

## TARGETING URBAN WATERSHED STRESSOR GRADIENTS: STREAM SURVEY DESIGN, ECOLOGICAL RESPONSES, AND IMPLICATIONS OF LAND COVER RESOLUTION

Anne Kuhn<sup>1</sup>, Nathan J. Smucker<sup>1</sup>, Mike A. Charpentier<sup>2</sup>, Carlos J. Cruz-Quinones<sup>3</sup>, Colleen M. Elonen<sup>4</sup>, Brian H. Hill<sup>4</sup>, James Lake<sup>1</sup>, Jonathan Serbst<sup>1</sup>, Sarah B. Whorley<sup>5</sup>, and John D. Wehr<sup>5</sup>

<sup>1</sup>Environmental Protection Agency, Atlantic Ecology Division, Narragansett, Rhode Island, USA

<sup>2</sup>Raytheon Company, Narragansett, Rhode Island, USA

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

<sup>4</sup>Environmental Protection Agency, Mid-Continent Ecology Division, Duluth, Minnesota, USA

<sup>5</sup>Louis 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 designed to target a gradient of development intensity, and to examine how associated changes in nutrients, carbon, and stressors affect periphyton and macroinvertebrates. Concentrations of nutrients, cations, and anions were positively correlated with increasing watershed impervious cover. The 2006 National Land Cover Data (NLCD; 30 m<sup>2</sup>) underestimated and overestimated impervious cover at low and high intensities, respectively, when compared to higher resolution state land cover data (<5 m<sup>2</sup>). These differences could affect where ecological responses are predicted to occur along development gradients, and subsequently affect management targets and strategies. Land cover regression models predicted lower background concentrations of nutrients when using NLCD 2006 versus finer resolution state GIS data. As TP increased, microbial phosphatase activity decreased, indicating a shift away from phosphorus limitation. Microbial respiration increased as the ratio of glycosidases to oxidases increased, potentially indicating increased quality of DOC. We are also examining the responses of  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$  in periphyton and macroinvertebrates to further examine how watershed development affects sources and availability of nutrients and carbon.

### 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.