Inundation Regimes Impact on Leaf Litter Decay Rate in Forested, Freshwater Wetlands

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Wetlands play a crucial role in breaking down allochthonous leaf litter, influencing the biogeochemical cycling and export of carbon (C) across a variety of spatiotemporal scales. In forested watersheds leaf litter is the primary source of detrital C and decays through two simultaneous pathways: (i) leaching of soluble compounds and (ii) microbial-mediated mineralization and humification of structural compounds. In freshwater wetlands, the activation of these biogeochemical pathways is influenced by inundation regime (i.e. the duration, magnitude, timing, and rate of change of inundation). However, there is no clear consensus on how inundation regimes impact leaf litter decay rate in freshwater wetlands, and it is uncertain how stressors affecting inundation regimes (i.e., climate and land use change) will impact leaf litter decay rates. The goal of this study is to investigate the relationship between leaf litter decay rates, heterotrophic soil respiration, and inundation regime in forested, freshwater wetlands along a gradient of hydrologic connectivity. We conducted the study at the J. Nicolene Tanglewood Biological Station located in western Alabama's Coastal Plain physiographic region. We selected nine wetlands with varying modes of hydrologic connectivity, ranging from hillslope-connected to floodplain-connected wetlands. At each wetland, we conducted serial leaf litter incubations, laboratory soil microcosm experiments, and continuous wetland water level monitoring to quantify both leaf litter decay and heterotrophic soil respiration as a function of changes in inundation. We focused on Tulip poplar (Liriodendron *tulipifera*) and Florida anis (Illicium *floridanum*) leaf litter. We hypothesize that leaf little decay rates will be highest in intermediate-connected wetlands due to increased frequency and decreased duration of inundation events. Our results will provide important insight into leaf litter decay and subsequent carbon and energy movement in forested, freshwater wetlands.