University of Oklahoma	David Engle
Natural Resource Ecology and Management	**Nano-based Wood Plastic Composites Manufactured from Eastern Redcedar** The eastern redcedar population in Oklahoma is growing. Eastern redcedar adversely affects grassland productivity, water resources, and wildlife habitat. This research proposes to develop wood plastic composite technology that would impact Oklahoma's economy by exploiting the largely underutilized eastern redcedar. (2862) Sponsors: Oklahoma Agricultural Experiment Station, OSU Food and Agricultural Products Research and Technology Center, Oklahoma Redcedar Association	Salim Hiziroglu
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. (2892) Sponsors: Oklahoma Agricultural Experiment Station, USDA AFRI	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. (2893) Sponsors: Oklahoma Agricultural Experiment Station, USDA AFRI, Oklahoma Cooperative Fish and Wildlife Research Unit	Karen R. Hickman
Plant and Soil Sciences	**Improvement of Nitrogen and Phosphorus Fertilization Use and Environmental Safety** The Greenseeker NDVI sensor invented at Oklahoma State University is now the benchmark equipment used for biomass determination in the world. More recently, OSU worked to develop the Optical Pocket Sensor (also NDVI) that has since been extended in China, India, Mexico, Nepal, Brazil, and various locations in the USA. The new pocket sensor measures NDVI and can be used to determine mid-season fertilizer N rates for corn, wheat, rice, and sorghum. Using one of the 29 algorithms developed by our precision agriculture team, farmers can increase their profit by over $15.00 per acre when they use our sensor-based approach. Farmers in the Yaqui Valley, Ciudad Obregon, Mexico how have many years of experience, increased revenue exceeding $40.00 per acre using the Greenseeker nitrogen fertilization approach. Our list of on-line algorithms now include versions that can be accessed by phone, and one that is generalized whereby it also works for different crops. Prescribed by- plant N fertilization has now become a reality. This is incredibly exciting since we can deliver across the board increases in nitrogen use efficiency for cereal crops, worldwide. Parallel research has shown that specific corn seed orientation at planting can influence emerging leaf angle. The effects of controlled leaf geometry facilitate planting higher populations with the potential for increasing grain yield and/or allow the maintenance of grain yields while reducing seed rates. (2192) Sponsor: Oklahoma Agricultural Experiment Station	Bill Raun
Plant and Soil Sciences	**Microbial Activities of Environmental and Agricultural Importance** Microbiological and biochemical reactions in soils dictate transformation of soil nutrients and amendments such as animal waste and soil contaminants. We continue to evaluate the impact of human activities and land use and management on ecosystem health and function, and to investigate the role of enzyme activities and microbial diversity, activity, and community structure in ecosystem health and function. We focus on addressing fundamental questions, bridging research and application to promote the use of beneficial microorganisms in agricultural production and bioremediation of contaminated soil and water, and to enhance environmental health, function, and sustainability. (2394) Sponsor: Oklahoma Agricultural Experiment Station	Shiping Deng; Sam Fuhlendorf (Natural Resources and Ecology Management); Jeff Anderson (Horticulture and Landscape Architecture)
Plant and Soil Sciences	**Enhancing Sustainable Cropping Systems through the Use of Cover Crops** An on-farm research location was identified in 2007 and several crop rotations were established. This past year activities have included analyzing data from grain sorghum, corn, and sunflower. With the inclusion of legume cover crops and using optical sensor technology we have reduced the total applied nitrogen by 10-40% compared to traditional nitrogen management practices, while maintaining grain yields. Results for the study have been presented at several extension meetings in western Oklahoma. (2628) Sponsor: Oklahoma Agricultural Experiment Station	Chad Godsey

Plant and Soil Sciences	**Reducing Phosphorus and Nitrogen Losses to the Environment through the Use of Soil and Manure Amendments.** Various industrial by-products have been collected and characterized for investigation in regard to their ability to sorb nutrients (phosphorus and nitrogen). This includes drinking water treatment residuals, slag from steel production, fly-ash, and waste gypsum. We have constructed a phosphorus removal structure designed to filter phosphorus out of runoff from areas with excessive soil phosphorus levels. The structure is constructed such that the byproducts (P sorbing materials; PSMs) are contained and runoff water is channeled through them to achieve a desired retention time. After the materials are spent and no longer remove phosphorus, they can be removed from the structure and replaced with fresh materials. Several structures have been constructed in drainage ditches on the Eastern Shore of Maryland, and one urban structure has been constructed in Stillwater, OK in a residential neighborhood. (2658) Sponsor: Oklahoma Agricultural Experiment Station	Chad Penn
Plant and Soil Sciences	**Improving Agroecosystem Function by Understanding and Managing Soil Water Dynamics** Mono-cropped winter wheat in Oklahoma results in a precipitation use efficiency of around 20%. Radiation use efficiency of Oklahoma agricultural systems is also low, averaging about 26%. The agroecosystems of the State are clearly functioning at low levels of efficiency. Below optimal agricultural productivity hurts the economy and ecology of Oklahoma. Soil moisture is often a limiting factor for plant growth, but little is known regarding soil moisture dynamics under current and potential cropping systems in Oklahoma. This project is expanding the knowledge base on soil water dynamics under annual and perennial crops, as well as rangeland, in Oklahoma. In the past year, we have continued field measurements of soil water dynamics to 2-m depth under forage sorghum, mixed grasses, and switchgrass, potential bioenergy feedstocks. We have continued monitoring soil water dynamics under rangeland and wheat, soybean, grain sorghum, and sunflower. We have also created a plant-available water monitoring system based on the Oklahoma Mesonet. These efforts are resulting in new understanding about soil water dynamics in Oklahoma agroecosystems and will ultimately contribute to identification of improved land management practices. (2735) Sponsor: Oklahoma Agricultural Experiment Station	Tyson Ochsner
Plant and Soil Sciences	**Bioenergy Crop Production: Toward Realizing Yield Potential** Diversified bioenergy crop production is the key to enhance sustainability and biomass supply to bioenergy industry in the State of Oklahoma. The diversified crop production will also enable improve economic status and farm sustainability of small farmers in Oklahoma. Agronomic adaptation of diverse bioenergy crops (lignocellulosic, sugar, and oilseed crops) and their best management practices are being evaluated using field research stations across Oklahoma by conducting replicated, multi-location, small plot tests. Morphological and physiological traits for improved tolerance to water and nitrogen were identified in switchgrass. In collaboration with OSU switchgrass breeding program, new and improved germplasm is being evaluated for agronomic and physiological traits for improved potential yields and geographic variation across Oklahoma. Research is continuing with other bioenergy crops using field, green house and controlled environment studies. Biomass production potential of the CRP acres (~1M) in Oklahoma is being evaluated through a Regional Feedstock Partnership program. Identified traits	Gopal Kakani

	for abiotic stresses are being analyzed and verified through tissue culture, proteomic and other techniques and integrated into the appropriate breeding programs in Oklahoma. Collaborations were initiated with national (USDA-ARS - Energy Cane and Camelina) and international (ICRISAT- Sorghum) organizations to improve bioenergy crops profile in Oklahoma. Research is being initiated in collaboration with WIT to improve drought and temperature tolerance in Wheat. Several in-state and multi-state teams are being developed to address regional feedstock production issues through SunGrant and Industry collaboration. Both field and controlled environments will be used to evaluate bioenergy crop performance under current and future climates and necessary input will be provided for breeding crops for future climates. Data generated from the agronomic and physiological studies will be used to develop or improve decision support tools that will use available resources such as Mesonet, GIS, Websoil Survey. (2736) Sponsor: Oklahoma Agricultural Experiment Station	
Plant and Soil Sciences	**Soil Carbon Sequestration in Soil Conservation Management Systems** The development of a carbon credit market has initiated a great interest in the sequestration of atmospheric CO2 into agricultural soils through conservation management. This is very much the case in Oklahoma. In fact, in 2001 Oklahoma legislature passed the Oklahoma Carbon Sequestration Enhancement Act which authorized the Oklahoma Conservation Commission to establish and administer a carbon sequestration certification program for the state. This action sparked a significant interest in establishing more accurate estimates of carbon sequestration rates under soil conservation management practices specific to Oklahoma. Therefore research has been initiated to assess soil carbon sequestration under conservation management practices, specifically no-till crop management and grassland establishment. Three basic approaches are utilized to assess the rate of soil carbon sequestration under soil conservation management practices. The first two approaches utilize farmer-cooperator fields. The first approach compares fields under conservation management to conventionally tilled fields. This quick assessment of carbon sequestration potential suggests that after conversion no-till soils sequester 0.5 Mton C2O acre-1 yr-1 with a 90% confidence interval of ±0.7 Mton CO2 acre-1 yr- 1. The second approach of long-term monitoring on farmer-cooperator fields under conservation management will improve this estimate. The third approach involves the collection of soil samples from ongoing small plot experiments in Oklahoma that include treatments that represent soil conservation management practices such as no-till crop production and grassland establishment in previously cultivated soils. This research will provide estimates of the soil carbon sequestration potential using large and small scale assessments that will provide insight into how management, soil type, and geographic location influence carbon sequestration in Oklahoma cropland. (2748) Sponsor: Oklahoma Agricultural Experiment Station	Jason Warren
Plant and Soil Sciences	**Ventilation Waste Heat Recovery in Food Processes** Ventilation waste heat is an example of an underutilized waste heat that can be exploited in the food industry. The overall objective of this project is to reduce energy costs in food processes by recovering ventilation waste heat. The goal of the project is to identify appropriate waste heat recovery technologies and techniques and develop and promote them for long-term implementation. Development will be at the pilot level while demonstration	Timothy Bowser

	will occur in both pilot and full scale installations. (2759) Sponsor: Oklahoma Agriculture Experiment Station	
Design, Housing and Merchandising	**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. Sponsor: Oklahoma Agricultural Experiment Station	Paulette Hebert, Mihyun Kang
Design, Housing and Merchandising	**Making Climate Change a Functioning Thread in the Baccalaureate Curriculum: Transforming Fiber, Textiles and Clothing Education** A three-year project is underway to accelerate integration of climate change concepts and other environmental issues into fiber, textile, and clothing (FTC) curricula via professional development programs. 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. The multiple perspectives of the roundtable participants resulted in significant outcomes including the development of a comprehensive set of environmental science competencies and professional development program areas that can be used to advance teaching and learning in sustainability. Sponsors: Kansas State University, United States Department of Agriculture, National Institute of Food and Agriculture	Cosette Armstrong; Douglas Hamilton, Jason Warren (Division of Agricultural Sciences and Natural Resources)
Nutritional Sciences	**EFNEP Related Research, Program Evaluation and Outreach** In 1968 Congress established the Expanded Food and Nutrition Education Program (EFNEP) to provide low-income families with education for obtaining nutritionally sound diets. At the time, the nutritional problems were deficiencies in calories and nutrients. Now they are obesity- related diseases. However, EFNEP methods for gathering dietary information so that effective education can be provided have not changed. This makes it difficult to determine the most effective ways to address today's problems. One goal of this multi-state research project is to develop new dietary assessment and food behavior measures so that more effective nutrition education can be provided, which, in turn, will promote obesity prevention. Sponsor: Oklahoma Agriculture Experiment Station	Nancy Betts
Spears School of Business	**The Effect of Sunshine on the Stock Market Response to Earnings News** We examine whether the level of sunshine on a given day affects the stock market response to firms' quarterly earnings surprises. We predict that firms announcing earnings on sunny days will be associated with a stronger market reaction. Our empirical tests support this prediction. A one-standard deviation increase in our measure of sunshine results in a 5.02 percent increase in an announcing firm's market reaction to the earnings. The findings are consistent with investors' having more optimistic moods on sunny days, which leads to a larger reaction to earnings news. Sponsor: Oklahoma State University, Stony Brook University	Dan Eshleman; Keval Amin (Stony Brook University)

Economics and Legal Studies	**An Analysis of Regional Income Variation Among The Five Regions of Oklahoma** This paper investigates recent trends of per capita personal income in the state of Oklahoma to ascertain what if any long-run trends are exhibited. Standard theoretical analysis suggests that per capita incomes are expected to converge, especially across regions. However, recent research indicates that the national trend is one of regional income divergence. The question posed by this paper is whether or not Oklahoma per capita income supports evidence of divergence. Sponsor: Oklahoma State University	Orley M. Amos, Jr. Tim C. Ireland
Economics and Legal Studies	**Market Power and Welfare in Electricity Markets Employing Tradable Green Certificates** We show that in an electricity operated under a Tradable Green Certificate system (for renewable energy promotion), an oligopolistic market structure may perform better than a perfectly competitive market structure. Sponsor: Oklahoma State University	Kevin Currier Yanming Sun
Economics and Legal Studies	**Some Implications of Investment Cost Reduction Policies in Energy Markets Employing Green Certificate Systems** In renewable energy markets, green certificate systems are often employed in conjunction with complementary measures such as government sponsored investment cost reduction policies. We demonstrate that, paradoxically, the intensification of an investment cost reduction policy results in increased emissions from fossil fuel producers. Sponsor: Oklahoma State University	Kevin Currier
Economics and Legal Studies	**Some Implications of Design Element Choice when Combining a Green Quota with a System of Feed – in- Tariffs.** Feed-in tariffs provide direct technology-specific subsidies for electricity generation from renewable sources. We show that employing the feed–in tariff subsidies as exogenously specified policy instruments is likely to lead to greater investor security than the alternative of employing the green quota and the end-user tax as the exogenously specified policy instruments. Sponsor: Oklahoma State University	Kevin Currier
Economics and Legal Studies	**Role of Social Networks and Social Capital on Household Food Security in North Texas** According to the U.S. Department of Agriculture, about 1 in 6 U.S. households are affected by food insecurity, meaning there's not enough food at all times to sustain active, healthy lives for all family members. This study analyzes the role of other factors causing food insecurity, such as urban or rural settings, access to nutrition assistance programs, access to inexpensive groceries, family support and social stigma. Sponsor: Southern Methodist University; North Texas Food Bank; Oklahoma State University	Mehtabul Azam; Daniel Millimet, Thomas Fomby (Southern Methodist University)
Economics and Legal Studies	**Effect of Environmental Tax on Steady State Production** This project evaluates the effect of higher pollution tax on long term levels of production and consumption. An increase in the environmental tax is results in lower production from the same capital stock but increases demand for the cleaner goods. The model finds that starting from low levels of environmental tax, initially the demand driven positive relation dominates while at higher levels of environmental tax the production lowering negative effect dominates, with the transition occurring before the economy reaches the optimal tax rate. Sponsor: Oklahoma State University	Bidisha Lahiri

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. Sponsor: Oklahoma State University	David A. Carter, Betty J. Simkins; Philip Humphrey (Valparaiso University)
Management	**Differentiating on Sustainability: Examining the Top-100 US MBA Programs and Sustainability Competencies** The instruction of corporate social responsibility and sustainability (CSRS) in institutions of higher education is increasing worldwide. The ability to provide high quality education in this area could potentially be a way for business schools to differentiate themselves from other schools. However, little is known regarding the degree to which business schools, in particular MBA programs, are differentiating their programs based on competencies in CSRS education. We employ a web-based search of the websites of the top 100 US MBA programs to ascertain the extent to which they have a competence in CSRS education and seek to differentiate themselves based upon such competence. Sponsors: Oklahoma State University, Oral Roberts University	Timothy A. Hart, Ken Ede; John Korstad (Oral Roberts University)
Marketing	**Energy Consumption Forecast Using JMP® Pro 11 Time Series Analysis** Energy consumption is increasing day by day with increased economic growth, population and other factors effecting high usage of energy, which necessitate forecast of energy consumption based on the historical data. Energy forecasts play an important role in energy optimization and balance the supply and demand of the energy. The main objective of this poster is to forecast the energy consumption by month using JMP Time Series Analysis model to predict Monthly energy consumption based on the past energy consumption. Sponsor: State of Oklahoma	Pradeep Reddy Kalakota Srinivas Reddy Busi Reddy Dr. Goutam Chakraborty