

Bounding salt marsh nitrogen fluxes: development of an ecohydrological salt marsh model

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A mass-balance approach to characterize nitrogen flux in a 2-hectare, meso-haline saltmarsh yielded extensive flow and water chemistry data. However, a significant, unevenly distributed population of the nitrogen fixer *Alnus rubra* (red alder) in the 20-hectare upland catchment led to large, variable nitrate inputs. This led to large uncertainties in the marsh nitrogen budget, underscoring the complexity of the upland-marsh ecosystem and the difficulty of identifying nitrogen sources and sinks empirically.

We used these data in a more detailed analysis using a well-validated, spatially-distributed ecohydrological model, VELMA (Visualizing Ecosystems for Land Management Assessments). To begin, we used VELMA to extend analysis of existing data, estimating unmeasured hydrological and biogeochemical processes controlling nitrogen sources and fate within the upland. We discuss how model results are identifying sources and flow pathways of dissolved nitrogen to the marsh and how they inform experiments to identify biogeochemical hotspots for reducing nitrogen losses to the estuary. New studies will be used to define variables and scales for a spatially-explicit (3D) marsh submodel for VELMA under development to provide better process-level understanding of upland-marsh-estuarine nutrient fluxes.