# Mississippi River Long Term Sediment Trap Contaminant Trends: Lock and Dam 3 and 4 (1987-2015)

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**Suspended Sediment Contaminant Concentration Trends**

The WI Department of Natural Resources has been conducting long term monitoring of suspended sediment contaminant concentrations in the Mississippi River at Lock and Dam 3 (Red Wing, MN) and Lock and Dam 4 (Alma, WI) since 1987 (Figure 1). Suspended sediment is collected passively through the deployment of glass sediment traps for about 60 days in a low velocity area immediately upstream of both lock and dams during spring, summer and fall (Figure 2). Field sampling and laboratory analytical methods have been previously described (Sullivan 1995). The Wisconsin State Laboratory of Hygiene in Madison, Wisconsin analyzed the sediment samples following U.S. EPA approved procedures. The PCB data presented in this summary represent total PCBs as derived by an Arochlor-based analysis prior to September 1991 and a congener-based analysis (congener sum) after this date. The Arochlor-based method had a detection limit of 50 ng/g (Sullivan 1995). The switch to a congener-based method was implemented to improve the analytical detection limit since sediment trap PCB concentrations declined rapidly and were usually less than 50 ng/g at LD 4. The primary purpose of this monitoring has been to assess long term trends and to provide an estimate of whole-water particulate-phase concentrations.

Suspended sediment or particulate matter in river water represents a major portion of contaminant transport, especially in turbid rivers like the Mississippi River. Organic chemicals that don't dissolve readily in water such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs) or organochlorine pesticides and elements such as heavy metals, adsorb to fine-grained suspended sediment particles, especially those high in organic matter content. Some sources of contaminant input include runoff from urban and agricultural land use, deposition from coal and waste incineration, resuspension of contaminated bed sediments and wastewater discharges.

An illustration of PCB and mercury concentrations in suspended sediment at both monitoring sites is shown in Figure 3 . River discharge, season, sediment particle size and organic matter content, and changes in contaminant inputs influence contaminant concentrations in suspended sediment. Spring sediment traps are generally characterized as having higher sedimentation rates, lower organic matter content (total volatile solids) and larger particle size than fall-deployed traps.

PCBs and mercury concentrations in suspended sediments are normally higher in samples collected from Lock and Dam 3 than at Lock and Dam 4 (Figure 3). This is due to the closer proximity to the Twin Cities Metropolitan Area, a major source of these contaminants. In addition, Lake Pepin, a natural riverine lake located in Pool 4, acts as a natural sediment trap, which results in decreased transport of these contaminants downstream.

Temporal trends indicate a decrease in PCB and mercury concentrations at both monitoring sites. PCB concentrations are presently one-third to one-fourth that observed in the late 1980s, while present mercury concentrations are roughly one-half of concentrations during the late 1980s. Pollution abatement efforts to reduce the use or discharge of these contaminants have led to these reductions in contaminant concentrations.


Figure 1. Location of sediment trap sampling sites at Lock and Dam 3 (Red Wing, MN) and Lock and Dam 4 (Alma, WI).

Figure 2. Example of sediment trap deployment at Lock and Dam 3. The traps are lowered below the water surface for roughly 60 days of passive sampling.

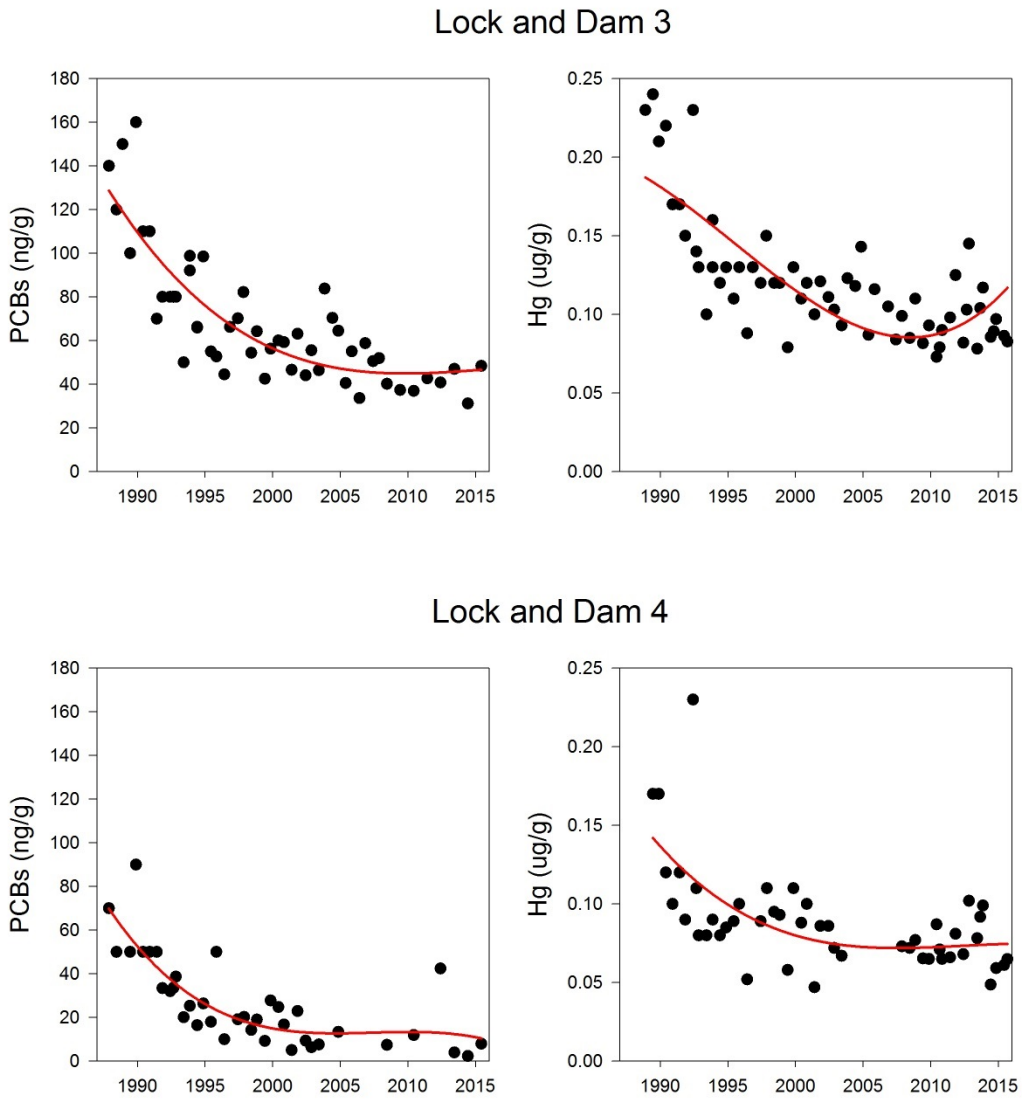


Figure 3. Long term sediment trap polychlorinated biphenyl (PCB) and mercury (Hg) trends at Lock and Dam 3 and 4 (1987-2015). PCB concentration is in nanograms/g and mercury concentration is in micrograms/g.

## References

Sullivan, J.F. 1995. Contaminants in Mississippi River suspended sediment collected with cylindrical sediment traps. U.S. EPA Flood Assessment Grant (Water Quality) Ambient Monitoring Project. Wisconsin Department of Natural Resources. La Crosse, WI, 65pp.