

## Environmental Research at UA

- AIR Research Summary –
- WATER Research Summary–
- LAND Research Summary-

**On-going Work:** The following table lists current work performed or otherwise directed by UAEI Core Faculty and Staff. Total funding for the work indicated represents approximately \$960,000.

### **Current and On-Going Projects and Proposals**

<b>Focus</b>	<b>Proposal</b>	<b>Sponsor</b>	<b>UA PI/CoPI</b>
Water	Identification and Treatment of Emerging Contaminants in Wet Weather Flows	US EPA	Pitt, Johnson, Ritchie, Clark, Samaranian
Water	Phase II NPDES Stormwater Technology Transfer	UTCA	Johnson
Water, Air, & Land	Sensors and Sensor Networks for Biological and Environmental Applications (Scott)	UA COE	Jackson, Williamson, Johnson, and 5 others
Water	NIH Global Health Education	NIH with UAB	Pitt
Water	Stormwater Pollution from "Environmentally Friendly" Roofing Installed in an Urban Environment	EPA Region 3	Pitt with Clark
Water	Development of Innovative Stormwater Treatment Practices	Auckland Regional Council with Landcare Research	Pitt
Water	Developing Local Stormwater Indicator Monitoring Program to Demonstrate Environmental Results	EPA	Pitt, et al.
Air & Water	Modeling Metals in Desulphurization Scrubber Blowdown (Johnson, Southern Company)	Southern Company	Johnson and Ritchie
Air & Water	Task 1 Instrument Aircraft Upgrade and Scaling Improvements for Water/CO2 Flux in Bondville	DOC-NOAA-ATDD	Williamson and Elebash
Land	Alternative Treatment Systems	Legacy	Johnson and Goodson
Water	Chamber Project	Legacy	Boykin
Water & Land	Irrigation State Study (Asked to participate in meetings for final project.)	NOAA/UAH	Durrans, Pitt, Boykin
Water	COSS Program; Center for Optical Sensors and Spectroscopies	NSF EPSCoR	Pitt, Fridley
Water	Measuring the Performance of the Upflow Filter Installed at the Tuscaloosa City Hall	Hydro International	Pitt et al.
Air, Water, and Land	Assessment of Meteorological, Seasonal, and Land Management Influences on Spatial Representativeness and Ecosystem-Level Scaling of CO2 Fluxes Using UA Sky Arrow ERA Aircraft	American Carbon Program, DOE	Williamson et al.
Water	Evaluation of Inlet Treatment Device, an EPA SBIR Phase 2 Demonstration Project with US Infrastructure	EPA	Pitt with US Infrastructure
Water	Evaluation of NPDES MS4 Stormwater Monitoring Data, with the Center for Watershed Protection	EPA	Pitt et al
Water	Techniques for Identifying/Correcting Inappropriate Discharges	EPA	Pitt et al
Water	Alabama Highway Drainage Conservation Practices	UA Transportation Center	Pitt, Durrans, et al
Water	NPDES Stormwater Phase II Technology Transfer	University Transportation Center	P. Johnson, Pitt, et al

Air	Spatial Variability and Functioning using Sky Arrow	DOE - NIGEC	Williamson and Elebash
Water	PnET and SWAT Coupling (Durrans, DOE).	DOE - NIGEC	Williamson and Elebash
Air, Water, and Land	Engineering Math Advancement Program	NSF	Whitaker, Boykin, Johnson, Wood, Wu, Bowen, Evers
All	Future Faculty Fellowship	UA	Johnson, Goodson

The organizational structure of the EI serves as an umbrella for multi-disciplinary teams of faculty and staff. A brief description of some of the categories for current work performed by ENV Core members is as follows:

- Atmospheric and Environmental Research The Atmospheric and Environmental Research Operations Laboratory (AERO), lead by Dr. Derek Williamson recently received funding from DOE for work entitled *Spatial Variability and Functioning using Sky Arrow*. This work is performed in conjunction with *The Bondville Intensive*, 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, and several satellite image packages, and many on ground measurements are coordinated during the growing season. Dr. Williamson's research area may be broadly defined as the study of fate and treatment of environmental contaminants. His research emphasizes Air Resources Engineering. Application areas include airshed/watershed interactions and transfers, mercury in the environment, transportation associated air quality issues, indoor air quality, incorporating uncertainty in pollutant fate modeling, and remediation of complex mixtures of weathered petroleum hydrocarbons. Dr. Williamson has participated in projects funded by: The University Transportation Center of Alabama, The Alabama Department of Transportation, The Legacy Fund for Environmental Research (ALERT), and the City of Tuscaloosa, Fletcher Hilliard Wastewater Treatment Plant.
- Water Resources and the Sustainable Water Resources group, has a number of currently funded proposals including the *Developing Local Stormwater Indicator Monitoring Program to Demonstrate Environmental Results (Pitt, EPA)*. This research group, headed by Dr. Robert Pitt is mostly supported by research grants from the U.S. Environmental Protection Agency, municipal governments, and several industries. Other current project are examining emerging methods that can be used to identify inappropriate discharges to storm drainage systems and compiling stormwater NPDES monitoring data from throughout the US. The group's progress reports and preliminary data for these projects are included at: <http://unix.eng.ua.edu/~rpitt/>.
- Alternative Water/Wastewater Treatment is an evolving area of research by core EI faculty and staff. Within the area, a recent award, *Modeling Metals in Desulphurization Scrubber Blowdown, (Southern Company)* is being conducted by *Johnson and Ritchie*. Dr. Pauline Johnson's research interest is in the general area of environmental engineering emphasizes water and wastewater treatment and pollution prevention. She has been involved in water quality monitoring and in experimental investigations of media for specific filter applications. She has extensive experience in industrial and stormwater metals capture from aqueous systems by sorption/filtration. She is also involved in ongoing collaborative research in with colleagues at Queen's University Belfast.

- Hydrologic Modeling is a general area for a very complex research focus. *PnET and SWAT Coupling*, a DOE sponsored award for Dr. Durrans, is work to improve and couple existing hydrologic and land use model. Dr. S. Rocky Durrans, Professor in CCE at UA, has taken lead of a number of applied statistical modeling activities. Durrans' research has focused on statistical analyses of hydrologic and environmental data, especially precipitation and streamflow. He has also investigated potential water resources impacts associated with climate change. He has directed numerous water quality and hydrology research projects throughout the US and has written more than 100 publications. He has worked with the other project co-PIs and collaborating institutions on prior projects and other activities.
- Environmental Education Research: Environmental education research is a major focus for the EI core members. Current work in this area addresses the mathematical background of incoming environmental engineering students. Core environmental engineering classes require calculus as a prerequisite or co-requisite. To graduate in a reasonable amount of time, the student cannot fall behind due to poor math skills. Many students become disillusioned and seek a change of major. The Living Laboratory and Environmental Stewardship components of the Engineering-Math Advancement Program (E-MAP), coordinated by Dr. Karen Boykin and funded by NSF, provide students with hands-on reinforcement techniques designed to establish a stronger pre-calculus mathematical foundation while introducing concepts of Calculus I. On-going project activities include EI operation of the Living-Laboratory and Environmental Stewardship component of EMAP and engineering, math, and education article preparation.
- Summer Research Experiences: Summer research experiences are also a priority. On-going work includes EI support of the Center for Optical Sensors and Spectroscopies' (COSS) environmental field and outreach education component. This NSF EPSCoR funded project requires a substantial amount of public and educational outreach efforts. A portion of this outreach is currently provided by the E-MAP project, described above. COSS is developing and testing new laser instrumentation for environmental monitoring. E-MAP summer institute students, through undergraduate research experiences, are taught how to test water and air samples for different analytes. The COSS program's objectives are to develop analytical methods that can be used during response efforts to natural disasters and as part of the EPA Water Sentinel Program for homeland security.