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PONDS IN THE URBAN LANDSCAPE

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Artificial surface impoundments, especially small ponds, are ubiquitous in the landscape. In South Carolina, there are over 2500 small impoundments, many of which are now in urban landscapes. Ponds have a significant impact on stream flow and biodiversity, but little research has been done on the impact of small ponds on the biogeochemistry of the fluvial watershed. Our previous work suggested that urban ponds acted as sinks for nitrogen and silicon. Our current research confirms this assertion, but also suggests complex nitrogen cycling occurs within ponds, driven by redox gradients.

We have analyzed nitrogen speciation (dissolved organic nitrogen, nitrate, nitrite, ammonium), carbon speciation, and major ion chemistry for five ponds in the Saluda and Enoree River basins of South Carolina. Additionally, we compare our results to that of a wetland in the Saluda River basin. Our results indicate that ponds function as a sink for nitrogen as shown by decreases in total dissolved nitrogen. Nitrogen is also transformed within the ponds, with nitrate concentrations decreasing and concentrations of dissolved organic nitrogen and ammonium increasing. Ammonium concentrations are typically highest at the downstream end of ponds and in seeps at the base of earthen dams. Additionally, our observations suggest that solutes considered "conservative," such as chloride, may not be acting in a conservative manner in some ponds as concentrations often decrease. Unlike wetlands, sulfate concentrations in ponds do not typically decrease significantly. Initial data suggest that some ponds act as a sink for carbon as well, depending on the nutrient flux. Dissolved organic carbon concentrations, however, typically increase in the ponds.

Our results indicate that ponds function as biogeochemical reactors in the urban landscape, primarily because they are fed by nutrients, especially nitrogen. The increased residence time of the water combined with higher temperatures and accumulation of organic-rich sediments changes the redox potential of the system. For nitrogen, mineralization of organic matter, dissimilatory nitrate reduction to ammonium, denitrification, and assimilation are all likely important processes in the ponds. For carbon, assimilation and mineralization of organic matter are important processes.

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