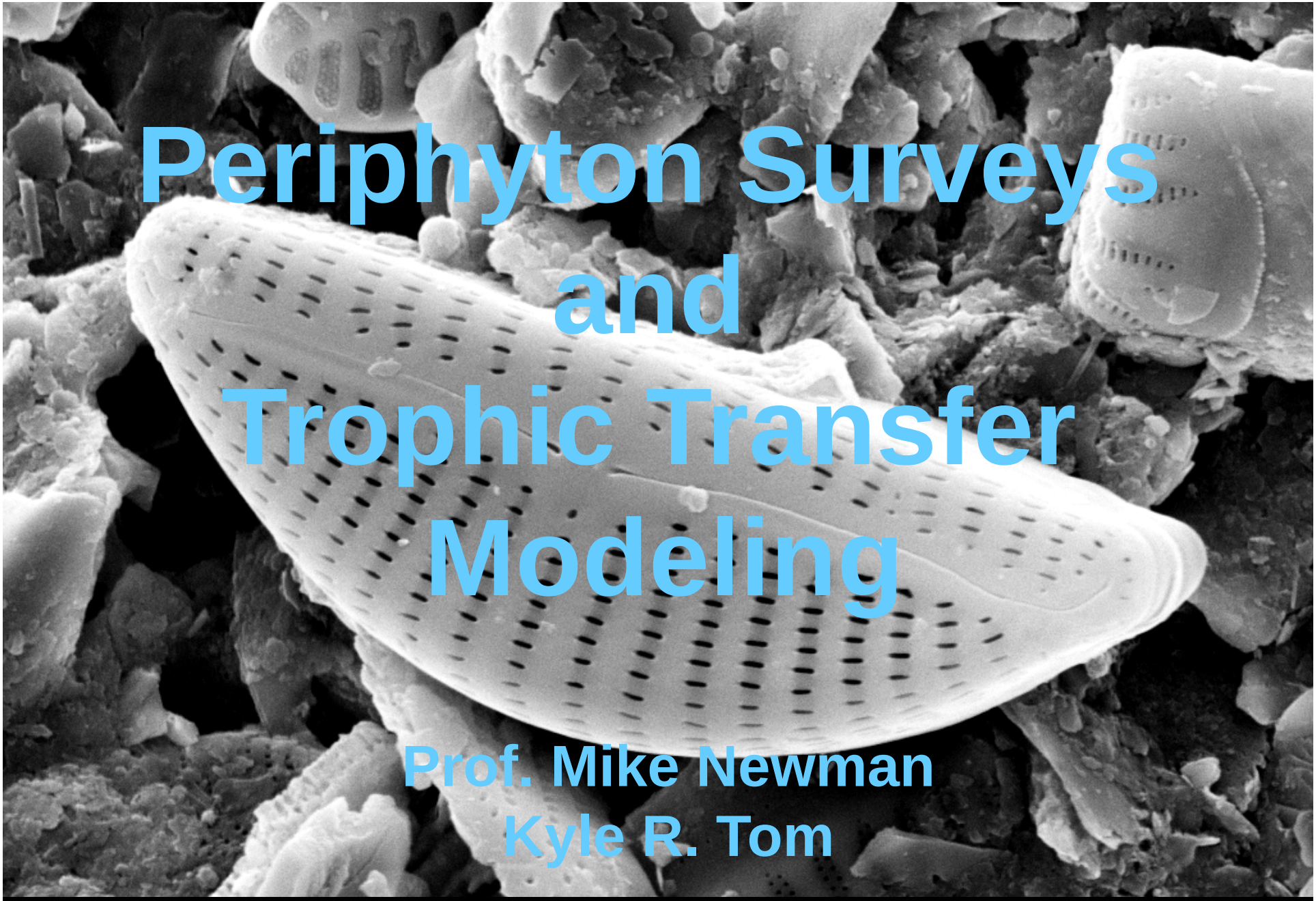
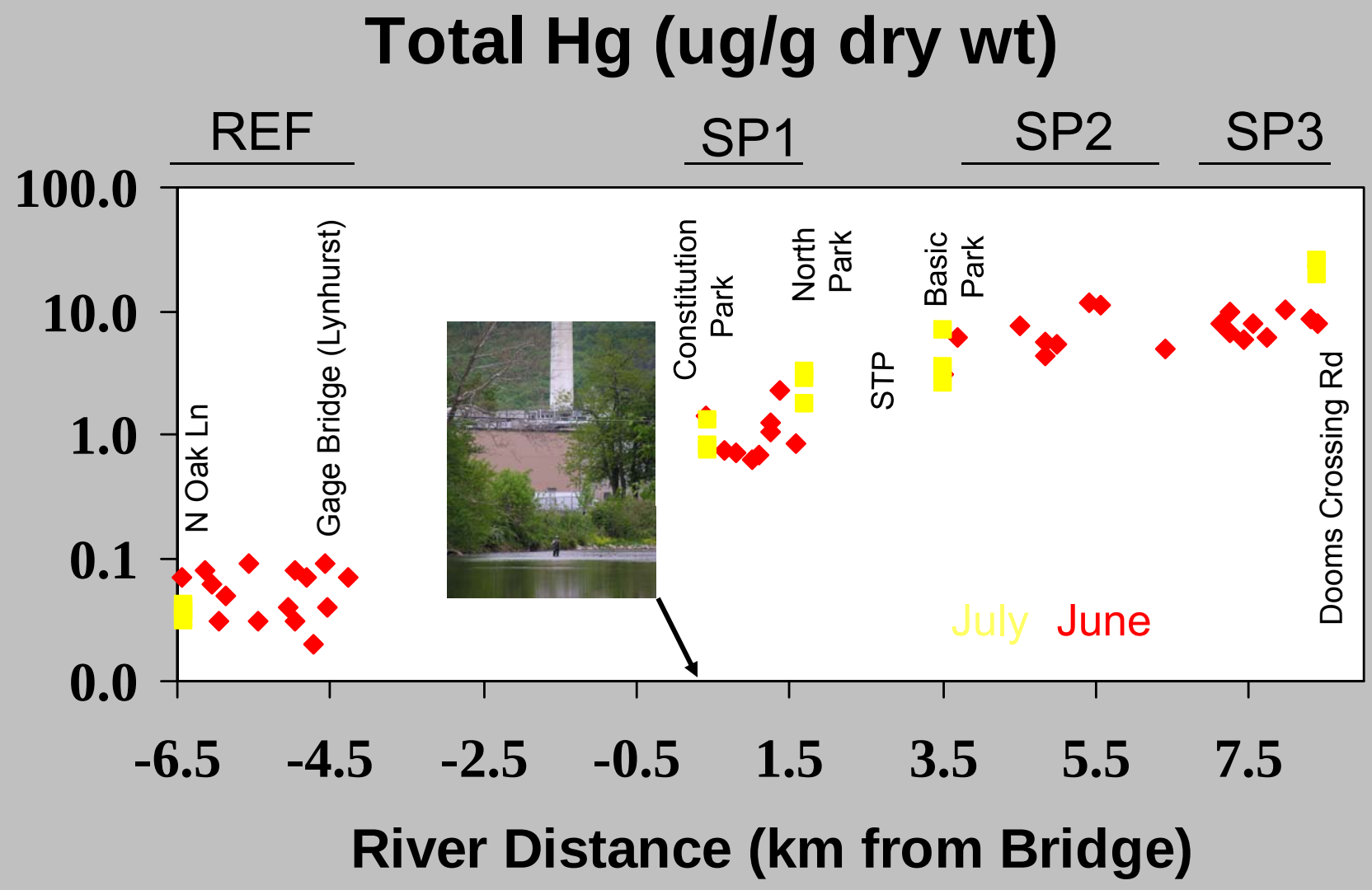


Periphyton Surveys and Trophic Transfer Modeling

Prof. Mike Newman
Kyle R. Tom

In collaboration with the W&M avian and URS Eco Study Teams

Mercury Spatial Distribution



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}N increased at STP and then decreased, ⊠^{13}C did not change spatially)

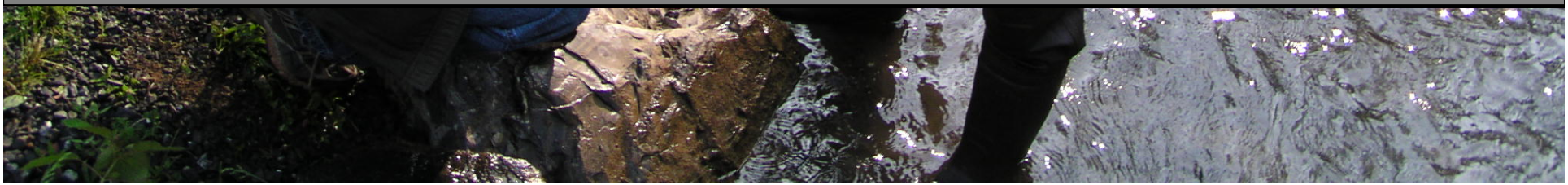
Distinct patterns so "depositional regime" is not sole driver of $[Hg]_{site}$

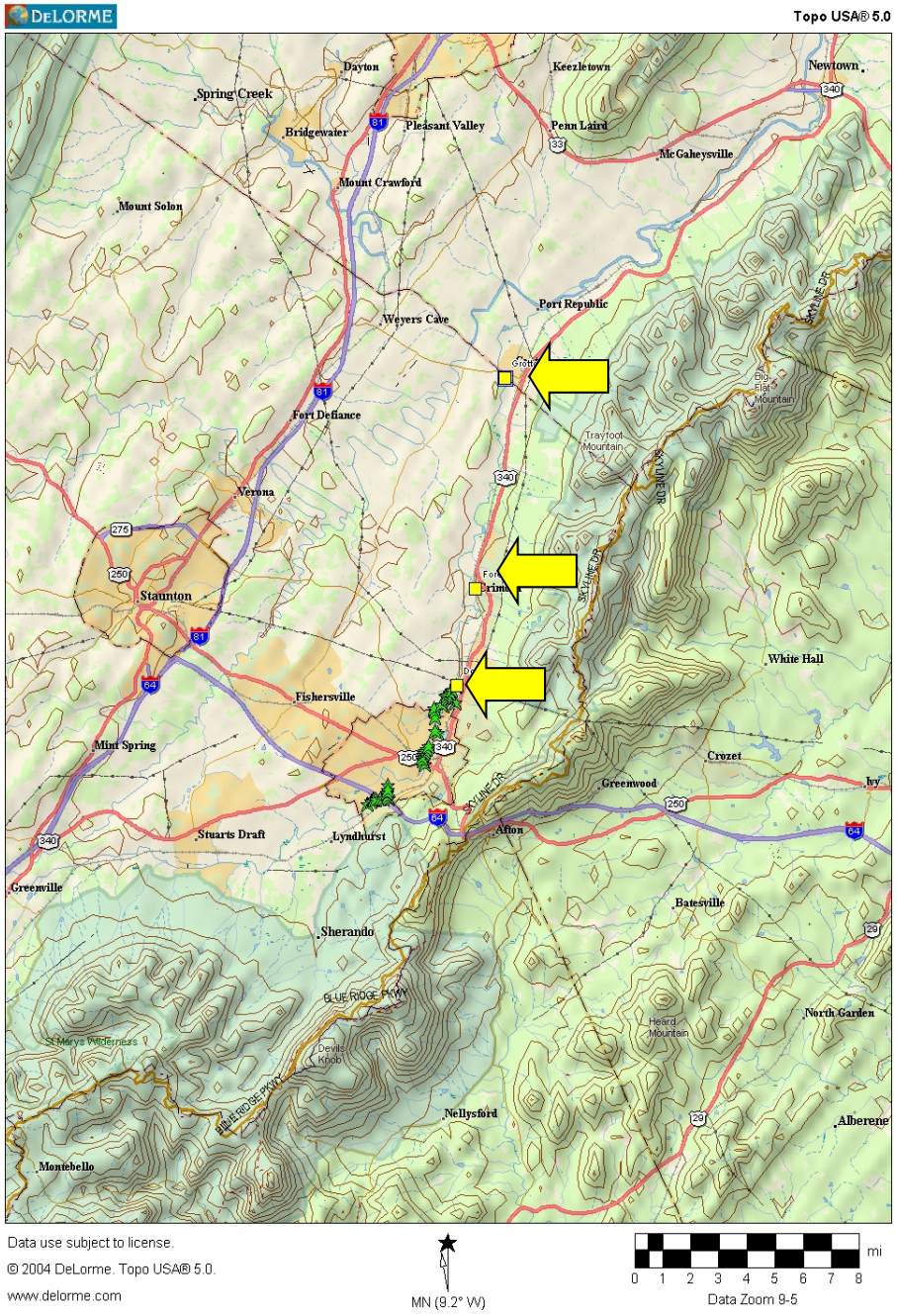
Hg is the only element still increasing after Dooms Crossing

Why? Are several plausible, nonexclusive hypotheses -

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?

Knowing which is/are "true" informs future predictions/remediation





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 to fill gaps.

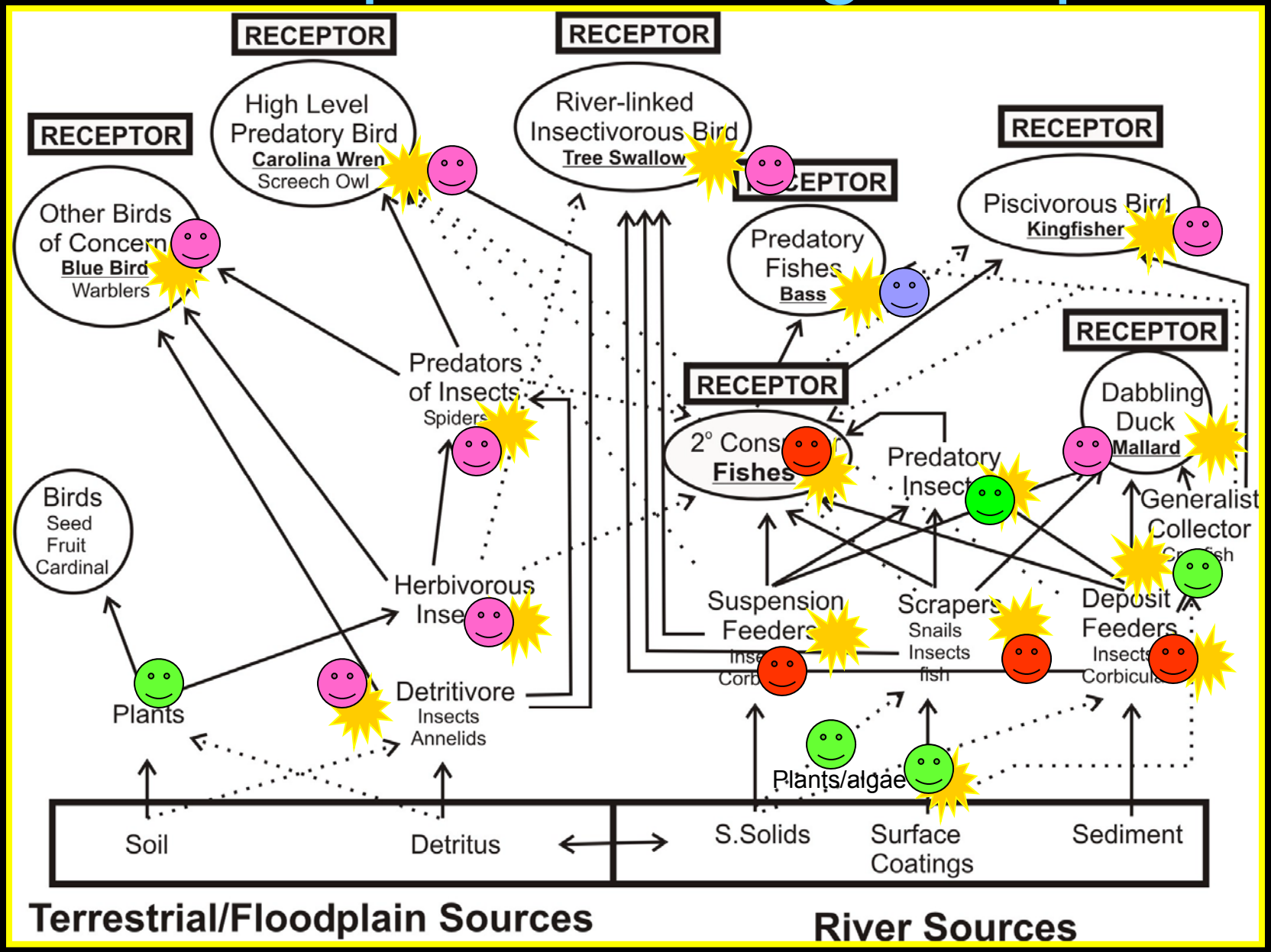
Sites were sampled at

- *Dooms Crossing Rd (Rt 611)
- *Crimora (Augusta Forestry Center)
- *Grottoes (Town 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

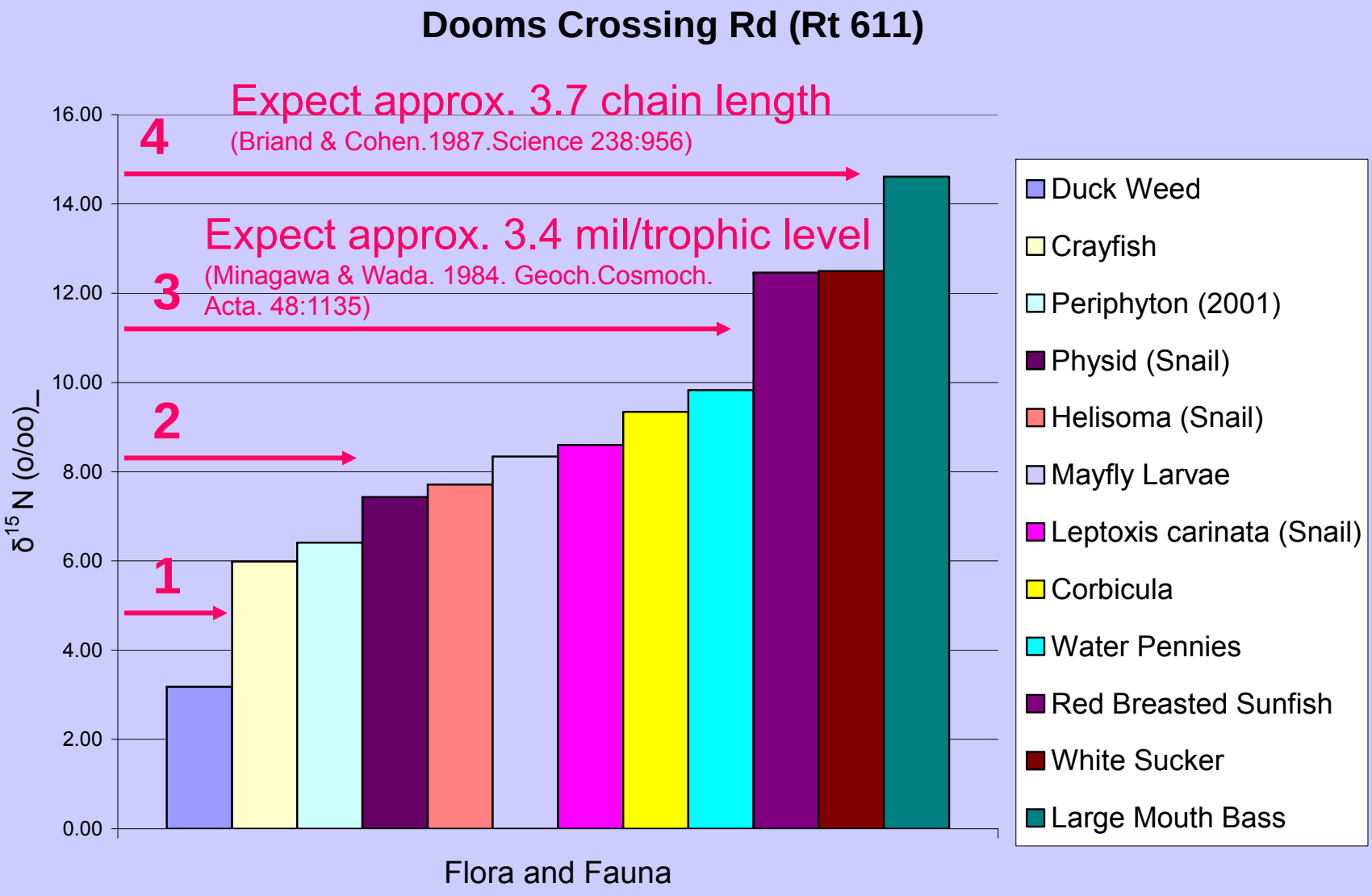
2006 Trophic Modeling Samples



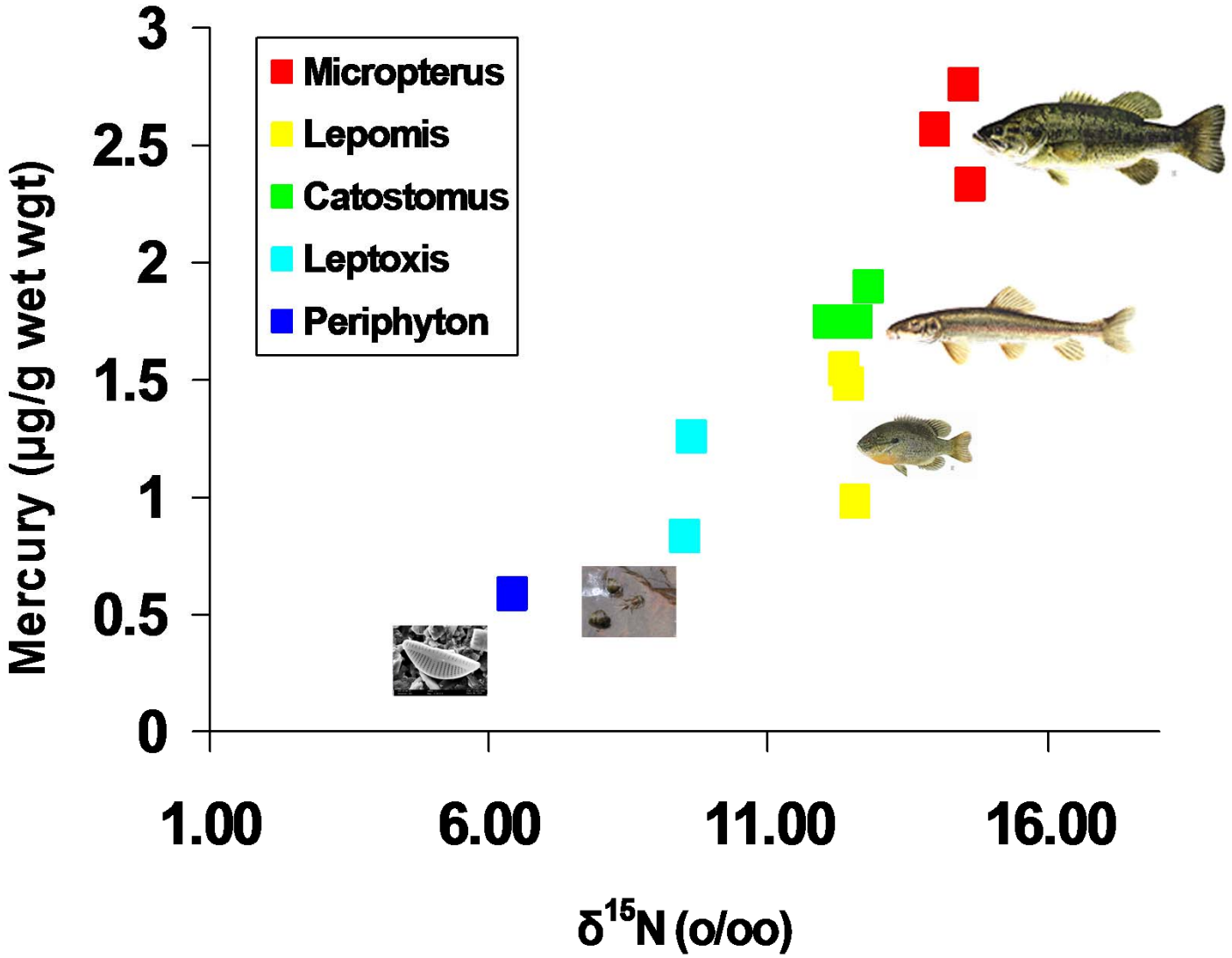
Promising Preliminary Results

Promising Preliminary Results

Patterns Slowly Surfacing



Patterns Slowly Surfacing



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 ✉ ^{15}N) will be fit to the model,

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

or, if plots of mercury concentration vs ✉ ^{15}N suggest an exponential relationship,,

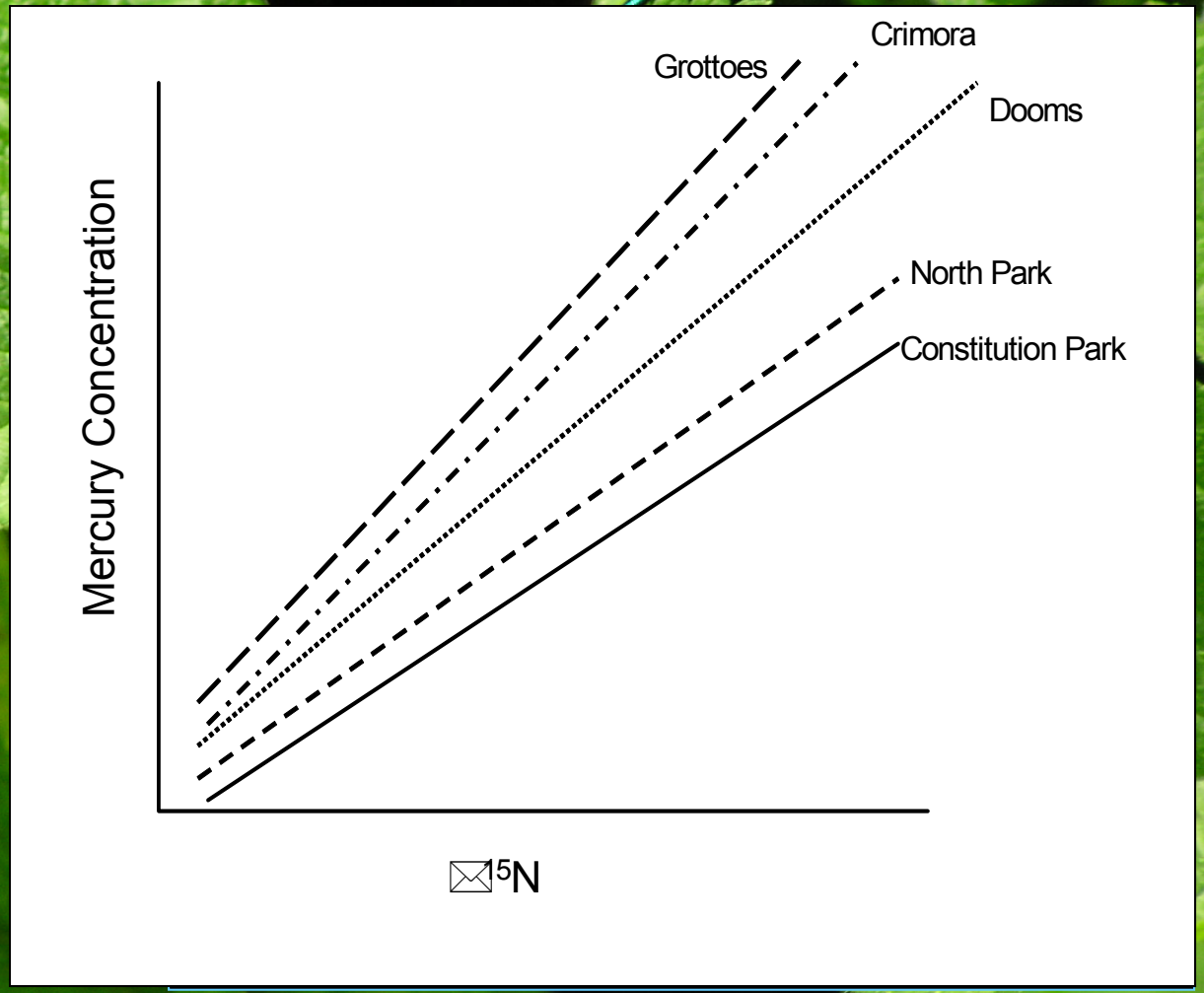
$$[Hg]_i = e^{a+b\delta^{15} N_i}$$

Proposed for 2007/2008

Locations
Constitution Park
North Park
Dooms Crossing
Crimora (AFC)
Grottoes (Town Park)

Sampling
Triplicates of each
All whole body
Split every composite
for Hg and N isotopes

Model Cross-validation
- 2 to Build/1 to Test
- Also PRESS



QUESTIONS?