Seasonal drivers of geographically isolated wetland hydrology in a low-gradient, Coastal Plain landscape

Jan 28, 2020

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Abstract

Geographically isolated wetlands (GIWs) provide a portfolio of ecosystem services in low-gradient, Coastal Plain landscapes. Understanding how GIWs influence downstream waters is becoming increasingly important for conservation and management of these unique and important wetland ecosystems. Climatic conditions are known to be key drivers of water budgets at both individual GIW and landscape scales; however differences in hydrologic response across these scales may provide insights into how GIWs influence downstream waters. In this study, we use a combination of GIW water level, gaged streamflow, and climatic data to explore linkages between seasonal climatic drivers, GIW hydrology, and downstream discharges within the Coastal Plain of the Chesapeake Bay watershed. We first examine water balance components at the larger watershed scale, where climatic drivers result in an energy-limited wet season from December to May and a water-limited dry season from June to November. We compare long-term water levels of three GIWs with downstream discharges. GIW water level and downstream discharges are correlated at seasonal (R²: 0.52-0.60) and daily (R²: 0.52-0.76) time steps. However, during dry seasons, GIW water level receded at a faster rate than downstream discharges, highlighting the influence of evapotranspiration on surface and shallow subsurface water storage. Conversely during wet seasons, GIW water level receded slower than downstream discharges, highlighting a potential period for surface water connectivity between GIWs and downstream discharges. Cumulatively, these findings quantify the impact of seasonal climatic drivers on GIW hydrology and connectivity to downstream waters.

Article published in Journal of Hydrology [1].

DOI for citing: https://doi.org/10.1016/j.jhydrol.2020.124608

Source URL: https://www.sesync.org/seasonal-drivers-of-geographically-isolated-wetland-hydrology-in-a-low-gradient-coastal-plain
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