

Title: Predicting ecosystem services in northeastern lakes from monitoring data and USGS SPARROW nutrient load estimates.

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Abstract: Reduction of nitrogen inputs to estuaries can be achieved by the control of agricultural, atmospheric, and urban sources. We use the USGS MRB1 SPARROW model to estimate reductions necessary to decrease nitrogen loads to estuaries by 10%. As a first approximation we looked at single source reductions. If only agricultural inputs are reduced, the required reductions for a 10% decrease in estuarine loads range from 82% in New England to 19% in the Chesapeake drainage. Alternatively, a 15% reduction of urban sources of nitrogen or a 47% reduction in atmospheric deposition is required for similar decreases in loads for New England estuaries; in the Chesapeake the required reductions are 31% (urban) and 64% (atmospheric). This reflects major differences in land use and deposition across the region. Reduction strategies for estuaries also benefit upstream ecosystems such as lakes. In the northeast, lakes provide important recreation and amenity values. The value of these cultural ecosystem services are strongly affected by both perceived and actual water quality. Using the 2007 National Lake Survey, the SPARROW model, and landscape metrics, we estimate the current aesthetic condition and expected changes for each estuarine reduction scenario for 18,000 northeastern US lakes. Agriculture, urban, and air reductions strategies result in improvements in aesthetic condition for 1170, 665, and 1230 lakes respectively. A complete ecosystem service analysis requires that we also estimate the number of people who will benefit from these changes. The number of beneficiaries was estimated at three scales: local residents (<1km), non-local frequent users (between 1-10km), and infrequent users who may still benefit from the improved availability of ecosystem services (between 10-100 km). Preliminary analyses suggest that although reductions in atmospheric deposition of nitrogen impact the greatest number of lakes, urban reductions benefit a greater numbers of people.