Session I7: National Monitoring Network of Coastal Waters and Their Tributaries

Room C124
10:00 – 11:30 am

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Nutrient and Dissolved Oxygen Monitoring for the Delaware Basin Demonstration Project of the National Monitoring Network for Coastal Waters

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The Delaware Estuary was selected in 2008 as a Demonstration Project Area for the National Monitoring Network (NMN) for Coastal Waters and their Tributaries (http://acwi.gov/monitoring/network/index.html). A major water- quality concern in the Delaware Estuary is low dissolved oxygen (DO) levels in the summer months that violate established criteria and may be harmful to certain species of fish. Ammonia is also a concern because it contributes to oxygen depletion, and may itself be harmful to some species of fish.

In consultation with Federal, State, Interstate, and University partners a plan was developed to more rigorously monitor nutrient species and dissolved oxygen at tributary sites and in the estuary. To more fully characterize nutrient loadings to the estuary the NMN has funded more frequent sampling for a wider range of nutrient species at four tributary locations that account for over 90 percent of the flow to the estuary. Ammonia and other nutrient species analyses were added at 22 existing estuary locations that are sampled eight times a year that were previously only being sampled for total nitrogen. A real-time DO, pH, temperature, and specific conductance monitor was added in the upper estuary - filling a critical gap between the head -of- tide site at Trenton and two saline locations further down the estuary. The goal of this increased monitoring was to provide greater understanding of interactions between DO, ammonia, other nutrients, algal growth, bay hydrodynamics, and sediment dynamics.

Results of the monitoring indicate that ammonia concentrations in the estuary are highest in the spring, and that low DO in the upper estuary can violate established criteria in the summer. Based on this and other existing information the Delaware River Basin Commission recently passed regulations requiring point-source dischargers to monitor for nutrient species. Eventually the Commission plans to use collected nutrient and other data to develop an estuary nutrient and DO model. Ultimately, nutrient loads to the estuary will be regulated to maintain DO levels above established criteria and to control algal growth. As the Delaware Demonstration Project winds down partners are being sought to maintain the upgraded monitoring network.

0455
I7-2

NOAA's National Estuarine Eutrophication Assessment

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Since the inception of the National Estuarine Eutrophication Assessment (NEEA), two assessments were completed representing conditions related to eutrophication in the early 1990s and the early 2000s, and respective changes in the ensuing decade. The Assessment of Estuarine Trophic Status (ASSETS) assessment method is used, a Pressure- State-Response approach that evaluates three components; influencing factors (nutrient loads and processing), eutrophic condition (indicators: chlorophyll, macroalgae, dissolved oxygen, Harmful Algal Blooms, seagrass loss), and future outlook (expected conditions) that can be combined into a single ASSETS rating for a system. The assessments were intended to provide individual system and comparative regional and US national results, and include comparative national and international case studies to examine and share management successes.

Results for the early 2000s show the majority of estuaries assessed, with the exception of North Atlantic systems, are highly influenced by anthropogenic factors, similar to results from the early 1990s. Eutrophication is a widespread problem with > 65% of assessed systems showing moderate to high level eutrophic conditions in both time frames; the most impacted region was the mid-Atlantic. Conditions were predicted to worsen in > 65% of systems in both time frames. In the early 1990s, only 7% of systems were expected to improve, while 19% were expected to improve in the early 2000s. About half of the assessed systems in both the early 1990s and 2000s had a poor or bad ASSETS rating. Change analysis (early 1990s to early 2000s) showed that conditions mostly remained the same (34 systems, 77% assessed area) while changes were observed in smaller systems; 13 systems (9% assessed area) improved and 13 systems (14% assessed area) worsened.

This national assessment highlights the need for coordinated and integrated action that balances management action, monitoring to assess management effectiveness, focused research, and a communication campaign aimed at engaging a broad community. Future updates will again include comparison of national and international case studies to highlight successful management measures including innovative ‘in-the-water’ measures, such as aquaculture, that are complementary to land-based nutrient removal methods.

0459
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Adapting Continuous Suspended Sediment and Water Quality Monitoring for New Findings in San Francisco Bay

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For monitoring programs to remain relevant they must adapt to new findings and avoid the pitfall of ‘mindless monitoring.’ Our program of continuous suspended-sediment concentration monitoring in San Francisco Bay, which began in 1991, has produced new findings that resulted in changes in the monitoring program to better satisfy the needs of resource managers. Beginning in water year 1999 there was a 36% step decrease in suspended-sediment concentration in San Francisco Bay probably because the threshold from transport to supply regulation was crossed as an anthropogenic erodible sediment pool was depleted. In the mid-late 2000s, data were conclusive that the observed sudden clearing was not merely due to drought conditions and that the estuary had crossed a threshold. This decrease has negative ramifications for wetland restoration, endangered fish that prefer turbid water, and eutrophication. In response to sudden clearing, Bay managers now think of sediment as a resource as opposed to a nuisance and are re-evaluating the dredged material management strategy for the Bay. To adapt to a clearer Bay, the continuous monitoring program added four elements:

1) Continuously monitor suspended-sediment flux at the Dumbarton Bridge to help develop a sediment budget for the South Bay Salt Pond Restoration Project, the largest tidal wetland restoration project on the west coast.

2) Continuously monitor suspended-sediment flux in the habitat of endangered fish (delta smelt) to understand turbidity distribution and to enable development of accurate numerical models of sediment transport.

3) Continuously monitor suspended-sediment flux at the mouths of some tidal tributaries to better evaluate sediment supply from the watershed for a new regional sediment management program.

4) Continuously monitor dissolved oxygen as a primary indicator of eutrophication. Productivity in San Francisco Bay is light-limited and phytoplankton populations began increasing after suspended-sediment concentration decreased. Resource managers are concerned that increased water clarity could lead to nutrient-limited conditions and possibly eutrophication.

The key steps in this adaptation cycle were collection and analysis of high quality data, knowledge transfer through presentations and peer-reviewed publication, acceptance by resource managers, identification of ramifications and new information gaps, and development and implementation of new monitoring activities.

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I7-4

Sources and Transport of Nitrogen to Estuaries Along the US Atlantic Coast

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The National Water-Quality Assessment Program of the US Geological Survey has developed a water-quality model for streams throughout the eastern US to investigate the transport and fate of nitrogen from watersheds to streams, reservoirs and estuaries. The model integrates water-quality monitoring data with geospatial information describing nitrogen sources, including point-source wastewater discharges, farm fertilizers, and background sources, to estimate mean annual rates of nutrient transport to receiving stream channels and delivery to estuaries. Results are presented for broad regions of the Atlantic coast and for selected estuaries to illustrate application of the model; for example, the long-term average annual mass of nitrogen delivered to the Albemarle Sound is estimated to be 12 million kilograms or 2.6 kilograms per hectare (kg/ha) with a standard error of about 30 percent. The predominant source (estimated to account for 47 percent) of nitrogen delivered to the Sound is farm fertilizers, followed by industrial emissions to the atmosphere (13 percent). Other sources - livestock manure, vehicle emissions, point- source wastewater discharges, background atmospheric sources, and urban land - account for 12, 10, 7, 6, and 5 percent, respectively, of nitrogen delivered to the Sound. These results can be used to estimate how changes in any of these sources could affect nitrogen load delivered to the Sound and to prioritize reductions among sources. A new online decision support system provides access to the model results and allows users to map predictions of nitrogen yields and sources by stream reach or catchment, track nutrient delivery to estuaries along the Atlantic coast, and evaluate alternative nitrogen source-reduction strategies.