

Developing Watershed Level Indicators for Predicting Aquatic Condition in Stream Networks

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Landscape level information is critical for resource managers to monitor, assess and prioritize protection and restoration efforts within individual watersheds. Spatial landscape indicators incorporate information on natural infrastructure (undeveloped and vegetated riparian areas necessary to maintain and support aquatic ecosystems) and stressors (impervious cover, land use alterations, excessive nutrient loads, altered flow regimes, etc.) and relate these to aquatic condition in stream networks. Using the Narragansett Bay watershed in northeastern US, we developed spatial indicators that reflect and predict the aquatic condition of streams within the NBW. Water quality and a number of biotic responses were quantified for more than 100 stream sites across an environmental gradient of impervious cover. We included spatial measures of physical processes such as in-stream flow, hydrologic connectivity, index of alteration for the 'Active River Area' (floodplains, streamside wetlands, material contribution zones), and stream site physical habitat. Additional landscape indicators related stream riparian buffers and upstream watershed condition to shifts in measured nutrient concentrations and trophic structure of food webs, as evidenced by $\delta^{15}\text{N}$ and $\delta^{13}\text{C}$ in periphyton and macroinvertebrates. The landscape indicators are being developed using a number of GIS methods to evaluate appropriate scale (e.g. stream reach, buffer widths and distances, upstream watershed-catchment characterization) and to accommodate spatial considerations (e.g., spatial autocorrelation and spatial arrangement of land use/land cover) when linking land use/land cover to stream response indicators.