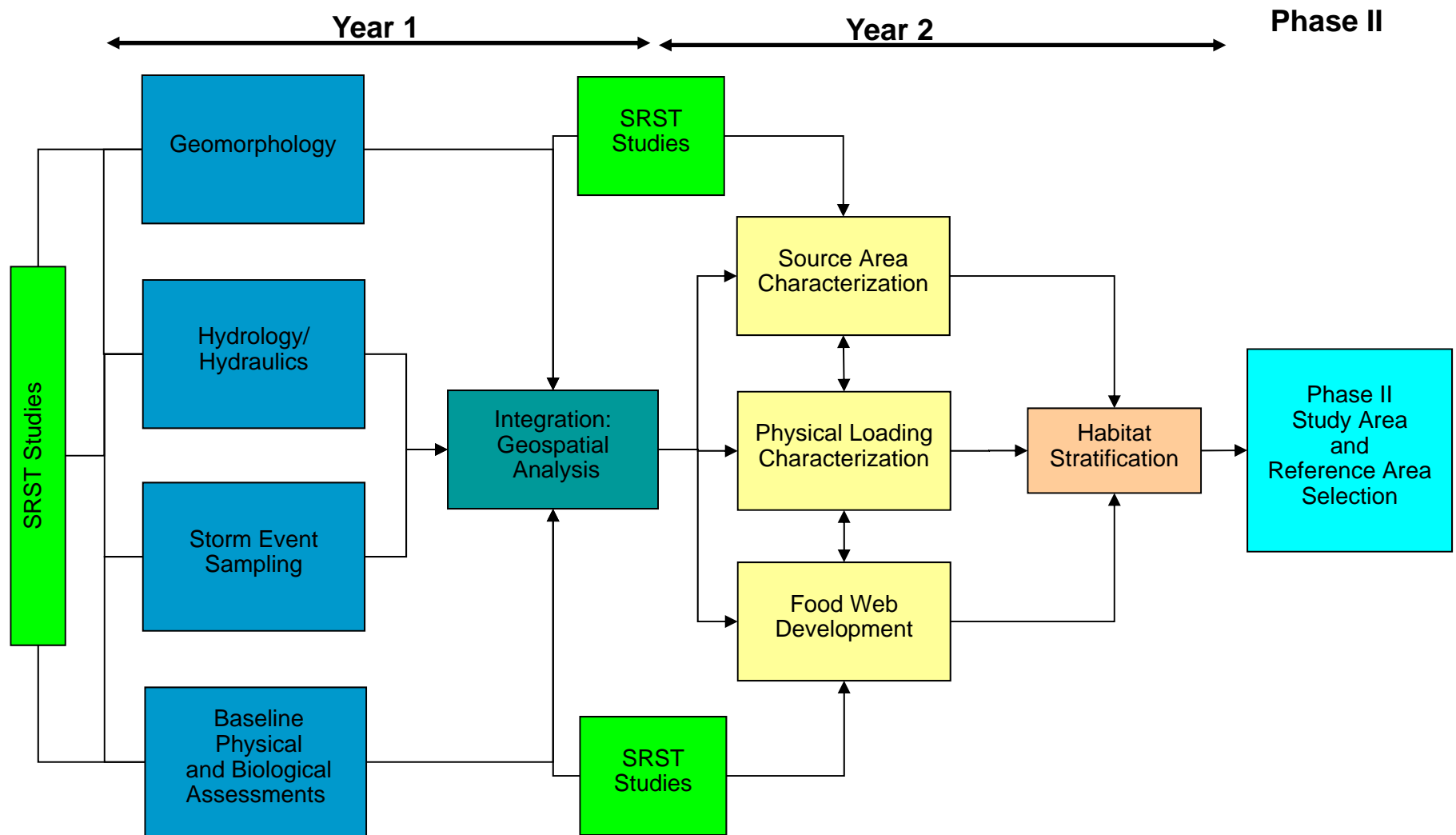


Phase I System Characterization: Ecological Study of the South River and a Segment of the South Fork Shenandoah River, Virginia



Overview: Phase I Ecological Study



Geomorphology – Jim Pizzuto, University of Delaware

Objectives:

- Characterize basic river geomorphology and physical features
- Define areas of fine-grained sediment storage in the floodplain and within the river channel
- Locate areas of sediment and soil erosion and estimate erosion rates
- Develop an annual fine-grained sediment budget
- Develop preliminary estimates of rates of transfer between the fine-grained storage areas within the river channel



Hydrologic and Hydraulic Analyses – Mary Roman, URS

Objectives:

- Develop elevation-discharge relationships (rating curves) for storm and baseline sampling locations
- Define inundation areas for various storm recurrence intervals
- Develop a predictive hydraulic model for the South River



Hydrologic and Hydraulic Analyses

How will this information be used?

1. Allow estimation of discharge to calculate loading during baseline flow and storm events
2. Predict inundation areas and geomorphic features likely to flood during storms
3. Predict floodplain boundaries for a range of recurrence intervals, including historic floods

Storm Event Sampling – URS, RT Geosciences

Objectives:

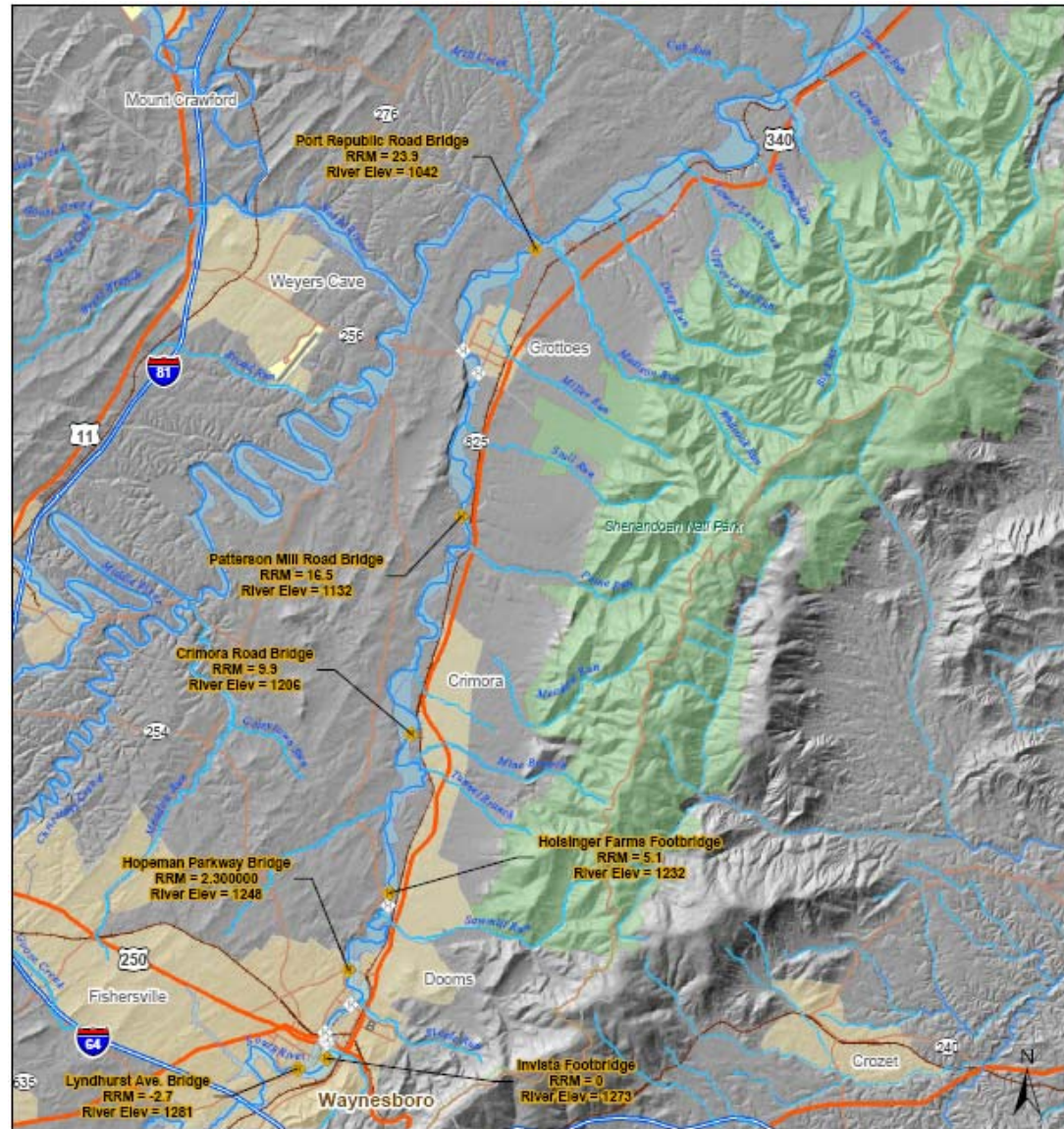
- Determine concentrations of total and dissolved total mercury (THg) and methylmercury (MeHg) in surface water over storm hydrographs
- Integrate/evaluate manual and automated stormwater sampling techniques
- Collect data to measure loading during storm events and determine contributions within reaches



Storm Event Sampling Locations

Sampling Goals:

- One storm event of > 500-cfs flow each season at 7 bridge locations
- Collection of discrete surface water samples over various intervals on the hydrograph
 - baseline conditions
 - 3-hr intervals during rising discharge
 - 1, 3, 5, and 7-days during falling discharge



Baseline Physical and Biological Assessments - URS

Objectives:

- Collect baseline physical, chemical, and biological data along the study area
- Provide monthly data regarding mercury concentrations and cycling in specific media types along the study area
- Gather information and data to be integrated with other studies and focus future ecological investigations for Phase II



Baseline Physical and Biological Station Selection Process

- 16 initial stations
 - Study Area (13)
 - South River station nomenclature based on river mile from Waynesboro facility
 - Reference areas (3)
 - Two locations on North River
 - One location on South River upstream of the former Waynesboro facility
- One riffle/pool unit selected within each scored reach
 - Riffle/pool unit integrates localized influences and physical features
 - Riffle/pool unit allows collection of data from primary habitat types in river

Baseline Physical and Biological Station Selection Process

Habitat Characterization and Scoring:

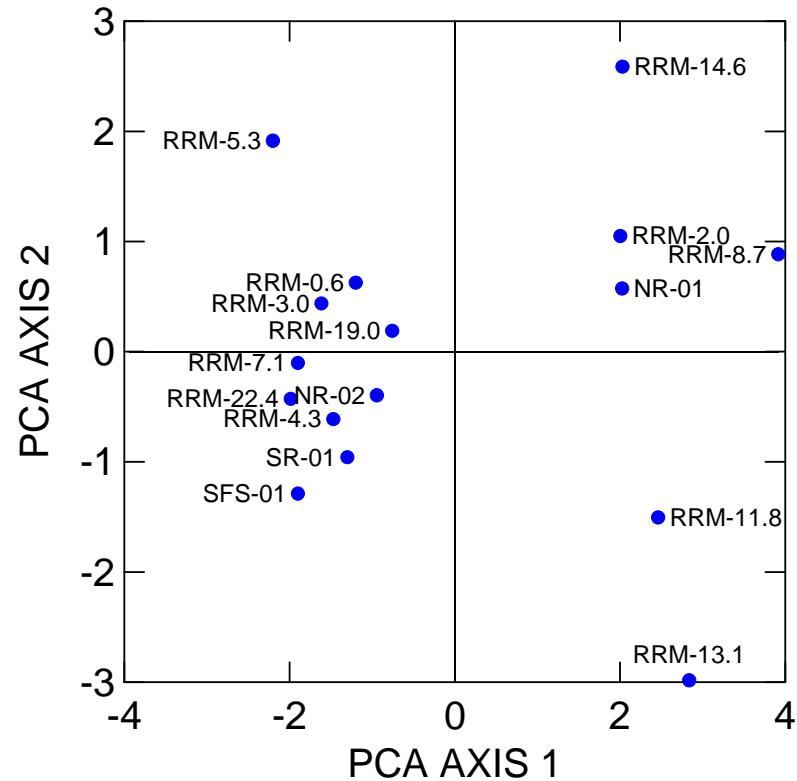
- Habitat characteristics based on EPA Rapid Bioassessment Protocols
- 30Xs the wetted channel width scored (approx. 0.6-1.6 kilometers)
- Scoring used to determine/justify reference and study area locations
- Characterization used to select riffle/pool unit for baseline assessments and media sampling

Habitat Characteristics

Epifaunal Substrate / Available Cover
Embeddedness
Velocity/Depth Regime
Sediment Deposition
Channel Flow Status
Channel Alteration
Frequency of Riffles (or bends)
Bank Stability
Vegetative Protection
Riparian Vegetative Zone Width
Pool Substrate
Pool Variability

Habitat Scoring

Principal Component Scores (Axis 2 v Axis 1) Based on Habitat Scoring



Axis 1 - positive correlation with scores for vegetative cover, riparian width, and frequency of riffles

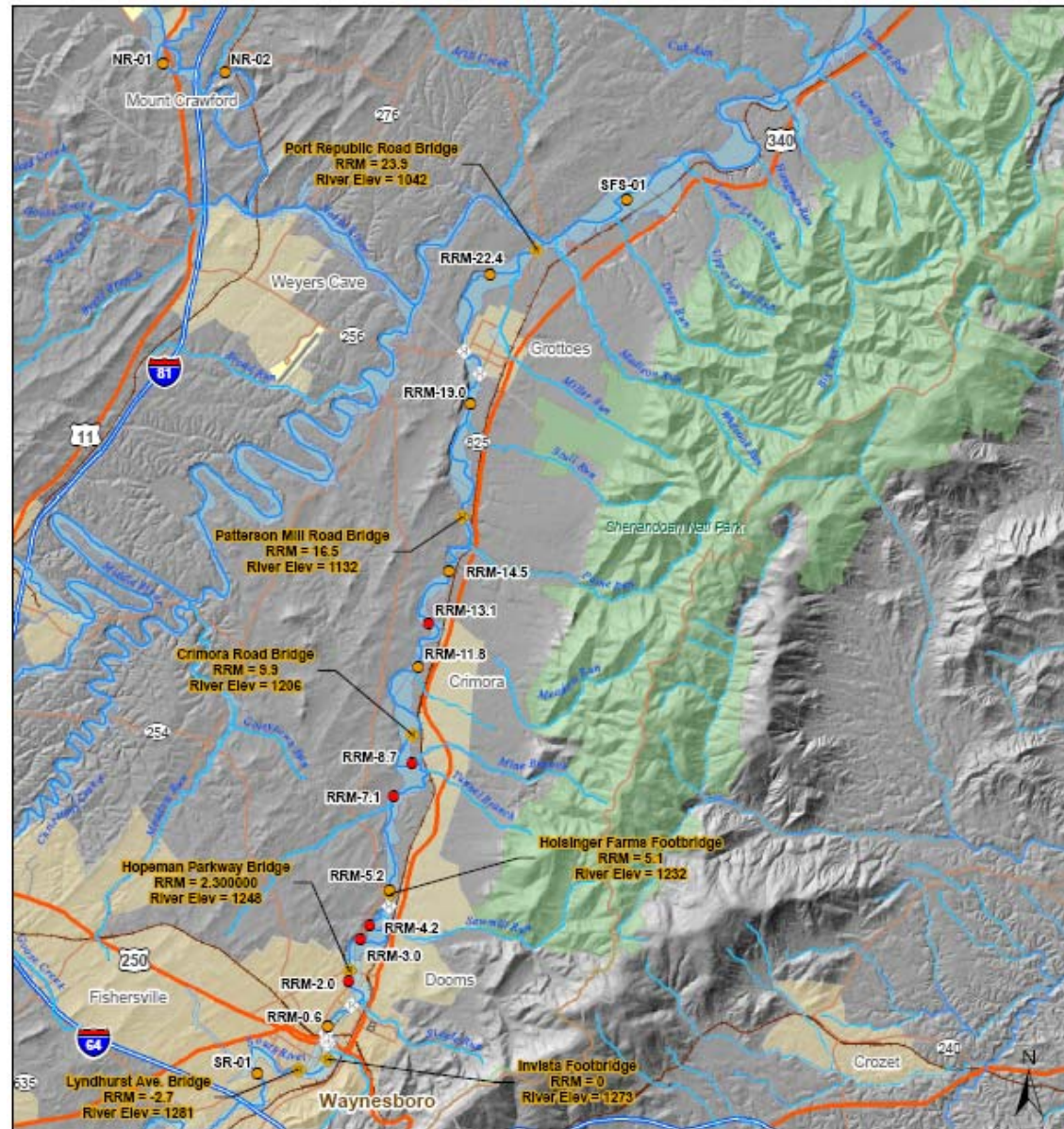
Axis 2 - positive correlation with channel alteration and negative correlation with sediment deposition/embeddedness

Quadrats - Habitat quality increases from I through IV

Physical and Biological Assessment Locations

Sampling Includes:

- Monthly collections of surface water, sediment, and crayfish tissue
- Quarterly collections of other biological tissue
- Quarterly assessments of biological communities (fish biannually)



Schedule of Activities in 2006

- Components of the geomorphic study are ongoing
- Work to begin in March and April for all other facets of the study including:
 - Hydrologic and Hydraulic Analyses
 - Stormwater Sampling
 - Physical and Biological Assessments

Phase I - Year 2 Study Direction

Physical Loading Studies Continued

- Passive stormwater samplers
 - Measure THg loading from banks, scour routes
- Benthic flux chambers
 - Measure flux of dissolved THg and MeHg

Source Characterization

- Physical characterization of flood plain soils, wetlands and other depositional features within targeted reaches
- Methylation assays and selective sequential extraction
 - Measure relative bioavailability of soils, sediments or other materials

Food Web Characterization

- Assign trophic relationships based on community surveys
- Incorporate Phase I tissue samples with C/N isotope work (VIMS)
- Other SRST tissue studies