

Pocosins: North America's Forgotten Peatlands for Climate Mitigation and Sea Level Protection

Curtis J. Richardson and *N. E. Flanagan*

Duke University Wetland and Coasts Ctr., Nicholas School of the Environment, Durham, NC, USA

Pocosins are coastal evergreen shrub bogs in the SE USA which cover over one million ha, an area similar in size to the Everglades National Park. They are ignored as important C sinks on the landscape mainly because these peatlands have been drained, burned, fertilized and are now under intensive agricultural or forestry practices, exacerbating C loss due to increased greenhouse gas (GHG) losses, (mainly as CO₂), increased nutrient and C export in runoff to coastal estuaries, reduced C sequestration and occasional uncontrolled deep peat fires. In addition, in their natural state they provide coastal protection against sea level rise. A 10-year study on the effects of water levels on CO₂ fluxes has shown low levels of CO₂ and CH₄ loss compared to other wetland ecosystems even under drainage and extended droughts due to the recalcitrant nature of the peat C chemistry in these peatlands. Our long-term restoration research provides key scientific data which quantifies the amount of increased C sequestration that occurs annually when restoration to natural hydrologic conditions takes place on these former drained peatlands. Eddy-covariance analyses revealed that restoring peatlands by raising water tables by 30 cm, i.e., by decreasing water table depth (WTD) from -60 to -30 cm, significantly reduces CO₂ losses to the atmosphere. When mean annual WTDs are deeper than a threshold of -30 cm, the drier peatlands generate an annual C loss and if WTDs are shallower than the threshold (wetter), the peatlands show annual C gains. Results show a net positive C storage balance that could be profitable on the open C market. Our Eddy-Covariance measurements of CO₂ fluxes under different seasons and water levels allowed us to develop a model that can be used to predict changing GHG losses in response to alterations of WTD and solar radiation across the SE USA. The restoration of 45,000 to 76,000 ha of similar drained peatlands along the Atlantic seaboard could prevent an additional 1– 1.6 Tg of CO₂ from entering the atmosphere each year. Thus, rewetting drained and fallow shrub peatlands along the southeastern coastal plain, which cover less than 0.01% of the US land area, would substantially reduce GHG emissions and could potentially contribute up to 2.4% of the annual reduction increment required to reduce the current 5 Pg of annual US CO₂ emissions to net- zero emissions by 2050. Thus, restoring (i.e., rewetting) not only rejuvenates pocosin peatlands as major C sinks on the coastal landscape, but also restores hydrologic conditions that prevent catastrophic ground- fire losses, excessive runoff of freshwater and nutrients into adjacent estuaries and restores degraded habitat for many endemic plant and animal species.