

GROUNDWATER DENITRIFICATION CAPACITY OF RIPARIAN ZONES IN SUBURBAN AND AGRICULTURAL WATERSHEDS

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ABSTRACT:

We evaluated the relationship of dominant watershed land use to the structure and nitrogen (N) sink function of riparian zones. We focused on groundwater denitrification capacity, water table dynamics, and the presence and pattern of organically enriched deposits. We used the push-pull method (measurement of ¹⁵N-enriched denitrification gases derived from an introduced groundwater plume of ¹⁵N-enriched nitrate) to evaluate groundwater denitrification capacity on nine forested wetland riparian sites developed in alluvial or outwash parent materials in southern New England. Three replicate sites were located in each of the three watershed types, those with substantial (1) irrigated agriculture, (2) suburban development, and (3) forest. Soil morphology and water table dynamics were assessed at each site. We found significantly lower mean annual water tables at sites within watersheds with substantial irrigated agriculture or suburban development than forested watersheds. Water table dynamics were more variable at sites within suburban watersheds, especially during the summer. Groundwater denitrification capacity was significantly greater at sites within forested watersheds than in watersheds with substantial irrigated agriculture. Because of the high degree of variability observed in riparian sites within suburban watersheds, groundwater denitrification capacity was not significantly different from either forested or agricultural watersheds. The highly variable patterns of organically enriched deposits and water tables at sites within suburban watersheds suggests that depositional events are irregular, limiting the predictability of groundwater N dynamics in these riparian zones. The variability of riparian N removal in watersheds with extensive suburbia or irrigated agriculture argues for N management strategies emphasizing effective N source controls in these settings.

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