Abstracts

Tuesday, April 29

Session C5: Nutrient Monitoring and Modeling to Restore and Protect Coastal Water Quality

8:00 – 9:30 am | Room 233

Hypoxia Forecast Models in Coastal Waters Used to Inform Nutrient Management

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Abstract
NOAA administers national competitive programs aimed at assessing the causes and ecosystem impacts of coastal (including Great Lakes) hypoxia, and developing quantitative predictive models to inform coastal managers of the effectiveness of alternative management strategies for preventing or mitigating hypoxia. Development of predictive models has advanced hypoxia management capabilities in several systems where the magnitude of hypoxia is related to nutrient enrichment through anthropogenic activities, including the northern Gulf of Mexico, Narragansett Bay, Chesapeake Bay, Delaware Bay, Lake Erie, and Green Bay. Scenario-based forecast models in these regions are being used to improve the predictive understanding of the quantitative relationship between nutrient loading and hypoxic zone size, inform nutrient reduction targets to mitigate hypoxia, and monitor management progress toward achieving hypoxia mitigation through nutrient reduction. A comparison of hypoxia forecast modeling approaches and management applications in these regions will be presented, and remaining research needs to inform management decisions discussed.

New Web-Based Capabilities for Using Spatially Referenced Regression Models to Support Decisions Related to the Management of Nutrient Loads to the Nation's Estuaries

Stephen Preston
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Abstract
Over the past decade, the U.S. Geological Survey (USGS) National Water Quality Assessment (NAWQA) program has developed models using the technique known as SPAtially Referenced Regressions On Watershed attributes (SPARROW) to assess the status of water-quality conditions throughout the conterminous United States (U.S.). SPARROW models use monitoring data combined with geospatial information describing contaminant sources (*e.g.*, land use) and loss processes (*e.g.*, stream attenuation) to consistently estimate levels of nutrients in all streams at national, regional or local spatial extents. Such information can be used for a variety of management objectives including: 1) identifying spatial patterns in nutrient sources and loading; 2) targeting and prioritizing management actions; and 3) improving monitoring networks. These models can be accessed using an online interactive decision support system (DSS) (http://water.usgs.gov/nawqa/sparrow/dss/). The DSS can be used to evaluate combinations of source reduction scenarios that target one or multiple sources of nutrients and see the change in the amount of nutrients transported to downstream waters – a capability that has not been widely available in the past. Recently added capabilities provide information regarding loads to estuaries and for relating upstream sources of nutrients to downstream estuarine loads. These new capabilities include maps of nutrient yields and summaries of nutrient sources for watersheds draining to most estuaries in the conterminous U.S. They also include preselected sets of stream reaches that drain to each estuary in the conterminous U.S. so that users can readily identify the areas draining to each estuary and easily develop maps that show the relative contributions of nutrients from areas of the watershed and from different source types. Lastly the new capabilities provide summaries of relative contributions of nutrients from sub-watersheds defined by HUCs and by states.

These new features will allow users of the SPARROW DSS to quickly identify sources of nutrients to estuaries and use that information to allocate management resources where they are likely to have the greatest benefit.

Nutrient Threshold Development for Saint Louis Bay, Mississippi: Content and Context

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Abstract
Nutrient pollution is a serious environmental issue for most regions of the US, and the Gulf of Mexico is no exception. Developing estuarine and coastal nutrient limits that protect valued ecological attributes is confounded by variability in developing clear target indicators and precise response models. One priority area of the Gulf of Mexico Alliance is reducing nutrients their impacts to the waters of the Gulf. As part of this initiative, a regional effort was undertaken to develop and strengthen procedures for deriving defensible and protective nutrient thresholds for estuaries and near-coastal waters. This presentation describes one project within that effort. The Mississippi Department of Environmental Quality performed a study of St. Louis Bay, Mississippi. This study combined mechanistic and empirical modeling to develop nutrient thresholds. Data and assessments from a monitoring program were used to calibrate a water quality model for the Bay, and included information on biological, chemical, hydrodynamic, physical, and climatic characteristics. The model was used to run various nutrient loading scenarios (forested, half of current loads, current loads, and a 50% increase in current loads) to evaluate ecological responses of the estuary to nutrient enrichment. Simultaneously, the monitoring data and assessment results were used to develop empirical models relating nutrient concentrations to response conditions. These two approaches were then combined to inform selection of nutrient concentration thresholds designed to protect uses of the St. Louis Bay estuary from the effects of nutrient pollution. We describe the case study, the results of the two modeling approaches, how the results are being used for site specific application as well as state nutrient threshold development, and how they can contribute to a core framework to be used in other Gulf of Mexico estuaries. In addition, we will discuss selected similarities and differences with other nutrient criteria efforts in the Gulf of Mexico.

Monitoring Nutrient and Sediment Inputs to Texas Bays and Estuaries: A Comparison of Selected High Flow Events, 2009-13

Michael Lee
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Abstract
Since 2009, the U.S. Geological Survey (USGS) has been evaluating the variability of nutrient and sediment characteristics in the lower reaches of the rivers entering Texas bays and estuaries during a variety of hydrologic conditions. Discharge, sediment concentration, sand/fine break, and nutrient concentration data were collected to gain a better understanding of the hydrologic and water-quality characteristics for the coastal ecosystems. Four events of unique hydrologic conditions on the Trinity River entering the Galveston Bay estuary are evaluated to demonstrate the variability of sediment and nutrient characteristics caused by differences in flood-discharge magnitude, duration, origin of floodwater runoff, and timing of sample collection. Some differences in the nature of the sediment and nutrient characteristics of high flow events were evident. These events are also compared to the hydrologic response of the Colorado River entering the Matagorda Bay estuary in Texas during high flow events. Results indicate that it might be possible to better understand the extent of nutrient and sediment loading in Texas bay and estuaries using selected measurements of discrete and continuous water-quality data. Both optical and acoustic methods are evaluated and an apparent correlation was observed with the concentrations of selected nutrients and suspended sediment, and an apparent correlation was observed between suspended sediment and total nutrient concentration measured during these high flow events.