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The effect of the 2011 flood on agricultural chemical and sediment movement in the lower Mississippi River Basin

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Extreme hydrologic events, such as floods, can overwhelm a surface water system's ability to process chemicals and can move large amounts of material downstream to larger surface water bodies. The Mississippi River is the 3rd largest River in the world behind the Amazon in South America and the Congo in Africa. The Mississippi-Atchafalaya River basin grows much of the country's corn, soybean, rice, cotton, pigs, and chickens. This is large-scale modern day agriculture with large inputs of nutrients to increase yields and large applied amounts of crop protection chemicals, such as pesticides. The basin drains approximately 41% of the conterminous United States and is the largest contributor of nutrients to the Gulf of Mexico each spring. The amount of water and nutrients discharged from the Mississippi River has been related to the size of the low dissolved oxygen area that forms off of the coast of Louisiana and Texas each summer. From March through April 2011, the upper Mississippi River basin received more than five times more precipitation than normal, which combined with snow melt from the Missouri River basin, created a historic flood event that lasted from April through July. The U.S. Geological Survey, as part of the National Stream Quality Accounting Network (NASQAN), collected samples from six sites located in the lower Mississippi-Atchafalaya River basin, as well as, samples from the three flow-diversion structures or floodways: the Birds Point-New Madrid in Missouri and the Morganza and Bonnet Carré in Louisiana, from April through July. Samples were analyzed for nutrients, pesticides, suspended sediments, and particle size; results were used to determine the water quality of the river during the 2011 flood. Monthly loads for nitrate, phosphorus, pesticides (atrazine, glyphosate, fluometuron, and metolachlor), and sediment were calculated to quantify the movement of agricultural chemicals and sediment into the Gulf of Mexico. Nutrient loads were compared to historic loads to assess the effect of the flood on the zone of hypoxia that formed in the Gulf of Mexico during the spring of 2011.