

## Soil Moisture and Salinity Dynamics in a Freshwater Bald Cypress (*Taxodium distichum*) Swamp Impacted by Saltwater Intrusion

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The Loxahatchee River is home to one of the last remnants of bald cypress (*Taxodium distichum*) river-swamp in southeastern Florida. However, hydrological modifications in the river channel and watershed have resulted in reduced freshwater flow and saltwater intrusion into this historically freshwater ecosystem, leading to the loss of bald cypress and a transition to mangrove-dominated systems. Previous watershed and hydrodynamic modeling efforts have focused on predicting river salinity, with the goal of keeping river salinity below identified threshold levels for bald cypress, but have not addressed soil moisture and soil porewater salinity conditions in the floodplain. The aim of this study is to characterize soil moisture and salinity dynamics at several depths and distances from the river during both wet and dry seasons and to develop a simplified, spatially-distributed model to extend soil moisture-stage relationships to the entire floodplain of the river. Twenty-four combined dielectric probes measuring soil moisture, salinity, and temperature were installed at four locations and three depths along two transects perpendicular to the river, one in an upriver location unimpacted by saltwater and one in a transitional area that receives daily tidal flooding. Analysis of data collected over a three-year period shows that soil moisture is tied to distance and topographical elevation throughout the floodplain as a function of river stage, with rainfall, evapotranspiration, and soil heterogeneity identified as additional factors. Increases in soil porewater salinity in floodplain during the dry season are related to the magnitude and duration of river salinity, with an apparent time lag between river and porewater salinity peaks, which increases with elevation and distance from river. This data collection and modeling effort represents a valuable basis for the Loxahatchee River water resources managers to develop and review Minimum Flows and Levels (MFL) standards mandated by the State of Florida, and to assess the success of various restoration scenarios.

**Keywords:** Saltwater intrusion, bald cypress, *Taxodium distichum*, mangroves, dielectric, soil moisture, porewater salinity, Loxahatchee, restoration.

**Challenges:** Public health, wildlife health, ecosystem health and water resource sustainability

**Issues:** Water availability and allocation