

## Uranium Remobilization from a Wetland 50 Years After Contamination

D.I. KAPLAN<sup>1</sup>, R.J. SMITH<sup>1</sup>, M. BAKER<sup>2</sup>, B.O. FERGUSON<sup>3</sup>, N.E. MARTINEZ<sup>3</sup>, D.A. MONTGOMERY<sup>3</sup>, C. PARKER<sup>3</sup>, J.C. SEAMAN<sup>2</sup>, B.A. POWELL<sup>3</sup>, E.J. O'LOUGHLIN<sup>4</sup>, K.M. KEMNER<sup>4</sup>

<sup>1</sup> Savannah River National Laboratory, Savannah River

Nuclear Solutions, Aiken, South Carolina, United States

<sup>2</sup> Savannah River Ecology Laboratory, University of Georgia, Aiken, South Carolina, United States

<sup>3</sup> Dept. of Environmental Engineering and Earth Sciences, Clemson Univ., Anderson, South Carolina, United States

<sup>4</sup> Argonne National Lab, Lemont, Illinois United States

From 1966 to 1968, 43.5 metric tons of uranium (U) was released from a nuclear reactor target facility into a stream on the Savannah River Site in South Carolina. Based on 31 sediment core samples collected in 1984, it was estimated that 70% of the released U had been immobilized in a 53-ha wetland (a drained pond that has been naturally revegetating since 1984). Since then, large rain events have caused the release of kilogram quantities of U downstream, of which essentially all the U is associated with suspended particles. The objectives of this study were to quantify the extent that the U remained immobilized in the wetland and to evaluate the extent that this wetland poses an environmental threat as a secondary source term. In 2014, an overflight campaign was undertaken to map the extent of U contamination at the study site using a helicopter equipped with three 10x10x40-cm NaI detectors. The resulting map indicated that the contaminated area above the drained pond was closer to 62 ha. In 2019, a more detailed mapping of the U contamination was undertaken by systematically and manually traversing the contaminated area with backpacks equipped with NaI gamma detectors (5x7.6x20 cm NaI detectors), telemetry, and GIS-equipped tablets. The resulting 149,000 gamma spectra, along with satellite images and 1-m LIDAR topographical data were compiled into maps. Preliminary results from this data show that the contamination area upstream from the drained pond may be as large as 346 ha. Early results indicate that about 20% of the released U remains in the wetland. Refined modeling of the 1984 data suggests that the original 70% U-retention value may be inflated. Finally, recent stream water analyses during storm events indicate a significant reduction in stream U concentrations, potentially the result of significant revegetation of the former pond, reduced stream flow rates due to curtailed operations, and a reduced source term. Future U mapping will be conducted downstream of the source term.