

Mesocosm Development for Manipulative Experiments

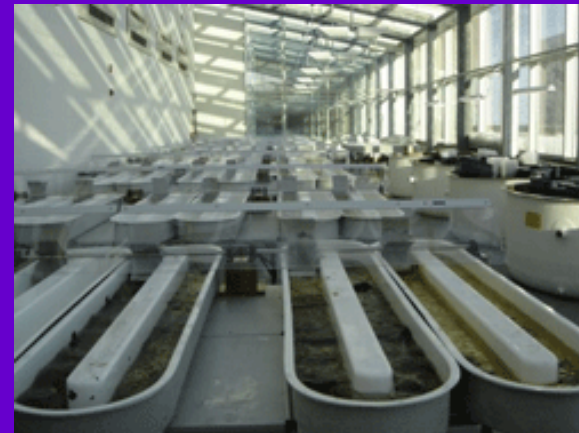
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April 23, 2010



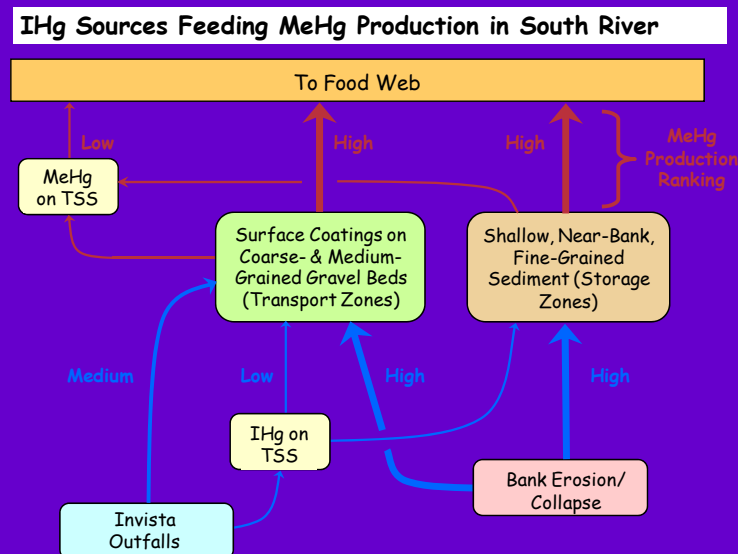
What is a Mesocosm?

- A scaled-down representation of the real-world environment that can be used for experimentation
- Bridges the gap between laboratory and field experiments



Why a Mesocosm?

- Growing need for manipulative experimentation
 - Test elements of working conceptual model
 - Test potential remedial strategies
- Mesocosms provide an appropriate platform for performing manipulative experiments
 - Level of environmental realism, while still allowing control of critical variables



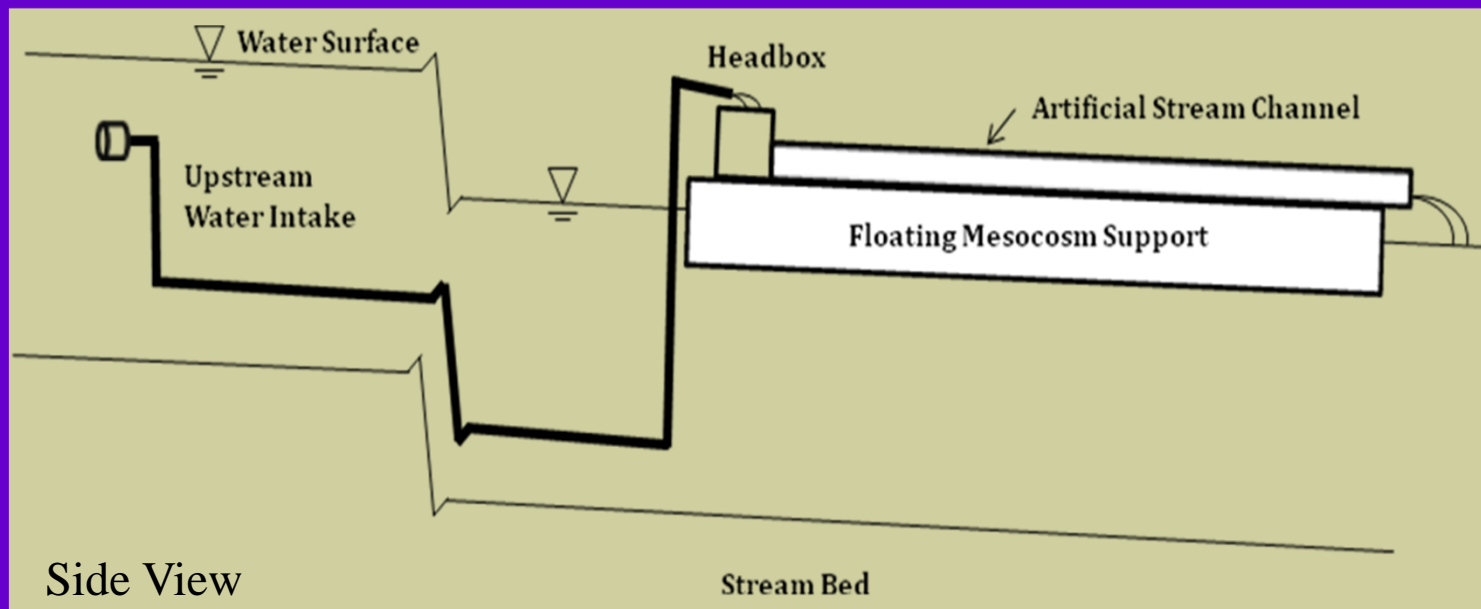
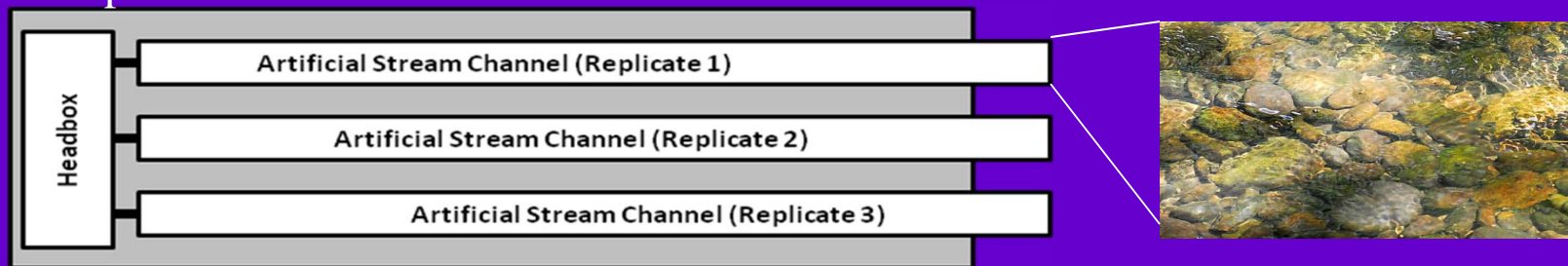
Plans for the Summer

- Task 1 – Research, design, and construct an experimental mesocosm in the South River
- Task 2 – Field test mesocosm design
- Task 3 – Manipulative experimentation
 - Relative importance of waterborne or sediment-derived mercury
 - Impact of hyporheic flow on mercury uptake

Mesocosm Design

- Task 1 – Research, design, and construct an experimental mesocosm in the South River

Top View



Side View

Stream Bed

Possible Materials



PVC pipe



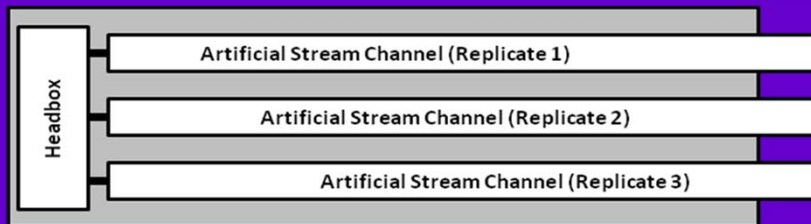
Channel Drains

Extruded PVC Channel Drain



Field Testing

- Task 2 – Field test mesocosm design
 - Does the mesocosm physically perform well under a range of conditions?
 - Is Hg uptake in mesocosm periphyton similar to river periphyton?
 - Place sterilized rocks in river and mesocosm
 - Measure Hg in periphyton at various intervals of growth



Vs.



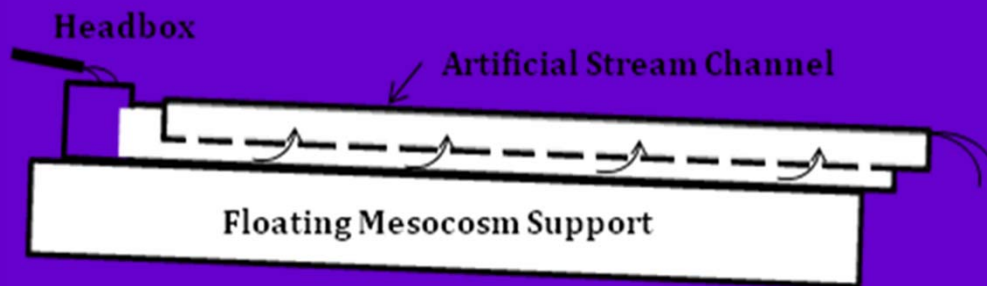
Experiment 1

- What is the relative importance of waterborne or sediment-derived mercury in determining uptake into the biological community?
- 2x2 experimental design with clean/dirty water and clean/dirty sediment

		Sediment Source	
		Uncontaminated Tributary	South River
Water Source	Uncontaminated Tributary	Negative Control	Treatment 1
	South River	Treatment 2	Positive Control

Experiment 2

- What is the relative importance of hyporheic flow in determining Hg uptake into the biological community?
- Similar set-up to previous experiment, but with and without hyporheic flow



		Sediment Source	
		Uncontaminated Tributary	South River
Water Source	Uncontaminated Tributary	Negative Control (w/ hyporheic)	Treatment 1 (w/ hyporheic; w/out hyporheic)
	South River	Treatment 2 (w/ hyporheic; w/out hyporheic)	Positive Control (w/hyporheic)

Additional Experiments

- Simulated bank erosion additions
- Impact of nutrient enrichment (or reductions) on Hg uptake in periphyton
- Pilot scale trials of remedial options involving adsorbents or capping