

Sustainability Research Conducted at OSU
(Based on FY13 Research Abstracts list and survey conducted spring 2014)

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= 147.

OSU Sustainability Research (Adapted from FY13 Research Abstracts)		
Department(s)	Title, Abstract & Co-Investigators	Principal Investigator Project Director
Veterinary Pathobiology	<p><i>In Vitro</i> Assessment for Antimicrobial Activity - Part A: Bacteria and Fungi. The purpose of the contract is to provide NIAID with a broad and flexible range of <i>in vitro</i> assay capabilities for human infectious diseases of human importance caused by infectious agents. The broad scope will allow NIAID to respond to changing priorities as scientific and public health needs shift, including rapid responses to public health emergencies. The scope of work encompasses any type of <i>in vitro</i> assay work needed for infectious disease research, to include routine screening of products and development of new <i>in vitro</i> assays and database management of work. The services provided under this and other similar contracts will assist NIAID in accomplishing its goal of developing medical products to counter emerging, reemerging and other infectious diseases, as well as agents of bioterrorism. Co-investigators are Christina Bourne, Ph.D., Phil Bourne, Ph.D.</p>	William W. Barrow
Botany	<p>Phylogenomics of Anti-Insect Defenses in Milkweeds Along with global climate change and soil erosion, herbivory by pests ranks as one of the major threats to global food security. Efforts to combat losses in crop productivity due to herbivory have long relied on pesticide application, which has raised concerns over impacts on human and environmental health. Fortunately, evolutionary-based studies on the genetics of pest resistance have led to dramatic breakthroughs in the development of crops that forego the need for intensive pesticide application. The proposed research seeks to identify the genetic basis of milkweed traits previously identified as important adaptations to herbivory, providing genetic tools for crop improvement in Oklahoma and throughout the world.</p>	Mark Fishbein
Botany	<p>Continuous Cultures of Algae: Basic Research Toward Biofuels A viable algal biofuels industry would readily fit into traditional economic drivers and infrastructure in Oklahoma: energy and agriculture. It also may remediate water quality by consuming nutrients in</p>	William Henley

	wastewater, and reduce net CO2 emissions by converting waste CO2 from fossil fuel combustion to biofuels that will displace future fossil fuel use. Henley's lab is studying the stability and physiological response of single- and mixed-species cultures of algae to variable temperature, salinity, and nutrients in the broader context of producing feedstock for biodiesel. First we manipulated community biomass and species balance, productivity and lipid yields by intuitively manipulating culture conditions based on prior observational data. Second, we developed a two-stage continuous culture system to enable continuous harvesting of algal biomass with enhanced lipid content.	
Botany	Laboratory for Innovative Biodiversity Research and Analysis (L.I.B.R.A.) These are exciting times for biodiversity theory. New developments such as the Unified Neutral Theory and Metabolic Ecology seem to offer challenges to classical thinking. The relevance of small-scale experimental manipulations for broad-scale biodiversity issues is increasingly questioned. Unfortunately, basic natural history is often divorced from recent theoretical discussions, leading to miscommunication and, ultimately, poor science. LIBRA is devoted to putting natural history on center stage, but keeping it in the context of modern ecological thought.	Michael Palmer
Botany	A cyberCommons for Ecological Forecasting An infrastructure will be created to allow scientists to analyze and access massive databases across platforms. This will enable collaborations to fill critical research needs in climate change and its effects on biodiversity.	Michael Palmer
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 reagent 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.	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.	Toby Nelson

<p>Geography; Natural Resource Ecology and Management</p>	<p>Quantitative Assessment of Climate Variability and Land Surface Change on Streamflow Decrease in the Upper Cimarron River Long term water resource planning and in-stream flow implementation require improved understandings of how climate, land use and land cover changes (LULC), and human activities have collectively affected streamflow. The overall objective of this project is to quantitatively assess the effects of climate, land surface change and human activities on long term streamflow characteristics of the upper Cimarron River.</p>	<p>Jianjun Ge, Chris Zou</p>
<p>Geography</p>	<p>Developing Biological Data Layers for Great Plains Species of Concern Using Predictive Models In 2008 the Western Governors’ Association (WGA) created the Western Governors’ Wildlife Council consisting of representatives from 17 WGA members working toward developing policies and tools to identify and conserve crucial wildlife habitat and corridors across the region. One of the main objectives of the WGWC is to improve landscape analysis of energy, land use, and transportation projects, as well as of conservation and climate adaptation strategies. The objective of this project is to produce remote sensing data that will inform and produce predictive suitability maps for five species of concern in the southern Great Plains.</p>	<p>Jianjun Ge</p>
<p>Geography</p>	<p>Socioeconomic Aspects of Two Wind Farms in Oklahoma The Oklahoma Wind Power Initiative of the University of Oklahoma and Oklahoma State University was contracted by Texas Christian University to study socioeconomic characteristics related to the Elk City and Minco wind farms in Oklahoma. We put several data layers into a Geographic Information System (GIS) to explore the geographic relationship between various patterns. Exact locations of each turbine were plotted. A viewshed analysis of the landscape shows the turbines can be seen from 20 miles away under clear conditions. The population density in view of the Minco wind farm is several times of that of the Elk City wind farm area. Traffic counts around the wind farms show much more traffic in sight of the Minco wind farm. The population demographics (age, education, etc.) within 10 miles of the wind farms are quite similar except the urbanized areas within 20 miles to the north and east of the Minco sites tend to be younger and have higher levels of education. We plotted visible gas and oil pads within 5 miles of the Minco turbines. Both areas have considerable activity and there is a very large dairy operation within 5 miles of the Minco farm. These areas are characterized as “rural”, but they are already industrialized landscapes! It is clear that Oklahoma opposition to wind farm development can be related to population density: the more people living in the vicinity the more likely there will be a number of people who express opposition.</p>	<p>Stephen J. Stadler</p>
<p>Geography</p>	<p>Land system vulnerability and resilience to drought: A multi-scalar, comparative analysis of public and private lands in the American West Agriculture drives environmental change. Degradation and drought decreases agricultural</p>	<p>Jacqueline Vadjunec</p>

	<p>production, making farmers increasingly vulnerable to change. Such is the case in Oklahoma’s Cimarron and New Mexico’s Union Counties. Both locations are nationally important cattle and agricultural producers. Yet, drought, changing cattle and agricultural markets, governmental policies, and invasive plants that compete with native grasses threaten cattle and agricultural production and other land use. Since 2000, the region has been experiencing an “extreme” (D3) to “exceptional” (D4) drought. Land managers have to make increasingly difficult land use decisions to sustain production, and to feed their families, as well as the rest of the country. This study explores how land users’ respond and rebound under such extreme environmental conditions. The study uses a mixed methods approach including household surveys, focus groups, oral histories, and GIS to explore how land uses change over time, and how these changes impact local landscapes and livelihoods.</p>	
Geography	<p>Reliability of interview data for monitoring and mapping of groundwater Directed a multi-national team in 2004 to test the efficacy and accuracy of interview-based methods for gathering data on groundwater resources. The National Academy of Sciences, COBASE Project Development and Initiation Grants awarded funding for testing these methods, in collaboration with Tashkent State Technical University and the State Committee on Geology and Mineral Resources, Uzbekistan. Field research was conducted to collect a 20 year record of groundwater data from users of traditional wells and results were compared to data from adjacent monitoring wells in the records of the State Committee on Geology and Mineral Resources. Results from correlation and regression analysis show that estimation of depths to the water table can be reliably made based on oral reporting from traditional wells in the absence of hydrological well monitoring. These results have been shared through workshops and conferences with colleagues in Uzbekistan, Nigeria, Uganda, Iran, and the U.S.</p>	Dale Lightfoot
Geography	<p>Assessment of groundwater sustainability using traditional knowledge from qanats and tube wells This line of research includes several studies of historic irrigation and dry farming methods that include using transportation models to assess the efficiency of surface canal networks and mapping changes in the water table at local and regional scales.</p>	Dale Lightfoot
Geography	<p>NESCO manual for sustainable karez restoration in Iran This manual was produced after completion of the UNESCO-sponsored karez survey in Iraq in 2009 (see below) and borrows heavily from that research. The manual was published by the International Center for Qanats and Historic Hydraulic Structures, a UNESCO facility in Yazd, Iran.</p>	Dale Lightfoot
Geography	<p>An assessment of groundwater stewardship in Morocco, Syria, and Yemen These projects are part of a long-term series of country-wide surveys of karez or qanat irrigation systems (traditional subterranean irrigation networks) that examine the history, diffusion, ecology and contemporary use of qanats across North Africa, the Middle East, and Central Asia.</p>	Dale Lightfoot

Geography	<p>The revival of karez in vulnerable communities: a case study from Iraq</p> <p>Directed a 2009 UNESCO-sponsored survey of karez irrigation systems covering the Kurdistan region of northern Iraq, highlighting the locations, status, and desiccation of traditional qanat irrigation and the social and environmental impacts of ongoing drought in rural Iraq. Results of this research were used by UNESCO to refurbish karez irrigation to expand water supply in drought-afflicted villages and reverse out-migration from rural areas.</p>	Dale Lightfoot
Geology; Microbiology and Molecular Genetics	<p>RAPID: Understanding Early Time Biogeophysical Signals of the Microbial Degradation of Crude Oil from the BP Spill in Saline Marshlands</p> <p>This is a collaborative project between Oklahoma State University and Rutgers University. The objective is to identify unique electromagnetic (EM) geophysical signatures that reflect specific changes in sediment physical, chemical, and microbiological characteristics due to oil spills in highly saline environments. Potential benefits include development of geophysical methodologies for the rapid characterization of microbial activity in extreme environments such as the deep ocean.</p>	Estella Atekwana, Eliot Atekwana and Babu Fathepure
Geology	<p>Biogeophysics for Optimized Mitigation of Hydrocarbon Contaminated Soils: From Theoretical Developments, Laboratory Experiments to Field Validation</p> <p>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 limitations of the use of biogeophysical techniques at sites contaminated with contaminants of concern to Chevron.</p>	Estella Atekwana and Eliot Atekwana
Geology	<p>Effects of Near-Term Sea-Level Rise on Coastal Infrastructure</p> <p>The primary goal of this interdisciplinary project is the development and testing of quantitative models for coastal processes. The models are being used to predict 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 climate change impacts on coastal systems and infrastructure; and 3) developing new methods for coastal risk reduction.</p>	Joseph Donoghue
Geology	<p>Nitrogen cycle changes across the Cretaceous-Paleogene mass extinction event</p> <p>This project seeks to evaluate the paleoenvironmental conditions in the oceans through the mass extinction event at the Cretaceous-Paleogene boundary, with a focus on the nitrogen cycle. A range of geochemical data, including nitrogen and carbon isotopic values, will be measured on samples</p>	Tracy Quan

	obtained from five deep-sea sediment cores. The data will provide information about the processes of global mass extinction and the subsequent recovery. The grant fully supports one graduate student, with partial support for another graduate student and an undergraduate student. Funding is also provided for the development of a novel educational activity by an outside educational coordinator.	
Geology	Water Management Strategies for Improved Coalbed Methane Production in the Black Warrior Basin Management of produced water is arguably the most important issue coalbed methane producers face today. In the Black Warrior basin of Alabama, fresh water is disposed exclusively in streams, and this practice is the subject of increasing environmental scrutiny. This study is applying a broad range of geological and geochemical techniques to develop a new water management plan for the Black Warrior basin that includes opportunities for beneficial use in industry and agriculture.	Jack Pashin
Geology	Use of SIP for Long-term In-situ Monitoring of Contaminant Stability Technology developed from this project will involve new comprehensive approaches to monitor biogeochemical dynamics, remotely, over an extended area of the subsurface. Our overall objective is to develop an inexpensive way to monitor the subsurface, in 3 dimensions, in-situ, to detect if subsurface perturbations cause changes in biogeochemical activity and destabilize immobilized toxic and/or radioactive contaminants. Spectral induced polarization (SIP) techniques will be applied to long-term biogeochemical monitoring strategies for nuclear waste facilities and residual contamination in the environment.	Estella Atekwana, Gamal Abdel Aal
Microbiology and Molecular Genetics	Assembly and Function of the Photosystem II Complex Photosystem II is the key enzyme of photosynthesis, natural solar energy production, and needs to be understood for food production and for carbon neutral production of energy and chemical feedstocks. Molecular genetic, biophysical, and bioinformatics techniques are being used to understand the catalytic properties of this crucial enzyme.	Robert Burnap, Han Bao
Microbiology and Molecular Genetics	Biofuel production from lignocellulosic biomass using 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.	Mostafa Elshahed
Microbiology and Molecular	Understanding Early Time Biogeophysical Signals of the Microbial Degradation of Crude Oil from the BP Spill in Saline Marshlands	Babu Fathepure, Estella Atekwana

Genetics; Geology	The major goal of this project was to characterize microbiological processes contributing to detectable geophysical signals during crude oil transformations <i>in-situ</i> in salt marshes of Louisiana that were impacted with the BP oil spill. We have obtained pre-spill baseline geophysical, microbiological, and geochemical data and subsequently studied microbial transformation of oil on the geophysical signatures. Our initial results show that salt-tolerant hydrocarbon-degrading organisms belonging to genus <i>Marinobacter</i> and <i>Halomonas</i> were dominant in soil impacted by BP oil spill compared to soil collected from locations away from the shores suggesting microbial response to BP oil spill.	
Microbiology and Molecular Genetics; Biochemistry and Molecular Biology	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 insight 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	Babu Fathepure, Rolf Prade, Patricia Canaan
Microbiology and Molecular Genetics	Gene Library for Bio-mass-Conversion Enzymes As enzymatic degradation of biomass to feedstock sugars moves towards the forefront of the biofuel industry, an overriding barrier is its inherent recalcitrance. Biomass composition becomes highly variable, with lignin and hemicellulose being removed in various ratios, to different extents, and from different substructures. Enzymatic hydrolysis of solid and oligomeric carbohydrates is different for each treatment. Finding the optimal benefit of pretreatment and enzyme synergy can be greatly facilitated by a diverse and comprehensive enzyme activity library that can be used in mixing studies to evaluate the required activities and ratios for a given pretreatment product. The goal of this project is to create this enzyme activity library.	Rolf Prade
Physics; Biosystems and Agricultural Engineering	Oklahoma EPSCoR Research Infrastructure Improvement Track-1 Award: Building Oklahoma's Leadership Role in Cellulosic Bioenergy The research consists of three objectives addressing critical issues in developing the cellulosic bioenergy industry – feedstock development and biomass conversion. One objective concentrates on establishing a better understanding of the molecular mechanisms of biomass development to improve yield potential while enhancing the tolerance to abiotic and biotic stresses. The other objectives are focused on the molecular mechanisms for efficient microbial conversion and new catalytic/thermochemical processes for converting cellulosic biomass to liquid fuels.	James P. Wicksted, Raymond L. Huhnke
Physics	Oklahoma EPSCoR Research Infrastructure Improvement Track-1 Award: Adapting Socio-	James P. Wicksted

	<p>ecological Systems to Increased Climate Variability</p> <p>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.</p>	
<p>Sociology; Physics; Microbiology and Molecular Genetics; Civil and Env. Engineering; Division of Academic Affairs</p>	<p>OSU ADVANCE Partnerships for Adaptation, Implementation, and Dissemination: Gender Equity in STEM at Oklahoma State University</p> <p>This project studies university policies and practices to better serve and represent its changing academic workers in terms of gender and ethnicity. This research targets uncovering the barriers to women’s and underrepresented groups’ advancement across STEM fields. The data gathered in this effort will help to institutionalize positive changes at the university level and identify department-specific barriers to increase overall participation and advancement of women and minority faculty to senior and leadership ranks.</p>	<p>Jean Van Delinder, Marlene Strathe, Robert V. Miller, James Wicksted, John Veenstra</p>
<p>Sociology; Psychology</p>	<p>ADVANCE Partnerships for Adaptation, Implementation, and Dissemination (PAID) Award: Gender Equity in STEM at OSU (REU Supp)</p> <p>This project is an evaluation experience for undergraduate students within the OSU NSF Grant. This internship broadens participation to undergraduates as well as providing an opportunity for students from underserved and underrepresented groups in STEM disciplines. Undergraduate students will be introduced to evaluation research and encouraged to pursue graduate work.</p>	<p>Jean Van Delinder, Melanie Page</p>
<p>Sociology; Psychology; Teaching and Curriculum Leadership; Chemical Engineering</p>	<p>Red Light, Green Light Signals? Defining Family and School Influences on Rural, American Indian Girls’ Early STEM Interests</p> <p>The goal of this research is to determine the significant predictors of low-income, rural Native American boys’ and girls’ early interests in science and mathematics and to provide new guidance for classroom practices that encourage young girls’ STEM career interests. Specifically, this research will (1) determine and examine family and school influences related to changes in students’ science and math interests and achievement from 3rd – 5th grade among rural, largely Native American populations in Oklahoma; (2) generate case studies describing instances of positive cultural impact; and (3) provide guidelines to help elementary practitioners encourage girls’ STEM interests within this special population.</p>	<p>Jean Van Delinder, Melanie Page, Julie Thomas, Karen High, James Smay</p>
<p>Sociology</p>	<p>Collaborative Research to Investigate and Document Social Impacts of High-Stakes Litigation</p>	<p>Duane A. Gill</p>

	<p>Resolution in a Renewable Resource Community</p> <p>On March 24, 1989, the tanker vessel <i>Exxon Valdez</i> ran aground on a well-marked reef in Prince William Sound (PWS), Alaska spilling more than 11 million gallons of crude oil into one of the most pristine ecosystems in the world. The EVOS continues to wreak havoc on the PWS's ecosystem and renewable natural resources, as well as individuals, groups, and communities that have built their lives and culture on ecosystem resources. Litigation has been a significant feature of the <i>Exxon Valdez</i> disaster. Class-action litigation remained unresolved 14 years after a 1994 jury trial in U.S. District Court, Anchorage found Exxon negligent and awarded \$287 million in compensatory damages and \$5 billion in punitive damages. On June 25, 2008, the Supreme Court reduced the punitive damage award to \$507 million. The goal of this project is to collect time sensitive data on how the Supreme Court decision and subsequent disbursement of punitive damage awards in the EVOS case affects communities, groups, and individuals.</p>	
Statistics	<p>Association Mapping of Cell Wall Synthesis Regulatory Genes and Cell Wall Quality in Switchgrass</p> <p>Switchgrass is an important potential biofuel crop. The objective of this project is to conduct statistical modeling and analysis of switchgrass association genetics data. It aims to identify candidate genes in association with cell quality and attempt to improve biomass quality. This project is in line with the U.S. goal to achieve 30% production of transportation fuel from alternative sources by 2030.</p>	Lan Zhu
Zoology	<p>Ecotoxicology</p> <p>Ecotoxicology can be described as the investigation of the presence and effects of environmental contaminants in natural ecosystems. Examples of recent studies include: Presence and toxicity of fungicides in wetlands embedded in row crop agriculture (PIs: Jason Belden, Scott McMurry, Loren Smith); Presence and toxicity of Trace Metals in Grand Lake (Belden); Pesticide occurrence and remediation in nursery runoff (PIs: Belden, Jason Vogel – Ag. Eng.); Contaminants in rainwater collected from rooftops (PIs: Belden and Vogel); Measurement of contaminants in aquatic systems using integrative passive samplers (Belden).</p>	Jason Belden, Scott McMurry, Loren Smith, Jason Vogel
Zoology; Natural Resource Ecology and Management; Entomology & Plant Pathology	<p>Terrestrial Connectivity across the South Central United States: Implications for the Sustainability of Wildlife Populations and Communities.</p> <p>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.</p>	Kristen Baum, Mona Papeş, Samuel Fuhlendorf, Kris Giles
Zoology	<p>Collaborative Research: URM: Preparing Biologists through Stewardship, Professionalism and Practice</p>	Kristen Baum, Donald French

	<p>This program is a collaborative project with Comanche Nation College (CNC) to increase the number of Native Americans who pursue graduate degrees in the biological sciences. The program includes activities for students at CNC and OSU. The OSU-URM program provides research experiences, as well as financial, academic, and professional development support, to Native Americans who transfer to OSU from a two-year school and pursue a bachelor's degree in biological science, zoology, or physiology.</p>	
Zoology; Office of Scholarship and Financial Aid; University Academic Services	<p>Broadening Opportunities for Biologists This program provides scholarships of up to \$10,000 per year to students transferring from two-year colleges and pursuing bachelor's degrees in biological science, physiology, or zoology at Oklahoma State University. Scholarships will be awarded to academically talented, financially needy students, and the program will provide scholarship recipients with academic support, professional development, and research related activities.</p>	Kristen Baum, Donald French, Charles Bruce, Martha McMillian
Zoology	<p>Organism-environment interactions - impact of cultural eutrophication on Daphnia tracked by genomics, physiology and resurrection ecology Previous work indicated that dietary phosphorus affected gene expression, physiology, life-history, and ultimately the frequency of Daphnia genotypes. We are using methods in resurrection ecology (hatching, or extracting DNA from decades-old resting eggs) in a variety of lakes to understand the microevolutionary trajectories of relevant genes that may be affected by anthropogenic enhancement of P-loading into lakes in the last century. In concert, a variety of physiological (e.g., radiotracers), and genomic (e.g., microarray) tools are being deployed for a thorough understanding of how humans can impact the evolution of biota.</p>	Jeya Singh
Zoology	<p>Amphibian community composition in man-made and natural wetlands in the Ouachita National Forest in Southeastern Oklahoma Amphibian populations are on the decline and appropriate management strategies are necessary to improve populations in some regions. The US Forest Service in the Ouachita National Forest located in southeast Oklahoma constructs ponds which are useful for amphibians, though it is not known if man-made ponds provide the same ecosystem services (e.g., breeding habitat) as the natural aquatic features of the region. This project catalogs amphibian species in natural and man-made wetlands in the Ouachita National Forest and aims to determine the impacts of man-made ponds on species composition. Field work was completed this summer.</p>	Loren M. Smith
Zoology	<p>Greenhouse gas fluxes in playa wetlands: Restoration potential to mitigate climate change Land use change has impacted services provided by playas in the High Plains, U.S. and likely affected their role in climate change forcing from greenhouse gas emissions. As a leading contributor to atmospheric greenhouse gases, the U.S. is taking steps to reduce emissions. This project was designed to examine seasonal greenhouse gas fluxes from playas embedded in dominant land use types in the western High Plains and Rainwater Basin region of Nebraska with the goal of</p>	Loren M. Smith, Scott T. McMurry

	evaluating the potential for U.S. conservation programs to reduce emissions from playas. This is a three year project scheduled for completion in October, 2014.	
Zoology	<p>Ecosystem Services Provided by Playa Wetlands Relative to USDA Programs</p> <p>Ecosystem services are the values that society receives from the natural environment. As part of a national assessment, an OSU team is evaluating the services provided by playa wetlands in the High Plains and how those services are influenced by USDA conservation programs and practices. Some of the services provided by playas include biodiversity provisioning, pollinator capacity, groundwater recharge, floodwater storage, contaminant filtration, and recreation. Practices are being evaluated in Texas, New Mexico, Oklahoma, Kansas, Colorado, and Nebraska in over 300 playas. Some USDA programs (NRCS and FSA) enhance certain services as well as hamper others.</p>	Loren M. Smith, Scott T. McMurry
Zoology	<p>Determining factors affecting the distribution of endangered fish and crayfish species with emphasis on the Ozark region in Northeastern Oklahoma</p> <p>Freshwater habitats are among the most imperiled ecosystems in North America. The Oklahoma Comprehensive Wildlife Conservation Strategy indicates that small rivers (Neosho River) and gravel/sandy bottom streams in the Tallgrass Prairie Region represent very high and moderate priority conservation landscapes respectively, while small rivers (Spring and Illinois Rivers), gravel bottom streams (Spavinaw Creek), and large rivers (Grand-Neosho River) in the Ozark Region represent very high and moderate priority conservation landscapes. These habitats historically and currently support fish and crayfish species that are listed as species of greatest conservation need within the state. This project aims to elucidate factors determining the distribution and population trends in small-bodied fishes and crayfishes in three river drainages of northeastern Oklahoma by combining extensive field sampling and comparisons of present and historic distribution with on-site habitat assessments and ecological niche modeling.</p>	Michael Tobler, Reid Morehouse
Zoology	<p>Replicated Ecological Speciation in Extreme Habitats: Patterns, Mechanisms, and Consequences of Multi-Trait Divergence</p> <p>Live bearing fish that have independently colonized multiple highly toxic springs containing hydrogen sulfide are a model to investigate patterns and mechanisms of adaptation and speciation. The objectives of this study are to identify convergent patterns of phenotypic and transcriptomic divergence in replicated pairs of sulfidic and non-sulfidic habitats, to identify candidate genes potentially involved in the expression of adaptations to the toxic environment, and to use experimental approaches to estimate potential roles of phenotypic plasticity in trait expression and to link adaptation to mechanisms of reproductive isolation. Overall, this project links selection from physiologically explicit and stressful environmental factors to phenotypic and genetic changes involved in the ecological speciation process by combining field and experimental approaches from disparate fields including evolutionary ecology, physiology, and genomics.</p>	Michael Tobler
Applied Health	Resources Management Plan, FY13	PIs: Lowell Caneday,

and Educational Psychology	<p>This project will integrate the use of a statewide Geographic Information System (GIS) in the sponsor’s programs by developing a centralized database to effectively serve as a library for geo-referenced infrastructure, facility, visitor, natural resources, financial, inventory, tourism, and other data. It will facilitate management of extensive digital data sets, transfer of data, and cooperation with outside agencies and the public. It will also identify and procure remote sensing data and integrate the GIS with remote sensing and better manage data internally as well as provide data to the public in a visual format. The purpose and scope of the resource management plan (RMP) is to provide background information, identify the policies and goals governing the management of individual state parks and their incorporated resources, summarize the plan’s components, and provide descriptive and historical information of the project. The RMP provides the basis for management of the continuing public demand to utilize Oklahoma’s state parks. The ultimate purpose of the RMP project over a number of years is to establish a management framework for the conservation, protection, enhancement, development, and use of the physical and biological resources in all of the state parks in Oklahoma.</p>	Kaowen Grace Chang
Teaching and Curriculum Leadership	<p>Global Climate Change: Literacy for Educators: Using On-Line Professional Development to Iterate Content and Pedagogy Oklahoma State University has been selected to evaluate the UNL program utilizing a mixed-methods evaluation strategy. This study employs both qualitative and quantitative data to describe the ways in which the online course design and implementation impacts teachers’ content knowledge and students’ learning.</p>	Julie Thomas
Teaching and Curriculum Leadership; Geology	<p>G.E.T. (Geoscience Experiences for Teachers) in the Field The three objectives of this project are to (1) improve the Earth system science content knowledge and pedagogical competencies of 6-12 science teachers through authentic geoscience experiences with geoscientists; (2) facilitate meaningful interactions between the geosciences research community and educators that promote learning about Earth system science concepts; and (3) strengthen 9-12 geosciences education in formal settings through integration of geosciences experiences. This innovative research will enhance our limited understanding of providing geoscience professional development opportunities to non-Earth Science in-service high school teachers. By addressing this gap in a crucial knowledge base, we will be contributing valuable research results to the fields of science teacher education and geoscience education.</p>	PIs: Toni Ivey, Julie Thomas, Jim Puckette
Center for Local Government Technology	<p>Oklahoma's Public Rural Transit Systems The Rural Transportation Assistance Program (RTAP) provides training, technical assistance, and software applications to 21 rural public transportation systems in Oklahoma. RTAP is funded through a contract with the Federal Transit Authority (FTA) and ODOT. Training is presented in workshops, annual meetings, and “one-on-one” site visits. Current information supporting rural transit operations is provided on the CLGT website.</p>	Kary Kiner

Chemical Engineering	<p>Multi-Scale Fouling Characterization of Fermented/Hydrolyzed Sweet Sorghum</p> <p>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.</p>	Rob Whiteley
Chemical Engineering; Philosophy; Psychology; Applied Health and Educational Psychology	<p>Ethics for Researchers: Helping Moral People Act Ethically</p> <p>Standard Research Ethics classes neglect the topic of <i>moral psychology</i>. Specifically, these classes do not teach students <i>why</i> people act unethically, and they do not provide students with strategies that they can use to increase the likelihood that they will act in accord with their own ethical commitments and/or the ethical codes of their professions. The goal of this proposal is to develop a class, Ethics for Researchers: Helping Moral People Act Ethically, which will meet this need.</p>	Martin S. High, Scott Gelfand, S. Kennison, R. Steven Harrist
Chemical Engineering	<p>The Coal-Seq III Consortium: Advancing the Science of CO₂ Sequestration in Coal Seam and Gas Shale Reservoirs</p> <p>The goal of the research is to develop improved algorithms and reliable coal-structure-based generalized adsorption models to facilitate realistic simulation of CO₂ sequestration in coal seams. Such models will be capable of describing adsorption equilibrium of CO₂ sequestration in wet coal seams and shales, and rigorous accounting for moisture effects in adsorption equilibrium calculations, as well as being an improved generalized method to estimate coal (or shale) capacity for coalbed gases based solely on readily accessible coal (or shale) characterization parameters.</p>	K.A.M Gasem
Civil and Environmental Engineering; Biosystems and Agricultural Engineering; Plant and Soil Sciences	<p>Biology and Engineering for a Sustainable Tomorrow</p> <p>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.</p>	G.G. Wilber, D. Bellmer, G. Kakani
Civil and Environmental Engineering	<p>Sampling Analysis and Evaluation of Water Depth and Water Quality in Enid Wellfields for Two Seasons – Phase II</p> <p>Recommendations from a recent investigation in a groundwater vulnerability assessment plan are to collect and analyze data on water depth, nitrate and TDS distribution in Enid wellfields. The current research proposes to collect and analyze water depth data and water quality data on nitrates and total dissolved solid for summer and winter seasons.</p>	A.K. Tyagi, G.G. Wilber

Civil and Environmental Engineering	<p>Development of an Interactive Website on Asphalt Recycling</p> <p>The intent of this project is to revise the Basic Asphalt Recycling Manual and develop an interactive website that will serve as a Basic Recycling Primer for Hot In-place Recycling, Cold Inplace Recycling and Full Depth Reclamation. Users will be able to navigate through written topics with embedded videos on the processes, supporting graphs, figures and photos. Optional self-tests will be available for the user to test their knowledge and obtain a printout as proof of the mastery of the subject overview as a precursor to more advanced courses.</p>	S.A. Cross, M.P. Lewis
Civil and Environmental Engineering; Materials Science and Engineering;	<p>Recycled Carpet Materials for Infrastructure Applications</p> <p>The purpose of this project is to develop and commercialize innovative engineered composite materials with tailored mechanical and physical properties from discarded waste carpet, thereby reducing its impact on the environment. These composite laminates can be used for building materials, transportation infrastructure, and other structural applications including franchising the technology to small manufacturers across the country. Our long-term goal is innovative use of advanced engineering materials in technologically relevant and high-value applications that will lead to a reduced amount of carpet going to landfills. This project will support the ‘green manufacturing’ economy in Oklahoma.</p>	Tyler Ley, Ranji Vaidyanathan, R.P. Singh
Electrical and Computer Engineering; Materials Science and Engineering; Graduate College	<p>Scalable Rapid Solar Hydrogen Production via Photo-Bio-Chemical Hydrolysis</p> <p>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. Vashae 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.</p>	D. Vashae, L. Tayebi, Ken Ede
Electrical and Computer Engineering	<p>Control and Operation of Large-Scale Wind Farms in the Power System</p> <p>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.</p>	R.G. Ramakumar
Electrical and Computer	<p>Thermal Transport and Energy Conversion in Thermoelectric Nanocomposite Materials</p> <p>The objective is to develop efficient nanocomposite thermoelectric materials in a combined</p>	D. Vashae

Engineering	theoretical and experimental effort. The research is expected to result in performance improvement of nanocomposite TE materials that are cheap and quick to make appropriate for waste heat recovery in large scale.	
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 clients 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.	William J. Kolarik
Materials Science and Engineering; 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.	Ranji Vaidyanathan, Daryoosh Vashaee
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 test bed will be developed that merges a detailed physics based building model with a detailed, physics based vapor compression system model. This will allow development of both process and predictive supervisory control schemes that take into account such factors as building thermal mass and changing weather.	D.E. Fisher, L. Cremaschi, J.D. Spittler
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 LD's proprietary flexible solar cell technology. As part of this effort, DII requires research and development assistance from OSU in the design and development of the wing molds, the new wing design, and development of the manufacturing and production processes required to produce wings.	Jamey Jacob
Mechanical and Aerospace Engineering; Biosystems and	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	D.E. Fisher, Daniel Thomas

Agricultural Engineering	by serving as liaison between the NPDC and its manufacturing clients.	
Mechanical and Aerospace Engineering	<p>Development, Optimization and Support of the EnergyPlus Central Plant Simulation</p> <p>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.</p>	D.E. Fisher
Mechanical and Aerospace Engineering	<p>Development of Design Tools for Surface Water Heat Pump Systems (SWHP)</p> <p>Surface Water Pump systems are widely used, yet there is a paucity of design data and documented design procedures. Existing design procedures provide a workable framework for most systems, if augmented by better knowledge of design water temperatures and convection correlations. For the heat extraction and rejection from the heat exchanger it will be necessary to model, at some level, the surface heat exchange along with the heat extraction/rejection and perhaps inflows and outflows, to determine the design water temperature. Objectives of this proposal are to develop as accurate and usable set of design data and design tools as possible.</p>	J.D. Spitler
New Product Development Center; Agricultural Economics	<p>Next Generation Green and Sustainable Manufacturing in Oklahoma</p> <p>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.</p>	Robert Taylor, Daniel Tilley
Design, Housing, and Merchandising	<p>Enhancing Facility Management and Design Research and Education</p> <p>The purpose of this project was to develop a proposal for facility management and design research and education. The proposal entitled "Energy Efficient Facility Management and Design Forum" was developed and submitted for internal university support. Although the proposal was not funded, the International Facility Management Association emerging leaders were invited to DHM 3823 (Professional Practice for Interior Designers) for interactions with students. Ideas, energy and enthusiasm for the facility management profession were shared during this social and networking opportunity.</p>	Mihyun Kang, Paulette Hebert
Design, Housing, and Merchandising	<p>Lead-Free Oklahoma</p> <p>The purpose of the project is to use a XRF, a portable X-ray fluorescence analyzer, to teach county Extension educators and subsequent consumers to evaluate hidden heavy metals dangers and address deficiencies through best practices. Program evaluation will take place using criteria</p>	Gina Peek

	developed by the Oklahoma Cooperative Extension Service Safety Issue Team.	
Design, Housing, and Merchandising; Biosystems and Agricultural Engineering; Plant and Soil Science	<p>Making Climate Change a Functioning Thread in the Baccalaureate Curriculum: Transforming Fiber, Textiles and Clothing Education</p> <p>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. A best practice assessment of sustainability science undergraduate programs in the United States was conducted to identify key skill competencies and core content grounding sustainability science programs and the best teaching practices associated with them. Methodology included analysis of secondary data sources associated with top-ranked sustainability degree programs in the U.S. and two field visits to top-ranked schools to interview faculty and students.</p>	Cosette Armstrong, Douglas Hamilton, Jason Warren
Design, Housing, and Merchandising	<p>The Fashion Detox</p> <p><i>FASHION DETOX</i> was inspired by the Free Fashion Challenge, an international project that began in 2011 when thirty-three fashionistas vowed to stop shopping for fashion for an entire year. The purpose of the <i>FASHION DETOX</i> challenge is to challenge students to stop acquiring fashion items (apparel & accessories) for an entire semester, and to blog about their experience.</p>	Cosette M. Armstrong, Melody L.A. LeHew, Kim Y. Hiller Connell
Design, Housing, and Merchandising	<p>Repurposing T-shirts into new designs</p> <p>This research project explores ways of deconstructing discarded T-shirts and reconstructing them into fabric, accessories and garments.</p>	Elizabeth Schrantz, Charissa Gabilheri, Lynae Dowdell
Design, Housing, and Merchandising	<p>Oklahoma Healthy Homes and Lead Poisoning Prevention</p> <p>The purpose of the project was to teach a series of National Center for Healthy Housing training courses. The Healthy Homes courses were provided in partnership with the Oklahoma State Department of Health and funded by the US Centers for Disease Control and Prevention. The Healthy Homes training courses are designed to help practitioners understand the connection between health and housing and how to take a holistic approach to identify and resolve problems that threaten the health and well-being of residents and clients.</p>	Gina Peek
Hotel and Restaurant Administration	<p>Green attributes & customer satisfaction: optimization of resource allocation & performance</p> <p>The purpose of this research is to address issues of performance optimization through accounting for asymmetric responses of customer satisfaction to different types of product or service attributes: core, facilitating and “green” (eco-friendly). The primary research inquiry was to explore how these attributes affect customer satisfaction and account for interactions among them in order to identify an optimal combination that would maximize customer satisfaction in lodging industry settings.</p>	Kimberly Mathe, Elena Karpova, Sheila Scott-Halsell
Human Development and Family Science	<p>Center for Family Resilience</p> <p>The Center for Family Resilience (CFR) focuses on scholarship emphasizing individual and family risk and resilience. The CFR works as an interface between community and government social service organizations and the resources of the university to create and disseminate scientific knowledge that contributes to programmatic and policy strategies that promote individual and</p>	Ron Cox, Joseph Grzywacz

	family resilience.	
Human Development and Family Science	<p>National Endowment for Financial Education - High School Financial Planning Program This program provides a financial literacy curriculum and support materials for high school students, teachers, and parents. Materials are available free of charge to all participants. The National Endowment for Financial Education provides a support website for students, teachers, and parents to assist with financial literacy education. The program assists with travel, conference registration, exhibit costs, and materials, and it provides training and support for program planning/delivery aimed at extending materials and education to county Extension educators, teachers, and students.</p>	Sissy Osteen
Human Development and Family Science	<p>Nonstandard Maternal Work Schedules and Child Health in Impoverished Families The project studies the threat of nonstandard maternal work schedules to poor children's physical and emotional well-being as precursors to school readiness. The project aims are to: 1) delineate differences in physical health and emotional well-being at 30 months among children by mothers' exposure to a nonstandard job schedule during the child's first year; 2) quantify how much parenting practices and maternal well-being explain differences in the physical health and emotional well-being of children by maternal work schedules; and 3) identify individual, familial, and social factors that serve as protective factors for children whose mothers have a nonstandard work schedule.</p>	Joseph Grzywacz
Nutritional Sciences	<p>Fulbright Scholar – Managing Climate Change Impacts on Biodiversity of Enset (Ensete ventricosum) and Traditional Wild Edible Plants in Enset Growing Homegardens of Southern Ethiopia The visiting scholar from Ethiopia is supported by this project for his work on enset and other traditionally consumed wild edible plants.</p>	Barbara Stoecker
Nutritional Sciences; Animal Science; Biosystems and Agricultural Engineering; Natural Resource Ecology and Management; Plant and Soil Sciences	<p>Resilience and Vulnerability of Beef Cattle Production in the Southern Great Plains under Changing Climate, Land Use and Markets The purpose of this multi-state project is to better understand vulnerability and enhance resilience of beef-grazing systems in a world of increased climate variability, dynamic land-use, and fluctuating markets through introduction of diversified forages, improved forage and grazing management, multiple marketing options, strategic drought planning, and improved decision support systems for evaluation of alternative options; and to safeguard and strengthen production and ecosystem services while mitigating greenhouse gas emissions in the Southern Great Plains. The College of Human Sciences will conduct a series of focus groups to examine consumer perceptions of environmental impact of beef production and how they affect beef choices.</p>	Barbara Brown, Dave Lalman, Albert Sutherland, Dave Engle, Daren Redfearn, Jeffrey Edward, Brian Arnall, Tyson Ochsner
Agriculture	Biobased Energy Research and Information Exchange Committee	Phil Kenkel

Economics	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 associated with using biological sources for energy.	
Agriculture 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.	Jeffrey D. Vitale
Agriculture 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.	Art Stoecker
Agriculture 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.	Brian Adam
Agriculture Economics	Providing Information and Decision Support Tools to Increase the Effectiveness of Traditional and Non-Traditional Cooperatives The overall objective of this project is to increase the effectiveness of traditional and nontraditional	Phil Kenkel

	cooperatives and help stakeholders evaluate new cooperative development opportunities.	
Agriculture Economics	<p>Sustainable Communities: Identifying, Analyzing and Measuring the Economic, Environmental and Social Resources in Rural Communities</p> <p>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.</p>	Dave Shideler
Agriculture Economics	<p>Assessing the Impacts of Farm, Food, Conservation, and Energy Policies on the Economy and the Environment</p> <p>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 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.</p>	Jody Campiche
Agriculture Economics	<p>Integrated Production Systems for Alternative Crops (OK) – Organic Vegetables for Local and Farm to School Markets</p> <p>The goal of this project is to develop and disseminate technology that would increase markets for vegetable producers through early and late season extension techniques that allow harvest to coincide with the public school year. To achieve this goal, the project will concentrate on the following objectives: 1) Develop plant density and arrangement techniques that will allow extended production and harvest of vegetables (both early and late), 2) Identify weed management needs and develop control techniques applicable to vegetable production using season extension technology, 3) Evaluate the costs and benefits of season extension technology, and 4) Transfer new season extension production information to farmers, consultants, agribusiness and University Extension Personnel. The major expected output of this project is an increase in the number of farmers marketing organic vegetables to schools either through wholesalers or through direct sales to the schools during normal school sessions. These outputs will be obtained as a result of conferences where results from the tests and demonstration sites on season extension techniques have been presented in workshops and training sessions for farmers, extension personnel and school produce buyers.</p>	Merritt Taylor
Agriculture Economics	<p>The Political Economy of Modern Food Production</p> <p>The overall purpose of this research project is to determine the economic consequences of consumers' food preferences and food policies directed toward modern industrial farming practices</p>	Jayson Lusk

	and food policies directed toward modern industrial farming practices. Specific research objectives are both qualitative and quantitative and include: Developing an integrative framework to conceptualize the various components of the seemingly disparate reactions to modern farming practices including factors such as local, production origin, rejection of certain technologies, and sustainability; Identifying the economic consequences of food preferences and food policies directed toward modern industrial farming practices and Determining the role of interest groups (farm organizations, consumers, and activists) in the emerging food controversies.	
Agriculture Economics	<p>Community Health and Resilience</p> <p>The objectives of this research project are to better understand the emerging opportunities and threats to the economic structure of non-metropolitan communities arising from the potential shifts in local and regional food systems and to identify and analyze policies and strategies contributing to the viability and resiliency of communities in responding to economic and policy changes and to natural and human-made stocks.</p>	Brian E. Whitacre
Agriculture Economics	<p>Resiliency of Socio-Economic Behavior and Policies to Protect Natural Resources and the Environment under Climate Variability in Oklahoma and the U.S.</p> <p>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, and 3) analyze the determinants of adoption and willingness to pay for different water and land conservation products and methods.</p>	Tracy Boyer
Biosystems and Agriculture Engineering	<p>Stream/Riparian Zone Interactions: Influence on Sediment and Contaminant Transport in Streams</p> <p>The research is aimed at improving our understanding of surface and ground water interactions in the hydrologic cycle, and the impact of this interaction on contaminant fate and transport to surface and ground water. This research will improve our understanding of the role of subsurface water in the erosion of soil on steep hillslopes through field measurements, laboratory experiments, and conceptual/numerical modeling. This research will also improve our understanding of the potential role of subsurface water flow to streams as a source of phosphorus and other water quality</p>	Garey A. Fox

	contaminants through field data collection and analysis and numerical modeling.	
Biosystems and Agriculture Engineering	<p>The Science and Engineering for a Biobased Industry and Economy</p> <p>A large portion of the efforts are application oriented and will be useful to develop pilot projects, demonstrations and commercialization of biomass conversion to biobased products. Other outputs include educational materials that could be used in traditional classroom settings or for distance education and web based distribution; publications in peer reviewed journals, trade journals, and popular magazines; development of intellectual property; presentations to economic development groups, legislative groups, and to the general public; and development of management recommendations for producers of biobased products.</p>	Raymond Huhnke
Biosystems and Agriculture Engineering	<p>The Science and Engineering for a Biobased Industry and Economy</p> <p>Liquid hot water, dilute acid and steam explosion pretreatment technologies will be evaluated. Technologies will be optimized and engineering analyses of processes will be conducted. Source of biomass investigated will include energy crops, agricultural residues and food processing residuals. Pretreatment effect is evaluated using common analytical protocols. Conversion of herbaceous crops into ethanol will be studied. Thermotolerant yeast and a high solids bioreactor for simultaneous saccharification and fermentation will be developed. Biomass gasification and hydrothermal pyrolysis processes of work will be undertaken. Use of steam-air fluidized bed gasification and downdraft gasification to produce syngas with higher carbon monoxide hydrogen content and maximum energy efficiency will be examined. Research will compare the production of fungal, bacterial and archaeal enzymes by both native and recombinant organisms. Fermentation of xylose to produce the sweetener xylitol will be done with various xylose-fermenting yeast. This regional project will serve as clearinghouse for biomass-related knowledge and training by interfacing with organizations involved in research and development in the bio-based economy and higher education institutions. Tasks will include identifying key areas for which training materials are needed, coordinating experts to create training materials, fostering collaborations between experts, organizing workshop/training on delivery methods for distance education, and assisting in assessment of biomass-related training materials. New multi-disciplinary educational materials will be developed to disseminate knowledge related to biobased products. Courses will be developed to teach professional skills of relevance, including effective methods for distance education and skills for working in multidisciplinary teams. Significant milestones in education subtask area will include recruiting experts to develop educational materials in key areas, developing educational materials suitable for distance education, organizing peer-review assessment of educational materials, and establishing a distribution method for educational materials.</p>	Mark Wilkins
Biosystems and Agriculture Engineering	<p>Biofuels and Bioproducts from Biomass-Generated Synthesis Gas</p> <p>The overall goal of this project is to enhance and critically assess syngas utilization in various reactors to identify reactor designs that increase the alcohol (primarily ethanol) productivity and</p>	Hasan Atiyeh

	<p>syngas utilization during the fermentation process. Mathematical models will be developed to describe the kinetics of syngas fermentation and predict the effectiveness of the various reactor designs. 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. (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.</p>	
<p>Biosystems and Agriculture Engineering; Plant and Soil Sciences; Agricultural Economics</p>	<p>Sustainable Feedstock Production Supply Systems to Support Cellulosic Biorefinery Industries</p> <p>The overall objective of this project is to develop the practices and technologies necessary to ensure efficient, sustainable, and profitable production of cellulosic biomass. This project addresses the needs and concerns of diverse stakeholders both within the cellulosic biorefinery industry and within the public at large. Using large-scale feedstock production research fields, the economic and environmental sustainability of switchgrass, mixed-species perennial grasses, and annual biomass cropping systems will be evaluated. Synergy between bioenergy and livestock production will be explored through dual-use (grazing plus biomass harvest) cropping system experiments. Feedstock quality characteristics, as desired by the biorefinery industry, will be assessed under varied harvest, handling, storage, and preprocessing scenarios. Sophisticated production and logistics economics models will use the data produced from the field-sized experiments to determine if an integrated landscape vision of diversified species can provide a flow of feedstock throughout the year to a cellulosic biorefinery at a cost that will enable cellulosic biofuel to compete with gasoline.</p>	<p>Raymond Huhnke, Carol Jones, Gopal Kakani, Tyson Ochsner, Jason Warren, Francis Epplin</p>
<p>Biosystems and Agriculture Engineering; Agricultural Economics; Plant and Soil Sciences</p>	<p>Biomass Based Energy Research, OK & MS</p> <p>The overall project goal is to further develop selected bioconversion technologies currently under investigation at Oklahoma State University and Mississippi State University. Among these technologies, the cellulosic bioenergy technology of greatest significance is gasification-fermentation process. In gasification, biomass is injected into a reactor where all of the components (cellulose, hemicellulose, and lignin) are gasified to what is commonly referred to as syngas (primarily carbon monoxide, carbon dioxide, and hydrogen). Syngas then flows through a cooling and cleaning system, and is subsequently directed to a bioreactor where it is microbially catalyzed to a mixture of ethanol, inert gases, water, and other potentially useful products. In this bioconversion process, the total biomass, including lignin, is utilized. This multidisciplinary, multi-institutional project takes a holistic approach, addressing the more critical issues for the development of biomass to the production of liquid fuel. Project areas include feedstock development and production, gasification and syngas conditioning, syngas fermentation, microbial catalyst development, process modeling and economics. Preliminary estimates suggest that at least three energy units could be</p>	<p>Raymond Huhnke, Hasan Atiyeh, Danielle Bellmer, Ajay Kumar, Krushna Patil, Mark Wilkins, Francis Epplin, Yanqi Wu</p>

	achieved for one energy unit of input. An added benefit in using this technology is that much higher carbon conversion efficiencies are realized compared to other processes.	
Biosystems and Agriculture Engineering	<p>Development and Evaluation of Low Impact Development Technologies</p> <p>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 will include, but 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. (4) Based on the results of the previous research, create and publish engineering guidelines for LID design, construction and maintenance. These objectives are broad, and it is probable that not all will be fully met. However, it is expected that Objectives 1 and 4 will be met in large part, and Objective 3 will be met at least in part. Objective 3 is relatively high-risk.</p>	Glenn Brown
Biosystems and Agriculture Engineering	<p>Feasibility Studies of rural Renewable Energy Based Distributed Power Generation Integrated with Electric Utility Grid as Demand Reduction Strategy</p> <p>There are four general objectives for this research: (1) Demonstrate a biomass based Combined Heat and Power System integrated as a utility demand reduction system using the OSU Swine Research facility AD unit or other suitable biomass energy system. (2) Determine which (other) biomass based distributed generation systems might be candidates to work as an aggregated power plant (consider small wind and solar systems also). (3) Determine how such distributed generation systems might be controlled and integrated by an outside entity (main utility). (4) Determine economics of the distributed generation systems (using assumptions for power pricing and carbon economics, etc.). Objective 1 is somewhat high-risk in that it depends on the availability of the swine facility digester (ASBR) to be in operation. This facility is currently undergoing budget discussion and may be shut down. If the ASBR is shut down, an alternative biomass energy production process will need to be identified and integrated into this research. Examples of alternative processes include landfill biogas, biomass gasifiers, and ethanol production systems.</p>	R. Scott Frazier
Biosystems and Agriculture Engineering	<p>Improving Quality and Yield of Producer Gas from Biomass Gasification by Optimizing Operating Conditions and using heterogeneous Catalysts</p> <p>The overall goal of this research proposal is to investigate various methods to improve quality and quantity of producer gas from biomass gasification. The goal is broken down into three objectives. Objective 1: Study the effects of gasifier operating conditions on yield and composition of producer gas using selected biomass (different plant species) and optimize the operating conditions to maximize net energy efficiency. Objective 2: Evaluate in-bed catalysts for improving yield and composition of producer gas. The purpose of this objective is to screen naturally occurring mineral-based catalysts and evaluate their effectiveness in improving gas composition, and reducing amount</p>	Ajay Kumar

	<p>of tar in producer gas. Objective 3: Evaluate selected commercially-available reforming catalysts in a secondary-bed reactor downstream from a biomass gasifier to reduce tar and improve gas composition. The purpose of this objective is to screen and evaluate the effectiveness of selected commercially available reforming catalysts to upgrade producer gas.</p>	
<p>Biosystems and Agriculture Engineering</p>	<p>The Science and Engineering for a Biobased Industry and Economy The objectives are: (1) Reduce costs of harvesting, handling and transporting biomass to increase the competitiveness of biomass as a feedstock for biofuels, biomaterials and biochemicals. (2) Improve biofuel production processes. Outputs: (1) A large portion of the efforts outlined in Objectives 1 through 4 are application oriented and will be useful to develop pilot projects, demonstrations and commercialization of biomass conversion to biobased products. (2) Other outputs include educational materials that could be used in traditional classroom settings or for distance education and web based distribution, (3) Publications in peer reviewed journals, trade journals and popular magazines. (4) Development of intellectual property. (5) Presentations to economic development groups, legislative groups, and to the general public. (6) Development of management recommendations for producers of biobased products. Outcomes or projected Impacts: (1) The committee has served and will continue to serve as a resource for: Bioresearch and Development Initiative (BRDI), Biomass, Research and Development Board working groups, SBIR panel Biofuels 8.8, USDA/DOE Biomass Initiative Project Review Teams, NRI 71.2 panel and reviewers for the Sun Grant Initiative. (2) The multistate membership will contribute to the implementation of the REE energy science strategic plan. (3) Multi-state membership will contribute to identification of funding priorities and shaping policy of Federal agencies. (4) Research as a result of this project will create technology adopted by industry with at least two licensed technology per year. (5) Research will enable reduced dependency on foreign-based fuels and chemicals.</p>	<p>Michael Buser</p>
<p>Biosystems and Agriculture Engineering</p>	<p>Investigation of the Long-term Viability of Rainwater Harvesting for Supplementing Water Supplies and Stormwater Management in Oklahoma The overall goal of this research is to answer questions regarding the long-term viability of rainwater harvesting in Oklahoma. The objectives of the proposed research are (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 design 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 expected outputs are a series of refereed journal articles and extension fact sheets to communicate the results of these studies to other scientists and to the public. The results of this</p>	<p>Jason Vogel</p>

	project will also be presented at state and national conferences and communicated to the public at extension workshops on rainwater harvesting and low impact development (LID). Extension fact sheets will be available on the OSU DASNR Print on Demand system and will also be available on the OSU LID web site (lid.okstate.edu).	
Entomology and Plant Pathology	<p>Integrated Pest Management of Wheat and Canola Insect Pests</p> <p>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 Hessian fly in Oklahoma winter wheat systems, 2) the relationship between aphids and canola yields in Oklahoma, 3) the plausibility of a 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 heat and canola production systems in Oklahoma, and 6) the ecology of aphidophagous natural enemies in simple and diverse wheat agroecosystems.</p>	Kristopher Giles
Entomology and Plant Pathology	<p>Impacts of Disturbance on Beneficial Insect Communities in Oklahoma</p> <p>This research focuses on how disturbance impacts community composition of soil-dwelling invertebrate assemblages, invertebrate assemblages that serve as a forage for wildlife, invertebrate taxa of special concern (due to threatened or endangered status), naturally occurring entomopathogens and other beneficial invertebrate organisms and communities. Individual invertebrate taxa, (bioindicators) and the composition of invertebrate assemblages are often informative in making inferences about the biotic integrity of a system. Disturbance may occur naturally in a system or result from agricultural processes such as tillage, patch-burn grazing, soil amendments, compaction or invasive plant species.</p>	Carmen Greenwood
Entomology and Plant Pathology	<p>Identification, Biology, Ecology, and Management of Stored-Product Insect Pests</p> <p>We conduct research on stored-product insects that are a threat to stored commodities. We investigate their biology and ecology to understand factors affecting populations, and also assess their economic impact. We provide information that can be incorporated into pest management strategies. Our research develops sampling tools to assess the size and impact of these insect pest populations and for IPM. We investigate pesticide resistance in stored-product pests. Ecologically sound control methods are developed as alternatives to conventional insecticide treatments.</p>	George P. Opit
Entomology and Plant Pathology	<p>Biological Control of Arthropod Pests and Weeds</p> <p>In association with regional working group S1034, I am working with on research projects related to: 1) implementation, evaluation, and enhancement of biological control, and 2) evaluating the benefits and risks of introduced and indigenous natural enemies. Field and laboratory studies continued to examine intraguild dynamics among aphid parasitoids and Coccinellidae predators. In addition studies are continuing on describing landscape level movement of insect predators among canola, wheat, and pasture via a unique protein marking system.</p>	Kristopher Giles, Carmen Greenwood
Entomology and	Biology, Integrated Pest Management, Damage Thresholds, Pollution Dynamics, Incidence	Tom Royer, Randy

Plant Pathology; Plant and Soil Sciences	<p>and Occurrence</p> <p>We will develop sustainable, integrated approaches to arthropod management in cotton and other crops grown in SW Oklahoma including: 1) determine the incidence and seasonal abundance of arthropod pests in SW Oklahoma cotton and their impact on yields, 2) to determine effective oversprays for managing Heliiothine escapes in transgenic cotton and its impact on yield, 3) determine the incidence of arthropod pests on wheat, grain sorghum, canola and corn, in SW Oklahoma, 4) evaluate current damage thresholds and determine if adjustments are necessary, and 5) identify, evaluate, and disseminate IPM tactics for implementation in crop production in W Oklahoma.</p>	Bowman
Entomology and Plant Pathology	<p>Biology, Ecology and Management of Emerging Disease Vectors</p> <p>This multi-state research project focuses on several objectives: 1) strengthen basic understanding of mosquito disease vectors, 2) use knowledge to help predict disease outbreaks, 3) enhance surveillance activities, and 4) train the next generation of medical entomologists. To address these objectives, we have several projects. Specific projects include the response of mosquito larvae to variation in nutritive environment, the landscape ecology of disease vectors, and monitoring viral disease in mosquito populations.</p>	Michael Reiskind
Entomology and Plant Pathology	<p>Biology, Ecology, and Integrated Management of Turfgrass Diseases</p> <p>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.</p>	Nathan Walker, Stephen Marek, Eric Rebek
Entomology and Plant Pathology	<p>Biological Control of Arthropod Pests and Weeds</p> <p>In association with the multistate working group, I am working with on research projects related to: Characterizing and evaluating the effect of established natural enemies, and implementation, evaluation, and enhancement (e.g., conservation) of biological control. Field and laboratory studies continued to examine intraguild dynamics among aphid parasitoids and Coccinellidae predators. In addition studies are continuing on describing landscape level movement of insect predators among canola, wheat, and pasture.</p>	Kristopher Giles, Carmen Greenwood
Horticulture and Landscape Architecture	<p>Improved Vegetable Crop Development through Sustainable Cultural Practices</p> <p>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</p>	Brian Kahn

	production periods that could meet market demand for selected Oklahoma vegetable crops, including sweet corn and eggplant.	
Horticulture and Landscape Architecture; Plant and Soil Sciences	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	Greg Bell, Dennis Martin, Justin Moss, Yanqi Wu, Chad Penn
Horticulture and Landscape Architecture	Investigations of Turfgrass Drought Stress Physiology & Water Use Efficiency 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 objectives of this research are to test and select Oklahoma adapted turfgrasses for improved drought resistant characteristics; identify, measure, and explain specific physiological mechanisms of turfgrass drought resistance; and identify water use characteristics of maintained turfgrass and landscape plants in Oklahoma and develop landscape irrigation water conservation best management practices.	Justin Moss
Natural Resource Ecology and Management	Coordination and Report of Research Efforts Related to Fisheries, Rangeland, and Wildlife Resources in Natural Resource Ecology and Management This project will coordinate the conduct and reporting of grants awarded to Natural Resource Ecology and Management investigators that are supported by OAES for the purpose of exploring novel approaches to current issues related to natural resources, ecology, and conservation issues. It is intended that the results of these grants will lead to more extensive research in areas that require preliminary data to stimulate creative approaches to address the sustainable management and conservation of fisheries, forestry, rangeland, and wildlife resources.	M. Keith Owens
Natural Resource Ecology and Management	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.	Rodney E. Will, Jr.
Natural Resource Ecology and	Invasive Plant Species in Oklahoma Grasslands: Ecology, Management and Restoration Oklahoma's unique natural resources are in danger from invasive species, such as Eastern Red Cedar, Old World Bluestems, Sericea Lespedeza, and Salt Cedar. These invasions reduce	Karen R. Hickman

Management	agricultural production, lower water quality and quantity, alter wildlife habitat, increase fire danger and reduce potential for rural economic development. To successfully control and eliminate invasive species that threaten rangelands, successful conversion techniques need to be developed that restore invaded areas and reduce or eliminate the invasive spread at both small and large scales. The information to develop new techniques is lacking. This project will provide information necessary to eradicate Old World Bluestems and establish native plant communities.	
Natural Resource Ecology and Management	Ecology and Management of Chickasaw Plum in North-central Oklahoma Sand plum is an important component of rangelands in the Southern Great Plains. This study has four projects to determine information on the ecology and management of plum. The first project involves best methods of establishing sand plum where it is deficient for some management goal. The second project involves estimation of the rate of spread of sand plum thickets. Knowledge of this rate is useful for management planning for wildlife and livestock forage management. The third project involves determining how nesting birds respond to different ages of plum stems and associated stands. The fourth project will determine how bird communities respond to different amounts and configurations of sand plum. This project will lead to original knowledge on the ecology and management of sand plum that can be applied in management of livestock forage and wildlife.	Fred S. Guthery
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.	Thomas C. Hennessey
Natural Resource Ecology and Management	Belowground Meristem Populations as Regulators of Rangeland Stability The primary objective of this research project is to study the role of belowground bud bank dynamics as key regulators of the productivity, sustainability, and ecological health of rangeland ecosystems.	Gail W.T. Wilson
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	Samuel D. Fuhlendorf

	fire-grazing interaction.	
Natural Resource Ecology and Management	<p>Closure of Swine Lagoon Using Short-rotation Woody Crops</p> <p>The objectives of this project are to: 1) determine the feasibility of using short-rotation woody crops to close lagoons in Oklahoma, 2) compare sycamore and cottonwood for use in such efforts in Oklahoma by evaluating survival and growth rate, 3) measure the rate of nutrient removal from sludge by measuring the nutrient capture by the aboveground biomass, and 4) test whether nutrient removal can be accelerated in woody crop systems.</p>	Rodney E. Will, Jr.
Natural Resource Ecology and Management	<p>Improving Sportfish Management in Southern Reservoirs</p> <p>The overall goal of this research is to provide knowledge necessary for the wise management of sportfish populations in lake and reservoir systems in the U.S. Specifically, the objectives are: 1) to assess commonly used fisheries gears to quantify bias and compare alternative sampling strategies to develop the best available fish population assessment approaches, and 2) provide knowledge needed to effectively manage catfishes, an understudied group of sport fish.</p>	Daniel E. Shoup
Natural Resource Ecology and Management	<p>Assessing Functions and Ecosystem Services Provided by the Wetlands Reserve Program in Oklahoma</p> <p>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.</p>	Craig A. Davis
Natural Resource Ecology and Management	<p>Assessing the Effects of Environmental Stressors on Reptiles</p> <p>The objective of this project is to improve our ability to conduct environmental risk assessments of reptiles relative to multiple stressors including parasitic diseases, environmental contaminants that result from pesticides, herbicides, and other anthropogenic causes, and rangeland and forest management practices. Specific objectives include: 1) evaluate the sensitivity of embryonic lizards to soil contaminants, 2) evaluate the effects of malaria parasites on the sensitivity of adult lizards to environmental contaminants, and 3) evaluate the effects of prescribed fire on the community structure of reptiles in grassland and xeric forest habitat.</p>	Larry G. Talent
Natural Resource Ecology and Management; Plant and Soil Sciences	<p>Understanding Plant-soil Microbial Processes to Enhance Soil Carbon Sequestration in Bioenergy Feedstock Production</p> <p>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 well as their contribution to belowground C storage for over 25 years. We wish to apply this ecological</p>	Gail W.T. Wilson, Yanqi Wu

	knowledge towards the development of sustainable practices for biofuel feedstock production.	
Natural Resource Ecology and Management	<p>Prioritizing Targets for Avian Conservation in Dynamic Oklahoma Landscapes Native bird populations have responded to declines in once abundant grassland species and increases of eastern forest species in the Cross Timbers. Conservation efforts focused on high priority species can be an efficient use of resources, but we need better information on distribution and abundance of multiple avian species in dynamic landscapes to determine what those priorities should be. We lack basic information on the quality of these habitat conditions for native birds. It is important to establish baseline understanding of how species respond to the unique habitat conditions in the Cross Timbers as those are forecasted to be increasingly variable over the next several decades. Native birds surveys will be conducted in Cross Timbers land cover types. The goal is to better inform the prioritization process with respect to native birds of the Southern Plains.</p>	Timothy J. O’Connell
Natural Resource Ecology and Management	<p>Measuring and Modeling the Flow Paths, Travel Distances, and Delivery of Sediment from Forest and rural Unpaved Roads to Streams in Oklahoma Roads are considered to be the greatest long-term source of sediment from forest management activities. This project focuses on the measurement and modeling of sediment delivery to streams from forest and other unpaved roads found in forest lands in Oklahoma and neighboring regions. This study will assist forest and water resource managers to make better judgments about the true effects of forest roads on water quality and the effectiveness of Best Management Practices.</p>	Donald J. Turton
Natural Resource Ecology and Management	<p>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.</p>	Thomas B. Lynch
Natural Resource Ecology and Management	<p>Statistically Rigorous Carbon Stock Predictions Following Forest Restoration in the Southern U.S. It is important to expand natural resource policy discussion to how forest management influences carbon sequestration. This project’s goals are to integrate carbon budgets into decision support tools relevant to ecosystem management of southern pine-oak forests, develop models of below-ground carbon dynamics, and provide statistically valid and defensible estimates of carbon pools and changes under alternate forest management practices at multiple scales.</p>	Duncan S. Wilson
Plant and Soil Sciences	<p>Improvement of Nitrogen and Phosphorus Fertilization Use and Environmental Safety The Greenseeker NDVI sensor invented at Oklahoma State University is now the benchmark</p>	Bill Raun

	<p>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.</p>	
Plant and Soil Sciences	<p>Environmentally Sound Management of Animal Waste in the Southern Great Plains Develop appropriate methods to incorporate animal waste into the N budget for selected production systems of the Southern plains and monitor soil nutrient levels from repeated applications of animal waste resources for potential environmental concerns.</p>	Shiping Deng
Plant and Soil Sciences; Natural Resource Ecology and Management; Horticulture and Landscape Architecture	<p>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.</p>	Shiping Deng, Sam Fuhlendorf, Jeff Anderson
Plant and Soil Sciences	<p>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.</p>	Chad Godsey
Plant and Soil	<p>Reducing Phosphorus and Nitrogen Losses to the Environment through the Use of Soil and</p>	Chad Penn

<p>Sciences</p>	<p>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.</p>	
<p>Plant and Soil Sciences; Natural Resource Ecology and Management; Horticulture and Landscape Architecture</p>	<p>Interactions between Plant and Soil Ecosystems that Regulate Rangeland Sustainability Rangeland is the dominant land type in the Southern Great Plains with livestock production being the leading agricultural income. Past research efforts in rangeland ecology have focused primarily on the above-ground plant community and wildlife biodiversity, while less emphasis has been placed on below-ground soil ecosystems, linkages between the soil and plant communities, and drivers in these ecosystems that regulate rangeland sustainable integrity. We hypothesize that the soil microbial community plays a crucial role in maintaining ecosystem health and sustainable integrity, with plant-microbe interactions contributing to success or failure of ecosystem conservation and restoration. We identified two study sites in Grant County, OK for this study. At each site, there are three ecosystems: native range, rangeland that was once cultivated and currently enrolled in the conservation reserve program (CRP), and land under winter wheat cultivation. During 2009 and 2010, two samplings were conducted each year with one in the spring and one in summer. For switchgrass plants in the native range and CRP sites we obtained data on protein, chlorophyll, and reducing power. Plant biomass production and diversity were determined for the overall plant communities. Preliminary data indicate that chronic plant stress parameters were affected more by season than by ecosystem management. For soil samples, we evaluated chemical, biochemical, and microbiological properties, including pH, organic carbon content, microbial biomass carbon, multiple enzyme activities, water-stable aggregation, and composition and structure of the soil microbial community using fatty acid methyl ester analysis. Roots isolated from soils were evaluated for arbuscular mycorrhizal intra-radical colonization. Preliminary data suggest that after six years of conservation, the soil ecosystems under CRP are not significantly different from their actively farmed counterparts. Grazing activities stimulated plant growth and enhanced soil microbial activities, which led to strengthen ecosystem health and function. Data obtained support our long-term goal to provide integrated scientific data and strategies to promote restoration of degraded ecosystems and enhance the sustainable integrity of rangelands.</p>	<p>Shiping Deng, Sam Fuhlendorf, Jeff Anderson</p>

Plant and Soil Sciences	<p>Bioenergy Crop Production: Toward Realizing Yield Potential</p> <p>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 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.</p>	Gopal Kakani
Plant and Soil Sciences	<p>Soil Carbon Sequestration in Soil Conservation Management Systems</p> <p>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</p>	Jason Warren

	<p>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.</p>	
<p>Plant and Soil Sciences</p>	<p>Leaf lamina Development: Understanding the Genetic Network of Biomass Accumulation Photosynthetic carbon assimilation, which directly or indirectly supports all terrestrial life on earth, almost exclusively occurs in leaves. The size, shape and arrangement of leaves on a plant determine its photosynthetic and transpiration efficiency, and the fitness of the plant to a given environment. We have recently cloned the <i>Medicago</i> WOX gene <i>STENOFOLIA</i> (<i>STF</i>) and shown that <i>STF/LAMI</i> is necessary and sufficient for leaf blade outgrowth and vascular patterning in widely diverged dicot species <i>Medicago truncatula</i> and <i>Nicotiana sylvestris</i>. Unlike most leaf axial polarity factors, <i>STF</i> is expressed at the adaxial-abaxial junction of the middle mesophyll and leaf margins, and regulates blade outgrowth by promoting cell proliferation. Using the classical bladeless <i>lam1</i> mutant of <i>Nicotiana sylvestris</i> as a genetic tool, we examined the function of the <i>Medicago truncatula</i> WOX gene, <i>STENOFOLIA</i> (<i>STF</i>), in controlling leaf blade outgrowth. Introduction of mutations into the WUS-box of <i>STF</i> (<i>STFm1</i>) significantly reduced its ability to complement the <i>lam1</i> mutant. Fusion of an exogenous repressor domain to <i>STFm1</i> restores complementation while fusion of an exogenous activator domain to <i>STFm1</i> enhances the narrow leaf phenotype. These results indicate that transcriptional repressor activity mediated by the WUS-box of <i>STF</i> acts to promote blade outgrowth. With the exception of <i>WOX7</i>, the WUS-box is conserved in the modern clade <i>WOX</i> genes, but not found in members of the intermediate or ancient clades. Consistent with this, all members of the modern clade, except <i>WOX7</i>, can complement the <i>lam1</i> mutant when expressed using the <i>STF</i> promoter, but members of the intermediate and ancient clades cannot. Furthermore, we found that fusion of either the WUS-box or an exogenous repressor domain to <i>WOX7</i> or to members of intermediate and ancient <i>WOX</i> clades results in a gain-of-function ability to complement <i>lam1</i> blade outgrowth. These results suggest that modern clade <i>WOX</i> genes are evolved by acquisition of the WUS-box to provide transcriptional repression activity for promoting cell proliferation. Current experiments are focused on identifying the downstream targets and interaction partners of <i>STF</i> using EMSA and Y2H techniques, respectively, to better understand the mechanism by which <i>STF</i> orchestrates its developmental and metabolic functions. The outcomes of this research will enlighten our understanding of the mechanism of vegetative biomass accumulation in plants which will facilitate our ability to improve biomass feedstock in energy crops.</p>	<p>Million Tadege</p>

Biosystems and Agricultural Engineering	<p>Use of Sweet Sorghum as a Bioenergy Crop for Oklahoma</p> <p>For a number of reasons, production of renewable, sustainable transportation fuels such as ethanol will continue to increase. Sweet sorghum has the potential to be used as a renewable energy crop, and is a viable candidate for ethanol production in Oklahoma. Advantageous properties of this crop are that it is a low input, drought tolerant, high carbohydrate producer, and can be cultivated in nearly all temperate climates. In addition, ethanol production from sugar crops is a low technology process which can potentially be conducted on-farm, requiring considerably less capital investment than starch-based ethanol ventures. The simplicity of ethanol production from sweet sorghum comes from the fact that the biomass is simply pressed, resulting in the collection of six-carbon sugars, which are directly fermentable to ethanol. The challenges involved in this process have been the high costs involved in transportation and fermentation of the entire biomass at a central processing plant that may be operated only seasonally. The central hypothesis is that producing ethanol from sweet sorghum can be made economically viable by using decentralized, low-cost processing systems, rather than constructing and operating a large central processing plant. The goal of this project is to develop economically viable processes to convert sweet sorghum into bioenergy products in this region of the U.S. On-farm production of ethanol presents a new set of opportunities and challenges compared to the centralized approach of existing ethanol production facilities. The goal of this research is to develop new, innovative ways of converting sweet sorghum to ethanol and other co-products. The main objectives are to investigate alternative methods for processing sweet sorghum juice into ethanol and to evaluate the potential uses for sweet sorghum bagasse.</p>	Danielle Bellmer
Biosystems and Agricultural Engineering	<p>Advanced Processing Techniques for Biobased Product Development</p> <p>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.</p>	Nurhan Dunford
Agricultural Economics	<p>Economic Assessments of Value-added Agribusiness and Biofuel Ventures in Oklahoma</p> <p>Work was completed on the economic impacts of assistance provided by the OSU Food & Agricultural Products Center, with a report forthcoming. A study was also completed on the impacts</p>	Rodney Holcomb

	<p>of the “Made In Oklahoma” Coalition member companies on Oklahoma’s economy, resulting in an OSU Experiment Station publication. A paper was completed and published in the Journal of Cooperatives regarding the factors impacting the operational involvement and purchasing practices of Oklahoma Food Cooperative members. Another manuscript coauthored during the year relates to the direct and indirect impacts of food safety and traceability regulations and protocols on small producers and agribusinesses involved in local food systems. The manuscript is forthcoming in a special issue of AAEA’s Choices publication.</p>	
Biosystems and Agricultural Engineering	<p>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 will occur in both pilot and full scale installations.</p>	Timothy Bowser
Pharmacology and Physiology	<p>Effects of Trace Environmental Pollutants on CNS Activity The early work in this field focused primarily on the effects of the following heavy metals; mercury, methylmercury, manganese, lead, arsenic, cadmium, and aluminum. These studies examine the effects of low-level heavy metal 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.</p>	David R. Wallace
Pharmacology and Physiology	<p>Development of a New Animal Model to Study Autism Spectrum Disorder: Role of the Dopaminergic System. These studies utilize the prairie vole as a novel animal model for investigating the underlying causes of ASD. By modifying the social activity/interaction of the vole one may postulate that these changes resemble the societal dysfunction normally observed in patients suffering from ASD. Current work is also focusing on alterations in dopaminergic function following exposure to environmental toxins, such as heavy metals. We have observed significant social dysfunction in male voles following exposure to mercury. Neurochemical studies in rats have demonstrated that the striatum is a dopamine-rich brain region which is robustly affected following exposure to mercury. Additional work is being performed to correlate the outcomes observed in rat and vole studies and to further examine the neurochemical alterations following mercury exposure.</p>	Tom Curtis and David R. Wallace