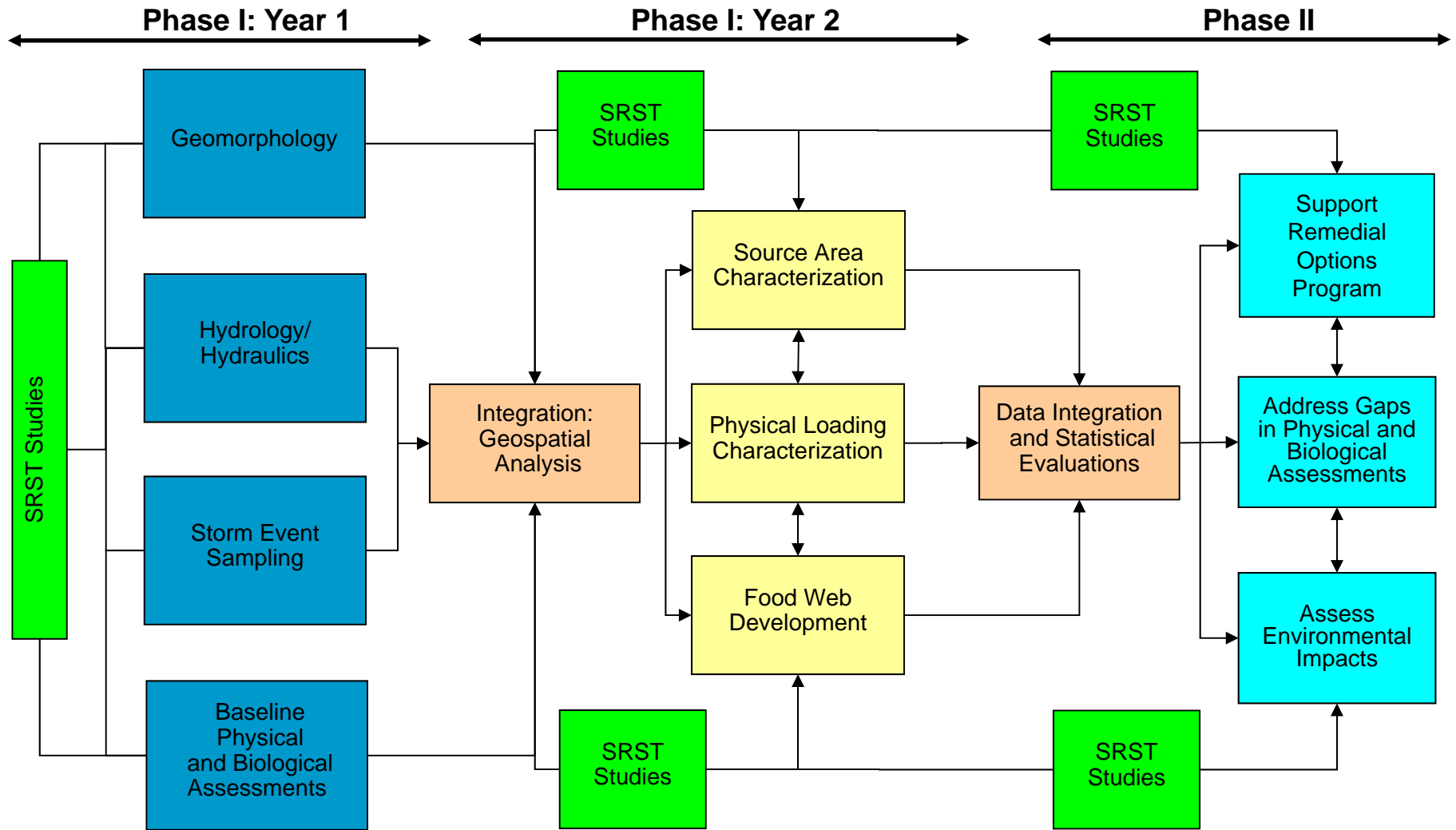


# Ecological Study: Phase II Plans

SRST Meeting: April 23, 2010



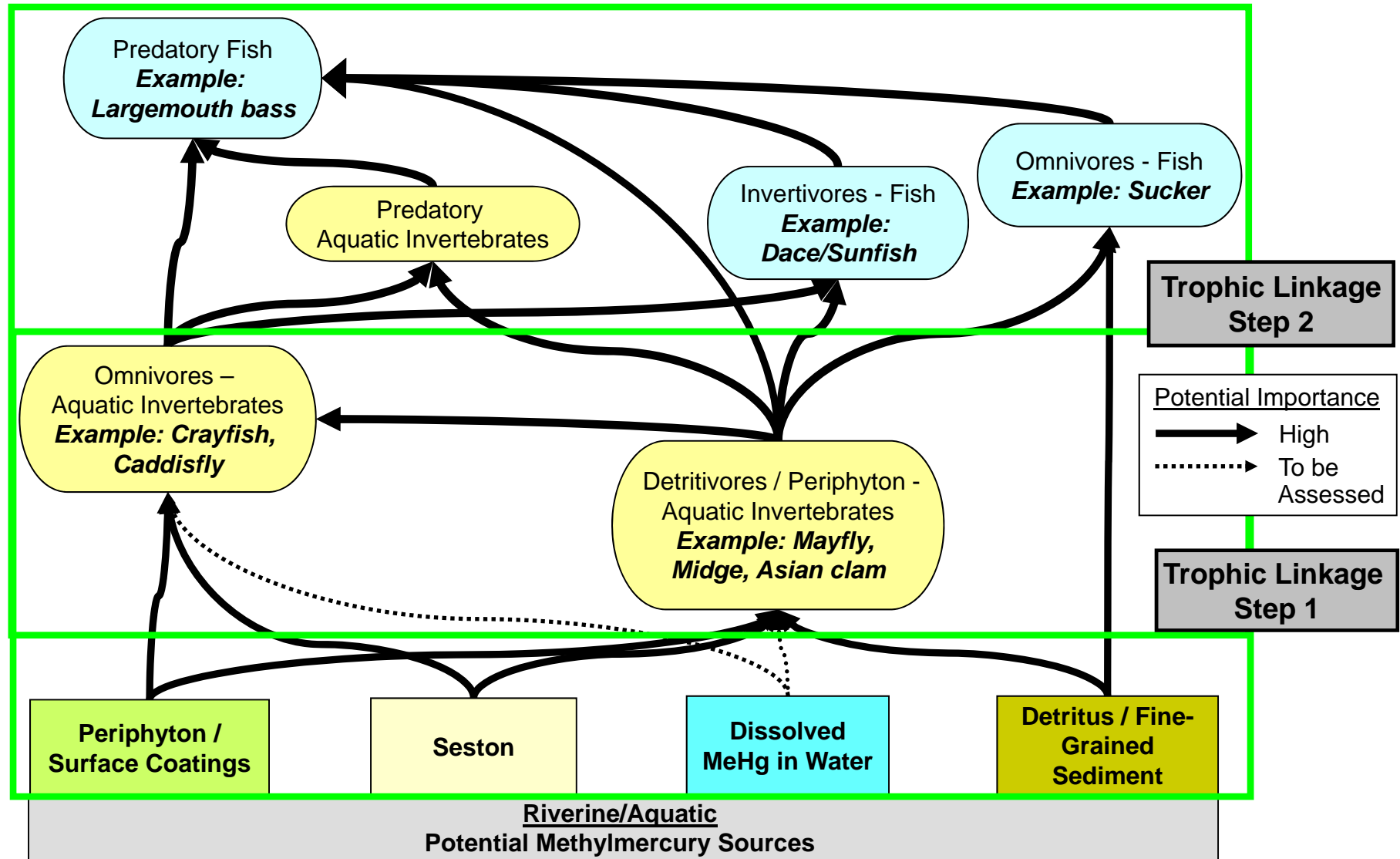
# Overview: Ecological Study



# Work Efforts in 2010

- 1. Support Remedial Options Program**
- 2. Assess potential impacts to aquatic invertebrate community**
- 3. Continue monitoring surface water and fish tissue**
- 4. Collect and integrate various physical and biological data sets to evaluate the movement and disposition of MeHg in the aquatic environment**

# Simplified Conceptual Pathway for MeHg Bioaccumulation



# Trophic Linkage Study – Step 1

## Objectives:

- Assess the importance of basal resources (i.e. carbon sources) to primary consumers using riffle and pool habitats in the South River habitats through stable isotopic ratios
- Evaluate THg and MeHg concentrations in surface water, basal resources (detritus/sediment, periphyton, and seston), and primary consumers
- Assess the relative importance of THg and MeHg uptake by aquatic invertebrates through dietary and aqueous pathways

Hydropsychidae



Baetidae



Chironomidae



# Trophic Linkage Study

## Stable Isotope Study Methods:

1. Phase II Study Areas in select riffle and pool habitats
2. Deploy artificial substrates for colonization
3. Standardized parameters, including depth, substrate, velocity, and canopy cover
4. Collect five composite samples of most sample types for stable isotope analysis ( $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}$ )
5. Data analyses will include the use of isotopic mixing models and will be conducted by Dr. Michael Newman at VIMS

# Targeted Samples and Organisms

## Riffle Habitats

1. Basal Resources - Epilithic periphyton
2. Detritivores/Herbivores - Mayflies (Baetidae, Ephemerellidae, and/or Heptageniidae)
3. Omnivore - Crayfish
4. Invertivore - Cyprinidae



## Pool Habitats

1. Basal Resources - Detritus/sediment, seston, and epiphytic and epilithic periphyton
2. Detritivores/Herbivores - Asian clam *Corbicula fluminea* and mayfly (Baetidae)
3. Omnivore - Caddisfly (Hydropsychidae)
4. Invertivore - Cyprinidae/Centrarchidae

# Mercury Uptake Study

## Study Methods:

1. Phase II Study Areas (except RRM0.1)
2. Artificial substrates trays will be placed into test chambers
3. Two types of test chambers will be employed to evaluate uptake; aqueous exposure and aqueous plus diet exposure
4. Study will evaluate two organisms collected at reference locations; Detritivores/Herbivores - Mayfly (Heptageniidae) and Omnivore - Crayfish

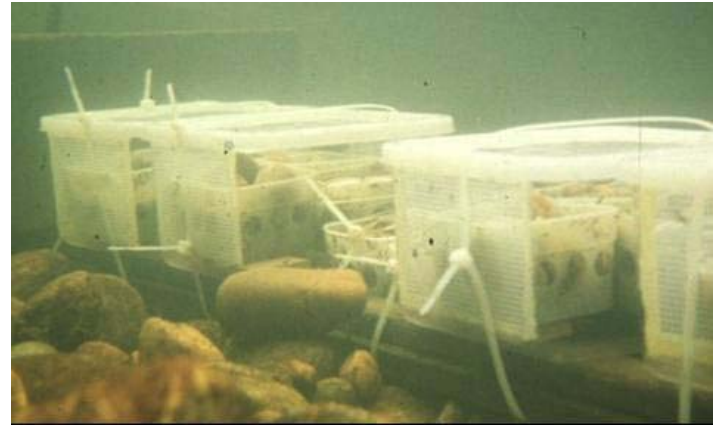


Photo courtesy of Dr. Clement



# Data Collections for Mercury Uptake Study

## THg and MeHg Sampling on Day-0 (Baseline) and Day-7

1. Physical Media - Surface water
2. Basal Resources -  
Detritus/sediment, seston, and  
periphyton
3. Test organisms (mayfly and  
crayfish)



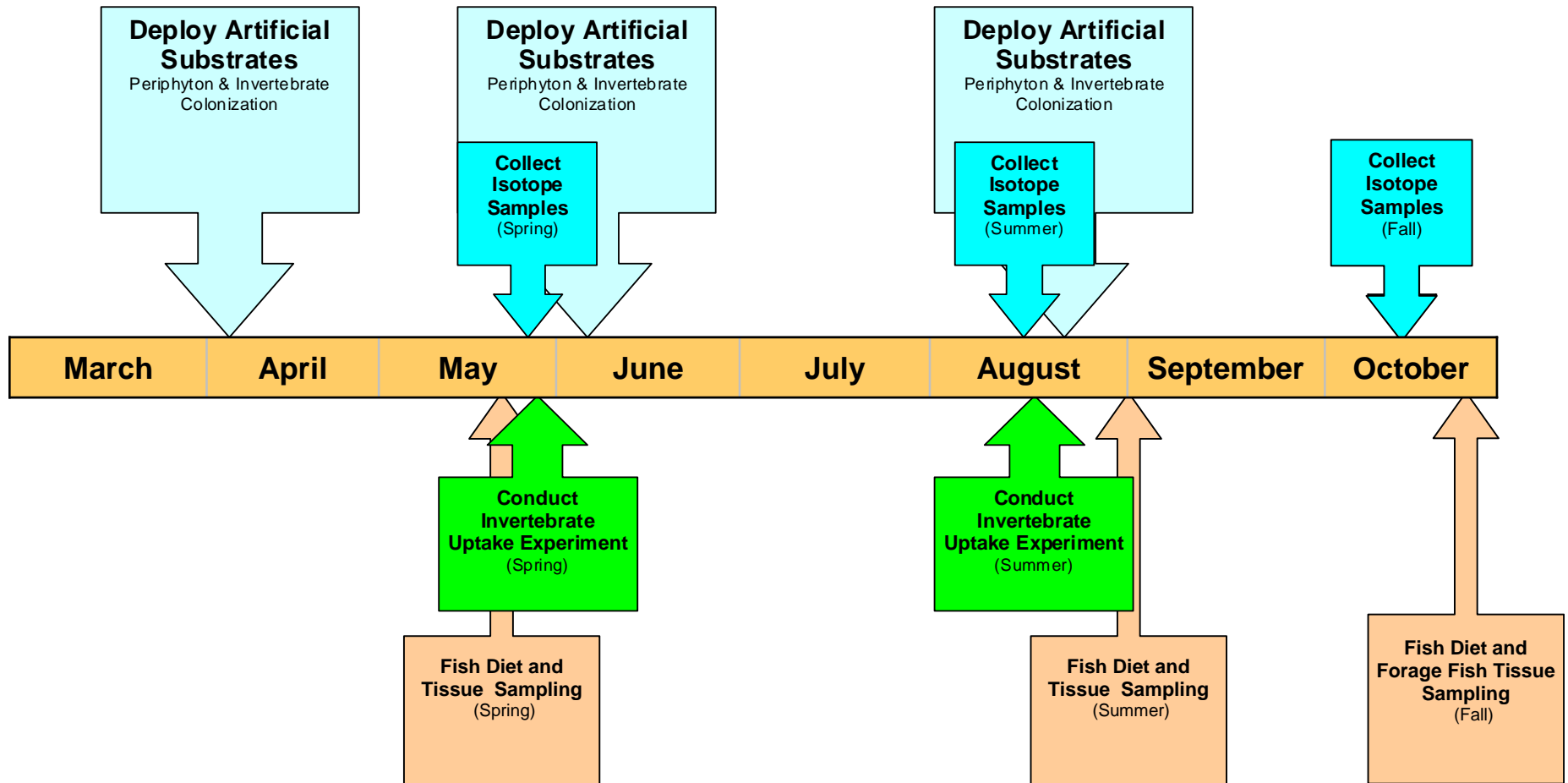
# Trophic Linkage Study – Step 2

## Objectives:

- Evaluate THg concentrations in whole-body forage fish and muscle biopsies for bass and sunfish
- Characterize the diets of forage fish using riffle and pool habitats
- Characterize the diets of largemouth bass and gather additional diet data for smallmouth bass and sunfish



# Study Timing



# Understanding Movement and Disposition of MeHg in the Aquatic Environment

## Data Uses

- Evaluate food resource partitioning for first order aquatic consumers in riffle and pool habitats using stable isotope ratio analyses
- Assess the relative importance of MeHg uptake by aquatic invertebrates through dietary and aqueous pathways
- Fish diet data and tissue data will be used to update and field test food web bioaccumulation models such as the Bioaccumulation and Aquatic System Simulator (BASS) Model

# Ecological Study Path Forward

- Data Collections Spring, Summer, and Fall
- Next meeting with NRDC in December 2010