



River Systems Investigations Update TVA Kingston Ash Recovery Project

Presentation 4 of 6

May 3, 2012

- Purpose
- Overview of presentation series
- Update on Wildlife results
 - Aquatic plants
 - Amphibians
 - Reptiles
 - Birds
 - Mammals



Purposes of Briefings

- Process leading to residual ash decision
- Information that will support decision
- Preview results of river investigations



Preview of “Upcoming Attractions”

Tonight’s focus: *Wildlife Results*

April 5: Residual ash nature & extent, transport modeling

April 19: Aquatics Results
(toxicity testing, bioaccumulation in invertebrates & fishes)

May 3: **Wildlife Results**
(birds, turtles, mammals, plants)

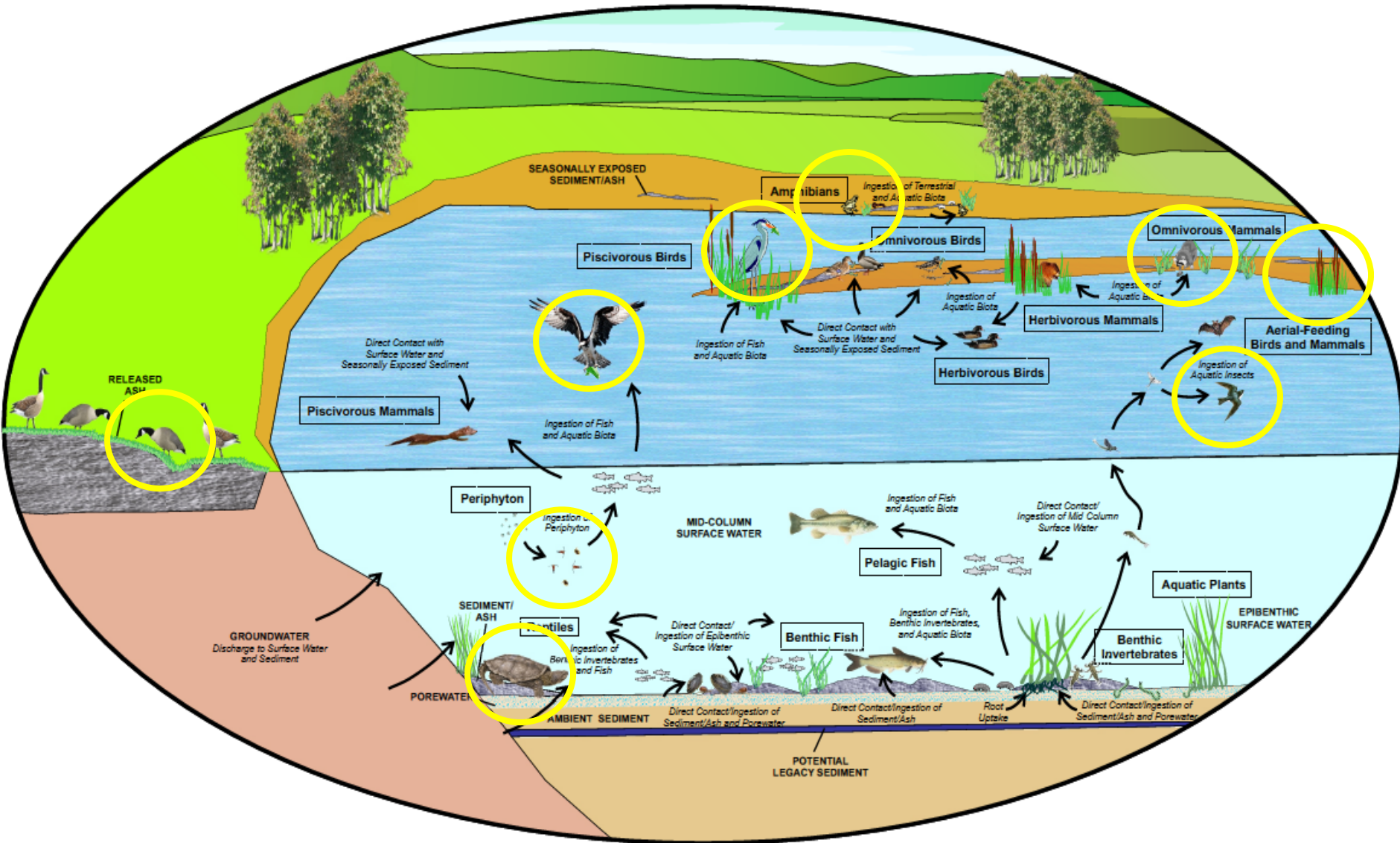
May 17: Human Health Risk Assessment
Ecological Risk Assessment Process
Development of General Response Actions

June 7: Alternatives Evaluation

Purposes:

- Determine if ash-related metals are bioavailable to wildlife.
- Determine if wildlife are maternally transferring ash-related metals to young.
- Determine if bioaccumulation and maternal transfer result in adverse effects to wildlife populations.

Conceptual Exposure Model



Aquatic Vegetation

- Periphyton (i.e., algae, diatoms)
- Shoreline and emergent vegetation

Amphibians

- Frog and toad whole body tissue

Reptiles

- Turtle blood, claws, and shell tissue

Birds

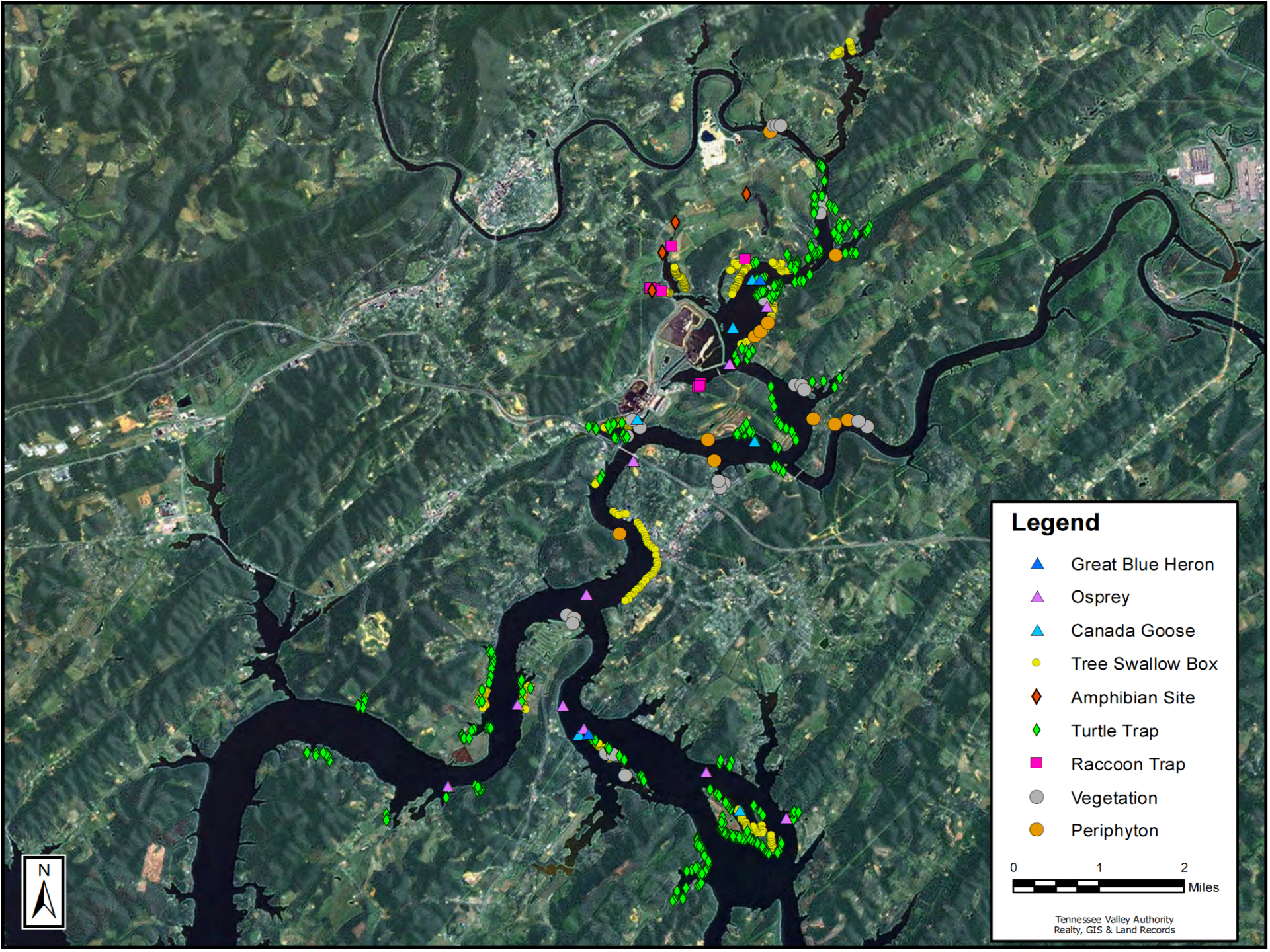
- Great blue heron eggs
- Osprey eggs
- Goose eggs
- Tree swallow eggs, eggshells, and nestlings
- Tree swallow reproductive data

Mammals

- Raccoon tissue and health metrics

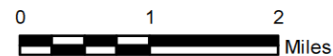
Metals Analyzed in All Tissue:

Aluminum	Lead
Antimony	Magnesium
Arsenic	Manganese
Barium	Mercury
Beryllium	Molybdenum
Boron	Nickel
Calcium	Sodium
Cadmium	<u>Selenium</u>
Chromium	Strontium
Cobalt	Silver
Copper	Thallium
Iron	Vanadium
Potassium	Zinc



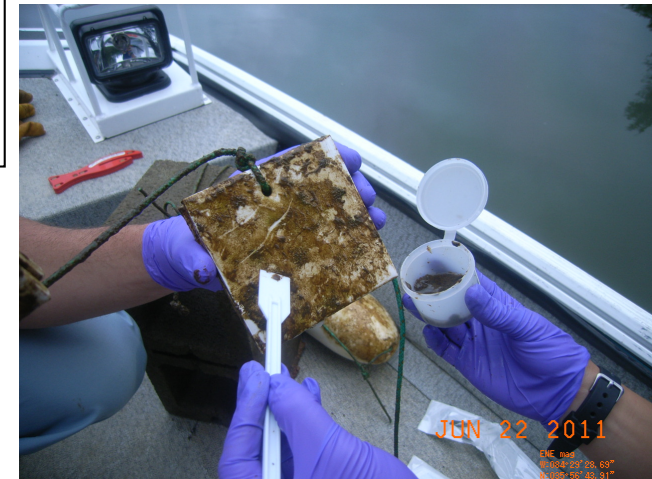
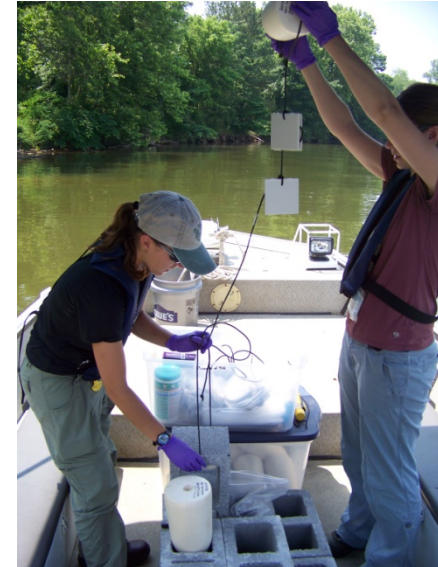
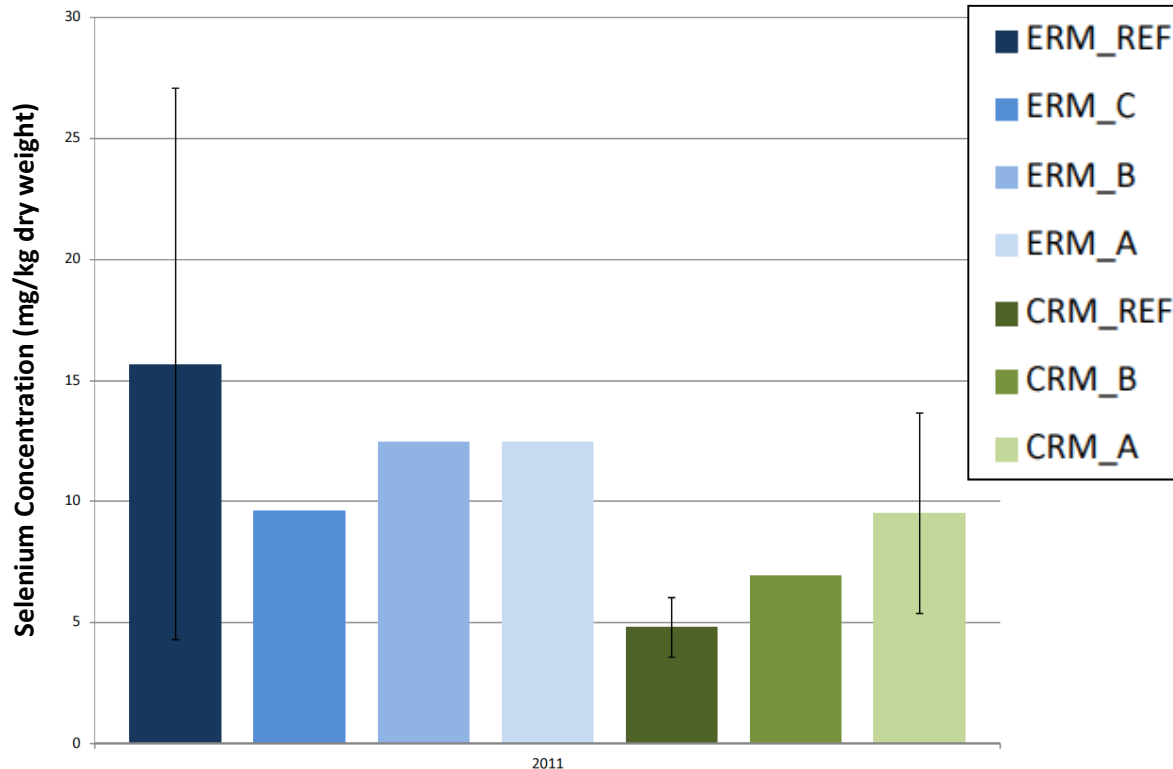
Legend

- ▲ Great Blue Heron
- ▲ Osprey
- ▲ Canada Goose
- Tree Swallow Box
- ◆ Amphibian Site
- ◆ Turtle Trap
- Raccoon Trap
- Vegetation
- Periphyton



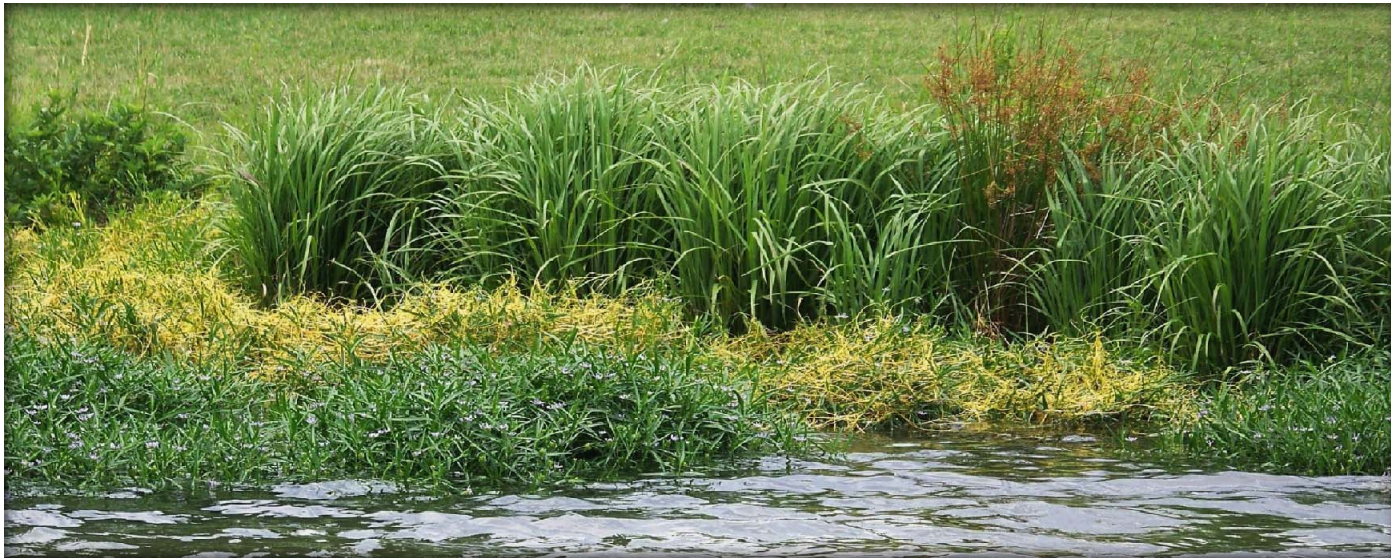
Aquatic Vegetation – Periphyton

- **Locations:** Reference (upstream Emory and Clinch), Emory River reaches, Clinch River reaches
- **Collections:**
 - 3 samplers per location – one composite sample per reach
 - Samplers left out for 3 weeks
- **Results:** No differences in locations (2011)



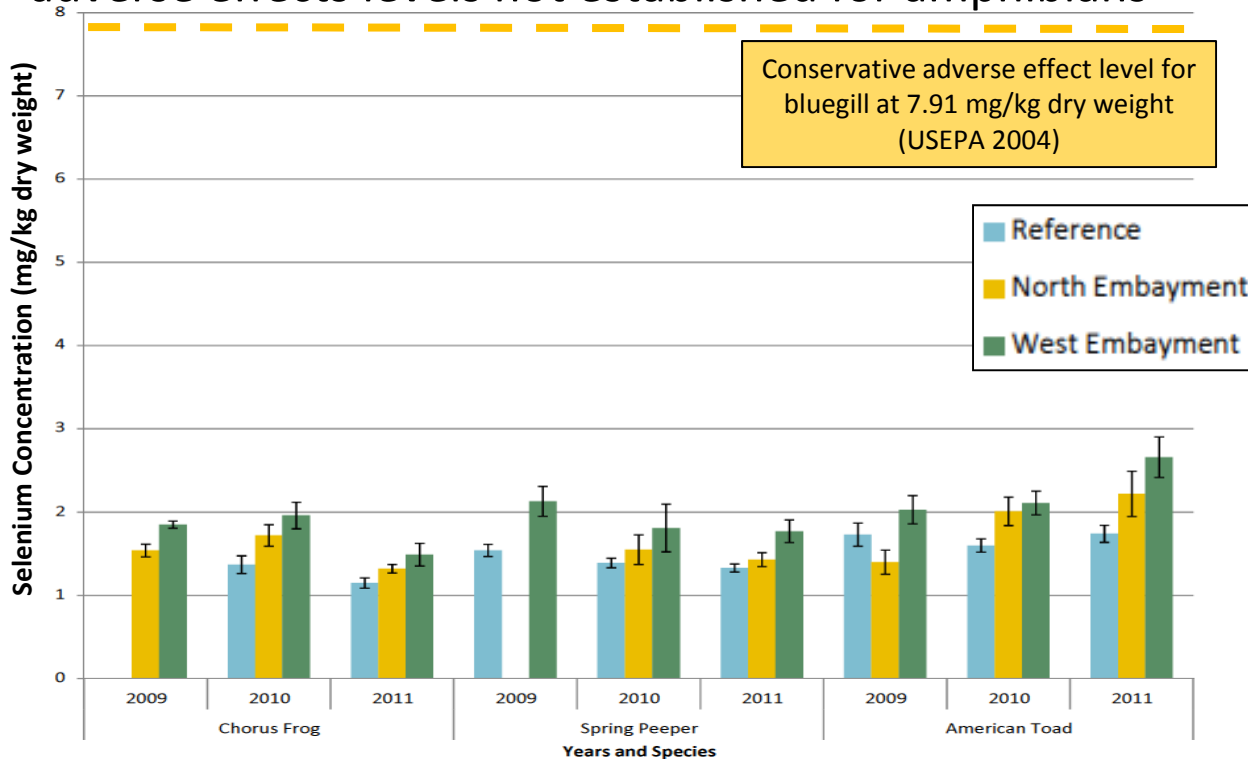
Aquatic Vegetation – Grasses and Sedges

- **Locations:** Reference (upstream Emory, Clinch, and TN Rivers), Emory River reaches, Clinch River reaches, and TN River reaches
- **Collections:**
 - Shoreline and emergent vegetation
 - 3 samples of each type per reach
 - Cut vegetation above ground (did not include roots)
- **Results:** No differences in locations (2011) for shoreline or emergent vegetation



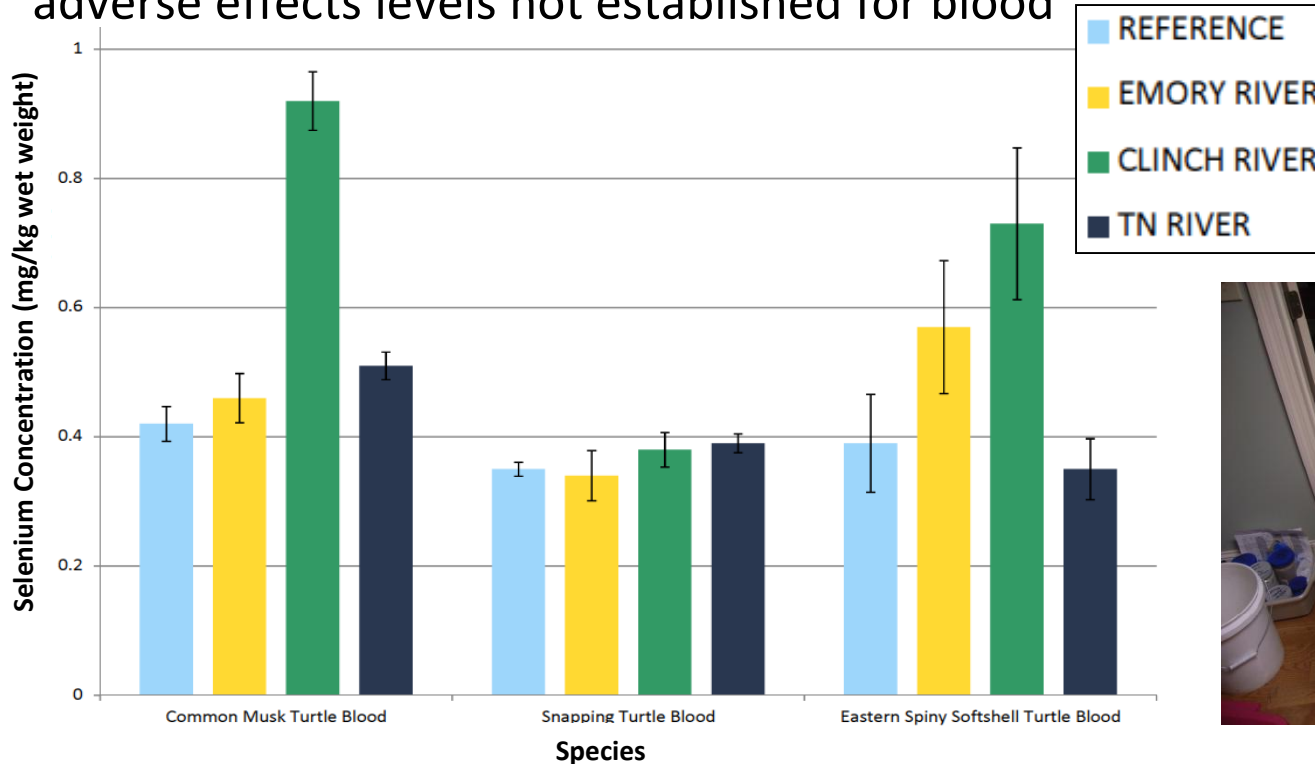
Amphibians – Frogs and Toads

- **Locations:** Reference (3 unimpacted areas), North Embayment, West Embayment
- **Collections:**
 - Upland chorus frog, Spring peeper, and American toad
 - 10 of each species collected per site
- **Results:** Some differences in locations or years (2009/2010), adverse effects levels not established for amphibians



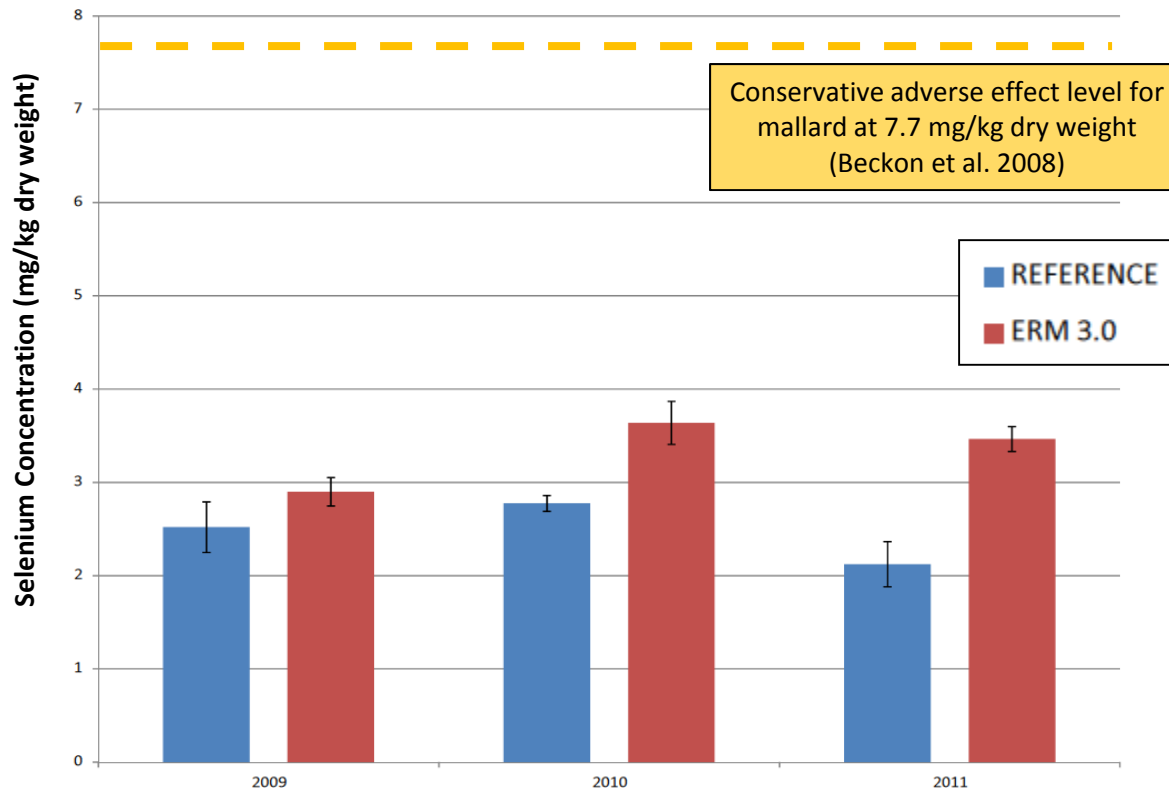
Reptiles – Turtle Blood

- **Locations:** Reference (upstream TN River), Emory River, Clinch River, TN River (downstream)
- **Collections:**
 - Common musk/mud turtle, snapping turtle, Eastern spiny softshell turtle
 - 20 of each species collected per river
- **Results:** Some differences in locations (2010), adverse effects levels not established for blood



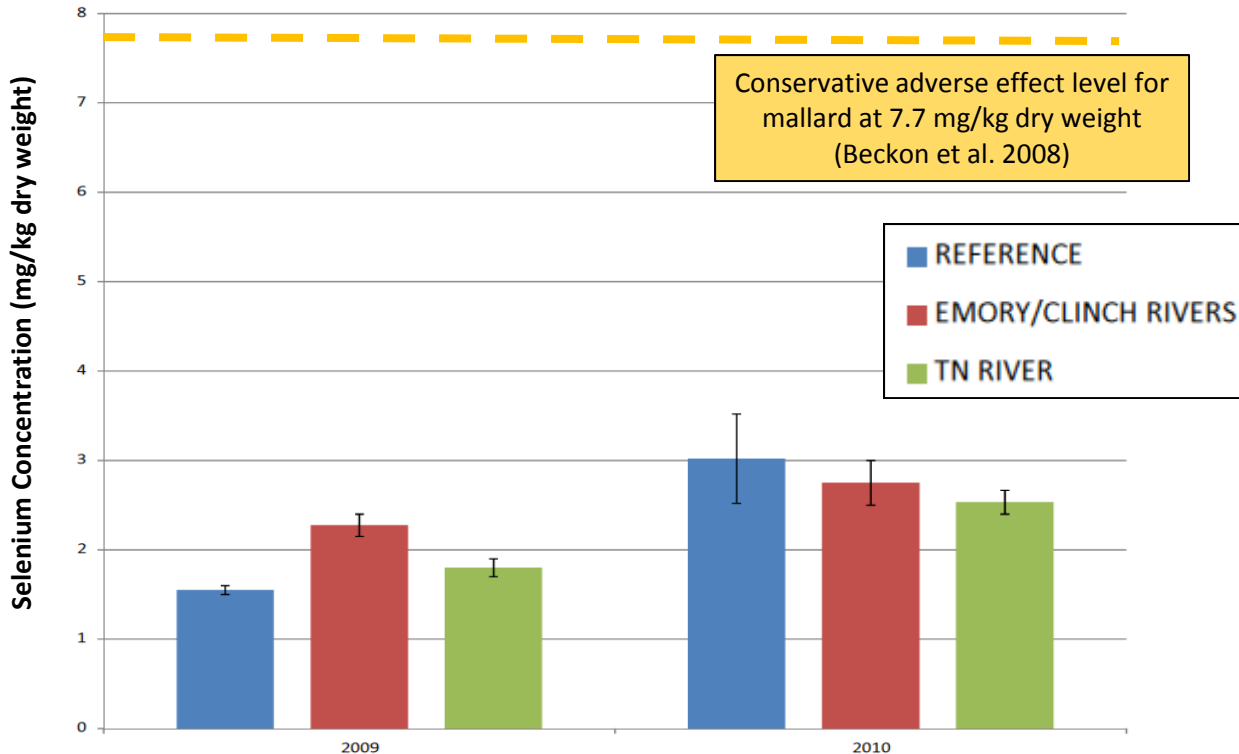
Birds – Great Blue Heron Eggs

- **Locations:** Reference (upstream TN River), Emory River (ERM 3.0)
- **Collections:**
 - 1 egg collected per nest, 10 eggs per site
 - Egg metrics recorded
- **Results:** Some differences in locations and years, all concentrations below conservative effects level



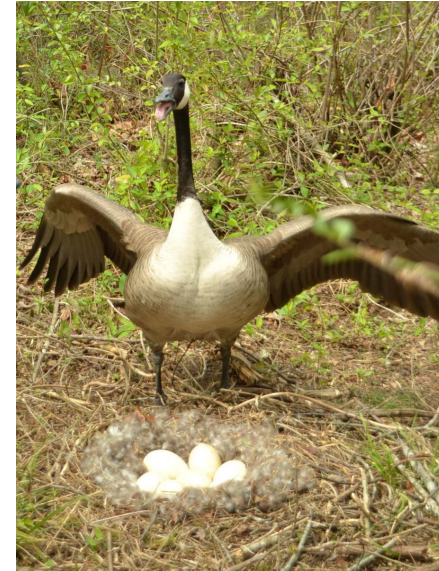
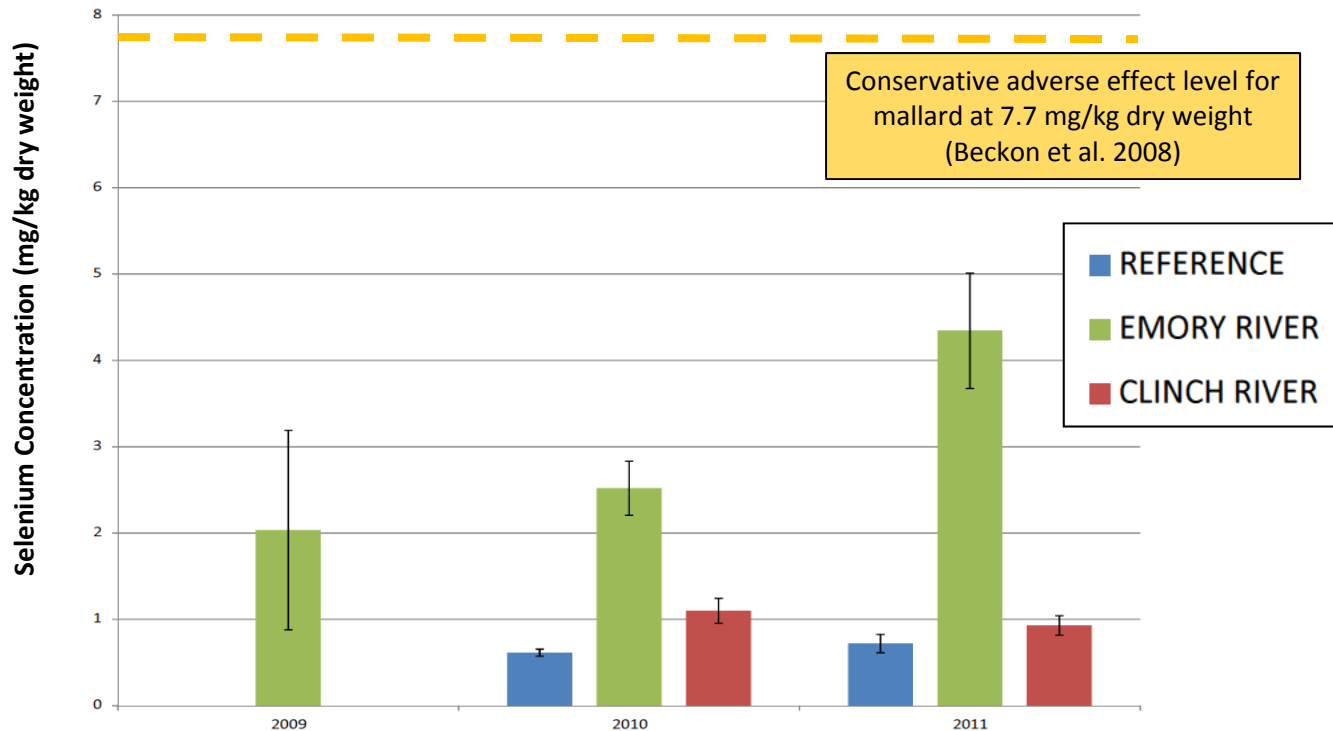
Birds – Osprey Eggs

- **Locations:** Reference (upstream TN River), Emory River, Clinch River, TN River (downstream)
- **Collections:**
 - 1 egg collected per nest, 10 eggs per site
 - Egg metrics recorded
- **Results:** No differences in locations or years, all concentrations below conservative effects level



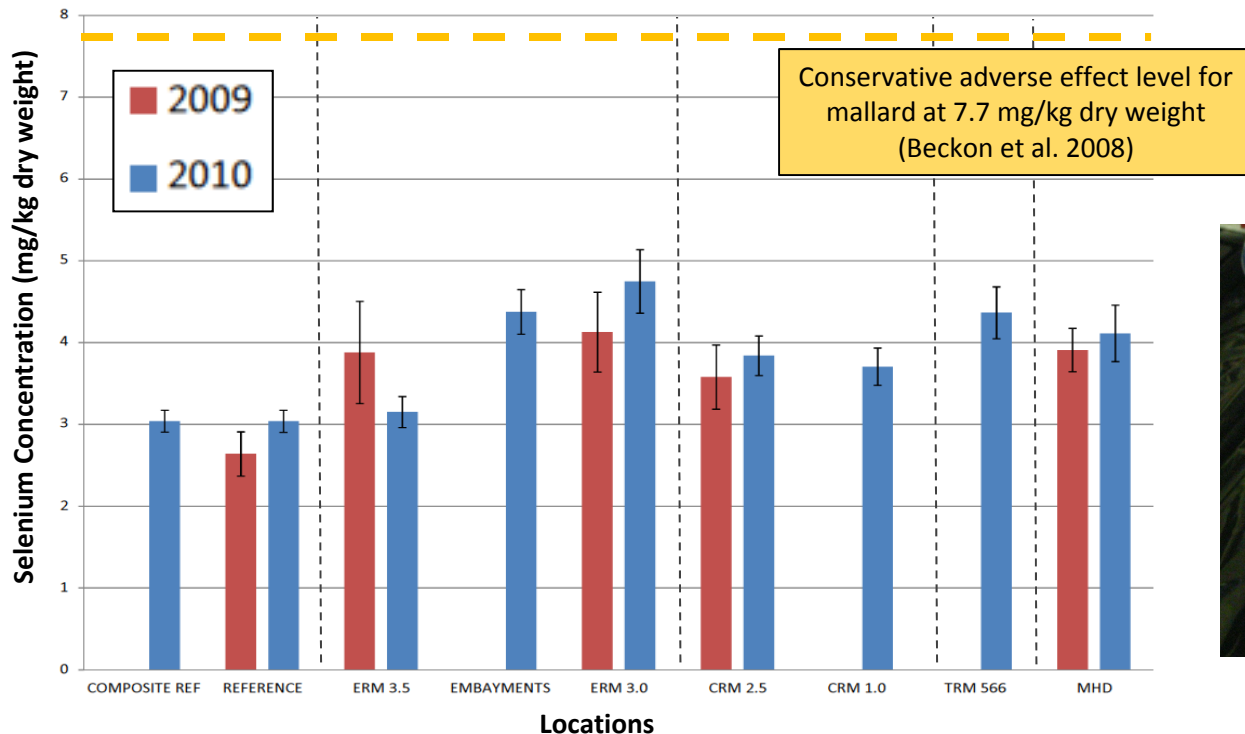
Birds – Canada Geese Eggs

- **Locations:** Reference (upstream TN River), Emory River, Clinch River
- **Collections:**
 - 1 egg collected per nest, 10 eggs per site
 - Egg metrics recorded
- **Results:** Some differences in locations, all mean concentrations below conservative effects level



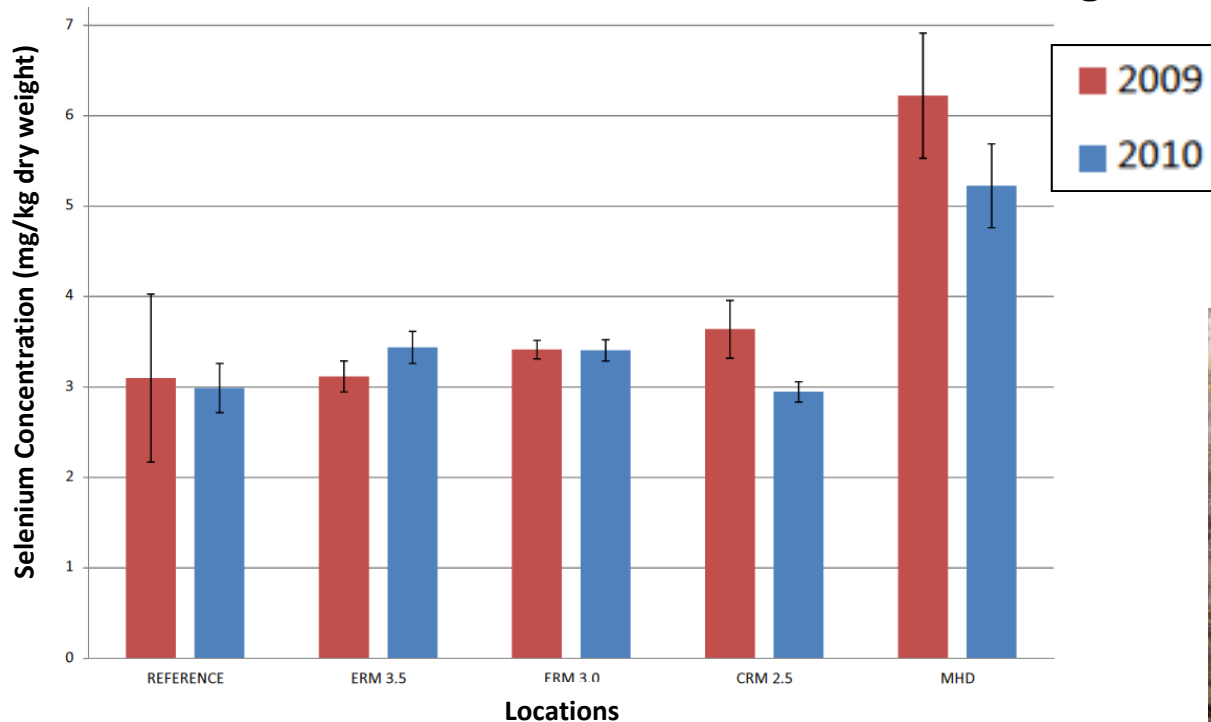
Birds – Tree Swallow Eggs

- **Locations:** Reference (Fort Loudoun Dam, Tellico Dam, upstream TN River), Emory River, Clinch River, TN River
- **Collections:**
 - 1 egg collected per nest, 10 to 15 eggs per site
 - Egg metrics recorded
- **Results:** Some differences in locations and years, all mean concentrations below conservative effects level



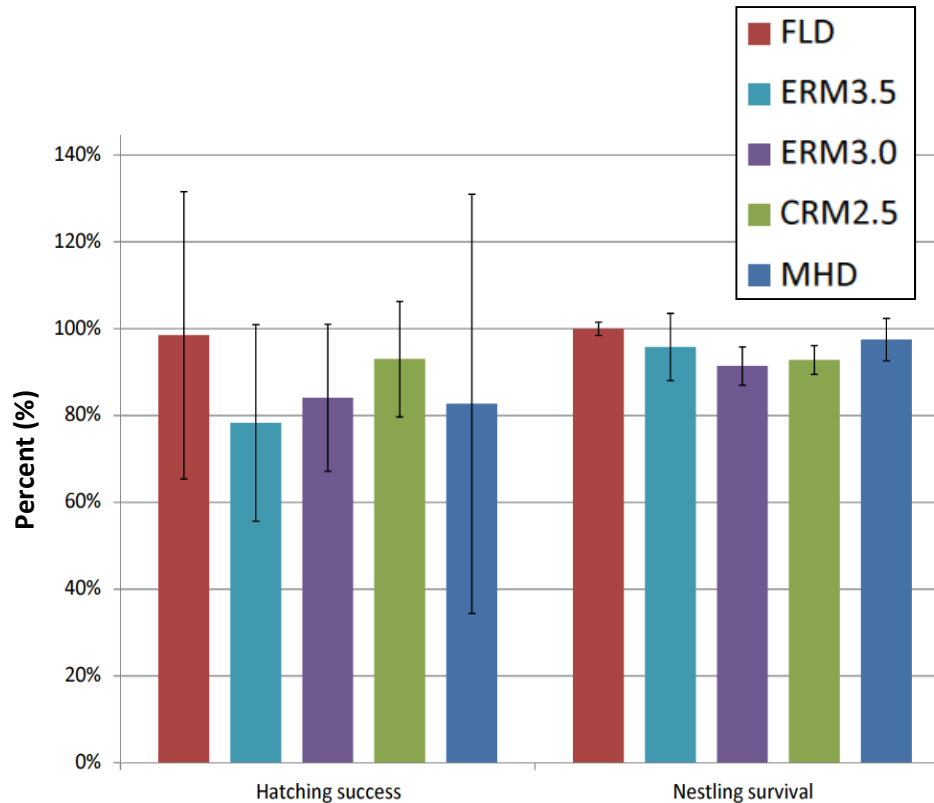
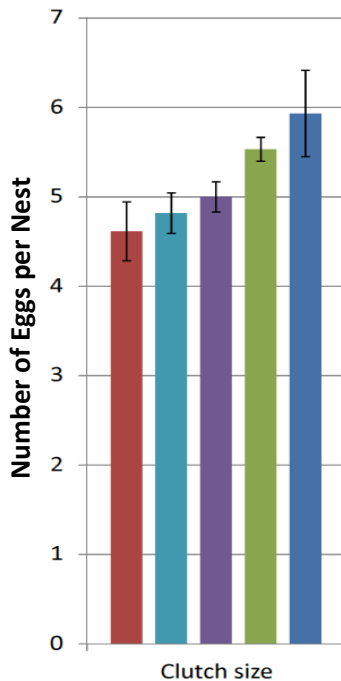
Birds – Tree Swallow Nestlings

- **Locations:** Reference (Fort Loudoun Dam), ERM 3.5, ERM 3.0, CRM 2.5, Melton Hill Dam
- **Collections:**
 - 1 nestling collected per nest, 10 to 15 nestlings per site
 - Weight and length measurements
- **Results:** Some differences in locations and years, adverse effects levels not established for nestlings



Birds – Tree Swallow Reproduction

- **Locations:** Reference (Fort Loudoun Dam), ERM 3.5, ERM 3.0, CRM 2.5, Melton Hill Dam
- **Measurements:**
 - Clutch size, Hatching success, Nestling survival
- **Results:** Some differences in hatching success (2010)



Mammals – Raccoons

(Marcy Souza at University of Tennessee)

- **Locations:** Reference (Melton Hill Dam, residences in Knox County), Intake Channel, Embayments (East, West, and North)
- **Collections:**
 - Tissues: Blood, brain, gonad, kidney, liver, ovary, skeletal muscle, and subcutaneous fat
 - Other: Blood counts, plasma biochemistry panels, pathologic lesions
- **Results:**
 - No significant differences between years (2009/2010) or locations
 - 2011 results are still being processed



What's Next on the Sampling Front?

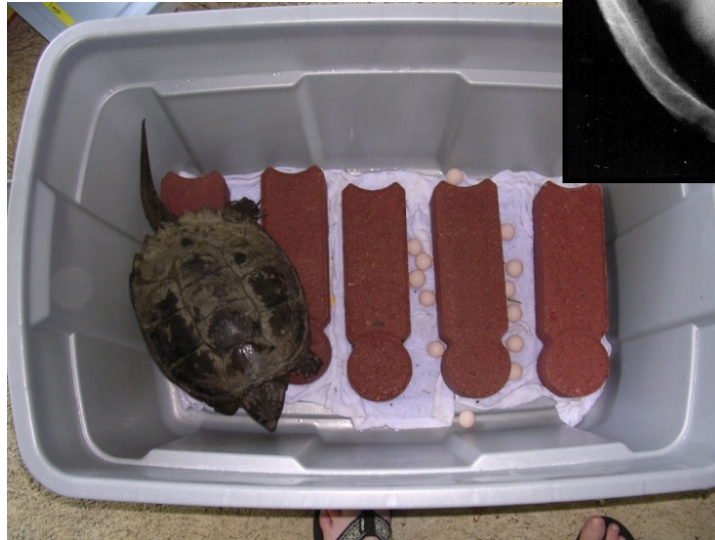
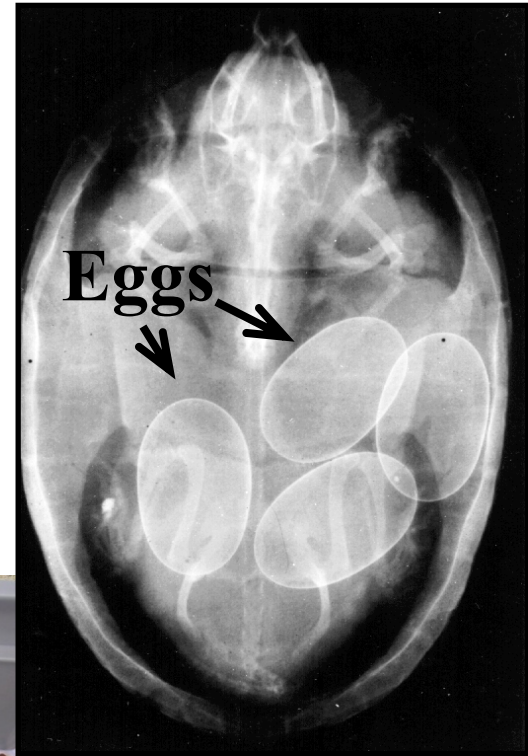
2011



Nicholas Morris

What's Next on the Sampling Front?

Virginia Tech 2011-2013



Summary

- Is there good evidence that selenium is bioavailable to wildlife?
 - Yes: Amphibians, heron, geese, and tree swallows.
 - No: Periphyton, aquatic vegetation, turtles, osprey, or raccoons.
- Is there good evidence that wildlife are maternally transferring metals to their young?
 - Yes: Heron, geese, tree swallows
 - No: Osprey
- Is there good evidence that bioaccumulation and maternal transfer are resulting in adverse effects to wildlife?
 - No: We don't see evidence that levels of accumulation are causing adverse effects in wildlife populations.



Preview of “Upcoming Attractions”

- May 17: Human Health Risk Assessment Process
- Ecological Risk Assessment Process
- Development of General Response Actions
- June 7: Alternatives Evaluation