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Role of wetlands and developed land use on dissolved organic nitrogen concentrations and DON/TDN in northeastern U.S. rivers and streams

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ABSTRACT: Previous studies have shown that watersheds with significant human development (i.e., urban and agricultural land use) generally have higher concentrations and fluxes of dissolved inorganic nitrogen (DIN) in comparison to less-developed or forested watersheds. However, the impact of watershed development on dissolved organic nitrogen (DON) concentrations in drainage waters has received little attention. We present data from 39 watersheds in Massachusetts (Ipswich River watershed) encompassing a gradient of developed land use (0%-92% urban plus agriculture) and wetland abundance (0%-32%) to assess controls on mean annual DON concentrations and DON/total dissolved nitrogen (TDN) in drainage waters. In addition, we compiled published data from 119 northeastern U.S. watersheds to evaluate broader-scale relationships between DON, developed land use, and wetlands. The percentage of developed land is a poor predictor of DON concentrations in the Ipswich watersheds (r^2 = 0.09) and the compiled dataset (r^2 = 0.27). In contrast, wetland percentage explains 56% of the variability in DON concentrations in the Ipswich watersheds, and 60% when all literature data are included. Excluding watersheds with direct wastewater inputs to surface waters improves the regional relationship significantly (r^2 = 0.79). The DON:TDN ratio is best explained by a multiple regression of wetland percentage and developed land use percentage for both the Ipswich watersheds (r^2 = 0.73) and the compiled dataset (r^2 = 0.50). Watersheds with abundant wetlands may therefore have high DON concentrations and DON:TDN ratios despite elevated anthropogenic nitrogen inputs associated with human development.

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