SULFATE MITIGATION STRATEGIES FOR THE EVERGLADES

***Matthew S. Varonka**, William H. Orem, and Tiffani Schell*
U.S. Geological Survey, Reston, VA, USA

Sulfate concentrations in much of the Everglades are many times the estimated background concentration of ≤ 1 mg/L. Increased sulfate concentrations are shown to stimulate production of the neurotoxin methylmercury via microbial sulfate reduction, leading to bioaccumulation of mercury in fish and wildlife. Human exposure to methylmercury through consumption of game fish is a serious health concern, and the Florida Department of Health continues to issue fish consumption advisories across the ecosystem.

Sulfate is discharged into the ecosystem via canals draining the Everglades Agricultural Area (EAA), where sulfur-containing fertilizer and soil amendments are applied to the fields. Sulfate may also be introduced to the system through groundwater pumping or infiltration through canal bottoms, but isotopic data suggests these effects are minimal. While best management practices (BMPs) and stormwater treatment areas (STAs) have been successful in reducing phosphorous loading to the Everglades, there are no BMPs for sulfur use, and STAs, as currently configured, remove minimal sulfate from surface water. Little attention has been paid to targeted sulfate remediation strategies.

Due to the scale and complexity of the Everglades ecosystem and extent of sulfate contamination, a multi-faceted approach is needed to reduce sulfate loading and mitigate the impacts of sulfate on the ecosystem. An approach incorporating limiting sulfur use in the EAA, controlling sulfate transport, and removal of sulfate through treatment may be successful in reducing sulfate concentrations in Everglades surface water. Reduction of sulfate sources by limiting sulfur-containing soil amendments, fertilizers, and fungicides and limiting inputs of high-sulfate groundwater is vital to the success of sulfate reduction. Water management through increased sheet flow and control of dry/rewet cycles could also reduce sulfate transport through the system. Additionally, several mitigation strategies including biological removal, chemical treatment, and removal using permeable reactive barriers will be discussed.

PRESENTER BIO: Dr. Varonka is a chemist with the U.S. Geological Survey Eastern Energy Resources Science Center in Reston, VA. He has worked for 10 years as part of a group of researchers studying the link between sulfate concentrations and methylmercury production in South Florida.