

Core Sampling of Sediments and Soils

Analysis & Dating

Participants/Contributors

Until Now

- Erin Mack (Excellent start on written proposal)
- Mike Sherrier, URS
- Nancy Grosso
- Mike Liberati

Objective of Study

The sediment/soil sampling proposal is intended to compliment the extant research on the river by examining the patterns of Hg contamination in sediments and floodplain soils, examining the potential roles of these pools of Hg in the local cycling of mercury, and by identifying or eliminating possible mercury sources from the conceptual model being developed for the site.

Working Hypotheses

to be addressed by this study

- WH-1: Ongoing sources from sediment/soils?
- WH-2: Water quality conditions have changed to promote MeHg. Methylation in sediments?
- WH-4: Wetland areas have increased and are contributors. Should we core a wetland area?
- WH-8/9: Should we measure Se? Se in sed?

Additional questions to answer

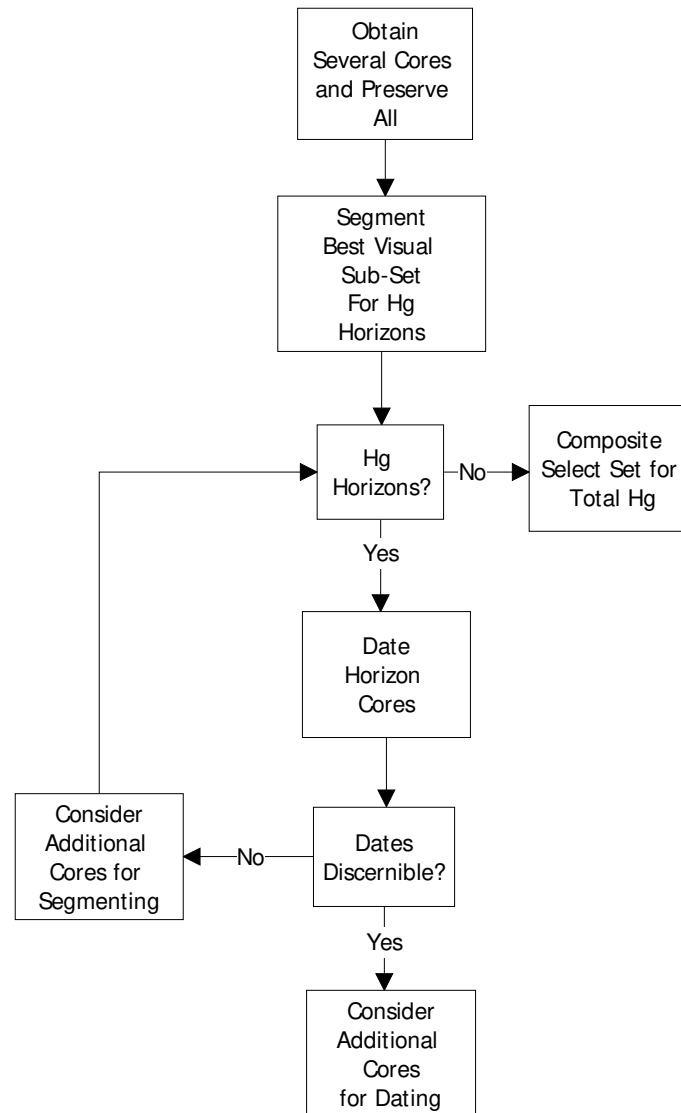
- Sediments
 - Historical sediments, or blown out each storm?
 - Are there horizons? Buried, inaccessible Hg? Current data does not address depth profiles of Hg, nor history.
 - What is the relationship between concentrations of total mercury (Hg_t) and methylmercury (MeHg) in vertically stratified sediments/soil cores? Is Hg methylating in and escaping sediment?
 - Are sediments/banks likely source of Hg or MeHg? Or not?
- Soils (Forestry Station - *No, we have no earlier data from there.*)
 - Validity of Hg at depth reported earlier?
 - Are there horizons? Buried, inaccessible Hg?
 - Shallow Hg available for runoff to river?
- Others?

Sampling Plan Elements

- Collaborate with 1-2 Expert Panel members in detailed design.
- Pick 2-3 sediment locations. One a wetland location. Dooks Dam, island cutback. Forestry Station for soils.
- Phased approach to optimize costs
 - Generous number of cores
 - Sub-set for Hg horizons only
 - Date only if horizons are discernible
 - Study more cores, if initial cores suggest learnings
- “Clean Metals” techniques throughout
- Institute necessary safety measures for workers and an appropriate waste collection and control program.

Experimental Logic

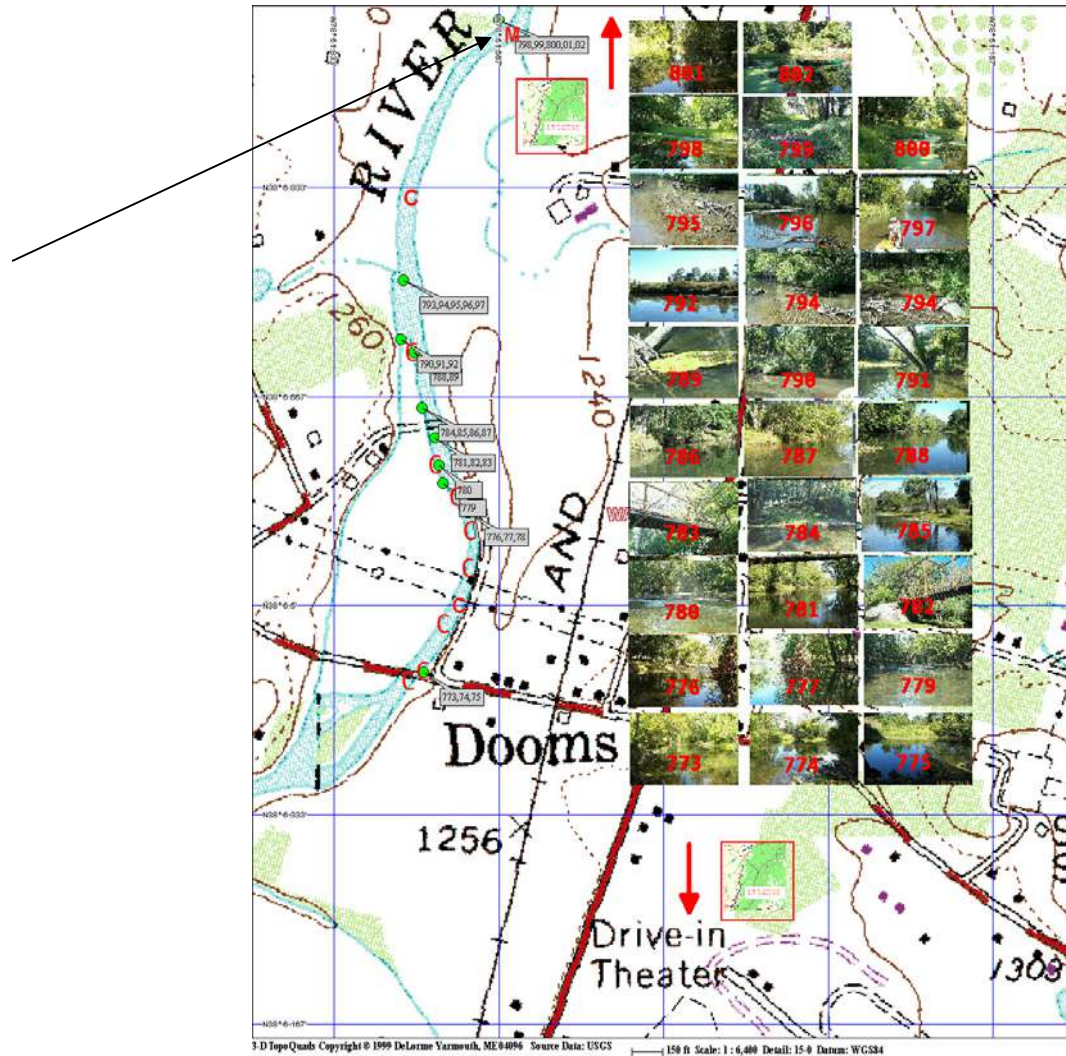
to optimize costs



Obtaining Cores

- Sediment (3 locations)
 - Access important!
 - pontoon boat
 - “Vibracore”
 - 25 cores max
 - 10 ft approx max depth
 - To refusal or “catcher”
 - 3 inch irrigation pipe
 - 3 people, 5-6 days
- Soil Cores (Forestry)
 - “Geo-Probe” rig
 - 3 transects
 - Near bank, 100, 500 yr
 - 15 cores max
 - 4 ft max depth
 - 3 people, 2 days
 - Total Hg only
 - unless often very wet

Possible Cutback Location



Double as Cutback/Wetland?



Flat Boat with Tripod

East Chicago, IN



Draws 16-18" of water

Core Dumped out of Barrel

East Chicago, IN



Core Prep Area

East Chicago, IN



Core Split Open



“Geo-Probe” Rig



“Geo-Probe” Visual Inspection



“Geo-Probe” Visual Inspection



Processing Cores

Slicing/Dicing/Storing

- Location on DuPont plant site?
- Crew to open/examine in “real time”?
- Photo documentation
- Selection of cores for sectioning/analysis
- Safekeeping of extra cores during analysis
- Allowable “hold times”,
technical/regulatory? 28 days for Hg, 48 hrs for MeHg

Core Dating

Cores deemed “datable” will be sectioned at 1-2 cm intervals over the first 20 cm and then at 2-5 cm intervals for the rest of their depth and prepared for Hg_t and MeHg analyses and possibly Cs/Pb dating.

Where should dating be done?? Science Team suggestions?

Additional Analyses

- Sediments
 - grain size
 - organic carbon
- Pore water for
 - Hgt, MeHg, TOC, and basic anions (e.g. sulfate, nitrate, phosphate, Cl-)??
- Surface water?
- Soils
 - organic carbon
 - clay/silt/sand ratios
 - total nitrogen
 - sulfur (or amount of humic and fulvic acids?)

Not to be Answered

- Narrow selection of sample sites precludes broad generalizations about sediments and soils in river bed and floodplain.
- Will not rule out roles of other compartments, such as gravel, cobble, and bedrock areas.
- This work in no way supplants need for other programs proposed or under way..

Expected Timing

- September/October/Early November 02 for sampling. Sediments and soils nearly concurrent, although field crews may differ.
- Initial analytical soon after sampling.
- Dating 1H03.
- Initial conclusions in time for 2003 season follow-up, if appropriate.
- Final report 2-3Q03.

From Science Team...

- Proceed with detailed plan?
- Ideas, comments, suggestions...