United States Department of the Interior
U.S. Geological Survey
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USGS Maryland-Delaware-District of Columbia Water Science Center

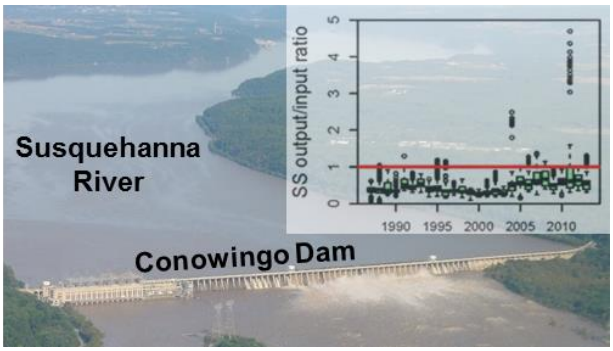
Seminar Series

Friday, April 15, 2016 at 11:00 a.m.

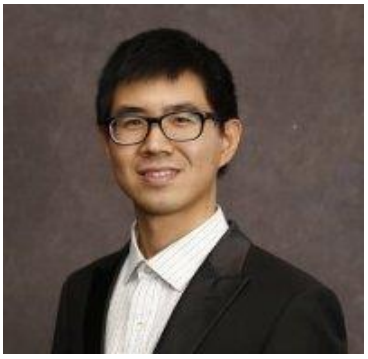
Effects of Reservoir Filling on Sediment and Nutrient Delivery from Susquehanna River to Chesapeake Bay: Input-Output Analyses based on Long-Term Monitoring

Qian Zhang, Ph.D. Candidate, Geography & Environmental Engineering, Johns Hopkins University

Reduction of suspended sediment (SS), total phosphorus (TP), and total nitrogen is an important focus for Chesapeake Bay watershed management. The Susquehanna River, the bay's largest tributary, has drawn attention because SS loads from behind Conowingo Dam (near the river's mouth) have been rising dramatically. To better understand these changes, we evaluated histories of concentration and loading (1986-2013) using data from sites above and below Conowingo Reservoir. First, observed concentration-discharge relationships show that SS and TP concentrations at the reservoir inlet have declined under most discharges in recent decades, but without corresponding declines at the outlet, implying recently diminished reservoir trapping. Second, best estimates of mass balance suggest decreasing net deposition of SS and TP in recent decades over a wide range of discharges, with cumulative mass generally dominated by the 75th~99.5th percentile of daily Conowingo discharges. Finally, stationary models that better accommodate effects of riverflow variability also support the conclusion of diminished trapping of SS and TP under a range of discharges that includes those well below the literature-reported scour threshold. Overall, these findings suggest that decreased net deposition of SS and TP has occurred at sub-scour levels of discharge, which has significant implications for the Chesapeake Bay ecosystem.



(Find this publication here: http://pubs.acs.org/doi/abs/10.1021/acs.est.5b04073.)



Mr. Qian Zhang is a Ph.D candidate in the Department of Geography and Environmental Engineering at the Johns Hopkins University under the advisement of Professor Bill Ball. In his doctoral work, Zhang has been actively using the USGS-developed WRTDS (Weighted Regressions on Time, Discharge, and Season) method to further understand long-term seasonal trends of nutrient and sediment loadings from the Chesapeake Bay watershed (three journal publications to date). He has also been working with Dr. Bob Hirsch (USGS) to improve the WRTDS method with additional exploratory variables. Since joining Hopkins in 2010, he has obtained two Master of Science in Engineering degrees, one in environmental engineering and the other in statistics. He hopes to obtain his Ph.D by August 2016.

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