Title: **The Terrestrial Ecosystem Manipulation to Probe the Effects of Storm Treatments Experiment**

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Project Abstract: Coastal upland forests are facing widespread mortality as sea-level rise accelerates and precipitation and storm regimes change. The loss of coastal forests has significant implications for the coastal carbon cycle; yet, predicting the likelihood of mortality is difficult due to our limited understanding of disturbance impacts on coastal forests. The manipulative, ecosystem-scale Terrestrial Ecosystem Manipulation to Probe the Effects of Storm Treatments (TEMPEST) experiment is designed to address the potential for extreme freshwater and seawater disturbance events to alter tree function, species composition, and ecosystem processes in a deciduous coastal forest in Maryland, USA. The experiment uses a large-unit (2,000 m^2), un-replicated experimental design, with three 50-m x 40-m plots serving as control, freshwater, and seawater treatments. Transient saturation (5 hours) of the entire soil rooting zone (0-30 cm) across a 2,000 m^2 coastal forest is attained by delivering 300 m^3 of water through a spatially distributed irrigation network at a rate just above the soil infiltration rate. Our water delivery approach also produces extensive, low-level (≤ 8 cm above ground) inundation and elevates the water table, which is typically ~5 m below ground. A TEMPEST simulation approximates a 15-cm rainfall and based on historic records, is of comparable intensity to a 10-year storm for the area. Treatment application frequency will increase over a decade to quantify tipping points where plant and microbial communities and biogeochemical cycles begin to change rapidly. Pre-treatment data collection began in 2019 and the first full simulation is scheduled for June 2022. This experimental framework provides us with an unparalleled opportunity to control disturbance frequency and intensity and disentangle the effects of saturation and salinity under in-situ conditions and at an ecosystem-scale.