

Working Hypothesis	Experimental Concepts / Actions
<p data-bbox="239 285 982 570">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.</p> <p data-bbox="239 610 982 646">Potential pathways for historical inputs include:</p> <ul data-bbox="285 651 579 878" style="list-style-type: none"> <li>• Groundwater</li> <li>• Sediments</li> <li>• Floodplain soils</li> <li>• Landfills</li> <li>• Dumping</li> <li>• Dredge spoils</li> </ul> <p data-bbox="239 919 982 954">Potential pathways for current inputs include:</p> <ul data-bbox="285 959 772 1187" style="list-style-type: none"> <li>• Groundwater</li> <li>• Atmospheric deposition</li> <li>• Point source discharges</li> <li>• Non-point source discharges</li> <li>• Dumping</li> <li>• Fertilizers</li> </ul>	<p data-bbox="1014 285 1829 354">a. Utilize information on Hg in water column collected during bi-monthly sampling of South River for TMDL.</p> <p data-bbox="1014 394 1829 500">b. Examine potential for old landfill near 2<sup>nd</sup> st. bridge area to have received Hg contamination and now act as a source to the South River.</p> <p data-bbox="1014 540 1829 678">c. Develop approach to conduct intensive sampling of water column downstream of DuPont footbridge to verify and expand on results obtained by Ralph Turner.</p> <p data-bbox="1014 719 1829 824">d. Review historical records and / or obtain anecdotal results of dredging activities in South River after flooding events.</p> <p data-bbox="1014 865 1829 938">e. Consider additional sampling of plant environs to determine if Hg inputs are occurring.</p> <p data-bbox="1014 979 1829 1052">f. Conduct sediment studies / coring at selected locations on the South River.</p>

<p><b>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.</b></p>	<p><b>a. Review information developed by Friends of the Shenandoah – look for trends and correlations.</b></p>
<p><b>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).</b></p>	<p><b>a. Conduct fish dietary studies in South River and other locations (as reference).</b></p>
<p><b>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.</b></p>	<p><b>a. Map locations and test against locations where fish tissue levels have remained high.</b></p> <p><b>b. Consider in-situ studies of MeHg production in selected wetland locations; develop flux estimates.</b></p>

<p><b>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.</b></p>	<p><b>a. Map flow / flood conditions over the past 20 years against fish tissue data results for the same period.</b></p> <p><b>b. Consider in-situ studies in floodplain.</b></p>
<p><b>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.</b></p>	<p><b>a. Review historical aerial maps to look for trends.</b></p> <p><b>b. Consider in-situ studies in floodplain.</b></p>

<p><b>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.</b></p>	<p><b>a. Adjust statistical methods to account for size, weight of fish and analyze data accordingly.</b></p>
<p><b>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.</b></p>	<p><b>a. Consider analyzing for Se in floodplain soils, sediments and the water column.</b></p>
<p><b>9. The South River has an unusually low level of Se which provides a mechanism for Hg to be more bioavailable.</b></p>	<p><b>a. Consider analyzing for Se in water column.</b></p>
<p><b>10. Mercury levels in South River biota have actually decreased over the past 20 years but are not reflected in the fish.</b></p>	<p><b>a. Consider additional biological indicators – Corbicula or other.</b></p>