Working Hypothesis	Experimental Concepts / Actions
1. Ongoing sources of Hg to the South River are present and have prevented the expected decline of Hg in fish tissue. The potential sources for existing Hg inputs to the river can be separated into: (a.) existing inputs potentially derived from historical releases; and (b.) existing inputs based on current releases. **Potential pathways for historical inputs include:** • **Groundwater** • **Sediments** • **Floodplain soils** • **Landfills** • **Dumping** • **Dredge spoils** **Potential pathways for current inputs include:** • **Groundwater** • **Atmospheric deposition** • **Point source discharges** • **Non-point source discharges** • **Dumping** • **Fertilizers**	**a. Utilize information on Hg in water column collected during bi-monthly sampling of South River for TMDL.** **b. Examine potential for old landfill near 2nd st. bridge area to have received Hg contamination and now acts as a source to the South River. (work on hold pending resolution with city of Waynesboro.)** **c. Conduct intensive sampling of water column downstream of DuPont footbridge to verify and expand on results obtained by Ralph Turner. (one sample session completed in 2002; another planned for 2003)** **d. Review historical records and / or obtain anecdotal results of dredging activities in South River after flooding events. (Larry Mohn made the contact for this issue.)** **e. Conduct stormwater / wastewater sampling of plant site to determine if Hg inputs are occurring. (completed in 2003.)** **f. Conduct sediment studies / coring at selected locations on the South River. (completed in 2002; sediment dating is pending.)** **g. Additional studies to determine Hg association with specific sediment constituents are being discussed.**

2. Water quality conditions (e.g. sulfate, chloride additions) have changed in the South River over the last 20 years in a manner that favors the formation of MeHg and this has resulted in increases in Hg concentrations in fish tissues.	**a.Review information developed by Friends of the Shenandoah – look for trends and correlations. (putting data into Excel spreadsheet.)** **b. No trends noted in TSS, Sulfate from historical DEQ data; limited number of stations on SR, SFSR.**
3. Observed changes in fish tissue Hg concentrations result from changes in the dietary preferences of important fish species in the South River during the last 20 years (locational differences).	**a. Conduct fish dietary studies in South River and other locations (as reference). (work ongoing in 2002-2004)**
4. Wetland areas in the South River watershed have increased during the last 20 years and are contributing larger amounts of MeHg to the surface water.	**a. Map locations and test against locations where fish tissue levels have remained high. (see also 1f)** **b. Consider in-situ studies of MeHg production in selected wetland locations; develop flux estimates.**

5. Changes in water levels, providing a regular wetting and drying cycle leads to periodic increased production of MeHg in the South River (similar to filling and draining of lakes and reservoirs) which in turn keeps levels in fish tissue from declining.	**a. Map flow / flood conditions over the past 20 years against fish tissue data results for the same period. (Ongoing in 2003; preliminary review shows clear wet / dry cycle; currently in a wet cycle.)** **b. Consider in-situ studies in floodplain.**
6. Clearing of forested areas (or other land use changes) along the South River watershed over the last 20 years has altered the availability of Hg from soils in these areas and resulted in increased inputs of MeHg to the surface water.	**a. Review historical aerial maps to look for trends.** **b. Consider in-situ studies in floodplain. (land use survey completed – CD is available)**

7. The observed changes in fish tissue Hg levels over the last 20 years result from sampling artifacts and variability, e.g. changes in tissues sampled and method of collecting tissues, changes in analytical methods and laboratories, or changes in data inputs – non detects vs zero, etc.	**a. Adjust statistical methods to account for size, weight of fish and analyze data accordingly. (completed; trends evident after correcting for size and weight of fish)**
8. Changes in agricultural practices in the floodplain and watershed have resulted in decreases in Se levels in the South River and thereby increased the availability of Hg in the system.	**a. Consider analyzing for Se in floodplain soils, sediments and the water column. (under discussion; part of floodplain sampling in 2004)**
9. The South River has an unusually low level of Se which provides a mechanism for Hg to be more bioavailable.	**a. Consider analyzing for Se in water column. (preliminary data from DEQ indicates Se levels are not abnormally low.)**
10. Mercury levels in South River biota have actually decreased over the past 20 years but are not reflected in the fish.	**a. Consider additional biological indicators – Corbicula or other. (preliminary scoping study with Corbicula completed in 2002, 17 locations sampled.)**
11. Mercury in soils of the South River floodplain is contributing to Hg levels in the water column and sediments; and potentially are source for human exposure.	**a. Consider floodplain soil / rainfall study to determine if Hg is carried to the river via soil erosion. (WP developed – tributary study)** **b. Consider floodplain soil studies with food crops to determine uptake rates. (phase 1 completed; phase 2 planned for 2004)**