et al 1997), but lacked direct sampling of the swamp itself. Others, like Kitchens & Rasmussen (1995), proposed swamp-to-aquifer flow based on lagged water levels. We confirm both claims with a new, integrated dataset that includes isotopes, water levels, and response modeling. At the same time, our results contradict recent regulatory assertions that “the Okefenokee Swamp is not hydraulically connected to the Floridan aquifer” (Georgia EPD, 2024). This discrepancy highlights how hydrogeologic paradigms—such as “thick clay equals isolation”—can persist in the absence of site-specific testing. Our findings call for an update to regional groundwater models to explicitly include swamp-sourced recharge and leaky confinement.

4.3 A coastal signature of swamp recharge

Figure 2E shows that $\delta^{18}O$ values in UFA groundwater increase systematically with distance from the coast. This inland enrichment gradient is roughly double the magnitude originally reported by Clark et al. (1997), suggesting that swamp recharge plays a more dominant role than previously recognized. Since the swamp occupies the headwaters of the Suwannee and St. Marys basins, its influence on aquifer composition may extend tens to hundreds of kilometers downgradient. The heavy isotope signal propagated downstream is unlikely to result from paleoclimate inputs (cf. L. Niel Plummer 1993), given the modern and evaporative nature of the swamp water. This coastal enrichment trend provides independent, spatial evidence of sustained vertical and lateral aquifer transport of swamp-derived recharge.

4.4 Water budget and ecological implications

Our findings imply that a meaningful portion of the swamp’s water exits not through rivers or evapotranspiration, but through vertical leakage into the Floridan Aquifer—behavior that is consistent with long-standing syntheses showing that wetlands can recharge groundwater where hydraulic gradients allow (Winter *et al* 1998). This flux could account for 5–15% of annual rainfall when scaled across the swamp area, i.e., comparable to surface runoff, and is consistent with field studies documenting focused downward exchange beneath wetlands in permeable or fractured settings (Oxtobee and Novakowski 2002). During drought, persistent head gradients and aeration may shift peatlands toward recharge behavior and trigger biogeochemical changes—notably enhanced DOC release and carbon losses—via the well-documented ‘enzymic-latch’ mechanism and post-rewetting pulses (Fenner and Freeman 2011, Freeman *et al* 2001). As a result, the swamp acts as a recharge wetland, not just a surface reservoir. During drought, persistent head gradients could pull water downward and further draw down swamp levels, potentially aerating underlying peat and driving chemical shifts. Indeed, declining water tables and observed increases in acidity, mercury, and lead in swamp biota (Kitchens and Rasmussen 1995) are consistent with such a mechanism. This hydraulic pathway provides a plausible causal link: aquifer drawdown or drought