

Filling Data Gaps (updated 10/19/2005)

Studies Ongoing or Completed

- ❖ **Sources of Hg to the system**
 - **Plant site stormwater investigation. Phase 2 completed.**
 - **Atmospheric – Dean Cocking, JMU / Ralph Turner @ Forestry Center. Preliminary results reported at Nov 2004 Expert Panel mtg.**
 - **Floodplain Soils – Rob Mason, shake & bake, completed as of 11/10/2004. Requesting “report”.**

- ❖ **Media investigations**
 - **Sediments. Initial coring and dating studies completed. Pilot test of “guzzler” completed. Results encouraging.**
 - **Floodplain soils. Phase 1 completed. Results reported at Nov 2004 Expert Panel mtg.**
 - **Water column. Intensive water sampling (Lumex and otherwise) for Hg (total and dissolved) completed. Ion investigation completed. DEQ and TMDL efforts continue. Some additional work completed by Turner x 2 and Jensen. Whole river investigation completed.**

- ❖ **Biological investigations**
 - **Corbicula – EMU, JMU – Doug & Tom. Phase 1 (& intensive around plant site) – finished. Transplant studies completed.**
 - **Fish Diet Studies - Virginia Tech – Greg Murphy, Don Orth, Tammy Newcomb – completed. Manuscripts prepared.**

- ❖ **Hydro geological investigations**
 - **River / land use survey – completed**
 - **Mud mapping – completed.**
 - **Water flows / water balance – initial study completed.**
 - **Flyover, aerial mapping - completed.**

- ❖ **Exposure, risk, outreach**
 - **Food crop study – Bill & Dean – Phase 1 and 2 completed. Manuscript in preparation. Subteam evaluated data and**

- concluded no significant risk posed by crops grown in floodplain soils.
- **Piscivorous birds – Phase 1 completed. Final results of mercury analyses pending.**
 - **Minority community – radio spots completed. Bi-lingual consumption advisory signs completed. Spanish brochure completed.**
 - **Publications – 5 abstracts accepted for SETAC World. Congress, Nov. 2004. 1 journal manuscript completed, 4 in preparation.**

Studies Planned, Proposed or Under Development

- ❖ **Sources of Hg to the system**
 - **Plant site stormwater investigation – additional wrap up work underway.**
 - **Bridges & tribs – Some work done during flood events of late 2004; more planned under NRDC investigation.**
 - **Floodplain soils – check ponds as methylation “hot spots”. Collect SW samples in areas of interest – add to surface water investigations. Plans being discussed.**
 - **Second street landfill – initial results from bottom of landfill during flood event do not suggest significant inputs of Hg.**
 - **Aqueous speciation of Hg – conduct preliminary work.**
 - **Subteam formed to support development of TMDL for South River, and become link to SRST.**

- ❖ **Media investigations**
 - **Water column – total and dissolved Hg (and MeHg) at plant site and surrounding areas.**
 - **Sediments – DEQ planning**
 - **Dam removal sampling – water and sediment - Pre-removal sampling and analyses completed. Pending full removal of dam more sampling will be conducted.**
 - **Flux chamber pilot work completed, additional work planned for spring of 2006.**

- ❖ **Biological investigations**

- **Corbicula – EMU, JMU – more transplant studies considered. Also thinking about frequent monitoring of wild clams to augment other routine sampling. Pending resources being available for the work.**
 - **Fish 1 – Trust fund monitoring, DEQ refining plans for 2005, may include small forage fish [trout study – hold overs from spring stocking]**
 - **Fish 2 – Request additional ideas from Virginia Tech**
 - **Corral studies ?**
 - **Earthworms – Dean Cocking w/students – planned.**
 - **Periphyton, Attached Vegetation – try indirect measurement in water column. Review results then decide whether to do plate experiments or not. What about gastropods ? Preliminary results in hand. More work proposed.**
 - **Small mammals, amphibians, etc. – Virginia Tech, under consideration. On hold pending results of bird study.**
 - **Piscivorous and other birds – consideration of additional work in watershed.**
- ❖ **Hydro geological investigations**
- **Geomorphology – Jim Pizzuto / Katie Skalek, good progress on Phase 1; more work planned for 2006.**
 - **Modeling – Hydroqual - 4Q 2005 – data review and integrating historical, current data - CSM.**
 - **Refine understanding of GW input to the river, perhaps correlate with areas where increase in Hg occurs (clams ?)**
- ❖ **Exposure, risk, outreach**
- **Creel, angler survey – DGIF completed in 2005 for SFSR and SR. Report ?**
- ❖ **Data Management**
- **Database development – searchable, underway in 2Q2004 [includes documents, data, reports, aerial photos, Science Team meeting minutes]. Working on web-based window.**

Suggestions from 2003 Expert Panel meeting – testing hypotheses

1. Are floodplain soils a source of bioavailable mercury
Shake and bake study using soils, river water and measuring MeHg production over time
2. Are river bed sediments a source of bioavailable mercury
Shake and bake study using sediments, river water and measuring MeHg production over time (could combine with clam uptake studies)
3. In 1 and 2, add organic matter to provide food source for bacteria (to stimulate microbial activity) – stack the deck. Maybe have a streamside flow through system – soils / sediments, river water, and clams (and enhancements to microbes) to see if bioavailable mercury is released.
4. For slow drip hypothesis, or new source hypothesis: need intensive water column study with total and dissolved Hg along with low detection limit. Sample at low flow period if possible. Include tributaries and other potential inputs other than the point at which the transect is specified. Need to check the ratio of total to methyl along with the change in this ratio downstream. Separate inorganic data from methyl data. The change in these will be reflective of new inputs to system – may need a statistical power test to help identify how many samples are needed to determine whether we'll be able to detect a difference.
5. For slow drip, hot spots of methylation: need intensive water column study and target areas in river conducive to methylation for MeHg analysis. Need to include flow measurements with this effort, particularly when going to areas where methylation might occur. Have to combine upstream, in the zone, and downstream of these areas.
6. For hypothesis # 3, for this to work, there would have to be an erosional process in the sediments and soils that would provide the continued input of inorganic Hg to the system. In the absence of the erosional process, it is likely that the levels in fish would have gone down.
7. For the globules hypothesis – difficult to distinguish from other hypothesis. Headspace analysis in water, sediment or soil samples (using inert gas like Argon) and measure elemental mercury content. Might be able to use PIMS or similar type of sampler. Difficult to distinguish among various forms particularly when adding air or other medium drives changes in speciation. Soil / vapor analysis might be useful for soils but it is unlikely that elemental mercury will be present. Might be helpful for studies on the plant site, particularly along river bank that are wetted during rain events (but need 10-

20 ppm in soils to be able to measure any elemental mercury; need to have about 100 ppm before able to measure anything in vapor).

8. Mass balance estimate: how much biomass is produced each year and knowing the MeHg, how much mercury would be required to maintain this level.