Abstracts

Thursday, May 1

Session J4: Monitoring Methods and Effects of Floods on Water Quality and Human and Ecological Health

8:00 – 9:30 am | Room 2

Concentrations and Transport of Nutrients and Suspended Sediment in the Lower Mississippi-Atchafalaya River Basin During the 2011 Mississippi River Flood, April through July

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Abstract
In April through July 2011, the lower Mississippi-Atchafalaya River Basin (MARB) experienced a flood of historic proportions. Since the flood occurred at a time of year when agricultural fields were being tilled, agricultural lands were thought to be more susceptible to overland runoff of sediment and agricultural chemicals. In order to characterize the suspended sediment and nutrient concentrations and fluxes in the river during the flood, the U.S. Geological Survey collected water samples at eight sites on the main stem of the lower Mississippi River, three sites on the Atchafalaya River, and the three major flood-control structures.

Suspended-sediment, total nitrogen, nitrate, and total phosphorus concentrations measured during the flood were similar to concentrations that had been measured historically in the lower MARB; however, fluxes were quite high because of the high streamflow. The majority of the suspended-sediment and nutrient species flux introduced into the basin during the flood was from the upper Mississippi River Basin despite that more flow came into the lower MARB from the more forested, less agricultural Ohio River Basin (March through July). Forty-nine percent of the 2011 total suspended sediment flux was delivered to the Gulf of Mexico during the flood period (51.7 million metric tons). When comparing the suspended sediment flux inputs into the lower MARB with the suspended sediment flux outputs to the Gulf of Mexico, 13 percent less sediment left the lower MARB than entered from the confluence of the Upper Mississippi with the Ohio River. Between the confluence of the Upper Mississippi with the Ohio River and the outlets to the Gulf of Mexico, there was a 5.2 percent loss in nitrate flux, an 8.8 percent loss in total nitrogen flux, and a 1.7 percent loss in total phosphorus flux. The flux losses in nitrogen and total phosphorus species are within the standard error of the estimation method, and the lack of significant changes in nitrate, total nitrogen, and total phosphorus flux between water-quality stations in the lower MARB indicate that these constituents are behaving conservatively within the basin.

The Occurrence and Transport of Pesticides in the Lower Mississippi River during the 2011 Flood

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Abstract
In April through July 2011, the lower Mississippi-Atchafalaya River Basin experienced a flood of historic proportions. This flood marked the first time in history that three of the major flood control structures (Bird's Point-New Madrid Floodway, Morganza Floodway, and Bonnet Carré Spillway) were operated simultaneously. Because the source water for the flood came from agricultural areas of the Midwest and agricultural land was inundated by opening the Morganza and Bird's Point-New Madrid Floodways, there was concern that the Mississippi River would export unprecedented amounts of pesticides into the Gulf of Mexico.

In order to characterize the occurrence and transport of pesticides in the lower Mississippi-Atchafalaya River Basin during the flood, the U.S. Geological Survey collected water samples for analysis of pesticides at 11 stations on the

Mississippi, Ohio, Yazoo, Arkansas, and Atchafalaya Rivers. Additional water samples were also collected in the two floodways.

Water samples were analyzed for up to 136 pesticides and pesticide degradates. Of the 136 compounds, 118 were not detected above the method reporting level. The remaining 18 compounds fall into several categories: (1) compounds that were frequently detected and showed an increase in concentration during the flood, (2) compounds that were detected almost all of the time at every site, but usually in very low concentrations, (3) and compounds that were infrequently detected. The first group included acetochlor, atrazine and its 3 degradates (deisopropylatrazine, deethylatrazine, and hydroxyatrazine), metolachlor, and simazine. The second group include 2,4-D, 3-4-dichloroanline, alachlor, diuron, metribuzin, prometon, and prometryn. Compounds that were infrequently detected included the fungicides cis-propiconazole, trans-propiconazole, and metalaxyl, and the herbicide, trifluralin.

The fluxes during April through July of 2011 for the most frequently detected pesticides (atrazine, metolachlor, acetochlor, and simazine) were in the mid to low range of historic fluxes. This indicates that the 2011 flood, although of historic proportions concerning flow, did not carry a similarly historic amount of pesticides into the Gulf of Mexico.

Long Term Contaminant Threats to Ecosystems and Humans Due to Hurricane Sandy

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Abstract

In late October 2012, Hurricane Sandy made landfall during a spring high tide on the New Jersey and New York coastline, delivering hurricane-force winds, storm tides exceeding 19 feet, driving rain, and plummeting temperatures. Hurricane Sandy resulted in 72 direct fatalities in the mid-Atlantic and northeastern United States, and widespread and substantial physical, environmental, ecological, social, and economic impacts estimated at $50 billion. In the immediate aftermath of the storm, first responders focused efforts on minimizing public-health risks due to a wide array of chemical and pathogenic contaminants released by damaged municipal, residential, and industrial infrastructure.

Because most contaminant-related mitigation and restoration activities are necessarily focused on the immediate aftermath of storms, much less is known about the longer term risks due to persistent contaminants in the environment. Samples of sediment and fish tissue will be analyzed for a wide array of contaminants including trace organic compounds, wastewater indicators, hormones, metals, and toxicity, prioritizing sites where pre-storm data is available. The research effort is a collaboration between USGS, NOAA, USEPA, USACE, and a number of state and local agencies and institutions to maximize the use of existing resources, data, and capability. This study will provide unique benefits to future decisions by increasing our understanding of longer-term contaminant threats to ecosystems and humans and results in an important baseline dataset for many previously unmonitored contaminants in the region. In particular, identification of the associations between contaminant sources and specific contaminant threats to aquatic organisms and humans will inform decisions about the management of priority contaminant sources (*e.g.*, municipal wastewater, oil and gas spills, etc.) and the protection of critical living resources.

Training and Equipment Required to Collect Water-Quality Samples on Large Rivers during High Flows

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Abstract

Epic flooding in the Mississippi and Columbia River basins in 2011 signaled the need for the U.S. Geological Survey (USGS) to train and equip field sample crews to safely collect water quality samples and data. As a result of the flooding, the USGS Office of Water Quality commissioned the fabrication of 3 additional D-99 collapsible bag samplers for water and suspended sediment and strategically positioned them for deployment on short notice. Heavy, large-volume collapsible-bag isokinetic samplers such as the D-99 and D-96 are required to properly collect a variety of water quality samples in streams and rivers where depths commonly exceed 15 feet such as some of those in the USGS National Fixed Site Network and Cooperative Program. USGS Water Science Centers contribute substantially toward training personnel and infrastructure in order for field sample crews to properly and safely deploy these samplers. Field crews must be familiar with a combination and variety of boats, vehicles, booms, reels, cranes and hydrologic conditions to safely deploy and recover the samplers. The isokinetic performance of bag samplers varies according to stream velocity, depth, and stream temperature and, therefore, the performance must be tested and documented before each sample is collected. The performance data and the results from the samples are stored in the National Water Information System (NWIS). Laboratory results from the samples are essential for calibrating and verifying watershed models and surrogates of water quality (such as optical and acoustic metrics) for continuous monitoring; results also are used to report concentrations, loads, and trends of nutrients, pesticides, sediment, and other contaminants in large rivers.