Abstracts

Thursday, May 1

Session K1: Monitoring and Modeling to Restore and Protect Coastal Water Quality

10:00 – 11:30 am | Room 263

Adaptation of a Weighted Regression Approach to Evaluate Water Quality Trends in Tampa Bay, Florida

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Abstract
The increasing availability of long-term monitoring data can improve resolution of temporal and spatial changes in water quality. In many cases, the fact that changes have occurred is no longer a matter of debate. However, the relatively simple methods that have been used to evaluate trends in environmental monitoring data in estuaries are often not sufficient to disaggregate the complex effects of multiple environmental drivers, limiting the potential to relate changes to possible causes. To improve the description of long-term changes in water quality, we adapted a weighted regression approach developed to describe trends in pollutant transport in streams and rivers to analyze a long-term water quality dataset from Tampa Bay, Florida. The weighted regression approach allows for changes in the relationships between water quality and explanatory variables by using dynamic model parameters and can more clearly resolve the effects of both natural and anthropogenic drivers of ecosystem response. The model resolved changes in chlorophyll *a* from 1974 to 2012 at seasonal and multi-annual time scales while considering variation associated with changes in freshwater influence. Separate models were developed for each of 4 Bay segments to evaluate spatial differences in patterns of long-term change. Observed trends reflected the known long term decrease in nitrogen loading to Tampa Bay since the 1970s, however, more subtle changes in seasonal variability and unexplained variance were resolved in ways that have not been described previously. Significant variation in the model residuals was explained by considering additional covariates such as the El Niño-Southern Oscillation patterns and estimated nutrient loading. Results from our analyses have allowed additional insight into drivers of water quality change in Tampa Bay that has not been possible with traditional modeling approaches and could help monitor and sustain the progress of the successful nitrogen management program. The method could also be applied to water quality management in other estuarine systems where long-term monitoring data are available.

Albemarle Sound Demonstration Study of the National Monitoring Network for U.S. Coastal Waters and Their Tributaries

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Abstract
The U.S. Geological Survey's (USGS) North Carolina Water Science Center is implementing a demonstration project in the Albemarle Sound for the National Monitoring Network for U.S. coastal waters and their tributaries. The goal of the National Monitoring Network is to provide information about the health of our oceans and coastal ecosystems and inland influences on coastal waters for improved resource management. The network integrates biological, chemical, and physical features and links uplands to the coastal ocean. The purpose of the Albemarle Sound pilot study is to:

1) Inventory current monitoring programs in the Albemarle Sound,

2) Conduct a gap analysis to determine current monitoring needs,

3) Implement a monitoring program to address data gaps, and

4) Create a web-based map portal of monitoring activities.

As part of the project, the USGS worked with stakeholders to inventory current programs and design a monitoring program. This presentation will provide more information about the project including a demonstration of the shapefile and database compiled as part of the monitoring inventory, and results from the first year of data collection.

Suspended Sediment-Bound Toxic Chemical Loads from Large Rivers to Puget Sound, Washington

Kathy Conn, Rick Dinicola, Bob Black, Rich Sheibley and James Foreman
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Abstract
In 2012, Puget Sound was selected as a demonstration area for the National Water Quality Monitoring Network for U.S. Coastal Waters and their Tributaries (National Network). The primary objective of this project is to summarize monitoring efforts in the context of the National Network design. The Puget Sound Partnership initiated an assessment of current monitoring activities and data gaps in the region through numerous interagency workgroups of the Puget Sound Ecosystem Monitoring Program. One major data gap that was identified included developing an improved understanding of sediment and toxic chemical loads to Puget Sound from large rivers.

As part of the Puget Sound demonstration project, we are sampling large rivers during a range of flow and turbidity conditions to assess variability in sediment loads and associated toxic chemical loads. The sampling effort is utilizing innovative technologies including 1) continuous, real-time turbidity monitoring, 2) discharge-weighted, depth-integrated sampling for water and suspended sediment, and 3) a field-portable flow-through centrifugation technique for suspended sediment chemical analysis that is being refined and documented. The resulting data is being used to develop regression relationships between discrete samples and continuous turbidity, stage, and discharge to improve estimates of event, seasonal, and annual chemical loadings from large rivers to Puget Sound.

Preliminary results suggest that sediment loads and associated chemical loads vary spatially and temporally within Puget Sound. For example, in the Green River near Seattle, WA, which receives commercial, industrial, and residential runoff through an extensive storm drain network, a suspended sediment-associated loading of approximately 200 mg/hr of polychlorinated biphenyls (PCBs) was estimated during a storm event, which was more than 50 times higher than low-flow loading estimates. In contrast, in the Puyallup River near Tacoma, WA, which receives berry farming agricultural runoff, a suspended sediment-associated loading of approximately 50 mg/hr of the fungicide pentachloronitrobenzene was estimated during a storm event, while PCB levels were low. This presentation will provide additional results from the first year of data collection and describe the current monitoring activities in the context of the National Network design.

Evaluating Water and Sediment Quality in the Gulf of Mexico Coastal National Parks

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Abstract
National Parks play a vital role in protecting natural and cultural resources for current and future generations. A critical goal of the Ocean and Coastal Resources program in the Natural Resources Stewardship and Science directorate is to integrate local and regional water quality data collected beyond park boundaries into useful information for informing decision-making by park management. Poor water quality in coastal areas often results from regional population growth and local development. Water quality monitoring data collected by I&M networks and coastal parks allow the NPS to evaluate conditions and track trends within park boundaries. However, effective management of estuarine and marine resources requires understanding water quality issues beyond park boundaries. Coastal parks are located at the downstream boundaries of watersheds; most of their water quality problems originate upstream. Understanding local and regional water quality issues is a critical step in the successful management of NPS coastal waters.

Water and sediment quality data were assembled from a variety of local, state and federal agencies. Water quality parameters used in the analysis include temperature, salinity, dissolved oxygen, chlorophyll *a*, nutrients, pH and turbidity. Trace metal and organic contaminants are also included in this analysis. We compare conditions inside and nearby eight national parks in the Gulf of Mexico region: Padre Island, Big Thicket, Jean Lafitte, Gulf Islands, De Soto, Big Cypress, Everglades and Dry Tortugas. The parks range in character from coastal and estuarine environments such as Padre Island, Gulf Islands, De Soto and Dry Tortugas to more brackish systems such as Big Thicket, Jean Lafitte, Big Cypress and the Everglades. Water quality and sediment conditions within the coastal parks are influenced by both local and regional anthropogenic stressors, as well as climatology, particularly freshwater input.