MERCURY DISTRIBUTION IN SOILS AND STREAM SEDIMENTS OF CENTRAL INDIANA, USA

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DEDICATION

Earning a masters degree is about more than just learning how to observe, study, and experiment to describe and explain natural phenomena. It includes the development of an individual from being the hesitant student to the confident scientist. Along this path we encounter people who facilitate this development – people who will be remembered as teachers. One of the most influential teachers I must credit is Rosalice Buehrer.

As the biogeochemistry lab manager, she's tasked with overseeing graduate students and aiding in their learning of how to run laboratory procedures. She was witness to my success through my own trials and frustration; she put my failures into perspective. Rosalice always found the time to offer support whether work or personal. Never hesitating to drop whatever she is doing to listen, understand, and give advice about lab work, looking at research papers, analyzing data, personal life, and other difficulties of being a student. She takes it in and guides in a warm and realistic manner, not only giving answers, but asking pointed questions.

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ABSTRACT

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Mercury Distribution In Soils and Stream Sediments of Central Indiana, USA

An investigation of mercury (Hg) in soils and stream sediments was conducted to understand the impact of urbanization on Hg deposition and accumulation on the upper west fork of the White River watershed in central Indiana. Samples were collected to the north and east (i.e., downwind) of emission sources to understand the anthropogenic influences on Hg distribution in soil. Stream sediment sampling was designed to characterize the riverine particulate deposition of Hg through Indianapolis and to predict the potential for stream sediments with high Hg to become sources of methylmercury (MeHg). Spatial analysis revealed that soil Hg was elevated downwind of known industrial emission sites, indicating a local footprint of Hg deposition in central Indiana. Hg in streambank sediments was generally low in up-river sites to the northeast of Indianapolis, and increased markedly as the White River flowed through downtown, with high Hg persisting to downstream rural locations far to the south approximately 40 miles.

The stream sediment results also revealed variations in total Hg ($Hg_{(T)}$) as a function of local depositional sources, sub-watershed location, combined sewer outflows (CSOs), and impoundments along the White River. Low Hg values were recorded where the White River flow rate increased south of the 16th street dam at the confluence of the Fall Creek, where bankside industry and development confine the river. Three tributaries feeding into the White River were included in this study site, all having CSOs. Fall

Creek and Pleasant Run have higher values of Hg with Lick Creek having lower values in comparison to the White River and other tributaries. The highest values occur right before confluences to the White River where the flow rate slows and drops sediment. Mercury values typically increased immediately downstream of dams and impoundments. $Hg_{(T)}$ deposition and transport processes pose a problem to anglers fishing south of Indianapolis who may not be aware of the potential dangers related to elevated stream sediment Hg values and the greater potential for MeHg production from these sediments.

Gabriel M. Filippelli, Ph.D., Chair

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