

Modeling Mercury Interactions with Sediments at East Fork Poplar Creek, Oak Ridge, TN



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Introduction

For more than four decades, radioactive and non-radioactive wastes have been generated at the Oak Ridge Reservation as a result of the development and production of nuclear weapons. Discharge of waste water from the Y-12 facility into the East Fork Poplar Creek contaminated the river with several compounds such as mercury, uranium and polychlorinated biphenyls (PCBs), among others. Periodic flooding events contaminated the floodplain soils.

Mercury has been associated with soil, sediment and water pollution at the EFPC.



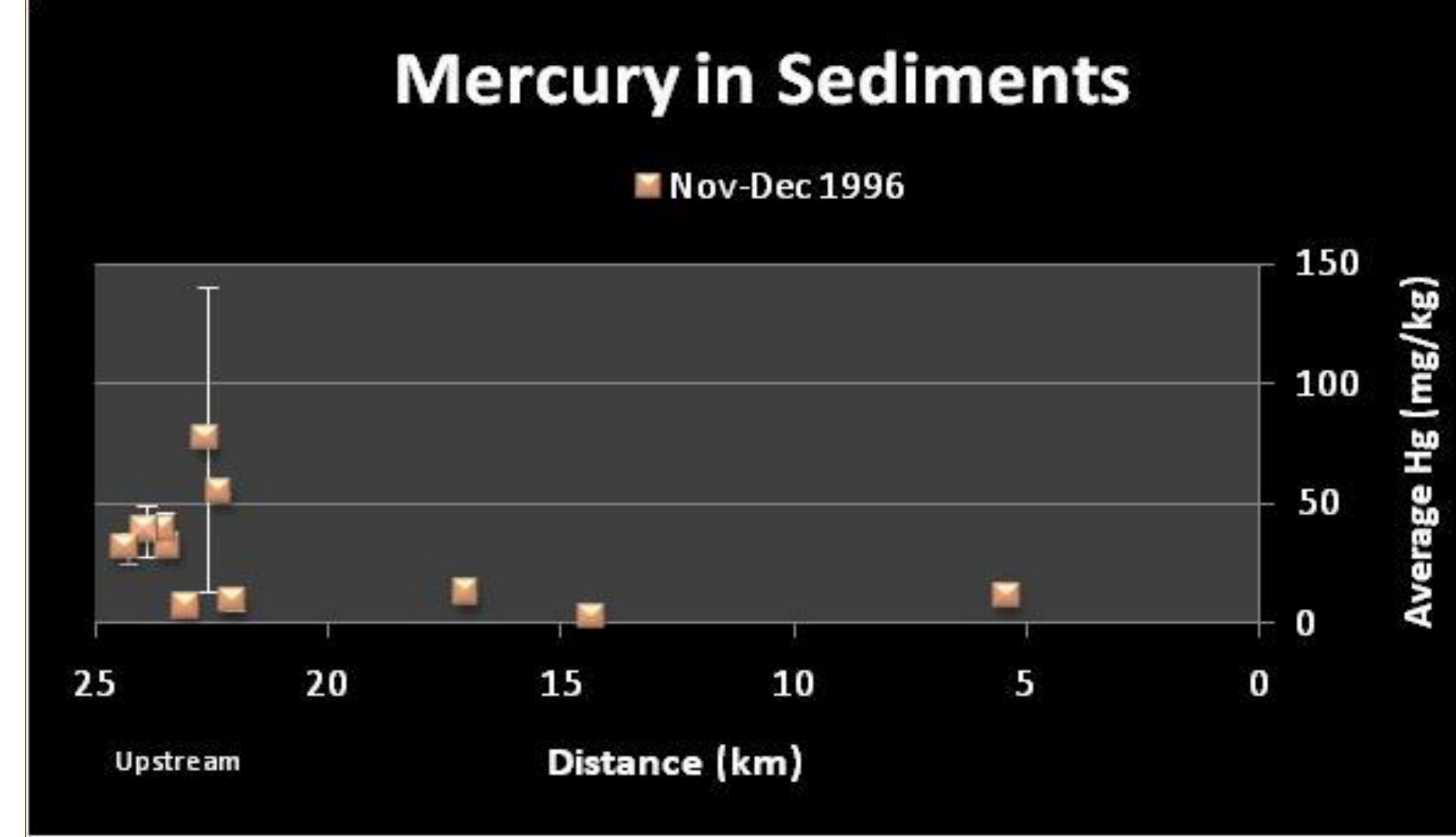
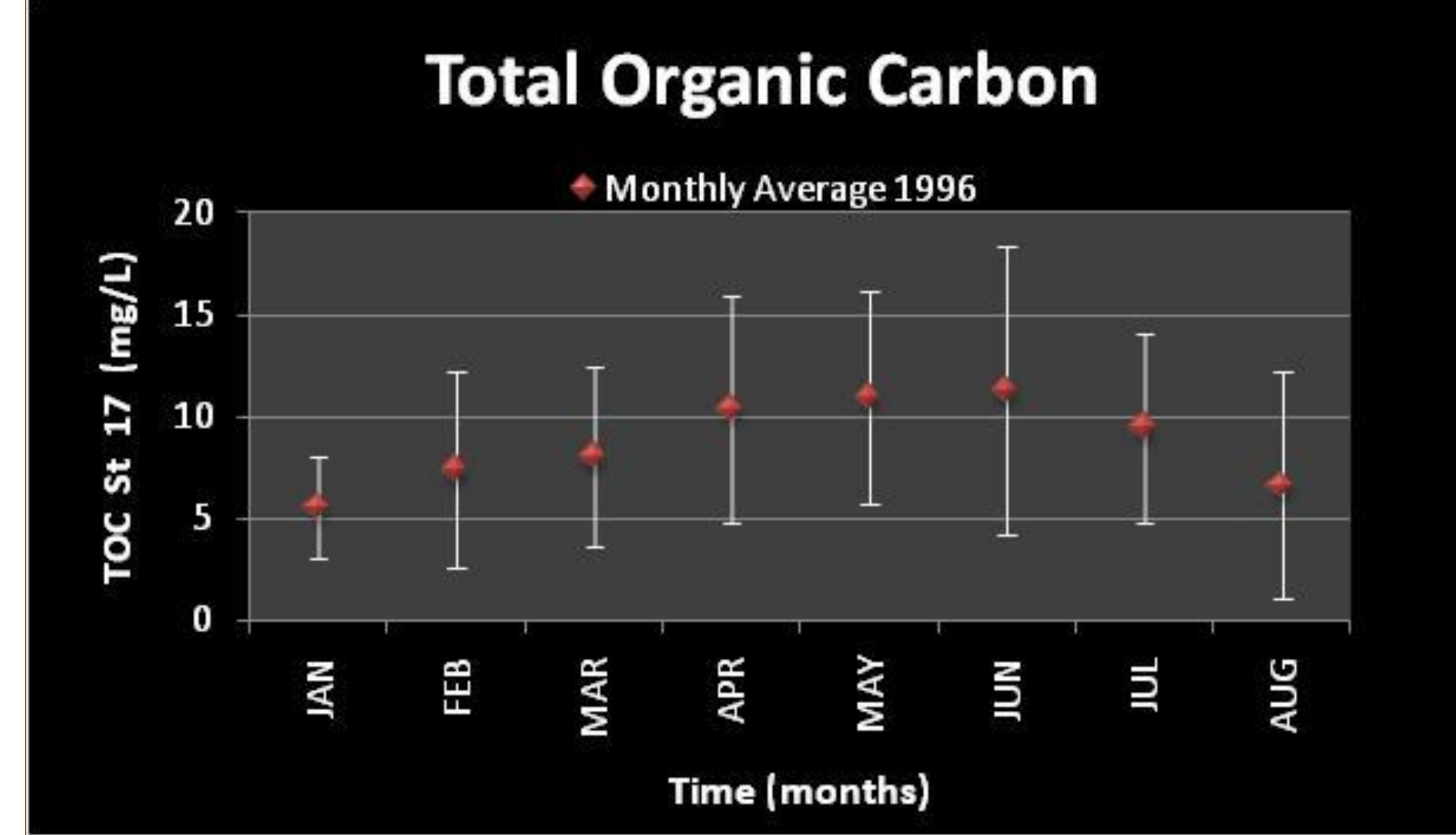
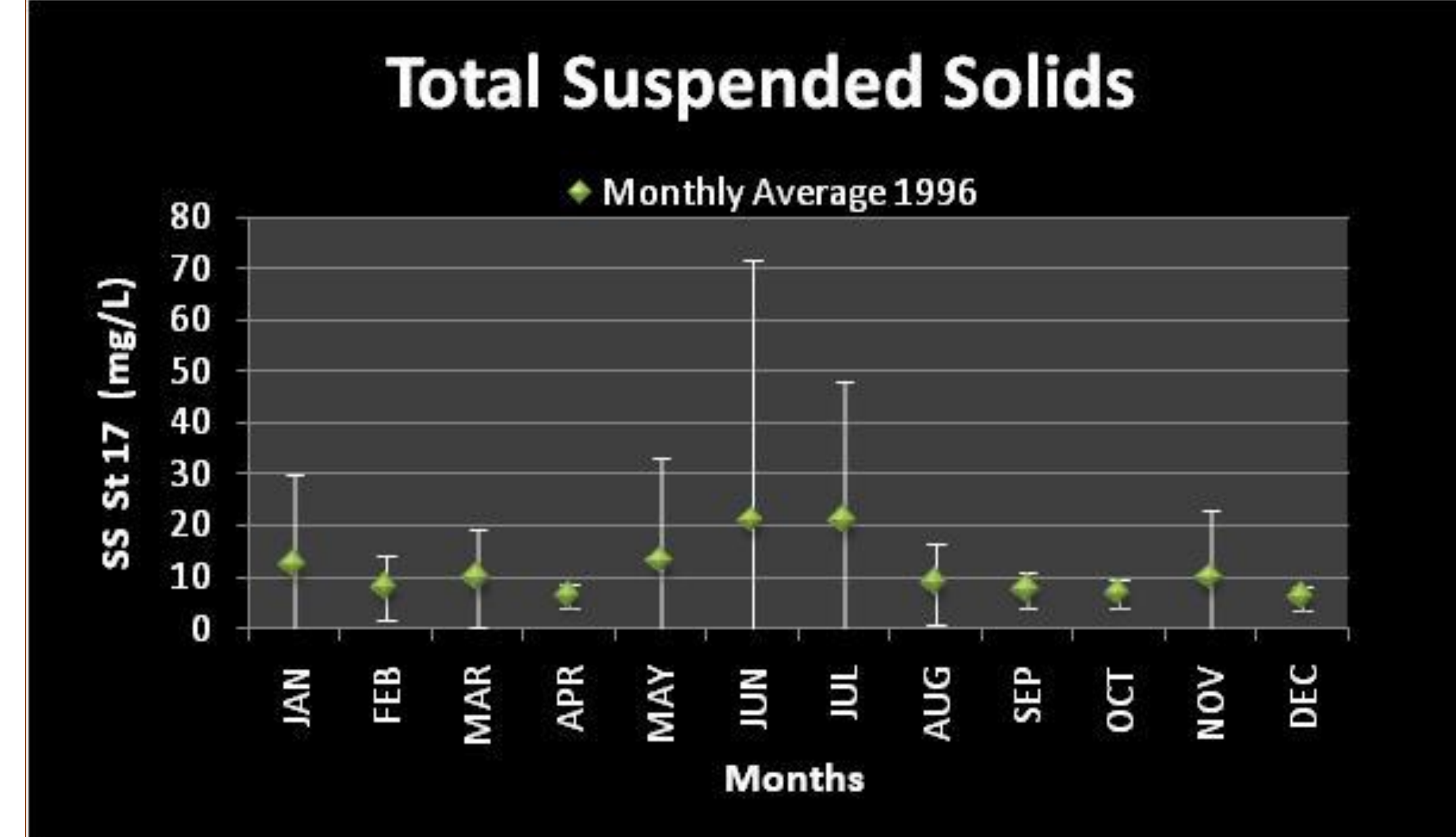
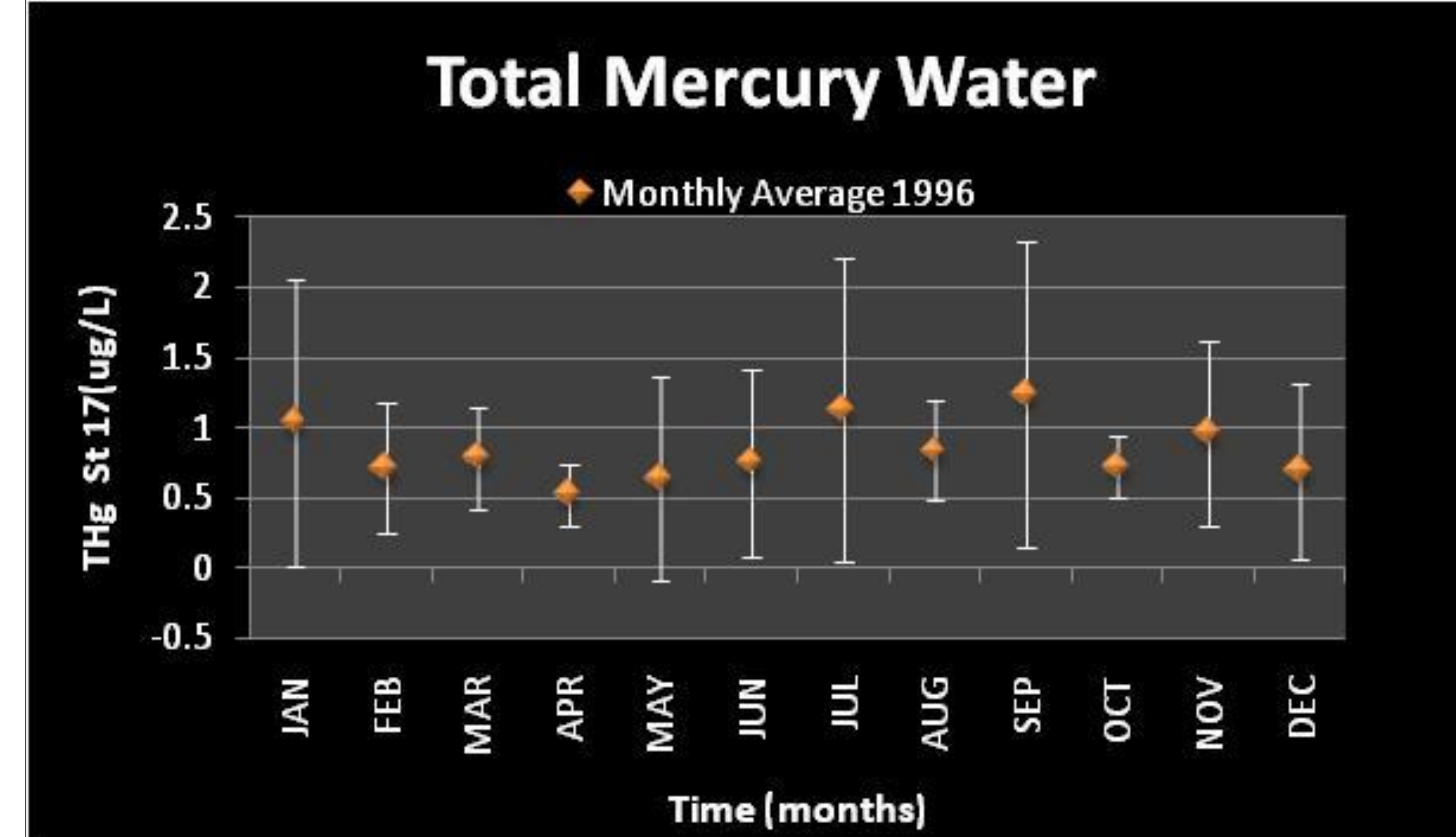
Objectives

To provide a decision tool based on a numerical model to aid in evaluating the effectiveness of remedial actions taken and in determining effects of flood events.

To improve the predictions of mercury concentration as a tool for accurate establishment of Total Maximum Daily Loads.

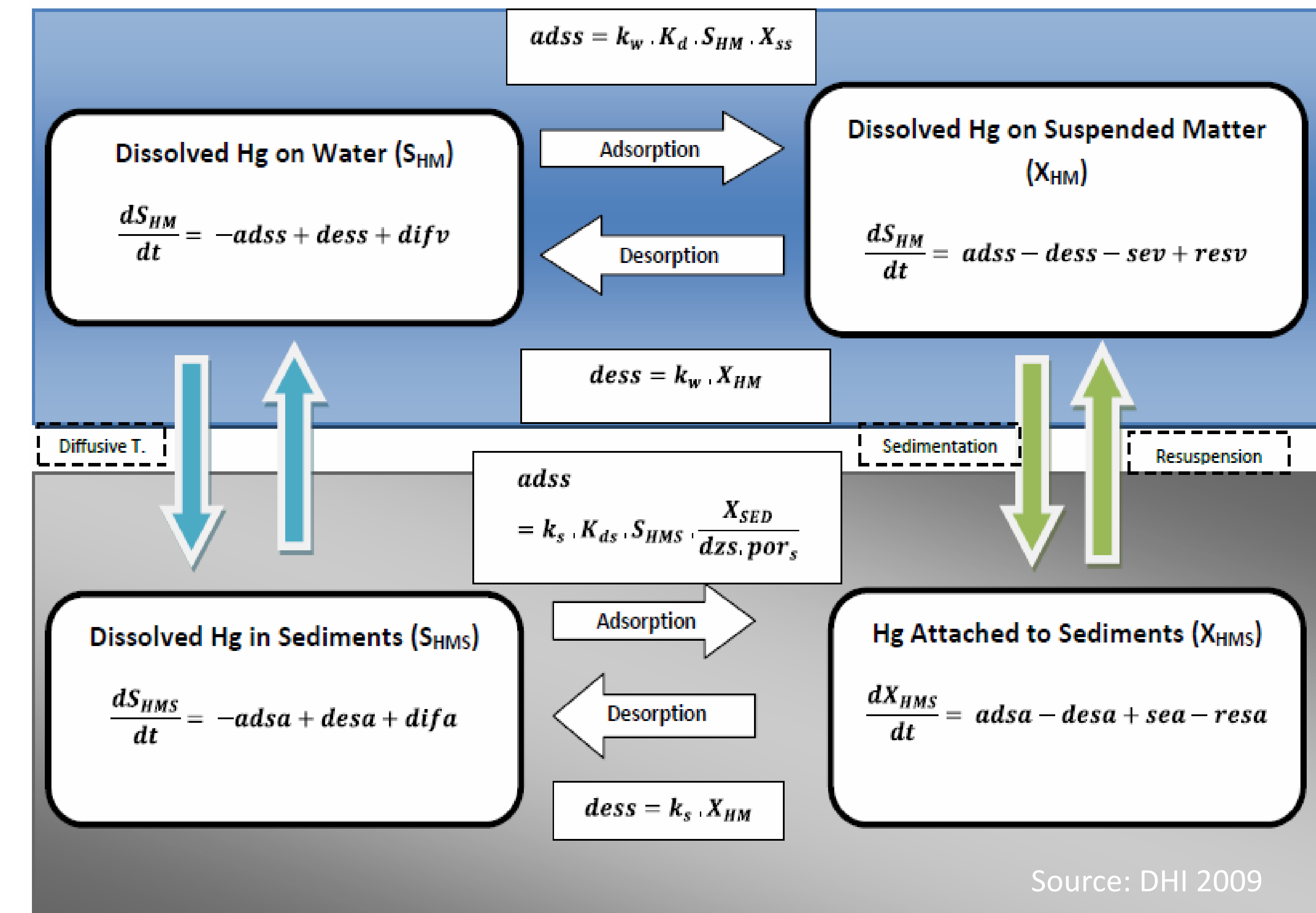
To study the dynamics of the water flow and chemical processes that determine the transport of mercury in water and sediment.

Observed Data



Data Source: OREIS database

Conceptual Model for Hg Transport



ECOLAB, a numerical model supported by DHI, is being applied to determine mercury concentrations in the water column and sediments.

The model allows the simulation of physical, chemical and biological dynamics of heavy metals interacting with the water body. Simulated processes include:

- Adsorption and desorption of the metal to suspended solids, and
- Diffusive transport of dissolved metal between the water column and sediment pore water.

Future Work

Sensitivity analysis of model parameters, including:

- Organic carbon partition coefficient
- Desorption rate of mercury in water
- Desorption rate of mercury in sediments
- Fraction of organic carbon in suspended solids and sediments
- Settling and resuspension of particles

Analysis of data related to characterization of sediments in the creek.