

Riparian sinks for mitigating septic system contamination in Urbanizing Coastal Watersheds

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Objectives:

- Examine the relationship of watershed development to the nitrate sink function of streamside and estuarine riparian zones in unsewered coastal developments of Rhode Island. This is the main thrust of our work.
- Develop an approach to map the nitrate removal capacity of riparian zones in unsewered coastal developments of Rhode Island.
- Coordinate with extension/outreach specialists to initiate the incorporation of our results in community decision making through an adaptive implementation approach.

Methodology: Our experimental plan includes three components: 1) reconnaissance *hydrologic and soil investigations* at numerous streamside and estuarine riparian locations to establish the range and distribution of riparian attributes associated with human disturbance in Rhode Island. We will examine the interaction of groundwater with labile carbon pools and microbial processes that control denitrification and renovation of nitrate-laden groundwater. 2) *intensive studies of in situ groundwater denitrification capacity* and hydrology at a subset of these streamside and estuarine riparian locations. We will use our “push-pull” technique (Addy et al., 2002) to estimate *in situ* rates of groundwater denitrification at discrete locations. We will introduce groundwater amended with ¹⁵N labeled nitrate and conservative tracers into the subsurface and analyze the tracers and ¹⁵N labeled denitrification gases (N₂, N₂O) following incubation and recovery. 3) Development of maps that depict the groundwater denitrification capacity of shoreline locations based on landscape features and the extent and nature of human alteration.

Rationale: We hypothesize that the current level of nitrogen loading to coastal waters is the net result of increased terrestrial N inputs and alteration of the shoreline sink. Where riparian zones have limited capacity to remove nitrate, communities need to focus on controlling the source (i.e., the septic system) through innovative upgrades and more stringent design standards for new systems. Where riparian zones serve to mitigate nitrate contamination, communities and state decision makers need to understand how to sustain the unique features of the land/water margin.