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**MODELING OF NUTRIENT TRANSPORT AND FATE USING NSM AND HEC-RAS INTEGRATED MODEL**

Zhonglong Zhang\*, Billy Johnson, Terry Gerald, Mark Jensen, Cindy Lowney

**ABSTRACT:** Nutrient Simulation Sub-Model (NSM) developed at the Engineer Research and Development Center (ERDC) has been integrated with Hydrologic Engineering Center - River Analysis System (HEC-RAS). The HEC-RAS model is used to simulate hydraulics and sedimentation in a river. The resulting flow information is integrated with the NSM to simulate the spatial and temporal variations of water quality indicators including algae, dissolved oxygen, and various components of nitrogen and phosphorus cycles. The NSM computes the phase distribution and biogeochemical transformation fluxes for each water quality constituent. Sediments and nutrients are the two most pervasive system-wide pollutants in the Mississippi River and have significantly degraded the water quality and ecological health of the river and Gulf of Mexico. Nutrient concentration and flux in the Upper Mississippi River have increased substantially over the last century because of changes in land use practices, climate, hydrology, and management. We use the NSM and HEC-RAS Integrated model to evaluate the transport and fate of nutrients in the Upper Mississippi River. This model can determine the amounts of nutrients lost or retained in the rivers by a variety of biogeochemical processes and provide great insights of spatial influences of both natural sources and anthropogenic activities from Upper Mississippi river watersheds.

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\* Sr. Scientist, BTS, USACE Environmental Lab., 3909 Halls Ferry Rd, Vicksburg, MS 39180 USA, Phone: 601-634-3337, Email: zhonglong.zhang@usace.army.mi