

Approaches to integrated assessment of large lakes involving new survey designs and synoptic, *in situ* technologies

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The Laurentian Great Lakes have had, for decades, regular water quality monitoring programs to track conditions in their offshore waters, as dictated by a binational Great Lakes Water Quality Agreement between the US and Canada. Unfortunately, resources have limited monitoring to offshore waters, with coastal conditions largely ignored, and certainly not included in any regular, comprehensive monitoring program. Within the past decade we have been conducting an extensive set of studies as a foundation to incorporate nearshore and coastal ecosystems into potential lakewide survey designs. Coastal systems are dynamic and there is great spatial variability along the vast Great Lakes shoreline (~17,000 km, spread across the five main lakes); consequently, comprehensive programs to assess coastal conditions have been seen as costly and/or perhaps lacking in statistical power. Our coastal studies have emphasized an exploration of the influence of the character of coastal watersheds upon ecological conditions in adjacent coastal waters, and the linkages we have resolved help explain a great deal of the spatial variation in nearshore waters, from local to whole lake scales. This paper will summarize some insights and developments to date using powerful, coast-wide surveys with continuous *in situ* sensor sampling and a number of statistically-based study designs across the Great Lakes. We have made significant progress towards our goal of providing an approach to ecological assessment that integrates landscape, coastal and open lake processes in an efficient monitoring system for the basin.