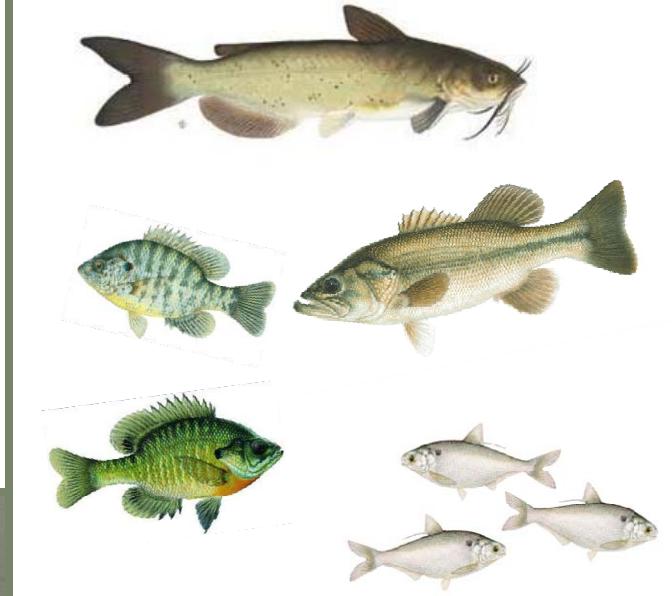


Periphyton and Aquatic Vegetation Sampling for the Kingston Ash Recovery Project



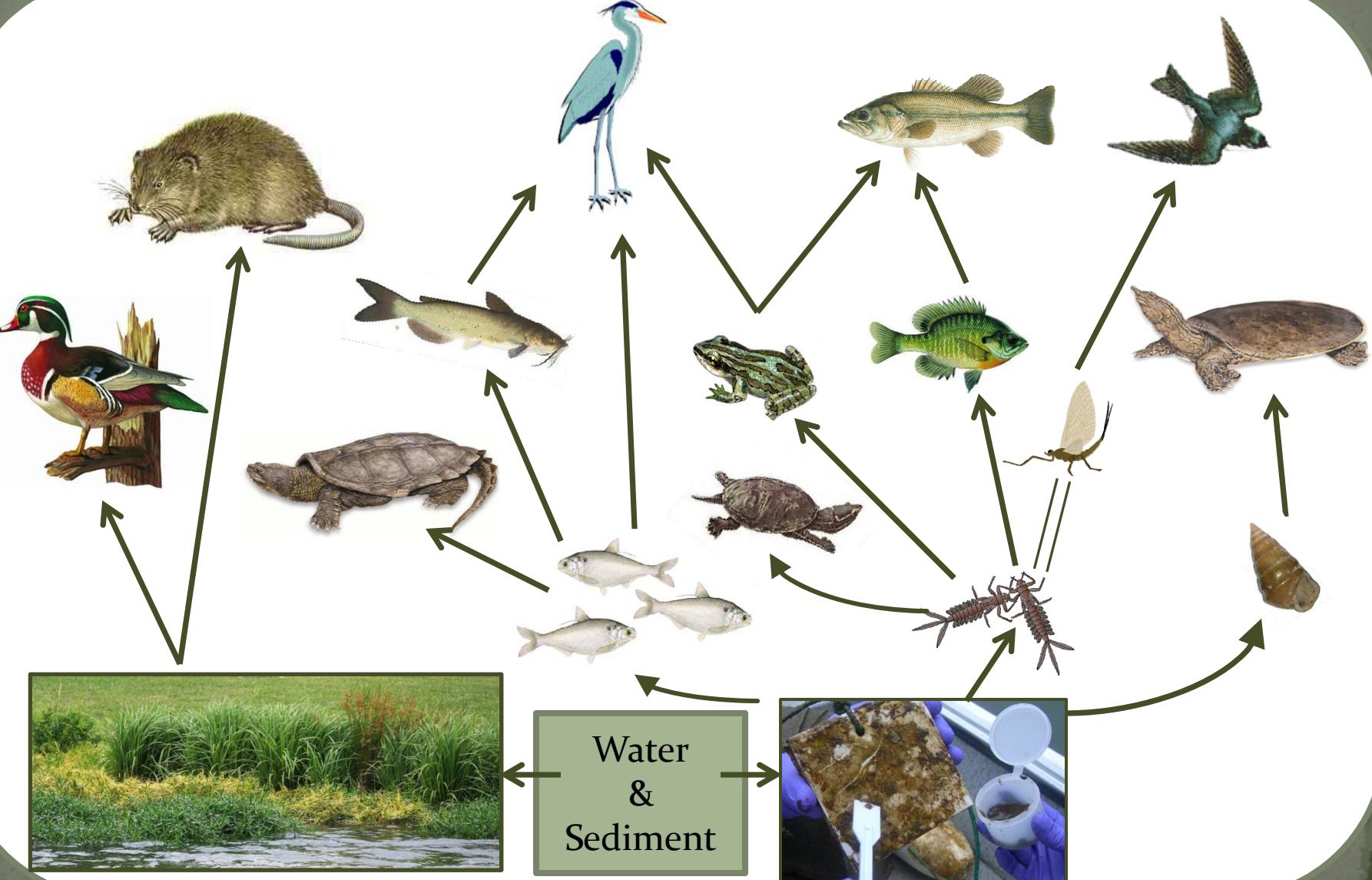
Amber Stojak
Suzy Young

Ecosystem Monitoring



Images courtesy of google images

Bioaccumulation & Trophic Transfer



Methods: Site locations

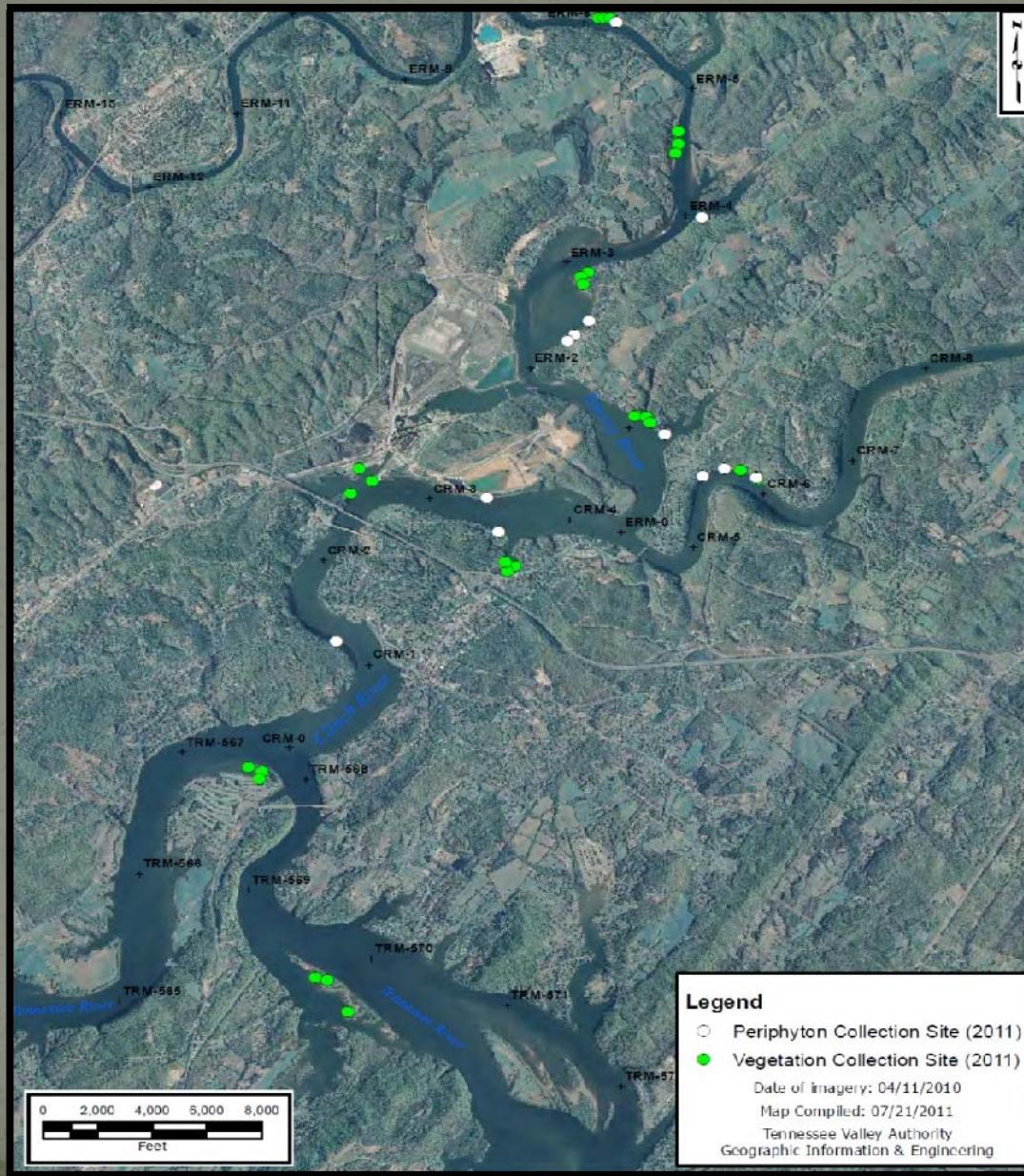
Vegetation
3 samples
per
location

Collected
on Clinch,
Emory &
Tennessee
Rivers

Periphyton
3 samplers
per
location

Composited

Collected
on Clinch &
Emory
Rivers



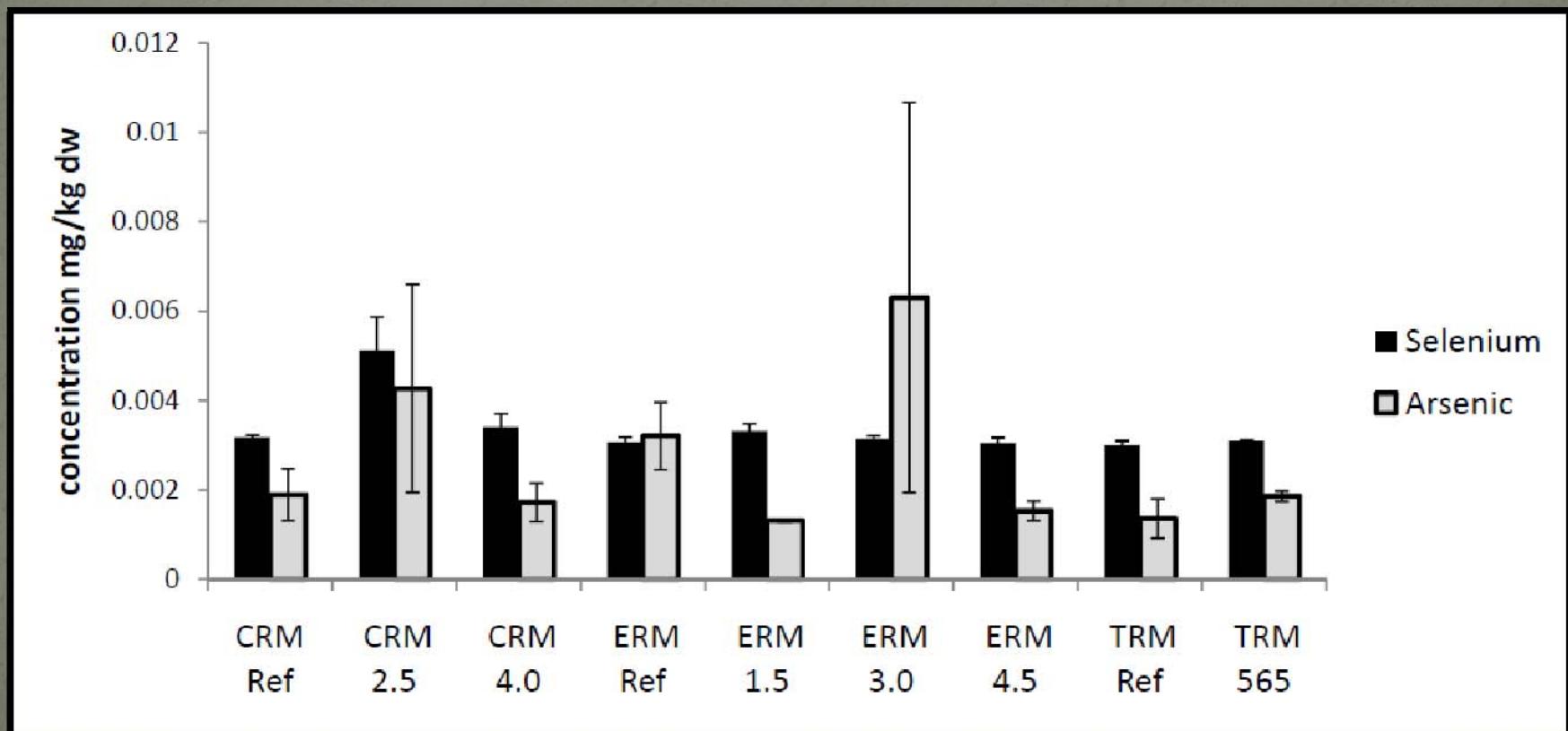
Methods- Aquatic Vegetation

- Previous field efforts identified areas with emergent vegetation
- Three locations total per river reach
- One sample each for emergent and shoreline vegetation locations
- Sampled using ceramic scissors
 - Emergent sampled above water-air interface
- Shipped frozen to Pace Analytical® for:
 - 26 metals and metalloids
 - % Moisture



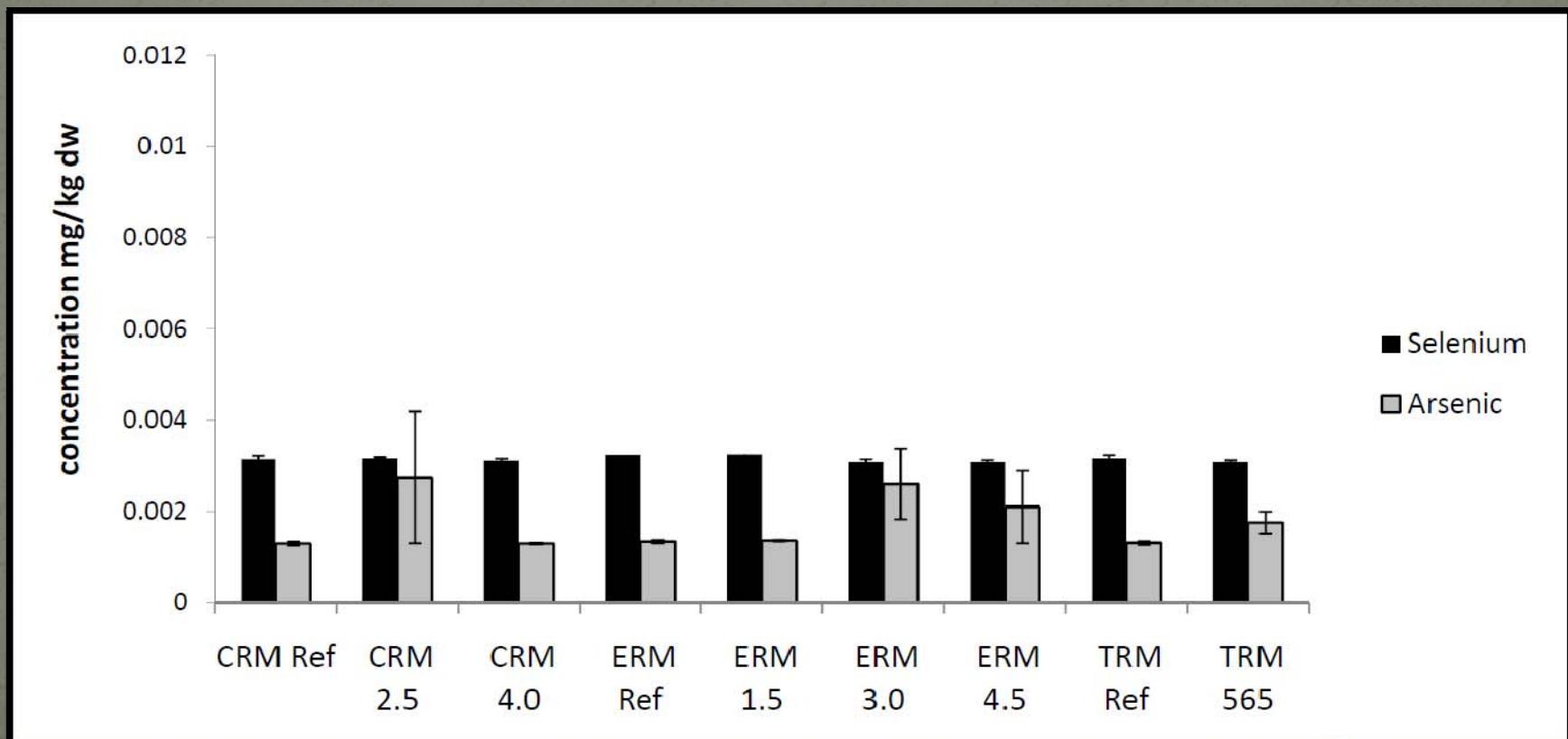
Results- Aquatic Emergent Vegetation

- All data considered “draft”
- Represents ranges within each river mile
- Error bars are standard error
- Selenium: all non-detects or flagged as estimates



Results- Aquatic Shoreline Vegetation

- All data considered “draft”
- Represents ranges within each river mile
- Error bars are standard error
- Selenium: all non-detects Arsenic: 25% detected; 85% estimates



Periphyton (a.k.a. biofilms/aufwuchs)

“All organisms attached to submerged substrates.”

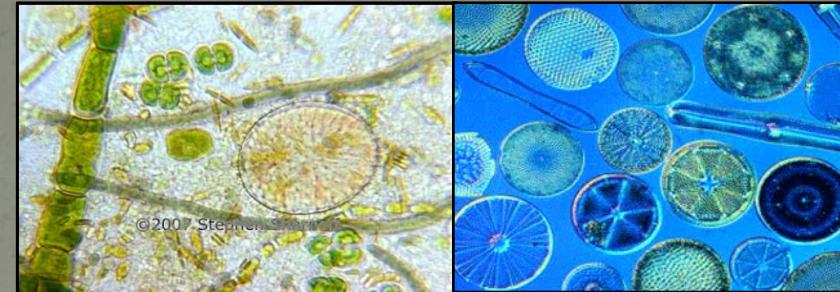
-Weitzel 1979

Includes:

- Diatoms and non diatom algae
 - Protozoans
 - Bacteria
 - Zooplankton
- All embedded in an extracellular matrix

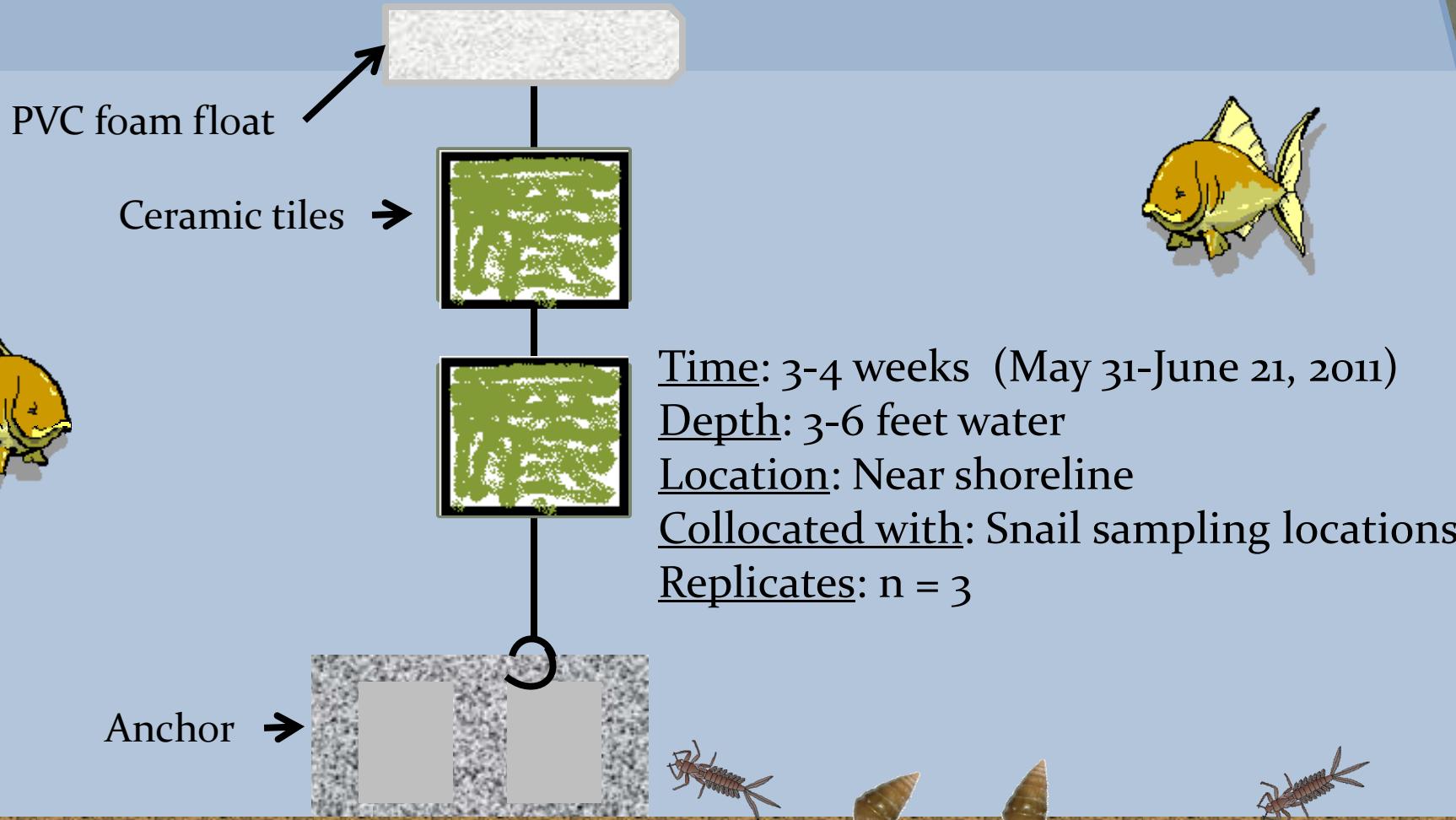
Affected by:

- | | |
|-------------|----------------|
| Light | Turbidity |
| Metals | Nutrients |
| Temperature | Substrate-type |



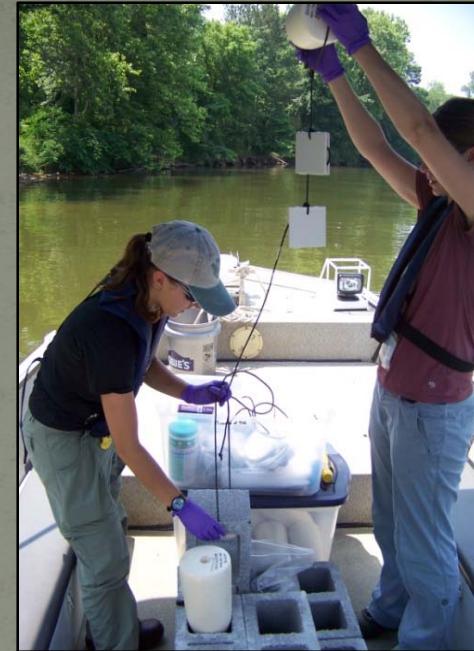
Methods:

Periphytometer design & deployment



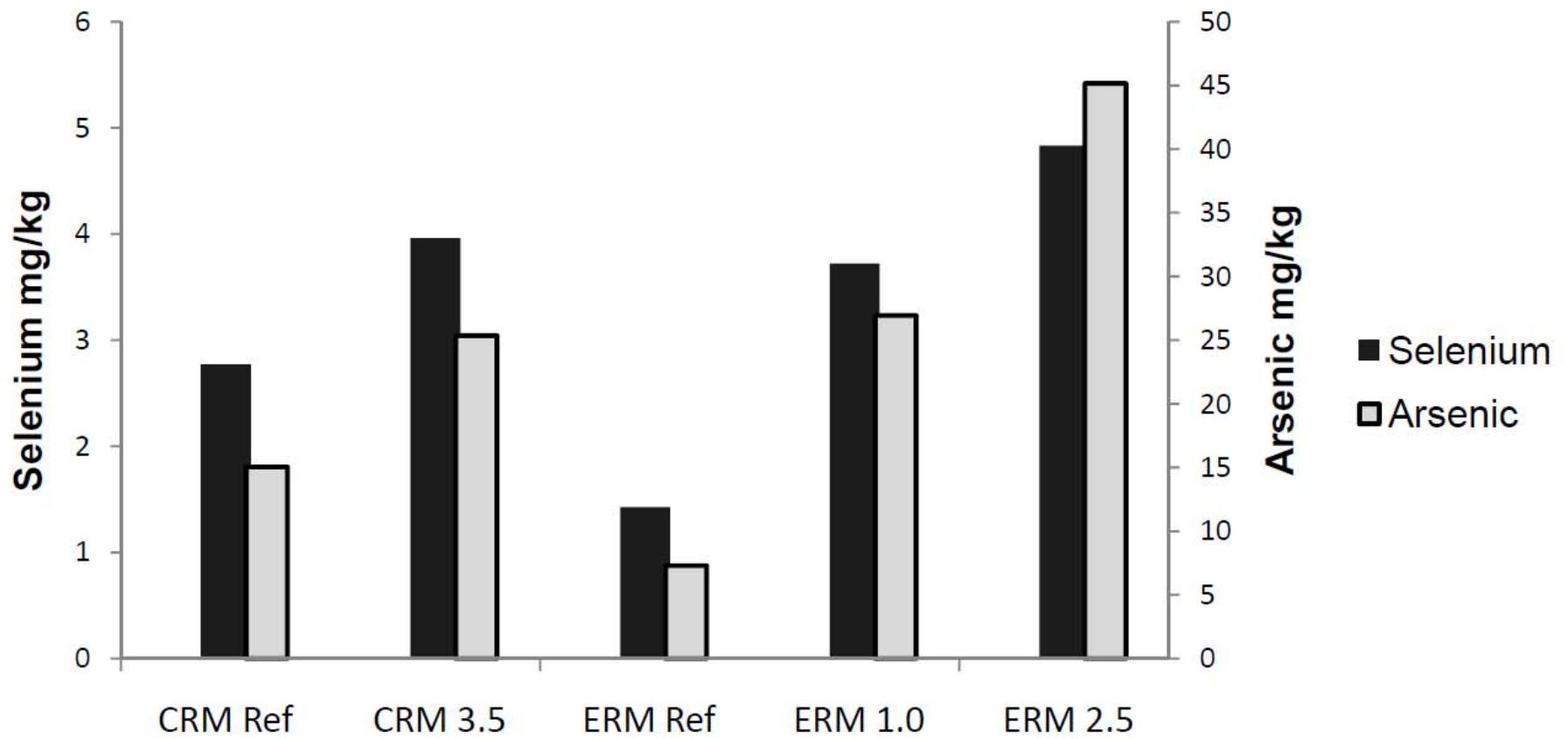
Methods-Periphyton

- Total of 3 weeks for sufficient growth
- All three periphytometers scraped
 - One composite per 3 periphytometers
- Shipped frozen to Pace Analytical®
- Analyzed for:
 - 26 metals and metalloids
 - % moisture

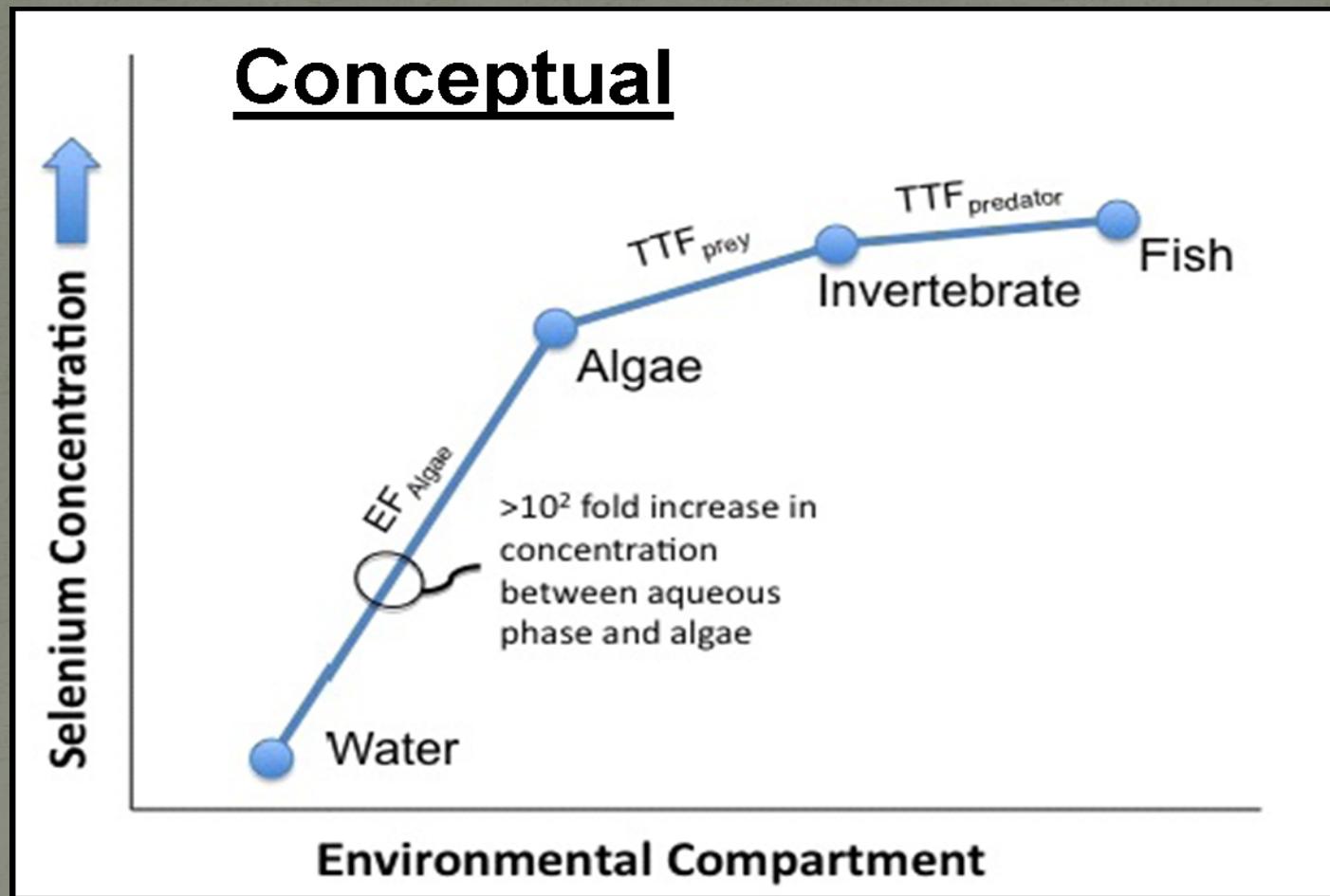


Results- Periphyton

- Results currently “draft” status
- CRM 1.5 and ERM 4.0 results unavailable



Results: Trophic Transfer

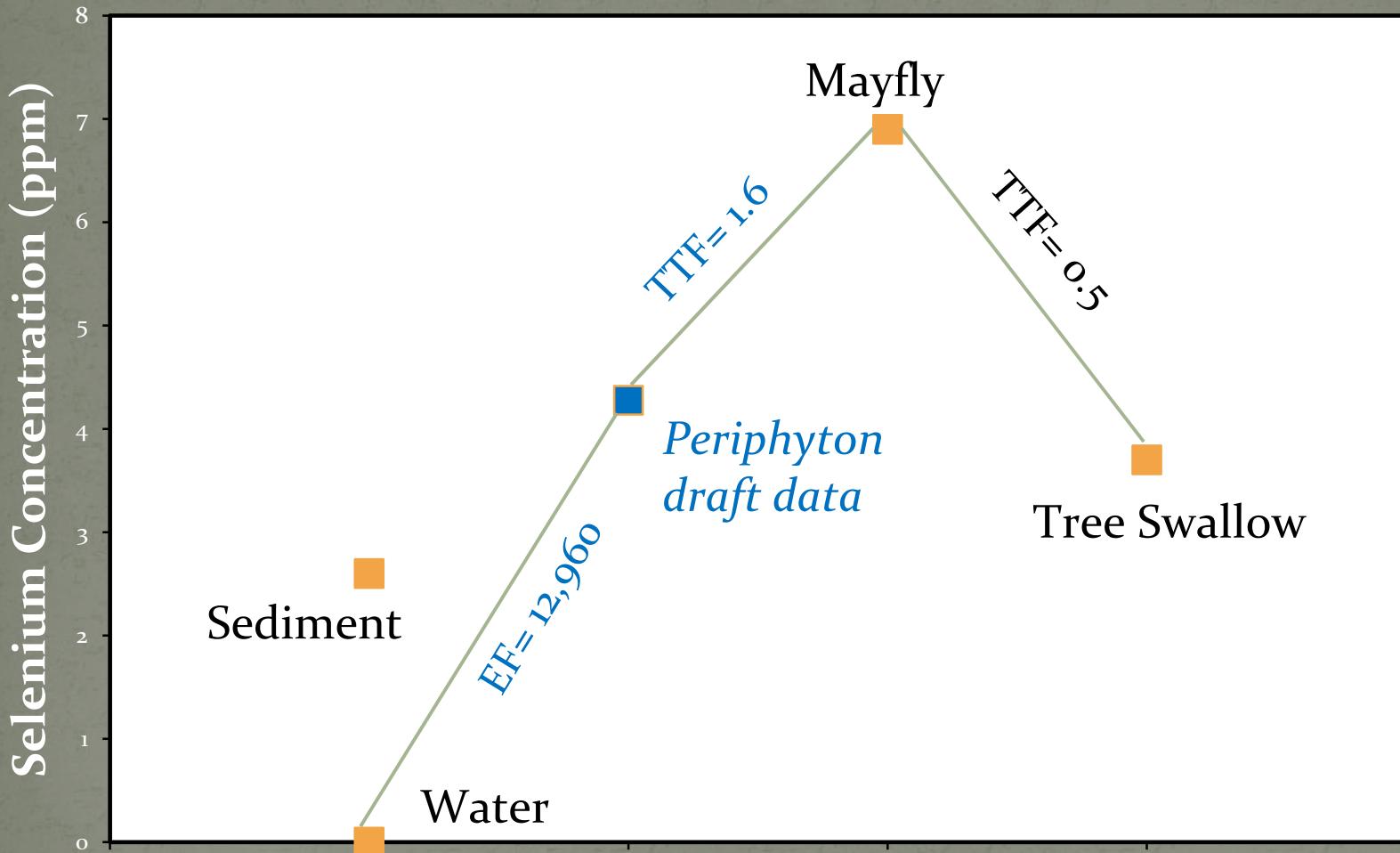


Chapman et al. 2010

EF= Concentration Se in Periphyton
Concentration Se in Surface Water

TTF= Concentration Se in Predator
Concentration Se in Prey

Trophic transfer: Median values- Emory River



$EF = \frac{\text{Concentration Se in Periphyton}}{\text{Concentration Se in Surface Water}}$

$TTF = \frac{\text{Concentration Se in Predator}}{\text{Concentration Se in Prey}}$

Discussion: Trophic Transfer

- EF= 12,960
(water= .0003mg/L; periphyton average= 4.3 mg/kg)
 - Estimated at 4 orders of magnitude higher
 - Comparable to typical selenium bioconcentration levels for primary producers
 - Demonstrates importance in monitoring ecological receptors to estimate risk in the river system
- Periphyton -> Mayfly TTF = 1.6
 - Comparable to other studies with 1.9 – 4.7 occurring in impacted areas or laboratory exposures
(Chapman et al. 2010, Conley et al. 2009, Muscatello et al. 2009)

Next steps

- Vegetation and Periphyton:
 - Data just in, currently in the QA/QC and validation process
 - Bioaccumulation – evaluate using literature values
 - Food chain modeling
 - Trophic transfer



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Questions?

