

URBAN EFFECTS ON MICROBIAL PROCESSES AND FOOD WEBS IN COASTAL WATERSHED STREAMS

Nathan J. Smucker¹, Anne Kuhn¹, Mike A. Charpentier², Carlos J. Cruz-Quinones³, Colleen M. Elonen⁴, Brian H. Hill⁴, James Lake¹, Jonathan Serbst¹, Sarah B. Whorley⁵, and John D. Wehr⁵

¹Environmental Protection Agency, Atlantic Ecology Division, Narragansett, Rhode Island, USA

²Raytheon Company, Narragansett, Rhode Island, USA

³University of Puerto Rico c/o Environmental Protection Agency, Greater Research Opportunities for Undergraduates Program

⁴Environmental Protection Agency, Mid-Continent Ecology Division, Duluth, Minnesota, USA

⁵Louis Calder Center—Biological Field Station and Department of Biological Sciences, Fordham University, Armonk, NY, USA

We conducted a stream survey in the Narragansett Bay Watershed that targeted a gradient of development intensity and examined how associated changes in nutrients, carbon, and stressors affected periphyton and macroinvertebrates. Concentrations of nutrients, cations, and anions were positively correlated with greater watershed development. National Land Cover Data (30 m²) underestimated and overestimated impervious cover at low and high intensities, respectively, when compared to higher resolution land cover data (<5 m²). These differences affected model predictions of nutrient concentrations and could affect where ecological responses are predicted to occur along development gradients. Microbial enzyme activities indicated changes in nutrient availability, and respiration decreased as the ratio of glycosidases to oxidases decreased, potentially indicating lower quality of DOC in urban streams. We are also quantifying $\delta^{15}\text{N}$, $\delta^{13}\text{C}$, and fatty acids in periphyton and macroinvertebrates to further examine how watershed development affects ecological communities and food webs by altering sources and availability of nutrients and carbon. Lastly, landscape indicators are being developed using GIS to characterize how spatial patterns of land cover are linked to stream conditions.

Impact statement:

Watershed development is a leading cause of stream impairment. This research examines how watershed development affects periphyton and macroinvertebrates by altering the sources and concentrations of nutrients, carbon, and stressors. Results can be used to develop indicators and inform monitoring and management decisions.