**ESTABLISHING A BASELINE OF COASTAL WETLANDS RESPONSE TO CLIMATE CHANGE USING COUPLED GEOPHYSICAL AND ISOTOPIC SURVEYS**

*Samuel H. Caldwell, U.S. Geological Survey, Richmond VA, USA*

*Kurt J. McCoy, U.S. Geological Survey, Richmond VA, USA*

*David Rey, U.S. Geological Survey, Lakewood CO, USA*

*Eric White, U.S. Geological Survey, Storrs CT, USA*

Samuel Caldwell1, Kurt McCoy2, David Rey3, Eric White4

Coastal freshwater ecosystems are under increasing stress from climate related phenomena such as sea-level rise and increases in extreme weather events as well as land subsidence. Jamestown Island, part of the Colonial National Historic Park (COLO) in eastern Virginia, rests only 5 feet above sea level near the mouth of the Chesapeake Bay and is host to a multitude of archaeological, cultural, and ecological resources. One of the consequences of climate change and sea-level rise on the island is the appearance of small ephemeral wetlands (300 m2) in the forested uplands of the island. COLO partnered with USGS to investigate the structure and provenance of these wetlands and their potential hydrologic connection with larger perennial wetlands (3000 m2) downgradient in adjacent brackish lowland marshes. Multi-scale, multi-method geophysical, and geochemical observations were leveraged to explore surface water groundwater interactions within the interior of Jamestown Island. These efforts sought to elucidate the spatiotemporal connection of ephemeral wetlands with the island’s underlying shallow groundwater system; a vulnerable freshwater lens that is vital for the native island ecology.

Repeat towed time domain electromagnetic (tTEM) surveys were used in conjunction with isotopic tracers to assess the hydrologic connectivity of isolated forested wetlands with the underlying shallow groundwater system. Geophysical observations informed by data from five discrete well clusters were coupled with stable water isotopic compositions of oxygen and hydrogen measured in open water and hyporheic zones across a wetland transect and in nearby groundwater wells. Geophysical surveys revealed a continuous conductive layer interpreted as a clay confining unit that separates shallow freshwaters from deeper brackish waters. This laterally continuous confining layer seemingly inhibits connectivity between waterways bounding the island and the wetlands in forested uplands. Isotope data and freshwater geochemistry (~300 microsiemens/cm) support the interpretation of ephemeral forested wetlands as rainwater catchments that serve as collection points for either focused recharge to the shallow fresh-groundwater system or evaporation.  Historical images and in-situ observations suggest geomorphic origin of ephemeral forested wetlands as being anthropogenically derived or the result of blowdown and tree throws. Brackish waters in perennial wetlands (4000 microsiemens/cm) support the conclusion that the large wetlands adjacent lowland marshes are primarily surface water features. Large perennial wetlands also had delta 18O and delta 2H ratios falling above the meteoric waterline, further supporting conclusions of a hydrologic regime where precipitation and evaporation drive surface water dynamics across the island.