

South River Mercury TMDL - Briefing Paper

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Purpose of Study: The purpose of the TMDL study is to determine fluxes of mercury in the South River basin and to calculate loading reductions needed to lower fish tissue mercury concentrations below the EPA recommended criterion of 0.3 ppm.

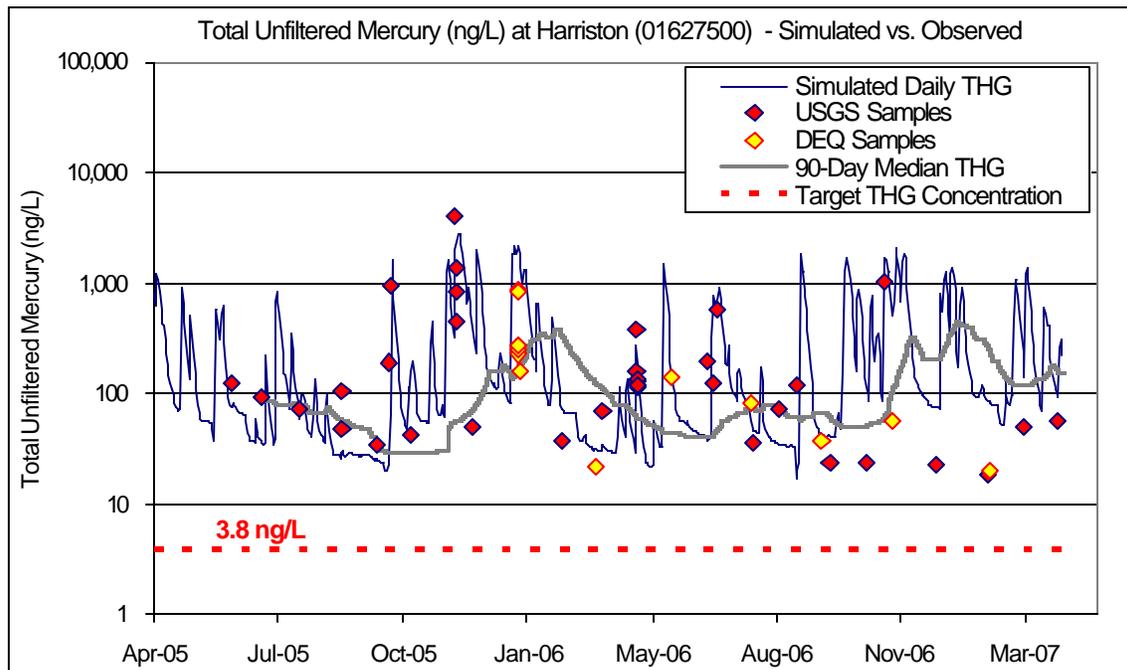
Study Period: January, 2005 – December, 2008

Recent Results:

Calibration of Mercury Simulation Model is Complete

The numerical model represents water, sediment, and mercury transport in the South River watershed and is based on Hydrologic Simulation Program – FORTRAN (HSPF), a software package commonly used in TMDL studies of surface water bodies. In the model, the South River watershed is divided into 5 subbasins, each with corresponding stream reaches. Outputs of the model include hourly time series of streamflow, suspended sediment concentration, and mercury concentrations at the end of each stream reach. The mercury transport component of the model has been successfully calibrated so the entire model is now ready for simulating mercury loading scenarios.

Figure 1. Simulated and measured total mercury concentrations at Harriston under existing conditions. The target concentration of 3.8 ng/L for the South River was calculated from a BAF model and measured fish tissue concentrations.



Simulated mercury fluxes under existing conditions.

Under existing conditions, during the period April, 2005 to March 31, 2007, simulated mercury loads in the South River at Port Republic averaged 189 kg/year. Non-point sources such as runoff and channel margin inputs contributed over 99% of the simulated mercury load. Point sources, direct precipitation to the river, groundwater discharge and interflow discharge together contributed less than 1% of the load.

TMDL load calculations

Simulated mercury inputs to the river were reduced to achieve water column THG concentrations below the protective target concentration of 3.8 ng/L. The target concentration varies according to river (South, SF Shenandoah, or main stem Shenandoah) and is calculated from a site-specific BAF model and measured fish tissue concentrations. The measure used to determine compliance with the target concentration was the 90-day median THG concentration. Successful reduction scenarios were those that maintained 90-d rolling median values in each river reach below the 3.8 ng/L target. Only the headwaters reach of the South River, above the Waynesboro gaging station at Lyndhurst Avenue, was below the target concentration under existing conditions. To keep all river reaches below the 3.8 ng/L target concentration, mercury loads to the South River had to be reduced by about 99%. The final calculated mercury TMDL for the South River was 2.0 kg/year of mercury. By extension, the mercury TMDL values were 3.8 kg/yr for the SF Shenandoah River above Luray and 5.8 kg/yr for the main stem Shenandoah River above the Warren power dam.