

An integrated set of observations to link conditions of Great Lakes nearshore waters to their coastal watersheds

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We combine three elements for a comprehensive characterization that links nearshore conditions with coastal watershed disturbance metrics. The three elements are: 1) a shore-parallel, high-resolution nearshore survey using continuous in situ towed sensors; 2) a spatially-balanced, random probability survey of nearshore stations; and 3) characterization of contributing watersheds using metrics developed in the Great Lakes Environmental Indicators (GLEI) project. We completed 6000 km of high-resolution nearshore tows (virtually all the US coastline) in surveys from 2004 to 2010. We use a random probability survey piloted in Lake Erie to develop the example of how the three elements work in concert as an observing system. Nearshore station-based TP concentrations were modeled [$N = 45$, $R^2 = 0.74$] as a function of three independent variables: (a) water column depth, (b) an agricultural landscape metric (non-point source), and (c) a point source landscape metric. Predictions from models such as this compare favorably with the observations from the continuous sampling, in which alongshore patchiness and “banding” of conditions appears coincident with patterns of alongshore landscape variability. The overall approach provides strong insights about nearshore condition and response to landscape stressors across scales that range from localized to lake-wide, to region-wide.