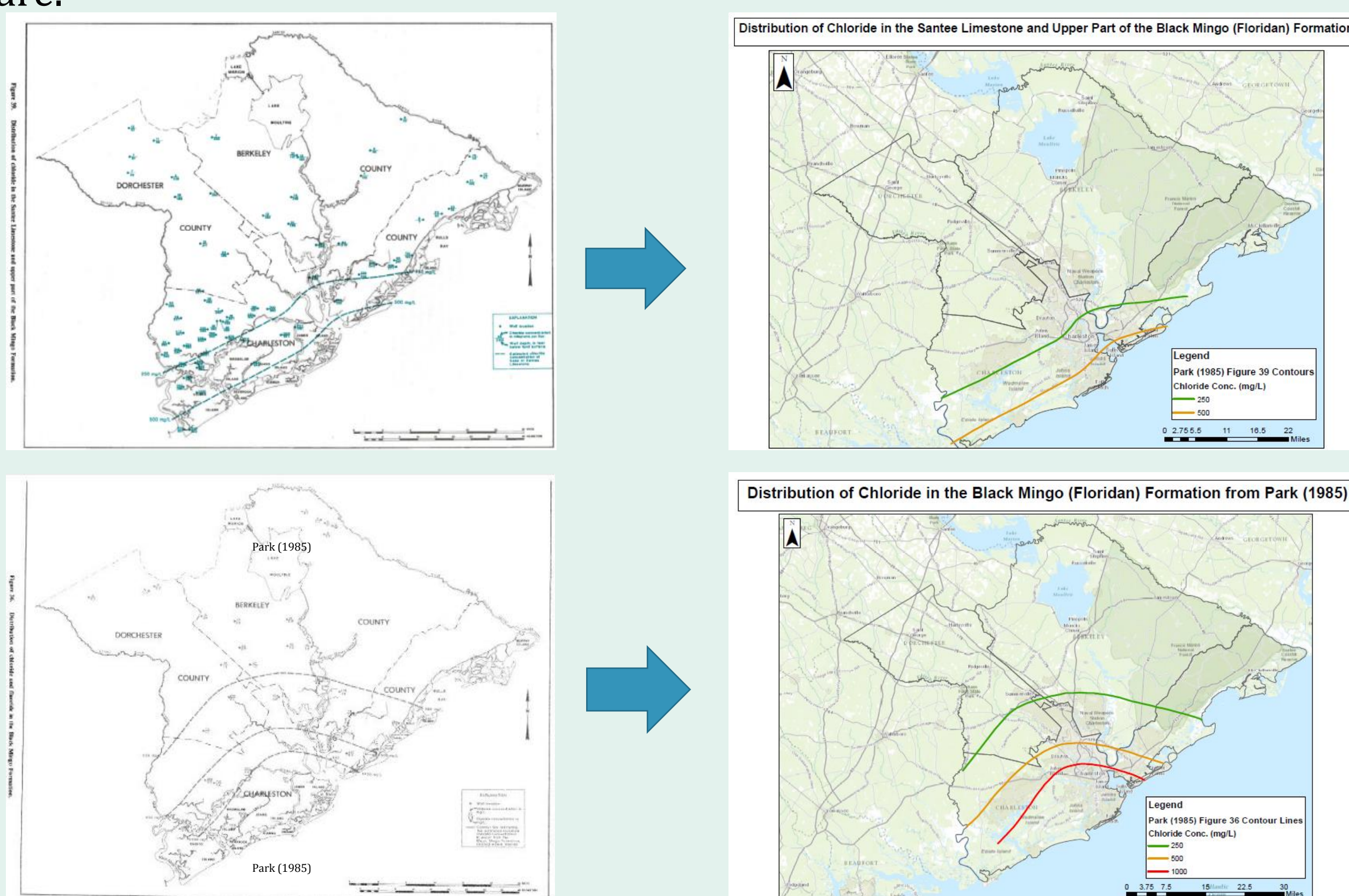


Abstract

The Floridan aquifer of the Southeastern United States is an important freshwater resource for private and commercial groundwater users. Within the past few decades, certain parts of the aquifer have experienced saltwater intrusion, which has affected the viability of this critical freshwater resource. Groundwater withdrawals, variability in recharge and discharge rates, and sea level rise has caused saltwater to advance into this and other freshwater coastal aquifers. While the South Carolina Department of Natural Resources (SC DNR) monitors conductivity in several coastal Floridan aquifer wells, a comprehensive hydrochemical saltwater intrusion study of the aquifer in the Berkeley-Charleston-Dorchester tri-county region of South Carolina has not been conducted since the publication of a SC DNR report in 1985. The goal of this current project, conducted in cooperation between SC DNR and the College of Charleston, is to inspect the water quality in Floridan aquifer wells in the tri-county region to determine the extent of saltwater intrusion within the aquifer. Objectives of this project include analyzing and mapping the location of the freshwater-saltwater interface, using hydrochemical analyses to identify signal elements of saltwater intrusion in the aquifer, and providing updated information regarding the groundwater resources of the Floridan aquifer in the study area. In-situ hydrochemical data from Floridan wells and associated geospatial analyses have indicated the areas of the study region likely impacted by saltwater intrusion, and current and future work will include analysis of well water for strontium, bromide and boron to serve as signal elements. Correlations between these elements and chloride concentrations will also be established to strengthen a model of saltwater intrusion. These results about the properties of the Floridan aquifer are in high demand for many stakeholders, including municipalities, agricultural operations, industrial activities, and natural resource managers who depend on a stable source of groundwater as public and private water supplies.

Background

- Groundwater in coastal aquifers can have interactions with the ocean and seawater. Saltwater intrusion occurs when saltwater from the ocean moves into the freshwater aquifer
 - Occurs naturally, but can be influenced by natural or anthropogenic phenomenon such as tides, sea level rise, other climatic shifts, installation of pumping wells, increased amounts of pumping, etc.
 - Characterized by increase in total dissolved solids, notably chloride, which can be estimated by specific conductance (Landmeyer and Belval, 1996)
 - Trace or minor elements also can be detected and signal source and presence of saltwater intrusion (Faye et al., 2005)
- The Floridan aquifer system is one of the largest and most productive aquifers in the US
 - Provides drinking water to approximately 10 million people
 - Underlies Florida, Georgia, southern Alabama, and southern coastal South Carolina
 - Park (1985) published a SCDNR report that evaluated the extent of saltwater intrusion in the tri-county area. His results are shown below, which have been recreated using GIS software.



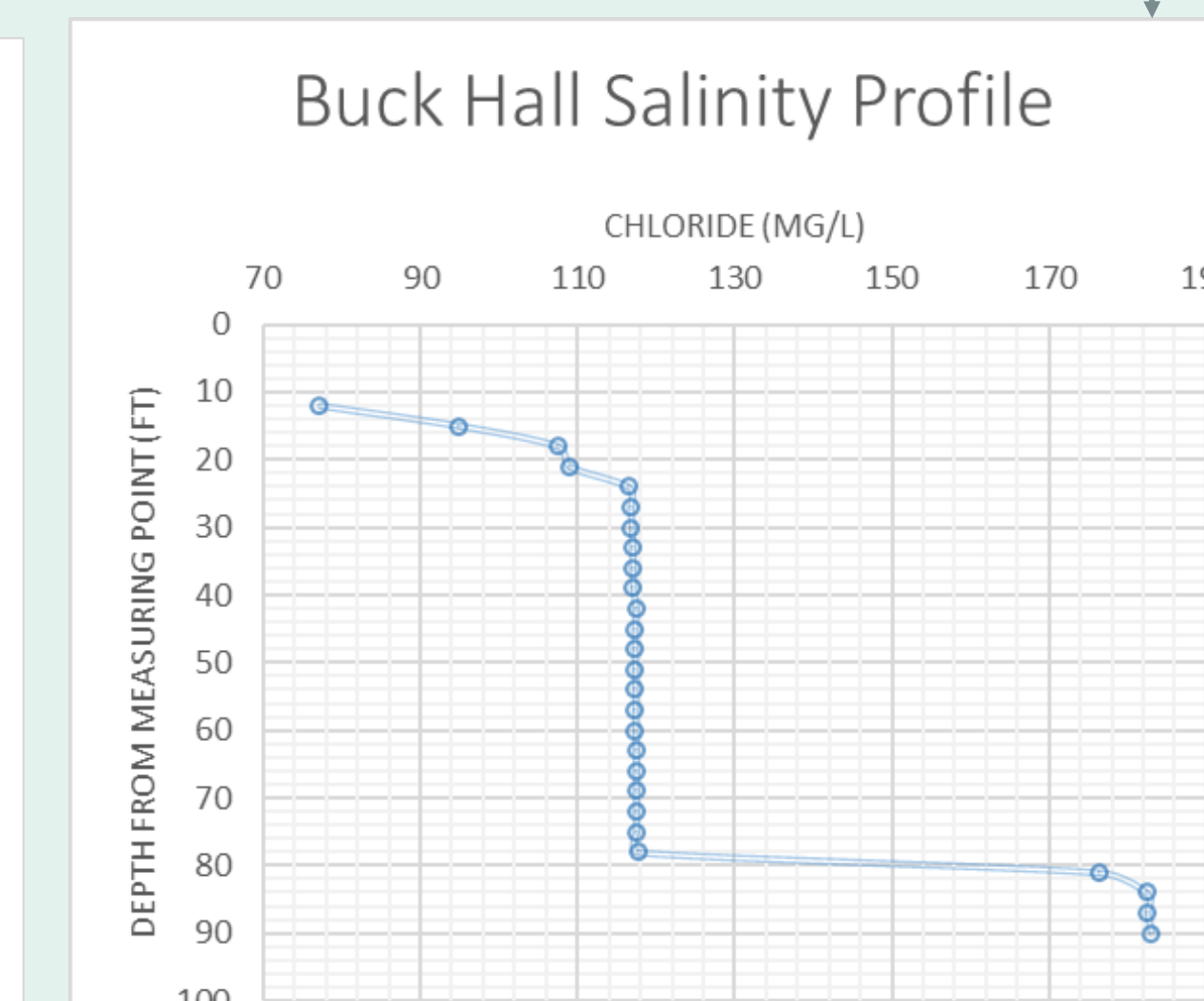
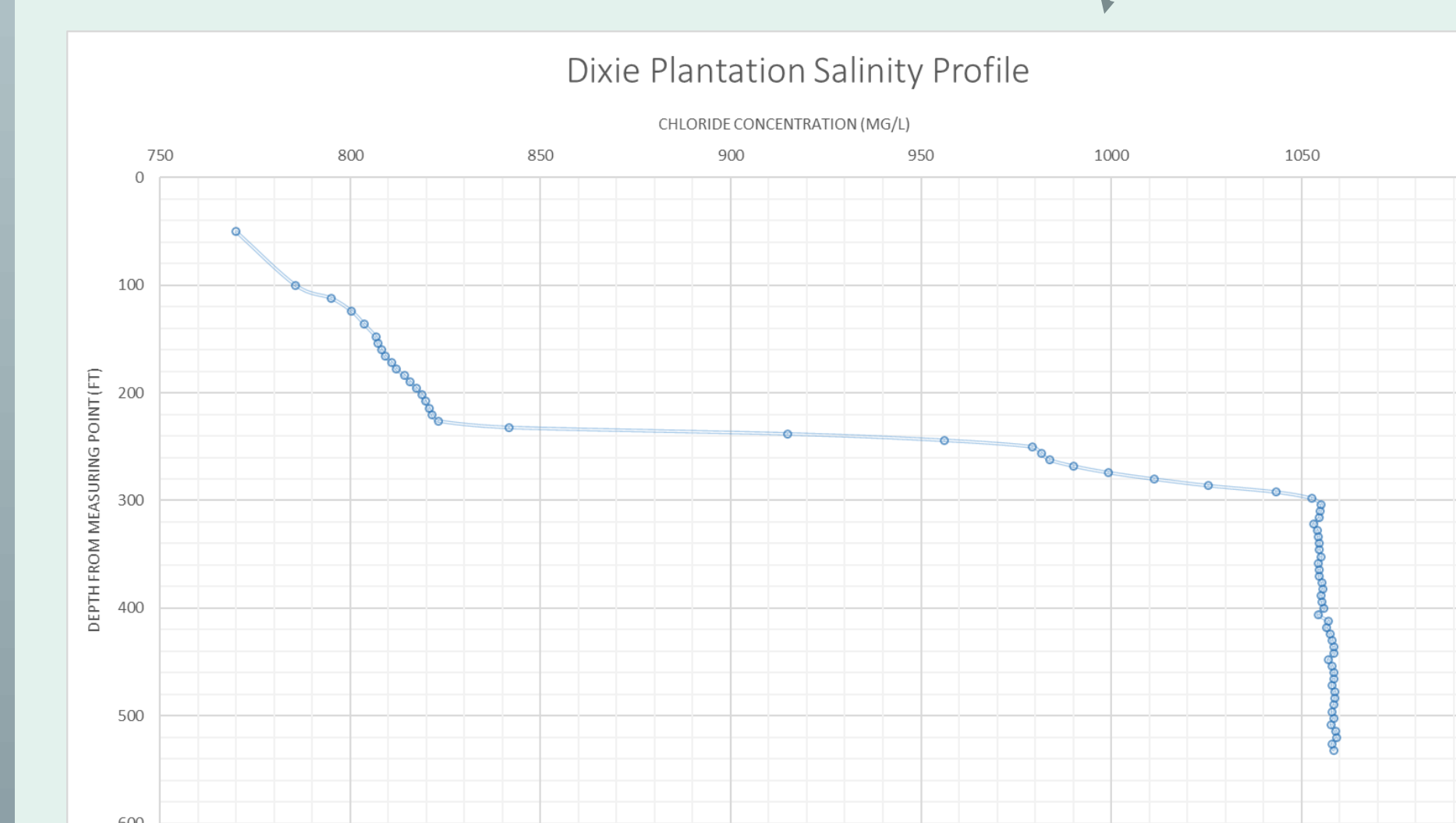
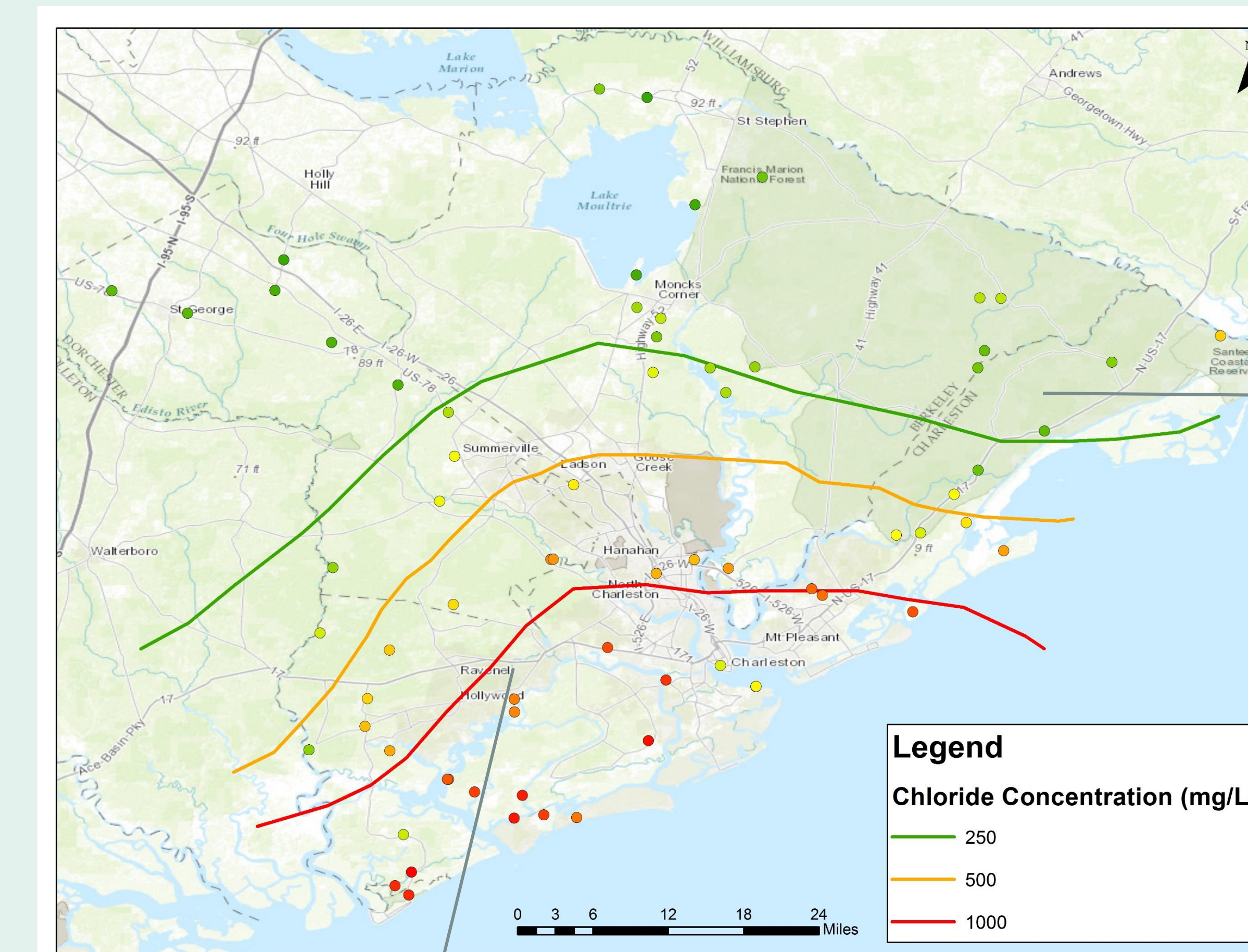
Objectives

- The goal of the project is to locate, map, and analyze the location of the freshwater-saltwater interface in the Floridan aquifer system in Charleston, Berkeley, and Dorchester Counties
- Specific objectives include:
 - Identify and locate Floridan aquifer wells to be analyzed and update SCDNR well file information
 - Analyze samples for hydrochemical indicators of saltwater intrusion using in-situ measurements and lab analyses of well water samples
 - Analyze samples for potential trace indicator elements of saltwater intrusion
 - Employ geospatial and statistical analysis techniques to visually display resulting data and provide useful, understandable products to stakeholders

Methods



Results



Significance

- Floridan aquifer is a vitally important source of freshwater for the southeastern United States
 - Provides drinking water to approximately 10 million people (Berndt, et al., 2014)
 - Agricultural, industrial, irrigation, and municipal uses (Maupin & Barber, 2005)
- Water withdrawals from the Floridan have increased by > 500% since 1950 (Berndt, et al., 2014)
- Current status of saltwater intrusion and chemical composition of the aquifer spanning the tri-county area remains relatively unknown
- Results provide key information for many stakeholders
 - municipalities, agricultural operations, industrial activities, natural resource managers, individual residents using well water
- Stakeholders depend on a stable source of groundwater as public and private water supplies, and as an important component of ecosystem health

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