

Title: Geospatial Tools for Evaluating Ecosystems Services in Lakes and Ponds of the Northeastern US

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Northeastern lakes benefit residents and visitors by providing valuable ecosystem services such as nutrient retention, recreational opportunities, and aesthetic value. Concurrently, however, complex changes such landscape change, population growth, and management decisions influence lake services both positively and negatively. To better understand and manage these systems, we are developing a database and geospatial tools to explore the association between lake condition and the provisioning of ecosystem services.

The database provides unique identification numbers for over 28,000 geographically referenced lakes which allows us to combine data from the National Lake Survey, the New England Lakes and Ponds Survey, the USGS SPARROW model, aircraft based hyperspectral data of select lakes as well as other datasets. These data include standard physical-chemical measures of water quality and subjective assessments (e.g., appeal, integrity) of lakes.

The geospatial tools are built with ArcGIS server, Oracle, SAS, R, and other applications and are served in an online application that enables mapping and analysis of lake ecosystem services that are sensitive to variations in predicted nitrogen and phosphorus loading. With this online application, we provide access to: 1) lakes monitoring database; 2) modeled nutrient fluxes; 3) state-specific data sets; 4) analytical tools and scripts for exploring associations between nutrients and lake ecosystem services, 5) tools for mapping lake ecosystem services, and 6) prototype ecosystem service production functions, sensitive to variations in predicted nitrogen and phosphorus loading.

These efforts will provide managers and researchers a better understanding of links between management decisions affecting nutrient fluxes and selected ecosystem services; support other novel research questions such as examining the link between ecological condition and human health; and provide our many partners with reproducible research that enhances understanding of our work, and encourages using similar approaches and analyses in novel ways.

Keywords: ArcGIS Server; R; Oracle; SAS; New England Lakes and Ponds Survey; National Lakes Assessment, Database Development; reproducible research

Purpose of research: This research is a proof of concept that focuses on integrating software to provide ecosystems services tools, data, and research results. This integration of software allows u to provide online access to data, GIS, and analysis. When completed the database and associated tools will allow our partners to include ecosystem services, supported by state of the art technologies and rich environmental data, in their management decisions.