

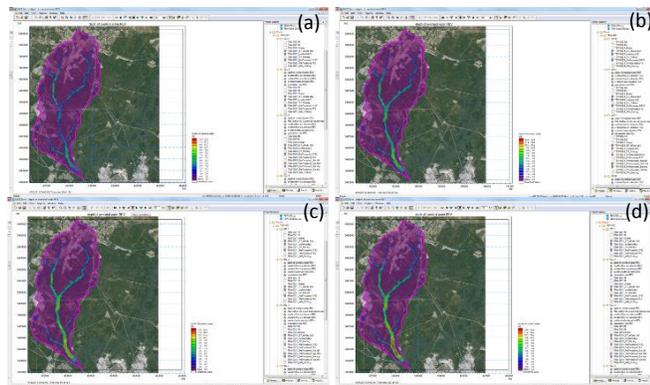
**ENVIRONMENTAL REMEDIATION**

**PROJECT: Environmental Remediation Science & Technology: Surface Water Modeling of Tims Branch**

**CLIENT: U.S. Department of Energy**  
**PRINCIPAL INVESTIGATOR: Dr. Leonel Lagos**  
**LOCATION: Savannah River Site, Aiken, SC**

**Description:**

This task involves hydrological modeling related to water, sediment, mercury and tin in Tims Branch at Savannah River Site (SRS) which has been impacted by 60 years of anthropogenic events associated with discharges from process and laboratory facilities. Tims Branch provides a unique opportunity to study complex systems science in a full-scale ecosystem that experienced controlled step changes in boundary conditions.



**Fig 1. MIKE SHE simulation results of seasonal overland depth of water for the year 1993 indicating (a) spring, (b) summer, (c) fall, and (d) winter, overland flow simulations**

FIU is continuing development and testing of an integrated hydrology and transport model of Tims Branch watershed using the MIKE commercial software suite developed by the Danish Hydraulic Institute (DHI) that is capable of simulating surface and subsurface hydrology and transport mechanisms. The Tims Branch watershed model was developed for a relatively well defined system in which all of the local mercury inputs were effectively eliminated via two remediation actions (2000 and 2007).

Furthermore, discharge of inorganic tin (as small micro particles and nanoparticles) was initiated in 2007 as a step function with high quality records on the quantity and timing of the release.

The principal objectives are to apply GIS and stream/ecosystem modeling tools to examine the response of Tims Branch to historical discharges and environmental management remediation actions.



**Fig 2. Cross sections of streams and tributaries in Tims Branch watershed that are directly exported from ArcGIS into MIKE 11**

**Benefits:**

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

**Accomplishments:**

- Developed process-based and data-driven conceptual models.
- Conducted data review and collection for input parameters required to set up MIKE SHE model.
- Completed preliminary simulations of surface runoff using MIKE SHE.
- Began preliminary development of a 1-D stream/river hydrology model using MIKE 11.

**ABOUT**

Since 1995, the Applied Research Center at Florida International University has provided critical support to the Department of Energy's Office of Environmental Management mission of accelerated risk reduction and cleanup of the environmental legacy of the nation's nuclear weapons program. ARC's research performed under the DOE-FIU Cooperative Agreement (Contract # DE-EM0000598) can be classified as fundamental/basic, proof of principle, prototyping and laboratory experimentation.

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