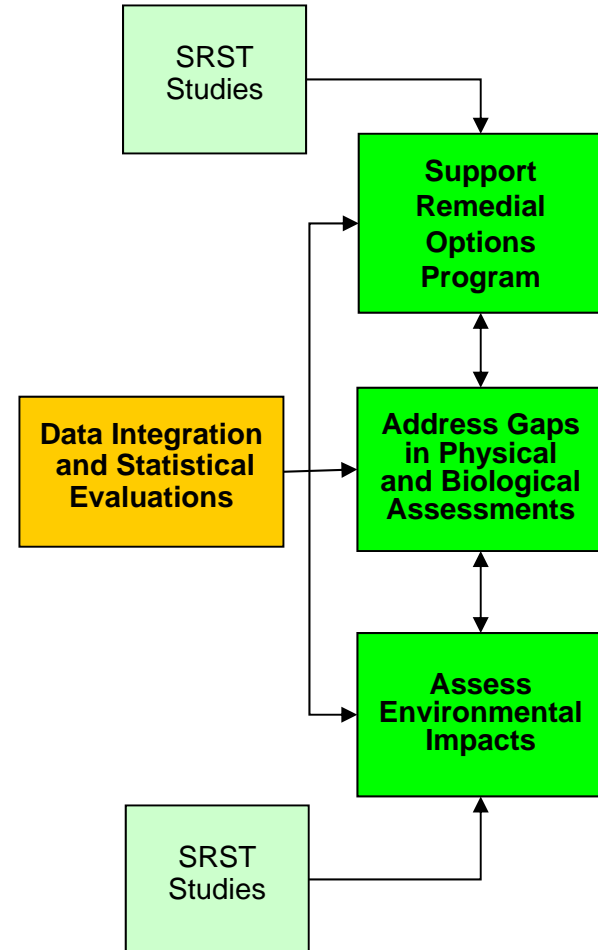


Phase II Conceptual Work Plan 2010



Phase II



Proposed Work Efforts in 2010

- 1. Support Remedial Options Program by gathering post stabilization data at Study Area 1 and baseline data for second pilot study near RRM 11.8**
- 2. Assess potential impacts to aquatic invertebrate community at Phase II Study Areas and a Reference Area**
- 3. Investigate the suitability of food web models (e.g., BASS model) to integrate various physical and biological data sets and evaluate the movement and disposition of MeHg in the aquatic environment**
- 4. Continued monitoring for surface water and bass tissue at proposed locations**

Supporting the Remedial Options Program

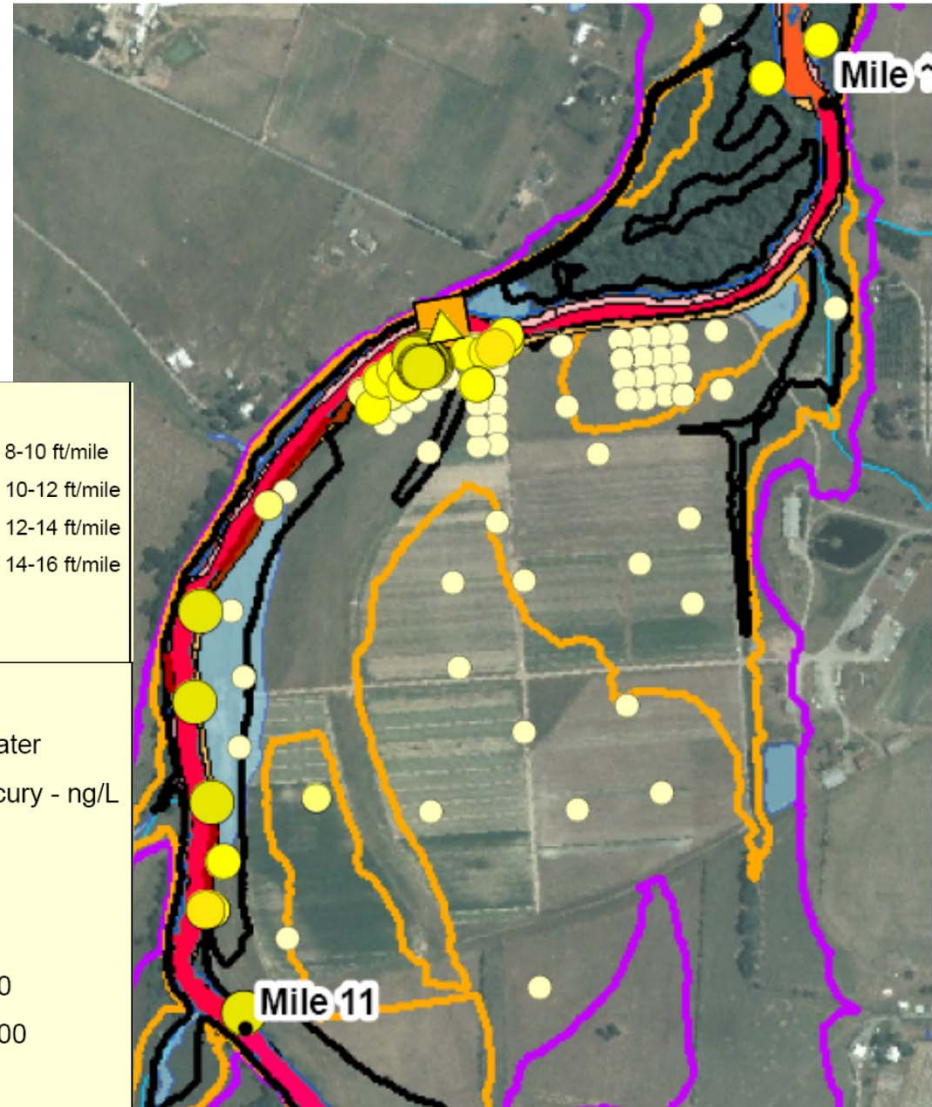
- Pilot 1 - Gather post stabilization data at Study Area 1
 - Collect physical loading data - evaluate porewater, surface water, and near-bank sediment
 - Collect biological loading data - evaluate seeded clams along the recently stabilized bank and within the river channel
- Pilot 2 (in development) - Gather baseline data to characterize a new Phase II Study Area at RRM 11.8
 - collect baseline physical and biological data

Phase II Study Areas Selection Steps – RRM 11.8

Phase II Study Locations Selection:

- Located in areas that allow safe work access to the river
- Corresponding with river-bank floodplain features (HRADs and LiDAR stations) and areas with FGCM deposits
- Located proximal to previous data collections including food web study; integrated with ongoing SRST studies
- Located along South River Study Area within an area of proposed pilot studies

Map of RRM – 11.8



Legend

- RRM Intervals
- Wetlands
- Rivers and Streams
- Bridges
- 2-Year Floodplain
- 5-Year Floodplain
- 62-Year Floodplain
- Historic Release Age Deposit Sample Sites
- Hist. Channel Migration - Flux
- Deposition
- Erosion
- SW Gradient Change
- 2 ft/mile
- 2-4 ft/mile
- 4-6 ft/mile
- 6-8 ft/mile
- 8-10 ft/mile
- 10-12 ft/mile
- 12-14 ft/mile
- 14-16 ft/mile

Explanation

| Soils | Sediment | Baseline Surface Water |
|-----------------------|-----------------------|---------------------------------|
| Total Mercury - mg/kg | Total Mercury - mg/kg | Unfiltered Total Mercury - ng/L |
| ○ 0.00 - 5.00 | △ 0.00 - 5.00 | □ 0.00 - 20.00 |
| ○ 5.00 - 10.00 | △ 5.00 - 10.00 | □ 20.00 - 50.00 |
| ● 10.00 - 23.00 | △ 10.00 - 23.00 | ■ 50.00 - 75.00 |
| ● 23.00 - 50.00 | △ 23.00 - 50.00 | ■ 75.00 - 100.00 |
| ● 50.00 - 100.00 | △ 50.00 - 100.00 | ■ 100.00 - 200.00 |
| ● > 100.00 | △ > 100.00 | ■ > 200.00 |

Assessing Potential Impacts to Aquatic Invertebrate Community – Triad Study

- Sample collection targeted in May 2010
- Sample locations at Phase II Study Areas 1, 3, 8, and RRM 11.8 and one reference area (likely on the Middle River)
- Bulk sediment collection in pools using suction sampler (sand and silts used for laboratory bioassays)
- Co-located invertebrate community samples using Surber or Hess sampler (3 replicates)

Triad Sample Methodology

Sediment parameter list:

- methylmercury and mercury
- TOC
- Sulfide

Bioassay Test (Method 100.1) - 10-d Survival and Growth Test for:

- *Chironomidae dilutus*
- *Hyalella azteca*

Assessing Potential Impacts to Aquatic Invertebrate Community - Field Microcosm Study

Sample event targeted in August to correspond with highest densities of immature insect taxa

Microcosms consist of substrate filled trays allowed to colonize for 30-days at a reference station

Methods will follow those outlined in Clark and Clements (2006):

- Colonized trays will be randomly assigned to triad locations (3 replicates at each location including a reference location)
- Trays will be sealed (with screen mesh holes on top, bottom, and sides) and retrieved after a 7-day exposure period
- Tray contents will be combined at each location and the invertebrate community sorted and identified
- Density and size distributions for select taxa will also be measured

Understanding Movement and Disposition of MeHg in the Aquatic Environment

Integrate physical statistical models for surface water/sediment and biological data sets using a food web bioaccumulation model

Example: Bioaccumulation and Aquatic System Simulator (BASS) Model

- simulation program that predicts the population and bioaccumulation dynamics of age-structured fish assemblages
- has been used to simulate fish methylmercury bioaccumulation in the Florida Everglades and in the South River (Murphy 2004)
- has been used to estimate lag times of mercury residues in fish responding to mercury load reductions (Knightes et al. 2009)

Understanding Movement and Disposition of MeHg in the Aquatic Environment

Evaluate model parameters and determine data needs in 2010. Potential data components:

- Fish community population and structure (depletion sampling)
- Invertebrate community data (as part of the Triad Study)
- Mercury concentrations in prey compartments (data sets from 2006, 2007, and 2009)

Develop model to evaluate bioaccumulation along four potential sections of South River:

- Phase II Study Area 1
- Phase II Study Area 3
- Proposed Phase II Study Area at RRM 11.8
- Phase II Study Area 8

Phase II Surface Water Monitoring Locations

| South River Monitoring Locations | 2007-2009 | | Proposed in 2010 |
|----------------------------------|-----------|------------|------------------|
| | VADEQ | Eco. Study | |
| Port Republic (Approx. RRM-23) | x | x | x |
| Grand Caverns (Approx. RRM-20) | | x | |
| Harriston (Approx. RRM-17) | x | x | x |
| Crimora (Approx. RRM-10) | x | x | x |
| Dooms (Approx. RRM-5) | x | x | x |
| Hopeman Parkway (Approx. RRM-2) | x | x | x |
| Main Street (Approx. RRM-0.1) | x | x | x |
| Lyndhurst Ave (Approx. RRM- -3) | x | x | x |

- Phase II surface water sampling will be conducted on a quarterly basis
- Parameter list will be expanded to include VADEQ monitoring list
- Sample at Grand Caverns will be dropped

Biological Monitoring of THg in Bass Tissue

Objective

Track and evaluate seasonal and inter-annual changes in THg concentrations in the muscle tissue of smallmouth and largemouth bass

Study Locations / Timing

- Add one additional study location near RRM 5.0
- 2009 study locations included Constitution Park (RRM 0.1), Augusta Forestry Center (RRM 11.8), and Grottoes Town Park (RRM 22.0)
- Two monitoring events will be conducted in Spring and late Summer / Fall



Timeline of 2010 Work

| Item | 2010 | | | | | | | | | | | |
|---|-------------------------|-----|-----|-------------------------|-----|-----|-------------------------|-----|-----|-------------------------|-----|-----|
| | 1 st Quarter | | | 2 nd Quarter | | | 3 rd Quarter | | | 4 th Quarter | | |
| | JAN | FEB | MAR | APR | MAY | JUN | JUL | AUG | SEP | OCT | NOV | DEC |
| Workplan Development | ■ | ■ | | | | | | | | | | |
| Phase II Field Work | | | | | | | | | | | | |
| Develop Phase II Study Area at RRM 11.8 | | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | ■ | | |
| Study Area 1 Physical and Biological Loading Data | | | | | ■ | | | | | | | |
| Triad Study | | | | | ■ | | | | | | | |
| Field Microcosm Study | | | | | | | | ■ | | | | |
| Fish Community Population Survey | | | | | ■ | | | | ■ | | | |
| Baseline Monitoring | | | | | | | | | | | | |
| Surface Water (VADEQ and/or Eco. Study) | ■ | ■ | ■ | | ■ | ■ | ■ | ■ | ■ | ■ | ■ | |
| Bass Tissue | | | | | ■ | | | | ■ | | | |
| Data Evaluation | | | | | | | ■ | ■ | ■ | ■ | ■ | ■ |

References

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