FIU Deploys to Savannah River Site for Environmental Data Collection

A team of researchers from the Applied Research Center (ARC) at Florida International University (FIU) are headed to the U.S. Department of Energy's (DOE) Savannah River Site (SRS) near Aiken, South Carolina for a week of sample and data collection from the Tims Branch watershed in early August 2016 in support of ongoing surface water and sediment transport modeling research being performed at ARC. Dr. Mehrnoosh Mahmoudi who is leading the excursion will be accompanied by three (3) FIU students (Natalia Duque, Mohammed Albassam, and Juan Morales) who are DOE Fellows that have been inducted into the DOE-FIU Science and Technology Workforce Development Program. Through this program, undergraduate and graduate STEM students are given the opportunity to participate in hands-on applied research and in this particular case, receive training on various field and laboratory procedures and on the use of various field and laboratory measurement devices.

ARC researchers are developing a surface water hydrological model in collaboration with the Savannah River National Laboratory (SRNL) and the Savannah River Ecology Laboratory (SREL) to provide SRS with a tool to simulate flow and the potential for contaminant (mercury, tin and uranium) transport in the Tims Branch watershed during extreme storm events. Tims Branch is a small stream ecosystem located in the SRS A and M Areas that has received discharges containing uranium, mercury, nickel, aluminum and other metals and radionuclides as a result of anthropogenic activities at on-site process and laboratory facilities. Innovative treatment systems were deployed to limit contaminant fluxes to Tims Branch, including a wetland treatment system in 2000 and a mercury removal system in 2007 that used tin (II) chloride and air stripping. These treatments eliminated all local anthropogenic mercury inputs to this ecosystem; however the tin-based treatment resulted in the addition of inert tin oxide particles. The principal objective of ARC's research therefore, is to apply geographic information systems (GIS) and stream/ecosystem modeling tools to examine the response of Tims Branch to historical discharges and environmental management remediation actions. The model:

- Conceptualizes the hydrology and transport mechanisms in Tims Branch watershed;
- Simulates surface water flow velocity, depth, and discharge over time;
- Estimates spatiotemporal distribution of various contaminant concentrations such as tin and mercury; and
- Predicts fate and transport of contaminants in surface water under different environmental and atmospheric conditions.

The trip to SRS will involve sampling and data collection at various locations along Tims Branch and the A-014 outfall tributary, which will be used for calibration and verification of the Tims Branch hydrological model being developed, including:

- Measurement of Tims Branch and A-014 outfall tributary cross-section profiles;
- Collection of water and sediment samples for laboratory analysis of heavy metals and radionuclides, sediment core content and core particle size; and
- Measurement of field environmental conditions such as flow velocity, suspended particle concentration and other water quality parameters (e.g., temperature, pH and dissolved oxygen).

This effort has been coordinated with the assistance of Dr. John Seaman, a Senior Research Scientist specializing in Environmental Geochemistry and the Associate Director of Research at

SREL. Dr. Seaman and his team have assisted in acquiring site-required permitting for FIU's staff and students to gain on-site access, and will be providing field and laboratory equipment and supervised escort to the sample locations. SREL will also provide support through laboratory sample preparation and analysis.

The data collected will be used for development of an eco-hydrological database to support the modeling research of the Tims Branch watershed being performed at ARC as part of the DOE-FIU Cooperative Agreement. The Tims Branch ecosystem represents an important applied science opportunity as a result of significant past research by SRNL and SREL. This collaborative effort is specifically focused on improving the conceptual and quantitative modeling of a real-world ecosystem that was impacted by DOE operations for 50 years and which is now recovering. This will provide valuable insight during the monitoring phase following the implementation of the applied remediation technology to remove the mercury contamination in Tims Branch.

For additional information, contact Dr. Leonel Lagos (Principle Investigator) at (305) 348-1810 or lagosl@fiu.edu.

Figure 1. The FIU/SREL Research Team

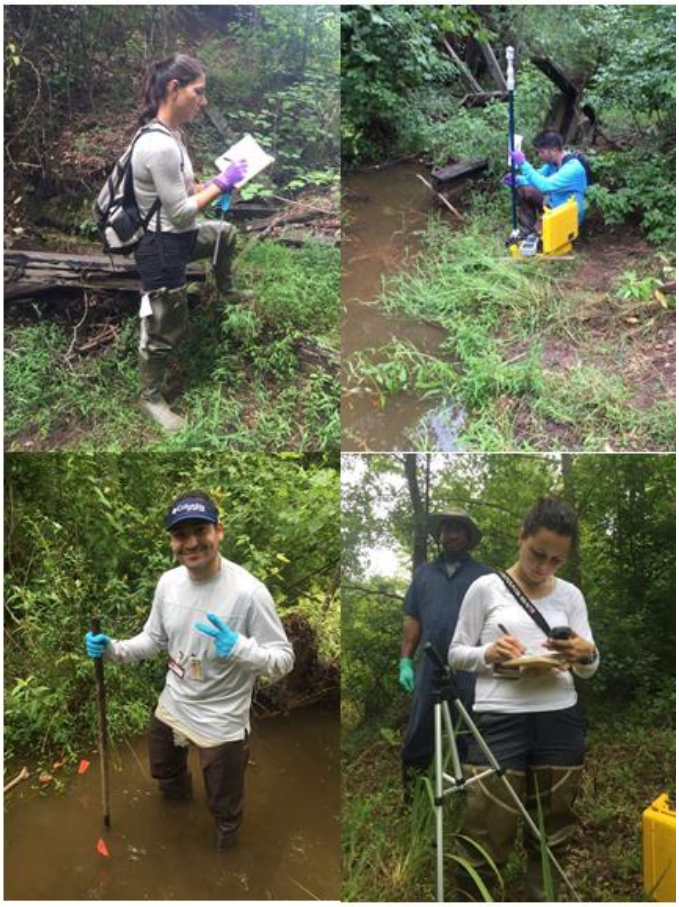

Figure 2. FIU Researcher and Students Recording Field Measurements

Figure 3. The Research Team Following Decontamination Protocol