A scanning electron micrograph (SEM) showing a large, elongated, and curved diatom with a highly perforated (reticulated) surface. The diatom is surrounded by other smaller, fragmented diatom structures. The image is in grayscale, highlighting the intricate texture of the diatom's silica shell.

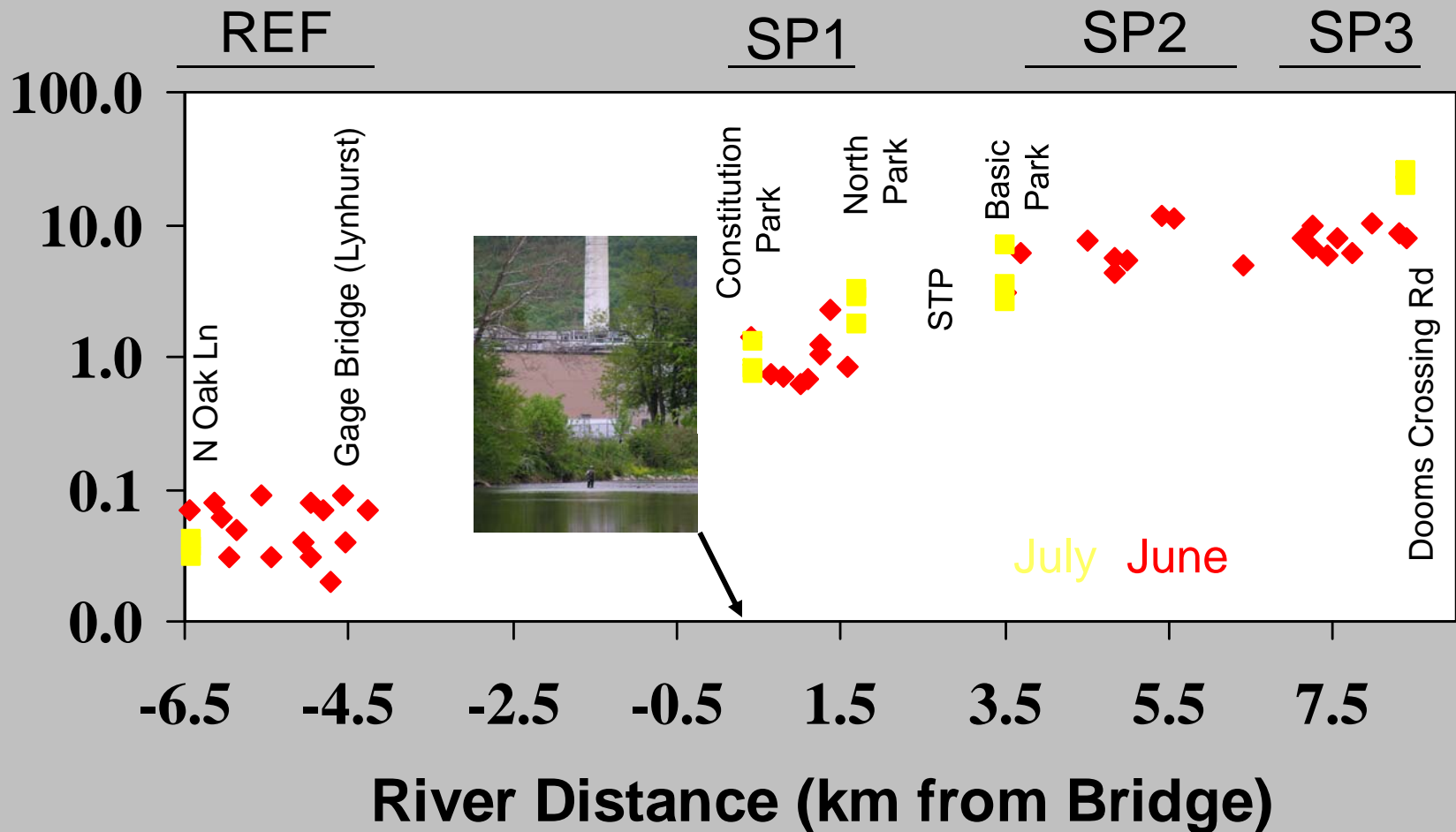
# Periphyton Surveys and Biomagnification Modeling

Prof. Mike Newman

In collaboration with the W&M and URS South River Teams

# Mercury Spatial Distribution

Total Hg (ug/g dry wt)



# Periphyton Update

- \* Extended sampling downriver in trophic modeling efforts
- \* We analyzed additional metals to further understand metal transport/accumulation. Student-Newman-Kuels Test

## WHAT INSIGHTS EMERGE FROM THIS ANALYSIS?

Several metals in addition to Hg increased at Waynesboro

(☒  $^{15}\text{N}$  increased at STP and then decreased, ☒  $^{13}\text{C}$  did not change spatially)

R Distinct patterns so “depositional regime” is not sole driver of  $[\text{Hg}]_{\text{site}}$

If this hypothesis were true, all elements would have roughly the same pattern

S Hg is the only element still increasing after Dooms Crossing

Why? Are several plausible, nonexclusive hypotheses -

- S
1. Relative magnitude of sources dictates metal spatial distributions?
  2. Spatial qualities (floodplain) of sources create differences in spatial distributions?
  3. Trophic domination of Hg dynamics relative to those of the other metals?

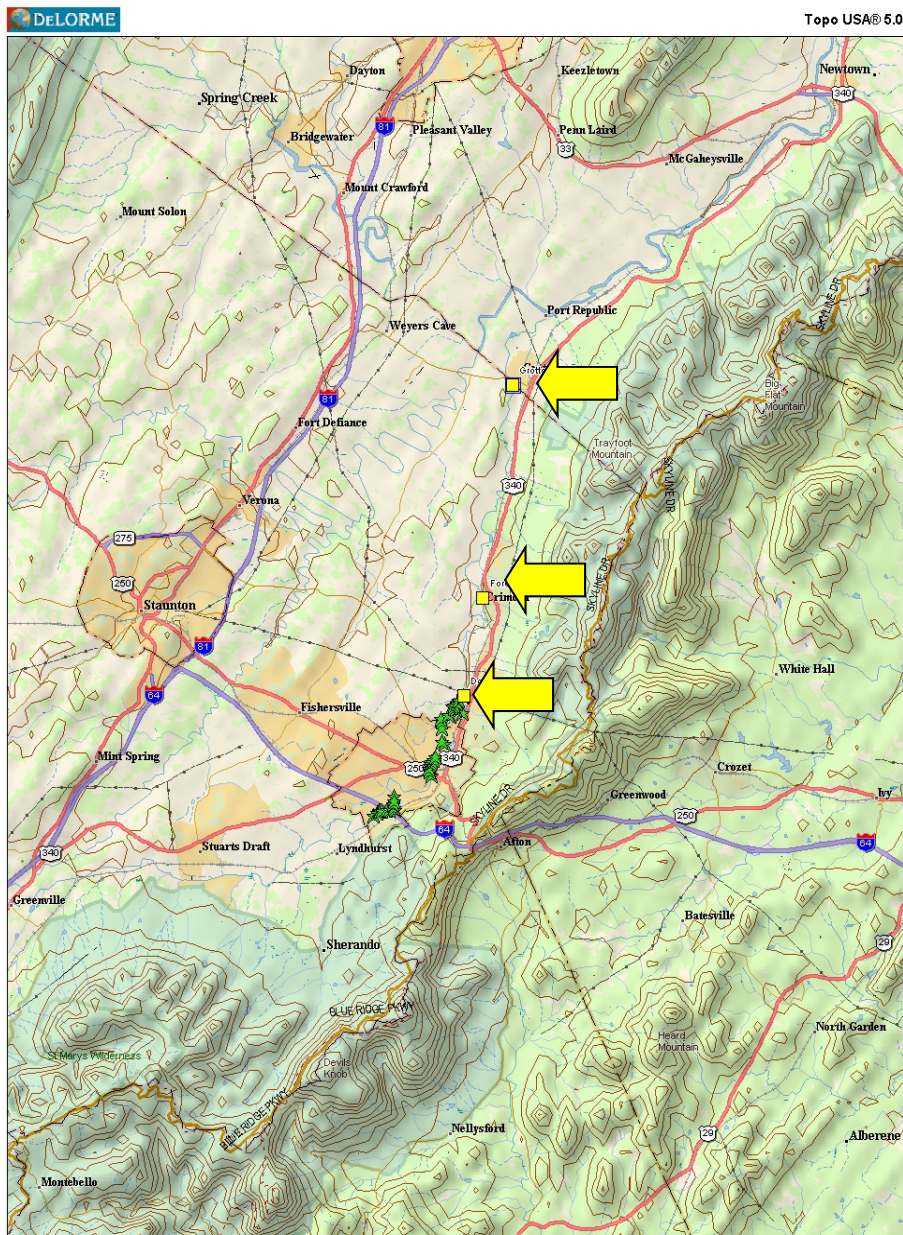
Like nutrients, Hg exhibits elemental “spiraling” that fosters retention?

S Knowing which is/are “true” informs future predictions/remediation themes

EHT=10.00 kV  
Detector= SE1

300nm   
Mag= 7.33 K X

VIMS 16-May-2006  
Photo No.=5294



Data use subject to license.  
 © 2004 DeLorme. Topo USA® 5.0.  
 www.delorme.com



# Current Sampling For Trophic Modeling

Central theme is to coordinate sampling with avian and URS Eco Study (invertebrates & fish) teams for tissue analyses. VIMS team also took samples (e.g., periphyton) to fill gaps.

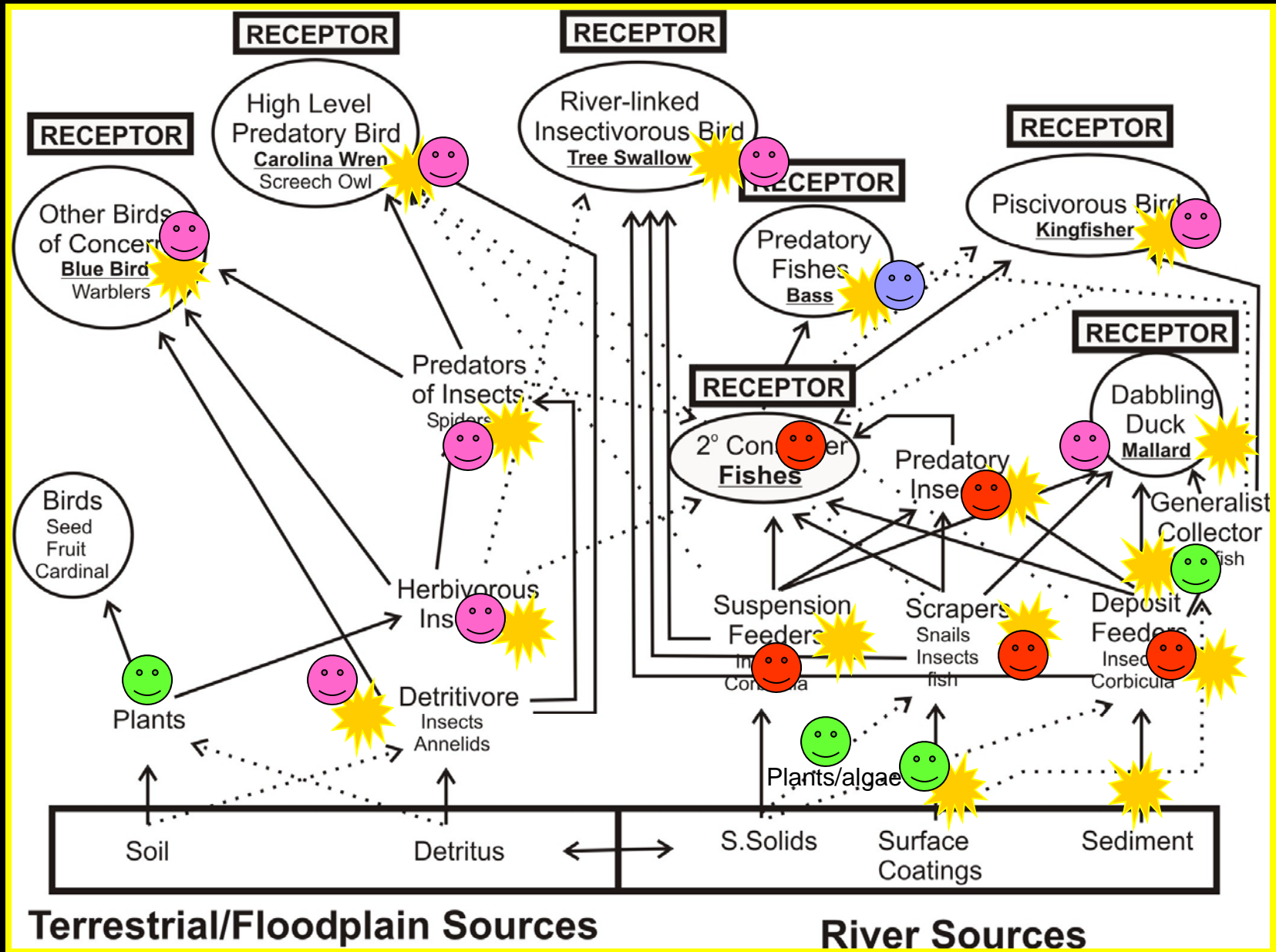
Sites were sampled at

- \*Dooms Crossing (Rt 611)
- \*Crimora (Augusta Forestry Center)
- \*Grottoes (Grottoes Park)

Also took advantage of past fish sampling (larger fish):

- \*1BSTH020.44  
Dooms near Rt 611 bridge
- \*1BSTH014.49  
Crimora at Augusta Forestry Center
- \*1BSTH004.21  
Grottoes near Grand Caverns bridge

# 2006 Trophic Modeling Samples



# Trophic Modeling

## Statistical Fitting of Data to Biomagnification Models:

A separate model will be generated for each site and slopes compared to assess whether a more general model can be generated that includes all sites. Data pairs (total mercury concentration vs  $\delta^{15}\text{N}$ ) will be fit to the model,

$$[\text{Hg}]_i = a + b(\delta^{15} N_i)$$

or, if plots of mercury concentration vs  $\delta^{15}\text{N}$  suggest a power relationship,

$$[\text{Hg}]_i = e^{a+b\delta^{15} N_i}$$

# QUESTIONS?

