

APPLIED COASTAL

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Project: Estuaries Project
Southeastern Massachusetts, USA

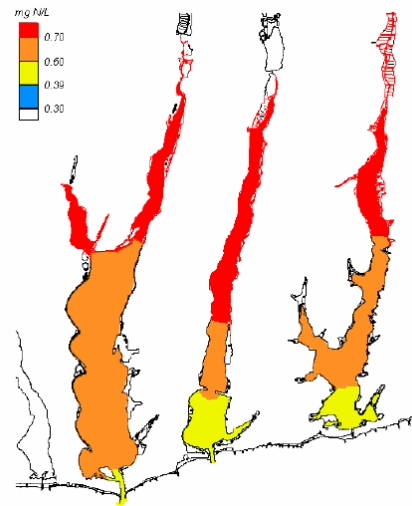
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Coastal embayments throughout the State of Massachusetts are becoming nutrient enriched. The nutrients are primarily related to changes in watershed land-use associated with increasing population within the coastal zone over the past half century. Many embayments have nutrient levels that are approaching or are currently over their assimilative capacity, which begins to cause declines in their ecological health. The result is the loss of fisheries habitat, eelgrass beds, and a general disruption of benthic communities. The regional effects of both nutrient loading and bacterial contamination span the spectrum from environmental to socio-economic impacts and have direct consequences to the culture, economy, and tax base of Massachusetts's coastal communities. DEP, Applied Coastal, and SMAST, have partnered under the Estuaries Project to address these embayment management and planning issues.

For Applied Coastal and SMAST the central component of the Estuaries Project is providing a quantitative tool for watershed-embayment management throughout Massachusetts. This will accomplish the goal of providing technical guidance to DEP in support of policies regarding nitrogen loading to embayments and establishing nitrogen TMDL's. Along with meeting the project goals to: develop a coastal TMDL working group for coordination and rapid transfer of results, determining the nutrient sensitivity of each of the 89 embayments in southeastern Massachusetts, providing necessary data collection and analysis required for quantitative modeling, conducting quantitative TMDL analysis, outreach, and planning, and keeping each embayment's model "alive" to address future regulatory needs.

Applied Coastal and SMAST are responsible for the project aspects:

- Watershed-embayment nitrogen management modeling to determine the spatial watershed load in to the marsh or embayment.
- Groundwater modeling and loading within the watershed.
- Conduct quantitative TMDL analysis for all 89 embayments.
- Data collection including nutrient loading, bathymetry, tidal elevations, current measurements using Acoustic Doppler Current Profilers (ADCPs), salinity measurement, dissolved oxygen measurements, nitrogen, macrophyte surveys, benthic surveys and infaunal surveys.
- Two- and three-dimensional hydrodynamic modeling for detailed multi-dimensional representation of time-varying estuarine currents and tides.
- Flushing / residence times for the embayments.
- Water quality modeling for assessing the existing ecological health of estuaries and evaluating potential methodologies for improving estuarine water quality.
- Watershed plan management and development in conjunction with local and state government and community organizations.
- Community outreach and planning.



Modeled long-term nitrogen concentrations (mg N/L) for existing marsh conditions.