

THE GREENER SIDE OF ALABAMA...GREEN RESEARCH

Research is continuously being conducted throughout the state of Alabama to promote and progress sustainability. Below are some of the various programs conducted in Alabama, listed by focus.

Focus: Air
Project: Spatial Variability and Functioning using Sky Arrow
Research Description: Performed in conjunction with The Bondville Intensive for developing and validating scaling combined carbon/water fluxes from the leaf-scale to regional-scale in the maize/soy agroecosystem.
Website: www.ei.ua.edu/research/
Project: Cost Effective Approaches to Reducing Greenhouse Gas Emissions through Energy Efficiency, Clean Energy, and Corp Greenhouse Gas Management
Website: www.ei.ua.edu/research/
Project: Atmospheric Monitoring Component of Gulf Coast Carbon Capture/Sequestration Project
Website: www.ei.ua.edu/research/
Project: Mast Cell Mediated Cardiac Effects of Particulate Matter
Research Description: The overall objective of this project is to elucidate the mechanisms responsible for the relationship between particulate matter (PM) exposure and untoward cardiovascular events. Towards this end the following the overall hypothesis will be tested: the greater incidence of adverse cardiovascular events associated with increased exposure to PM involves cardiac mast cell degranulation which in turn causes extracellular matrix degradation, ventricular dilatation and reduced cardiac function.
Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7158
Project: Interaction of Ecosystems, Fires, Air Quality and Climate Change in the Southeast
Research Description: The objectives of this research are: (1) integrate process-based ecosystem, fire emissions, air quality, and regional climate models to systematically understand the complex interaction of these components in the Southeast in a climate change setting; (2) evaluate the integrated modeling system with state fire statistics, ground and satellite observations for the present and understand better the effects of fire emissions on air quality in the Southeast; (3) propagate and calculate the sensitivities of the modeling system to major inputs, and to use those sensitivities to quantify uncertainties in the system results; and (4) assess the impact of regional climate and land use changes and fire management on ecosystems and fire emissions and the consequent effects on air quality in the Southeast. Further, assess the impact of changing aerosol concentrations as a result of fire emissions and other sources on regional climate.
Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/707
Project: A Numerical Study of the Effects of Large Eddies on Trace Gas

Measurements and Photochemistry in the Convective Boundary Layer
Research Description: It is the purpose of this investigation to examine turbulent chemical interaction in the convective boundary specifically related to isoprene/NO ozone chemistry. First, the large scale coherent eddies in the convective boundary layer can lead to chemical structures due to incomplete averaging of the turbulent medium. This can adversely affect interpretation of observations and can potentially lead to misunderstanding of the chemical pathways. This project will attempt to use coupled Large Eddy Simulation (LES) /chemical models to define appropriate averages and in the absence of complete averaging ascribe error bars to the concentration measurements. Second, it is hypothesized that the fast chemistry associated with soprene/NO interaction coupled with the large coherent eddies in the deep convective boundary layer can produce different ozone levels if average concentration are used versus explicit treatment of the corresponding concentration fluctuations associated with the large eddies.
Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/707
Project: Exploration of uncertainty in the simulation of power plant plume chemistry
Research Description: The objectives of this research include all of the following. (A) Performance evaluation and process analysis of three leading chemical mechanisms (RADM2, CB-IV, SAPRC), and, investigation of the role of mixing, biogenic emissions and dry deposition, in the simulation of rural PPP chemistry ; (B) Integrated assessment of the research results, aimed at recommendation of improvements in the simulation of PPP chemistry in operational air quality simulation models (OAQMs).
Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/954/report/0
Project: Southeast Regional Carbon Sequestration Partnership
Research Description: SECARB will accomplish its research objectives by defining similarities in the 11 state region (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia); characterizing the region relative to sources, sinks, transport, sequestration options, and existing and future infrastructure requirements; identifying and addressing issues for technology deployment; developing public involvement and education mechanisms; identifying the most promising capture, sequestration, and transport options; and developing action plans for implementation and technology validation. SECARB has identified three target areas for geologic sequestration projects that involve CO2 storage in saline formations, oil and natural gas reservoirs, and deep unmineable coal seams.
Website: http://www.secarbon.org/secarbprogrambackground.html

Focus: Biomass
Project: Allocation of Biomass Derived Products for Optimal Economic and Environmental Performance
Research Description: The research project involves developing a framework to help decision makers in determining the optimal processing routes in the field of biorefining, which is the conversion of various forms of biomass into high-value final products. The

vast range of possible products from biorefining results in a high level of complexity and a need for a systematic approach to formulate a production strategy needed to maximize value while minimizing environmental impact. The framework will determine the products and amounts needed to attain optimal economic performance as well as level of environmental impact for profitable production routes using the EPA WAR algorithm. The objective of this work is to develop a flexible decision making framework for the allocation of biomass into value-added products through the use of a holistic problem solving approach.

Website: http://cfpub2.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8233

Focus: Climate

Project: Collaborative Research: Predicting Effects of Climate Warming on Stream Ecosystems Using Metabolic Theory and Iceland's Unique Geothermal Environment

Research Description: This study will take advantage of a unique geothermally-active watershed in Iceland that contains a steep gradient of stream temperatures and very little difference in solute chemistry. Using a landscape gradient study of temperature-acclimated streams, streamside manipulations, and an ecosystem-scale experiment, this study will quantify the effects of warming on critical ecosystem processes (ecosystem metabolism and nutrient cycling) and the flow of energy and elements through stream food webs.

Website: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0949774>

Focus: Conservation

Project: Relative Degrees of Equilibrium among North American Stream Fish Assemblages: Integrating Data from Multiple Sources to Quantify Assemblage Structure at Local, Regional, and Transcontinental Scales

Research Description: The objective of this research is to characterize the equilibrium status of North American fish assemblages, by analyzing assemblage data from Pacific Northwest, Southwest, and Southeast Rivers. In order to determine whether each of the three regional fish assemblages have achieved equilibrium, there will be an integration of extensive fish distribution and abundance records from five independent agency and university sources, including the Environmental Protection Agency's Environmental Monitoring and Assessment Program.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7653

Project: Conservation of a Florida Carnivorous Plant: Godfrey's Butterwort, *Pinguicula ionantha*

Research Description: The objective of this research project is to study *Pinguicula ionantha* R.K. Godfrey (Lentibulariaceae), a recently described species endemic to a 25-mile radius area in the panhandle of Florida with the goal of its conservation. *P. ionantha* primarily occupies the transition zone between flatwood and cypress stringer habitats. Although there have been limited studies on some aspects of *P. ionantha*

biology, no demographic information is available. Because of its shrinking population size, *P. ionantha* was listed as threatened by the U.S. Fish and Wildlife Service on July 12, 1993, and is currently listed as Florida State endangered. Without population demographic information and knowledge of the effects of prescribed fire on *P. ionantha*, the long-term viability of this threatened plant cannot be ensured.

Website: http://cfpub2.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7412

Project: Restoring and Managing Longleaf Pine Ecosystems

Research Description: Longleaf pine ecosystems once dominated up to 90 million acres in the southeastern United States. The 3 million acres of remaining longleaf pine ecosystems are refuges for hundreds of threatened and endangered plants and animals. Restoring longleaf pine ecosystems across its range is critical for the long-term survival of these threatened and endangered species. The objective of this study is to provide knowledge and strategies for restoring, managing, and sustaining longleaf pine ecosystems in the southeastern United States.

Website: <http://www.srs.fs.usda.gov/science/documents/Final%20Threats%20Charter.pdf>

Focus: Ecology

Project: Bridging Science With Management: Optimizing Habitat Quality for Black Bears on a Landscape Level by Manipulating Spatio-Temporal Parameters of Clearcuts

Research Description: The objectives of this research project are to: (1) improve our understanding of how clearcuts affect habitat quality for black bears (*Ursus americanus*) in the Southern Appalachians; and (2) use this information to develop optimization models that can be used to design landscapes that maximize habitat quality for black bears by manipulating when and where future clearcuts are implemented.

Website: http://cfpub2.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/6851

Focus: Ecosystem Protection

Project: Effects of Nutrient Enrichment and Large Predator Removal on Seagrass Nursery Habitats: An Experimental Assessment

Research Description: Nutrient enrichment and overfishing are two of the most common man-induced perturbations of coastal systems. Eutrophication can produce many undesirable effects in coastal systems. Among them is a decline in submerged aquatic vegetation (SAV) through increased light attenuation and algal overgrowth of SAV leaves, which may outstrip the ability of their grazers to control them. Alternatively, reductions in the abundance and composition of predator populations can also produce profound effects in aquatic systems. A review of predator/prey interactions in SAV systems leads us to hypothesize that losses of top predators could also lead to the disappearance of SAV. Mechanistically, researchers expect that removing top predators would result in the following sequence of events: 1) increased small fish densities, with a subsequent decrease in their prey (i.e. epibenthic grazers such as amphipods and snails); 2) increased fouling on SAV after decreases in grazer populations; and 3) loss

of macrophytes due to overgrowth by algal epiphytes. Therefore, the predicted effects of eliminating top consumers are identical to those of eutrophication: namely, a shift from a system dominated by rooted macrophytes to a plankton-dominated system. This "top down" alternative to the "bottom up" nutrient enrichment hypothesis could account for reductions in SAV biomass in heavily fished areas, but to date remains untested.

Website: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0966846>

Focus: Energy

Project: American Energy Security Study

Research Description: The American Energy Security Study presents a comprehensive plan for United States energy security through the production of ultra-clean liquid transportation fuels from domestic resources, and sets an aggressive timeline for achieving energy independence by 2030.

Project: Collaborative Research: SHINE--Observations and Modeling of Energetic Particles Associated with Corotating Interaction Regions During Solar Cycles 23 and 24

Research Description: This collaborative research team will investigate the evolution of energy spectra, time-intensity profiles, and charged particle flows along and across the interplanetary magnetic field in co-rotating interaction regions (CIRs) observed during solar cycles 22 and 23. They will use measurements of energetic particles, magnetic fields, and solar wind plasma obtained by the ACE, Wind, and STEREO spacecraft to study these CIR events. This team will also develop a new theoretical model, based on their existing 'Particle Acceleration and Transport in the Heliosphere' (PATH) numerical code, in order to study the time-dependent acceleration and transport of particles associated with CIRs, as well as to probe the 3D structure of CIRs and the evolution of magnetic connections between an observer at Earth and remote CIR locations beyond Earth orbit.

Website: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0962658>

Project: Collaborative Research: Investigating and Improving the Production of Butanol by *C. Pasteurianum* for the Value-Added Conversion of Biodiesel-Derived Crude Glycerol

Research Description: The goal of this research is to quantify metabolism and tolerance in *Clostridium pasteurianum* and to engineer this bacterium to improve the value-added conversion of biodiesel-derived crude glycerol using anaerobic fermentation. This project will focus on fundamental research to understand and improve the metabolic pathways that control glycerol utilization and substrate formation from both extracellular and intracellular approaches. The proposed research has three objectives. The first objective is to elucidate the cellular response of *C. pasteurianum* to both substrate and product toxicity. The second objective is to evaluate cell membrane structure and stability in response to increasing concentrations of substrate impurities and butanol. And the third objective is to metabolically engineer *C. pasteurianum* to increase butanol production.

Website: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0966846>

Focus: Environment

Project: The Fate, Transport, and Microbial Effects of Veterinary Antimicrobials in the Environment

Research Description: The main purpose of this research is to advance the current state of knowledge on veterinary antimicrobial fate and transport processes in soils. The specific questions that will be answered through research are: Question 1: What is the mobility and fate of selected individual antimicrobials in selected aquaculture soils from Alabama? Question 2: How does one antimicrobial affect the fate and transport of another antimicrobial? Question 3: What is the effect of individual antimicrobials and antimicrobial mixtures on the structure of microbial communities in selected soils?

Website: http://cfpub2.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8228

Focus: Environmental Protection

Project: Improved Space-Time Capabilities for the Visualization and Analysis of Multisource Disparate Data

Research Description: This project will improve the capabilities for spatial and temporal integration of disparate (e.g., cross-media, multiscale, multisource) data within visualization and analysis tools and will provide a framework to merge and extend GIS and visualization capabilities. It will also investigate data structures for adaptive gridding, and provide a framework to build improved capabilities for dynamic exploration of large, distributed data archives. These capabilities will be tested through two specific applications: visualization and analysis of multisource data from the SOS Nashville Field Measurement Study, and visualization and validation of the multiple resolution output from the Plume-in-Grid emission/dispersion model. Delivered results will include interoperable software components for improved integration of disparate data within standalone and distributed Problem-Solving Environments, as well as specific tools to meet the needs of the two testbed projects.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/713

Focus: Green Construction

Project: Collaborative Research: Geopolymeric Nanocomposite, A Next Generation Material For Infrastructure Sustainability

Research Description: The major objective of this study is to develop an inexpensive, ecologically sound, high-performance, cementlike construction material, geopolymeric hybrid composite through nanoengineering the fly ash particles. This new material consists of fly ash based geopolymer matrix and carbon nanotubes (CNTs). This research will be conducted through the close collaboration between two major research universities in Alabama, the University of Alabama and Auburn University. Auburn University will focus on the development of microwave irradiation method. The University of Alabama will manufacture and characterize the proposed new materials.

Website: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1000491>

Focus: Hazardous Waste

Project: Soil Sampling in South Alabama Oil Fields

Research Description: The objective of this research is to test contaminated soils from Alabama oil fields to find good candidate sites for clean-up by the method of agglomeration-flotation. Samples from contaminated sites will be cleaned in the laboratory to determine the effects of soil type, oil type and weathering on the effectiveness of the agglomeration-flotation.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5922

Project: New Insoluble supports for Protein Immobilization for Use in Metalloprotein Affinity Metal Chromatography

Research Description: The purpose of this research is to identify alternative procedures for activating hydrophobic polymers such that 1) proteins (most notably transferrin) can be covalently attached in high yield without appreciably affecting the metal binding properties of the biomolecule. 2) The polymer does not possess metal-binding capacity, and 3) The expenses of producing the activated support is minimized. The synthesis, evaluation and optimization of these materials should lead to the development of new Metalloprotein Affinity Metal Chromatography (NAMC) media that can be used in practical scale remediation applications for the recovery and/or removal of metals from contaminated water.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5940

Project: Soil Remediation with Ultra-High-Efficiency Hydrocyclones

Research Description: The objective of this project is to produce a clarified water stream with no soil particles larger than 5 microns using a hydrocyclone. This is so that the stream can be recycled in the agglomeration-flotation soil remediation process. Also, a concentrated stream with 50 wt % soil needs to be produced so that the remediated soil can be returned to the ground.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5923

Project: Subsurface Contamination Site characterization Via a Computer-Aided Visual Tool (continuation of previous project)

Research Description: In response to increasing costs of groundwater remediation and more stringent environmental regulations regarding groundwater pollution, we propose to investigate another way of reducing the remediation costs under existing remediation technologies through better characterization of contamination sites. The main objective is to develop a computer-aided visual tool for effectively characterizing groundwater remediation sites by estimating important unknown parameters such as hydraulic conductivity and hydrodynamic dispersivity.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5913

Project: New Insoluble supports for Protein Immobilization for Use in Metalloprotein Affinity Metal Chromatography

Research Description: The goal of the first year of the project was to identify the best matrix and protein immobilization chemistry for use in metalloprotein affinity metal

chromatography (MAMC). In year two, a micro-pilot plant consisting of a column of the metalloprotein transferrin immobilization to the best matrix identified in year one was to be constructed and evaluated during six months of continuous operation of selectively removing an actinide from dilute aqueous solution.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5915

Project: Waste Minimization in the Magnetic Tape Industry: Waterborne Coating Formulations for Magnetic Tape Manufacture

Research Description: This project has been supported by the Gulf Coast Hazardous Substance Research Center for over 2 years. Most objectives for developing a waterborne coating process for video tape (with Co-modified, g-Fe₂O₃ pigment) have been met: a formulation was identified and optimized; laboratory samples with good physical and magnetic properties were made; the technology was demonstrated at an industrial pilot plant; an economic evaluation showed potential for cost savings; an environmental evaluation confirmed; a virtually complete elimination of pollution; and the technology has been transferred through industrial sponsor's meetings, professional society meetings, and publications in journals. The Environmental Protection Agency is now funding research for a 3-year, multi-investigator project to expand pollution prevention research for magnetic tape manufacture. A specific tape product (Graham Magnetic's Reel-to-Reel line) will be developed and demonstrated at Graham's pilot plant. New barium ferrite pigments will be used in a waterborne formulation. Solventless, electron beam, or UV cured formulations will also be investigated.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1163

Project: Soil Remediation by Agglomeration with Petroleum Coke

Research Description: This project proposes to use petroleum coke to remediate soil heavily contaminated with crude oil or other high molecular weight hydrocarbons. This project will treat oily soil with finely divided petroleum coke. The bridging liquid (oil) will be supplied by the contaminated soil. The agglomerated fine coke and contaminant oil will be floated and removed leaving an oil-free soil.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1162

Project: Recovery of Dilute Phosphoric Acid in Waste Streams Using Waste Gas Ammonia: The Regenerative MAP/DAP Process

Research Description: This research addresses the following areas: using dilute phosphoric acid solutions typical of those making up the majority of toxic releases, involving removal of toxic metal contaminants from waste phosphoric acid streams using membrane separation techniques, involving separation of MAP/DAP from the dilute product stream using the technique of atomized spray drying, improving MAP/DAP crystal properties, and showing the commercial viability of this process in the Gulf Coast States with particular focus in Alabama.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/1161

Project: Surfactant Enhanced Photo-oxidation of Wastewaters

Research Description: In preliminary experiments, low concentrations of non-ionic surfactants (Brij-35) were found to result in an increase in decomposition of pinacyanol chloride. It is planned to study a set of hydrophobic aromatic pollutants consisting of benzene, chlorobenzene, phenol, anthracene, 2-chlorophenol, pentachlorophenol, benzoic acid, pyridine, Indigo Blue, and Erichrome Red in the presence of different surfactants to determine which pollutants are solubilized by the surfactant aggregates

and for which solubilization results in enhanced photodecomposition. The extent of photodecomposition will be determined by extraction with CH₂Cl₂ from the aqueous dispersion followed by analysis by UV-vis, fluorescence and LC as appropriate.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5891

Project: Stationary Power Generation Via Solid Oxide Fuel Cells: A Response to Pollution and Global Warming

Research Description: This proposal addresses an emerging technology that will significantly alter the entire infrastructure of power generation in the United States or even the World, while using underutilized high-energy fuel sources including those derived from waste. The purpose of the proposed research is to improve upon the state-of-the-art technology for non-polluting, solid oxide fuel cells in order to facilitate their commercialization.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5887

Project: Sequestration of Subsurface Elemental Mercury (Hg⁰)

Research Description: The primary goal of this proposal is to develop an improved understanding and predictive capability for the in situ abiotic immobilization of subsurface elemental mercury (Hg⁰) using sulfide minerals. Specific objectives are to 1) elucidate the fundamental thermodynamic and kinetic parameters that control the partitioning (uptake and release) of Hg to these materials; 2) investigate the behavior of these materials under more complex hydrodynamic (i.e., flow-through) and environmental conditions, including the long-term stability of the products; 3) probe the immobilized Hg with state-of-the-art environmental spectroscopic techniques to determine the mechanism(s) responsible for immobilization; and 4) validate our results with materials from contaminated sites.

Website: http://cfpub2.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7446

Project: Investigation of the Entrapment and Surfactant Enhanced Recovery of Nonaqueous Phase Liquids in Heterogeneous Sandy Media

Research Description: The remediation of aquifers by conventional pump-and-treat technologies is often an inefficient and costly undertaking, particularly when nonaqueous phase liquids (NAPLs) are present. The failure of this technique can be attributed, in large part, to the low aqueous solubilities of most NAPLs and their relatively slow rates of mass transfer into the aqueous phase. To overcome such limitations, surfactants have been proposed as a means for enhancing the performance of pump-and-treat systems based on their ability to increase the aqueous solubility of hydrophobic organic compounds via micellar solubilization and to mobilize entrapped NAPLs due to interfacial tension reductions. Although laboratory studies have demonstrated the capacity of surfactants to recover NAPLs from porous media, field studies conducted to date have achieved mixed results. To facilitate more effective transfer of surfactant enhanced aquifer remediation (SEAR) technologies from the laboratory to the field, this research will: (a) investigate the influence of scale and formation heterogeneity on the entrapment and surfactant-enhanced recovery of NAPLs in two-phase aquifer systems, and (b) refine and validate numerical simulators which can be used for the design and prediction of SEAR performance at the field scale. To accomplish these objectives the project has been divided into the following four tasks: (1) measurement of fundamental parameters needed to characterize NAPL solubilization and mobilization; (2) refinement and adaptation of mathematical models to

describe SEAR in 2-dimensional domains; (3) assessment of NAPL infiltration and entrapment in 2-dimensional aquifer systems of varying scale and heterogeneity; and (4) evaluation of SEAR for NAPL recovery in heterogeneous 2-dimensional aquifer systems.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/682

Project: Environmental Decay of Pathogens

Research Description: The objective of this research project was to develop input parameters for modeling fate and transport of pathogenic microorganisms to assess the health risk of sewage contamination, especially from separate sewer overflow.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/6436

Focus: Land

Project: Alternative Treatment Systems

Website: www.ei.ua.edu/research/

Project: Alabama Mesonet (Hydrometeorological Network)

Research Description: Alabama A&M University (AAMU) operates this network of 11 combination meteorological and soil stations (8 in Alabama) and 10 soil profile only stations (all in Alabama). The combination stations are included within the Department of Agriculture (USDA)/ Natural Resources Conservation Service (NRCS) Soil Climate Analysis Network (SCAN). SCAN provides hourly observations of air temperature, relative humidity, wind speed, wind direction, solar radiation, precipitation, barometric pressure, snow water content, snow depth, soil temperature, and soil moisture.

Website: <http://wx.aamu.edu/ALMNet.php>

Project: Response of Forest Herpetofaunal Communities to Thinning and Prescribed Burning in Mixed Pine-Hardwood Forests in the William B. Bankhead National Forest, Alabama

Research Description: This project examines forest management practices (prescribed burning and tree thinning) upon forest herpetofaunal communities. Results from this study will allow forest managers to address factors that affect herpetofauna in combination with forest health goals. Experimental design for this project will consist of a two-way factorial randomized complete block design consisting of six forest treatments replicated four times across the landscape. Forest treatments will include three thinning levels (no thin, 11 m²ha⁻¹ residual basal area, and 17 m²ha⁻¹ residual basal area) and two burn treatments (no burn, burn). Drift fences with funnel and pitfall traps, coverboards, and artificial pools will be used to monitor herpetofauna at each treatment plot. Habitat characteristics will be determined at each treatment plot using line-transect surveys. Air and soil temperature will be monitored with HOBO® dataloggers, while soil moisture will be monitored with a digital soil probe during sampling periods.

Website: http://cfpub1.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7586

Project: Relationships Between Herpetofaunal Community Structure and Varying Levels of Overstory Tree Retention in Northern Alabama

Research Description: The objective of this research project is to examine the

relationship between silvicultural techniques, particularly shelterwood cuts with varying levels of basal area retention, and the community structure of amphibians and reptiles in the Cumberland Plateau of northern Alabama. This research project will provide both a theoretical framework furthering our understanding of factors affecting the distribution and abundance of these organisms, and applicable data that may be used to assist forest managers in sustaining these communities.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/6684

Project: Breeding Ecology Response of Songbirds to Forest Disturbance

Research Description: This research is based on the theory that forest disturbances such as prescribed burning and canopy thinning mimic natural habitat disturbances and will alter resource abundance and availability. Research techniques will include breeding bird surveys, territory mapping, radio tracking, nest monitoring, arthropod sampling, and habitat surveys. Two Neotropical migratory species, the hooded warbler (*Wilsonia citrina*) and the worm-eating warbler (*Helmitheros vermivorus*), will be used as focal species. Experimental design consists of a before-and-after control-impact (BACI) randomized complete block design with two factors – three thinning levels (no thin, 11 m² ha⁻¹ residual basal area (BA), and 17 m² ha⁻¹ residual BA) and two burn treatments (no burn and burn). Each treatment will be replicated three times. The experiment will be conducted at the Bankhead National Forest in northwestern Alabama. It is my hope that the results of this research will aid forest resource managers in understanding how forest disturbance affects bird populations.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8146

Project: Mapping Cogongrass on Alabama Rights-of-way

Research Description: Two studies examined an integrated approach to cogongrass control on right-of-ways with herbicides and the planting of aggressive replacement species. These studies were the Loxley and Malbis experiments.

Website: <http://www.cogongrass.org/aldotreport.pdf>

Focus: Multi

Project: Modeling Metals in Desulphurization Scrubber Blowdown (Johnson, Southern Company)

Website: www.ei.ua.edu/research/

Project: Task 1 Instrument Aircraft Upgrade and Scaling Improvements for Water/CO₂ Flux in Bondville (Bondville-Bottom Up Intensive Study)

Research Description: The Bondville Intensive has focused on developing and validating scaling the combined carbon/water fluxes from the leaf-scale to regional-scale in the maize/soy agro-ecosystem. Flux aircraft, remote sensing aircraft, several satellite image packages, and many on the ground measurements are coordinated during the growing season. Scaling methodologies from tower to aircraft have been developed. Up-scaling with models (ALEXI) is being performed. Heat flux modeling, validating with aircraft and towers, is being performed. Remote sensing products and techniques for modeling canopy structure leaf-level gas exchange are being developed and validated.

Website: www.ei.ua.edu/research/

Project: Development of Techniques for Assimilating GOES Satellite Data into Regional-Scale Photochemical Models

Research Description: The purpose of this proposal is to improve the fidelity of the physical atmosphere in photochemical modeling systems, specifically Models-3. This is accomplished by enlisting methods of satellite remote sensing to reduce the uncertainty in the cloud and soil-moisture information which meteorological models pass to their photochemical counterparts. The factors forming the basis for the proposal include the following. Among the largest sources of uncertainty in regional photochemical modeling is the specification of clouds and soil moisture. Clouds dominate the availability of actinic flux, control the distribution of surface insolation, and govern the variations in surface temperatures. Soil-moisture availability feeds back to significantly affect the partitioning of sensible and latent heat flux, which also influences the magnitude of surface temperatures. Surface temperatures, in turn, affect the variations in biogenic emission rates, soil-moisture availability, and regional mixing heights. Meteorological models predict clouds but only in a highly parameterized manner, causing model estimates of spatial distributions and radiative characteristics to be subject to considerable error. In recent years progress has been made in controlling model error through assimilation of wind and temperature observations, but corresponding progress has been lacking in assimilating cloud and soil-moisture data.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/391

Project: Assessment of Meteorological, Seasonal, and Land Management Influences on Spatial Representativeness and Ecosystem-Level Scaling of CO₂ Fluxes Using UA Sky Arrow ERA Aircraft (Assessment of Spatial CO₂ Flux in the Midwest using a Flux Aircraft)

Research Description: The University of Alabama and NOAA are using UA's Sky Arrow Flux aircraft to perform evaluations of spatial flux in Midwestern landuses (maize, soy, and forests). Two sites are currently being investigated: Bondville (Champaign, IL: maize/Soy) and Columbia, MO (mixed hardwoods and Agriculture). In particular, fluxes and associated footprints are measured during the growing season. A new methodology for calculating fluxes by land-use (in addition to traditional averaging length methods) has been developing and is being evaluated under a variety of conditions and constraints. This flux fragment method (FFM) is being used to investigate fluxes in highly heterogeneous landscapes with individual land use characteristic lengths being on the order of 0.3km. The aircraft is being operated in full collaboration with local Ameriflux tower PIs.

Website: www.ei.ua.edu/research/

Project: GK-12 Sustainable Energy Systems

Research Description: The two main goals of the project are to increase the professional caliber of STEM (Science, Technology, Engineering, and Mathematics) graduates from the University and to provide resources for the State of Alabama High School Engineering Academies.

Website: www.ei.ua.edu/research/

Project: Airborne Measurement of Land-Surface Energy, Water, and Carbon Fluxes over Heterogeneous Systems

Research Description: The goal of this project is for UA Scientists and USDA's Agricultural Research Service to coordinate and execute a series of airborne flux

measurement campaigns. The approach is to use the resulting large-scale flux datasets to contain/validate ALEXI model estimates and improve embedding algorithms.
Website: www.ei.ua.edu/research/
Project: Biofiltration Media Evaluation
Research Description: Treatment efficiency of bioretention for a wide variety of pollutants found in urban stormwater runoff.
Website: www.ei.ua.edu/research/
Project: Environmental Contamination Sensor Development & Evaluations Associated with Natural Disasters
Research Description: Center for Optical Sensors and Spectroscopies (COSS)
Website: www.ei.ua.edu/research/
Project: MSP START in Nanotechnology, Biotechnology, and Sensor Technology
Research Description: The Mathematics and Science Partnership (MSP) program is intended to increase the academic achievement of students in mathematics and science by enhancing the content knowledge and teaching skills of classroom teachers. Nanotechnology is the engineering of functional systems at the molecular scale.
Website: www.ei.ua.edu/research/
Project: Supplemental Funding for Optical Sensors and Spectroscopies Development
Research Description: Program promotes the optical sensing and spectroscopy research on environmental, biomedical, and national security issues through collaborative use of resources and expertise among the member universities, government and industrial laboratories, and improve sensor techniques using recently developed revolutionary laser and spectroscopic technologies.
Website: www.ei.ua.edu/research/
Project: National Demonstration of Advanced Drainage Concepts Using Green Solutions for CSO Control
Research Description: Kansas City demonstration project on the use of "green infrastructure" to minimize combined sewer overflows using a variety of integrated practices and modeling approaches.
Website: www.ei.ua.edu/research/
Project: Alabama RII Nanotechnology Partnership Program
Research Description: The RII program promises to advance technology important to national security and provide research and education experiences for a diverse group of students, postdoctoral scholars, high school teachers and institutions in the state. Nanotechnology is the engineering of functional molecular scale systems.
Website: www.ei.ua.edu/research/
Project: City of Tuscaloosa BioGas Feasibility Study
Research Description: This study analyses the feasibility and potential production of biogas and considers the risk on its inputs.
Website: www.ei.ua.edu/research/
Project: Collaborative Research: Experimental Studies to Reveal Boundary Layer Control Shark Skin
Research Description: Discovering background information and using hypothesized shark scale information to theorize scale utilized mechanisms in reducing the likelihood of boundary layer separation.

Website: www.ei.ua.edu/research/
Project: Educational Workshops in Collaboration with Green Composites: RII/Enhancing Alabama Research Capacity in Nano Bio
Research Description:
Website: www.ei.ua.edu/research/
Project: Research Experience for Undergraduates and High School Students in NanoGeoPolymers
Research Description: Research Experience for Undergraduates (REU) is sponsored by the National Science Foundation and the University of Alabama and the American Recovery & Reinvestment Act of 2009.
Website: www.ei.ua.edu/research/
Project: Center for Hurricane Intensity and Landfall Investigation
Research Description: The goal of the Center for Hurricane Intensity and Landfall Investigation (CHILI) is to advance understanding of the physical processes involved in hurricane landfall and to assist National Oceanic and Atmospheric Administration (NOAA) in improving hurricane landfall forecasting. In order to achieve these goals, the center utilizes elaborate data collection facilities as well as a state-of-the-art high performance compute cluster (HPCC). In close collaboration with NOAA's Environmental Modeling Center (EMC), CHILI will use its collected data to validate and test the Nation's operational hurricane model, the H-WRF, to be run on the HPCC. Data is collected via a mesonet of stationary weather stations, as well as intricate sensors observing ocean currents and waves from the bottom of the ocean. These Acoustic Wave and Current Sensors (AWACs) are deployed in the Gulf of Mexico south of Mobile Bay at the beginning of each hurricane season and retrieved when the season ends in collaboration with NOAA's Atlantic Oceanographic and Meteorological Laboratory (AOML). Mesonet sites are selected in a joint effort with the Mobile Weather Forecast Office (WFO) of the National Weather Service (NWS).
Website: http://chiliweb.southalabama.edu/
Project: Synthesis and Application of a New Class of Stabilized Nanoscale Iron Particles for Rapid Destruction of Chlorinated Hydrocarbons in Soil and Groundwater
Research Description: The overall goal of this research is to develop a cost-effective, in-situ remediation technology that employs a new class of highly dispersive iron-based nanoparticles for the rapid destruction of chlorinated hydrocarbons in soil and groundwater. The specific objectives are to: 1) synthesize a new class of stabilized iron-based nanoparticles using low-cost and "green" stabilizers such as starches and celluloses; 2) test the effectiveness of the stabilized nanoparticles for dechlorination of select contaminants (TCE and PCBs) in soil and groundwater; and 3) test the feasibility of an in-situ remediation process that is based on the nanoparticles.
Website: http://cfpub2.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7549
Project: Sensors and Sensor Networks for Biological and Environmental Applications (Scott)
Research Description: This research activity seeks to advance fundamental knowledge in new technologies for sensors and sensor networks, and in the use of sensor data in control and decision-making for biological and environmental purposes.
Website: www.ei.ua.edu/research/
Project: A Novel Ion Exchange Process for Selective Removal of As(V) and Enhanced

Stability of Process Residuals
Research Description: This research addresses the urgent technology need for cost-effective arsenic (As) removal in small drinking water systems and for minimizing the environmental impacts of process waste residuals. The overall objective of this project is to develop an innovative, selective ion exchange (IX) process that: 1) removes As(V) more cost-effectively than current IX processes; and 2) minimizes the volume and As-leachability of process waste residuals. The specific research goals are: (1) to prepare and characterize a new class of IX materials, referred to as polymeric ligand exchangers (PLEs), for highly selective removal of As(V); and (2) to develop an engineered approach to reuse the spent regenerate and to minimize the volume and As-leachability of process waste residuals.
Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/6282

Focus: Pollution
Project: Gulf Oil Spill: Impact of Oil and Methane on Microbes
Research Description: The purpose of this research is to examine the impacts of the Deepwater Horizon oil spill on microbes in the waters and sediments near the BP spill site. This research is essential to assessing how massive amounts of oil will affect the health of the Gulf of Mexico in both the short- and long-term.
Website: http://earthsky.org/water/mandy-joye-on-the-gulf-oil-spill-one-year-later
Project: RAPID: Accelerating biodegradation of hydrocarbons from the Deepwater Horizon Oil Spill in the Gulf of Mexico with Naturally Occurring Marine Substrates
Research Description: The primary goal of this proposal is to determine means of enhancing rates of biodegradation of the hydrocarbons in the coastal zone of the Northern Gulf of Mexico resulting from the catastrophic Deepwater Horizon oil spill. The scope and impact of the this ongoing oil spill disaster are of unprecedented scale and information on key environmental data is critically needed as quickly as possible. The objectives of this research include (1) identify sources of endogenous organic matter in the affected areas that accelerate biodegradation rates, (2) identify the composition and genomic potential of the indigenous microbial consortium to promote polycyclic aromatic hydrocarbons (PAH) degradation and to undergo horizontal gene transfer off PAH genes, and (3) examine changes in rate processes and composition of the microbial consortium as the oil is weathered over the course of a year.
Website: http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1042743
Project: RAPID: Resolving higher trophic-level change within the northern Gulf of Mexico ecosystem as a consequence of the Deepwater Horizon oil spill
Research Description: This project will focus on characterizing ecosystem-level changes to the pelagic system of the northern Gulf of Mexico. This effort will specifically contribute a temporal component to a separately funded spatial component. The group will employ a trophic assessment using both gut contents and Carbon/Nitrogen stable isotope ratios of pelagic filter-feeding invertebrates (jellyfish) and vertebrates (planktivorous fish). These will be compared to SI and gut content information collected over the previous two years in the spill-impacted area east and west of the Mississippi

River.

Website: <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1043413>

Focus: Pollution Prevention

Project: Solvent-less, Electron Beam-Cured Vinyl Ether Coating Formulations for Flexible Magnetic Media Manufacture

Research Description: The objective of the research program was to provide new tape and floppy disk manufacturing processes that prevent air pollution. The approach was to replace the organic solvents used in the coating process with a mixture of liquid vinyl ether monomers. The monomers served as the solvent to disperse the magnetic pigments and dissolved any other ingredients, rendering fluidity and coatability to the formulation. Upon electron beam irradiation, the monomers went into a cationic polymerization to give a solid binder with the requisite mechanical properties.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/357

Project: Investigation of Room Temperature Ionic Liquids as Environmentally Benign Solvents for Industrial Separations (TSE99-A)

Research Description: The work in this research will generate new data leading to the development of a fundamental scientific-engineering knowledge base in RTIL properties (with particular emphasis on their use in separations), a prerequisite to the development of pollution prevention technologies using RTIL. The major long range goal of this project was to understand the physical, chemical, and solvating properties of RTIL from the perspective of enabling the successful replacement of conventional solvent methodologies based on VOCs.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/782

Project: Pretreatment of Agricultural Residues Using Aqueous Ammonia for Fractionation and High Yield Saccharification

Research Description: The objective of this project is to develop a pretreatment process suitable for enzymatic conversion of agricultural residues into fermentable sugars. The proposed process uses aqueous ammonia (a non-polluting substance) as the pretreatment. Use of ammonia offers significant economic and environmental merits since it is easily recycled and leaves no residual effect on the environment. The proposed pretreatment is a part of the integral biomass-to-fuels process that does not generate net CO₂ (a green energy process). It is a pretreatment method of our own invention. When it is incorporated into the current biomass saccharification processes, it can accomplish a near complete fractionation of biomass into the three major constituents (pentosans, cellulose, and lignin).

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/7088

Project: Place-Based Green Building: Integrating Local Environmental and Planning Analysis into Green Building Guidelines

Research Description: This project will develop a model for place-based green building guidelines based on an analysis of local environmental, social, and land use conditions. The ultimate goal of this project is to develop a methodology and model for placing green buildings within their local context that can be transferred to other

communities throughout the world. It will provide the basis for making objective decisions about where financial investments in green buildings will have the most environmental impact.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8605

Project: A Bio-Diesel Baja Vehicle and Student Competition

Research Description: The SAE Mini Baja® competition is an extremely popular design competition for students in engineering programs around the world. The competition focuses on the design of an off-road vehicle for performance and cost-of-production. The objective of the proposed effort is to convert a vehicle created for the SAE Mini Baja® competition to a bio-diesel vehicle. Through the conversion, the rules for a new competition will be created, resembling the SAE Mini Baja®, but focusing on vehicle performance and the production bio-derived diesel fuels, employing the carbon cycle to produce sustainable automotive propulsion.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8094

Focus: Sustainable Environment

Project: Membrane-Based Nanostructured Metals for Reductive Degradation of Hazardous Organics at Room Temperature

Research Description: The overall objective of this proposal is the development and fundamental understanding of reductive dechlorination of selected classes of hazardous organics by immobilized nanosized metal particles (single and bimetallic systems) in ordered membrane domains. This integrated research will examine nanoparticle synthesis in a membrane domain, the role of metal surface area and surface sites, the potential role of ordered nanometal domains in membranes, membrane partitioning and reaction kinetics with the main emphasis on obtaining highly enhanced dechlorination rates, and selectivity from dilute aqueous solutions. The overall hypothesis to be tested is that nanosized (< 50 nm) zero-valent metal domains can be created in an ordered membrane matrix by the use of novel, polypeptide-based biomolecules with helix-coil forming ability or by di-block copolymers.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/2172

Focus: Waste

Project: Subsurface Contamination Site Characterization via a Computer-Aided Visual Tool

Research Description: In response to increasing costs of groundwater remediation and more stringent environmental regulations regarding groundwater pollution, we propose to investigate another way of reducing the remediation costs under existing remediation technologies through better characterization of contamination sites. The main objective is to develop a computer-aided visual tool for effectively characterizing groundwater remediation sites by estimating important unknown parameters such as

hydraulic conductivity and hydrodynamic dispersivity.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/5934

Focus: Waste Reduction

Project: Polymer-Based Aqueous Biphasic Extraction Technology for Reaction Engineering of the Alkaline Paper Pulping Process

Research Description: The objectives of this project are to utilize environmentally benign polymer-based separations of reaction products during the pulping reactions and thus, reduce the consumption of chemical feedstock and the extent of the reaction to only that required to release and solubilize the lignins from the pulp. Waste of reagents through further hydrolysis and sulfonation of already solubilized lignins would be avoided leading to the production of a lower degree of sulfonation in the lignin byproducts and thereby reducing the scale and energy demands of the recausticizing recycle.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/965

Project: Solvent Properties of Ionic Liquids: Enabling the Assessment of Ionic Liquids for Clean, Environmentally Benign Technologies

Research Description: The overall goals of this research are to develop and elaborate the classification of ILs in order to compare and contrast different ILs, to benchmark performance, and to discover new applications and uses of ILs. In addition to the core scientific information to be developed, this program of research will provide an educational aspect that will provide information to train researchers about the scope, potential, and pitfalls of ILs, most importantly that ILs can be utilized as much more than just non-volatile solvents.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/6919

Project: Manufacturing IT Center

Research Description: The MITC brings together core competencies in the areas of component based development, enterprise integration, domain engineering, large scale project management, information systems design, intelligent systems, internet, intranet and e-business, data mining, data warehousing, and manufacturing systems. MITC uses research to find out how manufacturing organizations use information technology (computers, networks, information systems, data, algorithms, and decision support) to make their processes more effective?

Website: <http://cba.ua.edu/mis/research/mitc>

Focus: Water

Project: Identification and Treatment of Emerging Contaminants in Wet Weather Flows

Research Description: This research addresses emerging contaminants that traditionally have not been considered contaminants. This knowledge about many chemical and microbial constituents is available through improved analytical techniques

and sampling. What remains unknown is the threat that these emerging contaminants pose to human health and the environment. Emerging contaminants are widely varied, and may include pharmaceuticals and endocrine disruptors, where improper disposal or overuse has resulted in measurable levels in the environment.

Website: www.ei.ua.edu/research/

Project: Phase II NPDES Stormwater Technology Transfer

Research Description: Under the Clean Water Act (CWA), point source discharges to "Waters of the United States" require National Pollution Discharge Elimination System (NPDES) permits. To address the nationwide problem of stormwater pollution, Congress broadened the CWA definition of "point source" in 1987 to include industrial stormwater discharges and municipal separate storm sewer systems. This 1987 expansion was promulgated in two phases: Phase I and Phase II. Phase I required that all municipalities of 100,000 persons or more, industrial dischargers, and construction sites of 5 acres or more have NPDES permits for their stormwater discharges. Phase I permits were issued in much of the U.S. in 1991. Phase II required that all municipalities, industrial dischargers, construction sites of 1 acre or more, and other large property owners (such as school districts) have NPDES permits for their stormwater discharges. Phase II rules came into effect in 2003.

Website: www.ei.ua.edu/research/

Project: Developing Local Stormwater Indicator Monitoring Program to Demonstrate Environmental Results

Research Description: EPA Office of Wastewater Management 104(b)3 grant; The monitoring study designs cover a range from characterizing the quality of stormwater to developing a paired watershed study that breaks down the larger issue of protecting water quality into manageable components.

Website: www.ei.ua.edu/research/

Project: Chamber Project

Research Description: The Chamber Project involves freshmen students working with graduate students and professionals on sustainability projects.

Website: www.ei.ua.edu/research/

Project: COSS Program; Center for Optical Sensors and Spectroscopies

Research Description: COSS is to promote optical sensing and spectroscopy research on environmental, biomedical, and national security issues through collaborative use of resources and expertise among the member universities, government and industrial laboratories, and improve sensor techniques using recently developed revolutionary laser and spectroscopic technologies.

Website: www.ei.ua.edu/research/

Project: Measuring the Performance of the Upflow Filter Installed at the Tuscaloosa City Hall

Research Description: Full scale evaluation of an UPFLOW filter-a catch basin insert for the treatment of stormwater at critical source areas.

Website: www.ei.ua.edu/research/

Project: Evaluation of Inlet Treatment Device, an EPA SBIR Phase 2 Demonstration Project with US Infrastructure

Website: www.ei.ua.edu/research/

Project: Techniques for Identifying/Correcting Inappropriate Discharges

Research Description: EPA Office of Wastewater Management 104(b)3 grant
Website: www.ei.ua.edu/research/
Project: Alabama Highway Drainage Conservation Design Practices
Research Description: The objective of this project is to show how a common AL DOT design and maintenance practice, the use of grass drainage swales, can help meet the requirements of the new Phase II Stormwater Regulations.
Website: www.ei.ua.edu/research/
Project: NPDES Stormwater Phase II Technology Transfer
Research Description: Under the Clean Water Act (CWA), point source discharges to "Waters of the United States" require National Pollution Discharge Elimination System (NPDES) permits. To address the nationwide problem of stormwater pollution, Congress broadened the CWA definition of "point source" in 1987 to include industrial stormwater discharges and municipal separate storm sewer systems. This 1987 expansion was promulgated in two phases: Phase I and Phase II. Phase I required that all municipalities of 100,000 persons or more, industrial dischargers, and construction sites of 5 acres or more have NPDES permits for their stormwater discharges. Phase I permits were issued in much of the U.S. in 1991. Phase II required that all municipalities, industrial dischargers, construction sites of 1 acre or more, and other large property owners (such as school districts) have NPDES permits for their stormwater discharges. Phase II rules came into effect in 2003.
Website: www.ei.ua.edu/research/
Project: PnET and SWAT Coupling (Durrans, DOE)
Research Description: Research focused on statistical analyses of hydrologic and environmental data, especially precipitation and streamflow. Potential water resources were also investigated with associated with climate change.
Website: www.ei.ua.edu/research/
Project: IGERT: Freshwater Ecosystems and Landscape Interactions in Contrasting Climates
Research Description: IGERT (Integrative Graduate Education Research Training), a program in aquatic ecology, hydrology, and geochemistry. Students will study freshwater ecosystems in areas of different climates, Alabama and New Mexico and will compare contrast research results in the two completely different environments.
Website: www.ei.ua.edu/research/
Project: Desalination and Demineralization with Solar Evaporation Array (SEA)
Research Description: This research examines the Solar Evaporation Array (SEA) panel, which is a self-contained desalination and water-purification apparatus powered by the sun. The objective is to bring ready, inexpensive access to pure water. Existing water purification methods either cannot remove dissolved minerals and salts, or else are too expensive to be used for small applications. The aim is to develop SEA panels as a way of making potable, irrigable water for a much lower cost per liter than existing methods. Also, the aim is to reduce and possibly eliminate brine pollution from the desalination process.
Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8845
Project: Effects of Urbanization on Sub-Basins in the Wheeler Lake Watershed
Research Description: The objective of this study is to examine the effects of urbanization on aquatic and riparian ecosystems in North Alabama. The study area

consists of two adjacent sub-basins within the Wheeler Lake Watershed with drainage systems that serve as tributaries to the Tennessee River. The research will involve (1) measurement of water quality indicator parameters including heavy metals, nutrients, and other parameters such as turbidity, dissolved oxygen, chlorophyll and fecal coliform (2) measurement of past pollutants, such as the organo-chlorine compound, DDT (3) relating observed trends in pollution to changes in landuse/landcover (4) monitoring the trends in water quality by watershed, location and season and (6) use of the Better Assessment Science Integrating Point & Non-point Sources (BASINS) and the Soil and Water Assessment Tool (SWAT) model to better assess environmental conditions in both watersheds.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8224

Project: Modeling Mussel and Fish Assemblage Composition Across an Urban-rural Gradient to Determine the Relationship

Research Description: The research goal is to model the difference in mussel and fish assemblages across an urban-rural gradient and determine the relationship between urbanization-related environmental stressors and community measures of mussels and fish. The proposed study could be important to the understanding of the relative effect of factors within an environmentally complex urbanization gradient upon aquatic ecosystems, including thresholds of response for organisms and the composition of communities in areas of intermediate disturbance. This project has the potential for community outreach to educate land managers and the public on how their decisions and practices can affect aquatic ecosystems.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/8513

Project: Genomic Database for *Cryptosporidium* spp.

Research Description: Using molecular techniques, researchers plan to construct gDNA libraries for various isolates and species of *Cryptosporidium*. In total, about 12 isolates of *C. parvum* and perhaps 8-10 other species of the genus will be included. These libraries will be made accessible through the American Type Culture Collection. These libraries should be useful to investigators who plan to design genetic probes for environmental testing. The advantage of these libraries will be to: 1) allow investigators to sequence and study any region of the genome of their choice without having to rely on previously published sequences from other researchers; 2) allow investigators to develop specific, rather than random, primers for developing PCR based diagnostic tests; and 3) to archive the DNA of various isolates and species in a manner where information can be retrieved in perpetuity.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/834

Project: Green Advantage

Research Description: This research has two primary thrusts: (1) to explore geochemical and biological aspects of Hg cycling and contamination in selected watersheds in the Mobile- Alabama River System (MARS); and (2) to lay the groundwork for remedial policies through a social science-based process of social impact assessment and public involvement. Specific objectives are to: (i) improve our understanding of Hg biogeochemistry and its accumulation in biota within the MARS; (ii) use this information to help predict the potential for Hg bioaccumulation in areas with similar geochemical and geographical features; (iii) inform and involve key stakeholder groups regarding the science of Hg contamination and its human implications; and (iv)

lay the groundwork for public understanding and support of possible remedial measures.

Website: http://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.abstractDetail/abstract/589

Project: Magnitude and Frequency of Floods for Urban Streams in Alabama

Research Description: The objective of this project is to develop improved methods and equations for estimating the magnitude and frequency of floods for urban streams in Alabama having the 1.5-, 2-, 5-, 10-, 25-, 50-, 100-, 200-, and 500-year recurrence intervals. These methods and equations will be documented in a Scientific Investigations Report (SIR) as well as the flood-frequencies and annual peaks at gaging stations in Alabama.

Website: <http://al.water.usgs.gov/projects/Urban.html>

Project: Flood Depth Frequency

Research Description: The approach to determine flood depths for hydraulic design and for floodplain mapping typically is to determine flood-frequency discharges by the best available methods and to use an open channel hydraulic model to obtain flood elevations, flow distributions, and velocities. Although these data are essential for many bridge and culvert design applications, this is an expensive approach because of the necessary data. In cases where flood management and planning requires only a flood elevation an alternative approach is to estimate flood depths directly without determining discharge or applying a hydraulic model. The objective of this project is to develop improved methods and equations for estimating flood-depth frequency for streams in Alabama. The end product of the flood-depth frequency study will be a USGS Scientific Investigations Report describing development and use of traditional regression methods for estimating flood depths for streams with recurrence intervals ranging from 1.5- to 100- years throughout Alabama.

Website: <http://al.water.usgs.gov/projects/FloodDepthFrequency.html>

Project: Bridge Site Hydraulic Studies

Research Description: The USGS has a cooperative program with the Alabama Department of Transportation in the area of bridge site hydrologic and hydraulic investigations. These hydrologic and hydraulic investigations have been conducted for both bridge replacement projects and projects involving the construction of new highways across flood plains. These studies incorporate the latest scientific methods for the computation of flood frequency and hydraulic modeling (both one and two dimensional models) at bridge sites.

Website: <http://al.water.usgs.gov/projects/Bridge-FloodStudies.html>

Project: Catoma Creek

Research Description: The future flooding potential of Catoma Creek is of great interest to the City of Montgomery and local residents. The objective of this study is to re-define the high-water (flood) profiles for a 15 mile reach of Catoma Creek. This reach extends from Norman Bridge Road downstream to the confluence with the Alabama River. For this reach, revised flood profiles will be developed for the 10-, 50-, 100-, and 500- year floods using hydrologic and hydraulic models. Prior to the development of these profiles, the hydraulic model will be calibrated to match the March 17, 1990 flood in order to give the model credibility and applicability to other flooding scenarios. The purpose of this study is to provide the community with a tool that could be used for future planning and design purposes.

Website: http://pubs.usgs.gov/sir/2008/5171/
Project: Assessment of Benthic Invertebrate Community Health in the Autauga Creek watershed, Autauga County, Alabama
Research Description: The proposed study will evaluate the benthic-invertebrate community over a wider area of the watershed as well as an overall assessment of water-quality field parameters throughout the watershed. By sampling the main stem of Autauga Creek as well as Bridge Creek, the largest tributary to Autauga Creek, it may be possible to more accurately determine where the predominant impacts to the creek are originating.
Website: http://al.water.usgs.gov/projects/AutaugaCreek.html
Project: Occurrence of Tetrachloroethylene in Shallow Groundwater and Surface Water near the Capitol City Plume Site, Montgomery, Alabama
Research Description: Tetrachloroethylene (PCE) was detected in very low concentrations in samples collected by the U.S. Geological Survey from Cypress Creek, a small creek presumed to be hydraulically down gradient from the plume, in summer 2006. Previous studies of the area by other sources have identified other contaminants as well. The objective of this investigation is to determine contaminant concentrations in shallow groundwater and surface water near the known plume location. Data gathered during this investigation will provide additional information about the possible transport of plume contaminants to local surface water.
Website: http://al.water.usgs.gov/projects/CapitolCityPlume.html
Project: Estimation of Long-term Reservoir Sedimentation in Lake Tuscaloosa, Tuscaloosa County, Alabama
Research Description: In the past, the effect of mining operations on water quality and sedimentation in Lake Tuscaloosa was a major concern. While the mining issues are still a concern, sediment yield caused by other fast-changing land uses, including shoreline and near shoreline development, has also raised concern. The objective of this project is to advance the understanding of how suspended-sediment loads are affected by hydrologic processes and land use and to furnish data and information that contributes to the protection of a major water supply reservoir and ecosystem.
Website: http://al.water.usgs.gov/projects/ReservoirSedimentation.html
Project: Assessment of Future Water Availability in the Major River Basins of Alabama
Research Description: The Office of Water Resources (OWR) in the Alabama Department of Economic and Community Affairs is charged in §Section 9-10B-1, et.seq. of the Alabama Water Resources Act to, among other things, assess the state's water resources including estimating the water use and the amount of water available in the 11 major river basins of Alabama. Each of these basins is in need of long-term hydrologic tools that can be used for assessing water availability under a variety of different conditions, including, climate extremes, water-use, and land-use changes. The U.S. Geological Survey (USGS) and OWR are working together to develop a water availability modeling toolbox that will be useful in the planning and decision-making process.
Website: http://al.water.usgs.gov/projects/WaterAvailability.html
Project: Pesticide Occurrence in Ground Water in Areas of Intense Agriculture in Alabama
Research Description: The U.S. Geological Survey (USGS), in cooperation with the

Pesticide Management Branch, is evaluating the occurrence of agricultural pesticides in ground water in three areas of intensive agriculture in Alabama: the Tennessee River Valley, the Wiregrass region in southeastern Alabama, and the coastal region of Baldwin County, Alabama. Ground-water wells will be selected for sampling through evaluation of existing ground-water quality and well construction data, and land use practices. Shallow wells in or adjacent to row crop areas will be targeted.

Website: <http://al.water.usgs.gov/projects/Pesticide.html>

Project: Coastal Plain Culvert Study

Research Description: The proposed investigation is a 5-year study that targets 8-10 small streams in the Coastal Plain physiographic province of Alabama, beginning in the Federal Fiscal Year 2010 (October 1, 2009). The study will include 4 years of data collection that encompass pre-construction, construction, first-year post-construction, and second-year post-construction phases of box culvert installation at the selected stream sites. The final year will focus on data analysis and report writing. The objectives of this project are to (1) assess the degree and extent of changes in geomorphic conditions, suspended sediment concentrations, turbidity, and benthic macroinvertebrate populations in selected small streams after box culvert installation and (2) identify any significant relationships between observed changes in geomorphology and benthic macroinvertebrate populations. Baseline conditions will be established for each stream and any observed post-construction physical and ecological impacts of the culvert will be documented.

Website: <http://al.water.usgs.gov/projects/CoastalPlainCulvertStudy.html>

Project: Water Use in the Tennessee Valley Region of Alabama

Research Description: Every 5 years since 1950, the USGS has conducted inventories of water use in the United States. In 1996, 2001, and 2007 the USGS, in cooperation with OWR, compiled water-use data for Alabama for 1995, 2000, and 2005 respectively. The Alabama data were aggregated with data for the rest of the United States and included in a report on water use in the Nation. A separate report published in 2009 summarizes 2005 water-use information in more detail for the State of Alabama. For 2010, the joint OWR and USGS water-use study proposes to complete integration of the 2005 water-use data, surface-water and ground-water availability analyses, and future water demand projections for the Tennessee River watershed in Alabama. An electronically-published scientific investigations report presenting the Tennessee River watershed results will be produced.

Website: <http://al.water.usgs.gov/projects/TennesseeValley.html>

Project: National Water-Quality Assessment (NAWQA) Projects in Alabama

Research Description: The long-term goals of this research are to describe the status and trends in the quality of a large, representative part of the Nation's surface- and ground-water resources, and to provide a sound, scientific understanding of the primary factors affecting the quality of these resources.

Website: <http://water.usgs.gov/nawqa/index.html>

Project: Collaborative Research: Groundwater Discharge, Benthic Coupling and Microalgal Community Structure in a Shallow Coastal Lagoon

Research Description: This project will investigate the link between submarine groundwater discharge (SGD) and microalgal dynamics in Little Lagoon, Alabama, a model system for such a study. In contrast to most near-shore environments, it is fully

<p>accessible; has no riverine inputs; and is large enough to display ecological diversity (c. 14x 0.75 km) yet small enough to be comprehensively sampled on appropriate temporal and spatial scales. The PIs have previously demonstrated that the lagoon is a hot-spot for toxic blooms of the diatom <i>Pseudo-nitzschia</i> spp that are correlated with discharge from the surficial aquifer. This project will use state-of-the-art techniques to assess variability in SGD, the dependence of benthic nutrient fluxes on microphytobenthos (MPB) abundance and productivity, and the response of the phytoplankton to nutrient enrichment and dilution.</p>
<p>Website: http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0962008</p>
<p>Project: Collaborative Research: Defining ecosystem heterotrophic response to nutrient concentrations and ratios</p>
<p>Research Description: In this study, laboratory incubations, streamside channels and whole-stream nutrient additions will be used to determine the concentrations and ratios of nitrogen and phosphorus that elicit ecosystem changes. Knowledge of these threshold concentrations and ratios can guide management of aquatic ecosystems to maintain water quality for wildlife conservation and human utilization. Study findings can aid predictions of how excess nutrients affect the fate of detrital carbon in streams, which is relevant to global carbon budgets.</p>
<p>Website: http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=0918904</p>
<p>Project: Construction of the Mobile Harbor Turning Basin, Mobile County, AL</p>
<p>Website: http://www.sam.usace.army.mil/pd/Document/EA-MobileHarborTurningBasin.pdf</p>

<p>Focus: Waterway</p>
<p>Project: Ophelia Within-Banks Disposal Area at River Mile 329, Black Warrior River, Tuscaloosa County, Alabama</p>
<p>Website: http://www.sam.usace.army.mil/pd/Document/OpheliaEADRAFT.pdf</p>
<p>Project: Bevill Cross Current Project, Tennessee-Tombigbee Waterway, Pickens County, Alabama</p>
<p>Website: http://www.sam.usace.army.mil/pd/Document/Signed_Bevill_FONSI_and_EA.pdf</p>
<p>Project: Dredged Material for the Bayou Coden Navigation Project, Mobile County, Alabama</p>
<p>Website: http://www.sam.usace.army.mil/pd/Document/Bayou%20Coden%20EA%202009%20(2).pdf</p>
<p>Project: Small Boat Access Channels in the Alabama River, Alabama</p>
<p>Research Description: The US Army Corps of Engineers is examining water quality recertification of operation and maintenance of federal navigation project and small boat access channels on the Alabama-Coosa River system.</p>
<p>Website: http://www.sam.usace.army.mil/pd/document/ALRiv_SBAC_EA2009.pdf</p>
<p>Project: Operation and Maintenance of the Gulf Intracoastal Waterway Federal Navigation Project, Mobile and Baldwin Counties, Alabama</p>
<p>Research Description: The proposed action would involve maintenance dredging and disposal operations for the Gulf Intracoastal Waterway in the State of Alabama.</p>
<p>Website: http://www.sam.usace.army.mil/pd/EAs/Draft_EA_GIWW_AL.pdf</p>
<p>Project: Maintenance and Disposal of Dredged Material for the Bon Secour River Navigation Project, Baldwin County, Alabama</p>

Research Description: The purpose of this Environmental Assessment is to determine whether or not the proposed action has the potential for creating significant impacts to the environment and would thereby warrant a more detailed study of possible impacts, mitigation, and alternative courses of action.

Website: http://www.sam.usace.army.mil/pd/Document/Draft-EA_Sep2007Maintenance.pdf

Project: The Release of Triploid Grass Carp for Hydrilla Management, Walter F. George Lake, Alabama and Georgia

Research Description: The purpose of this Environmental Assessment is to evaluate the environmental effects that would result within Walter F. George Lake and contiguous upstream and downstream waterbodies from the release of triploid grass carp (*Ctenopharyngodon idella*) to assist in the management of the exotic invasive submersed aquatic plant hydrilla (*Hydrilla verticillata*).

Website: <http://www.sam.usace.army.mil/pd/Document/FinalEATriploidGrassCar%20ReleaseJun07.pdf>