

Estimating historical nitrogen loading rates to Great Bay Estuary, NH/ME USA

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The state of New Hampshire is developing nutrient criteria for the Great Bay Estuary (GBE). Threshold values were proposed for total nitrogen concentration, chlorophyll-a, and light attenuation to be protective of aquatic life uses related to hypoxia and seagrass habitat. A previously published and validated watershed nitrogen loading model was applied to the GBE in order to put the nitrogen thresholds into an historical context and to guide management decisions about nitrogen source reductions. Watershed delineation, land use, atmospheric deposition, human wastewater and fertilizer application rates were estimated for 1962, 1974, 1998 and 2001. Preliminary results suggest that total nitrogen load increased by as much as 23% through the 1990s. This increase was due to increases in human wastewater inputs while nitrogen from fertilizer and atmospheric deposition decreased over the period. For assessment purposes, the watershed of the GBE was divided into four subwatersheds. The rates of increasing nitrogen loads were similar for the individual subwatersheds, and averaged approximately 0.5-0.6% per year. Sources were dominated by human waste, indirect atmospheric deposition (onto watershed surfaces) and fertilizer nitrogen. Direct atmospheric deposition onto the surface of the estuary was less than 10% of the total of all the sources. In the early 1960s the dominant source was fertilizer nitrogen, but by the late 1990s, the load from human wastewater had increased markedly, reaching nearly 48% of the total for one of the subwatersheds. Indirect atmospheric deposition comprised from 24 to 32 % of the load to the GBE. Thus, using data from the most current period, atmospheric source controls at the regional or national levels could affect 25-33% of the total nitrogen load; whereas, the remaining 67-75% of the load from fertilizer (27-36%) and wastewater (31-48%) would be need to be controlled by local to regional scale reductions.