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DEFINING SUSTAINABLE DEVELOPMENT TARGETS FOR COASTAL HYDROLOGY, WATER QUALITY, AND ECOLOGY IN SOUTH CAROLINA, USA

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ABSTRACT Headwater streams in lower Coastal Plain forests of the Southeastern U.S. function as natural storage and conveyance mechanisms for surface and groundwater flows. Water table elevations influenced by evapotranspiration, both seasonally and diurnally, often control stream flows where soil saturation typically drives surface runoff. The dynamics of coastal forested watersheds are complex, and water budgets of these headwater streams are difficult to quantify. Assessing baseline hydrology and vegetative ecology, as well as their interaction, provides a benchmark for sustainable development goals over the course of land use change, and understanding short- and long-term hydrologic response to this change. Bannockburn Plantation, located in coastal South Carolina, USA provides a unique opportunity for the spatial and temporal investigation of coastal hydrology, ecology, and land use change. The site is currently dominated by forested wetlands and upland pine stands and is slated for future development. The site is also part of a remote data acquisition network project - the Intelligent River™. Toward the goal of quantifying the water budget in a pre-development forested watershed, stream flows, groundwater levels, and rainfall are being measured in an approximately 400-acre coastal watershed, Upper Debidue Creek, at Bannockburn Plantation. Evapotranspiration rates are also being estimated where temperature, relative humidity, and photosynthetically active radiation (PAR) are being measured on site. Sap flow is being measured in both upland pine stands and in stands of mixed hardwoods in the floodplain. Surface water quality measurements are also being collected. Preliminary water budget estimates from Upper Debidue Creek will be presented.

Keywords: Sustainable development, evapotranspiration, coastal forests, hydrology, ecology