



River Systems Investigations Update TVA Kingston Ash Recovery Project

Presentation 3 of 6

April 19, 2012

- Purpose
- Overview of presentation series
- Aquatics Results Summary

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: *Aquatic Results*

- *Sediment toxicity tests*
- *Mayflies and snails*
- *Fish*

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

What are they?

- Standard procedures
- Standard test species
- Site sediments
- Controlled environment



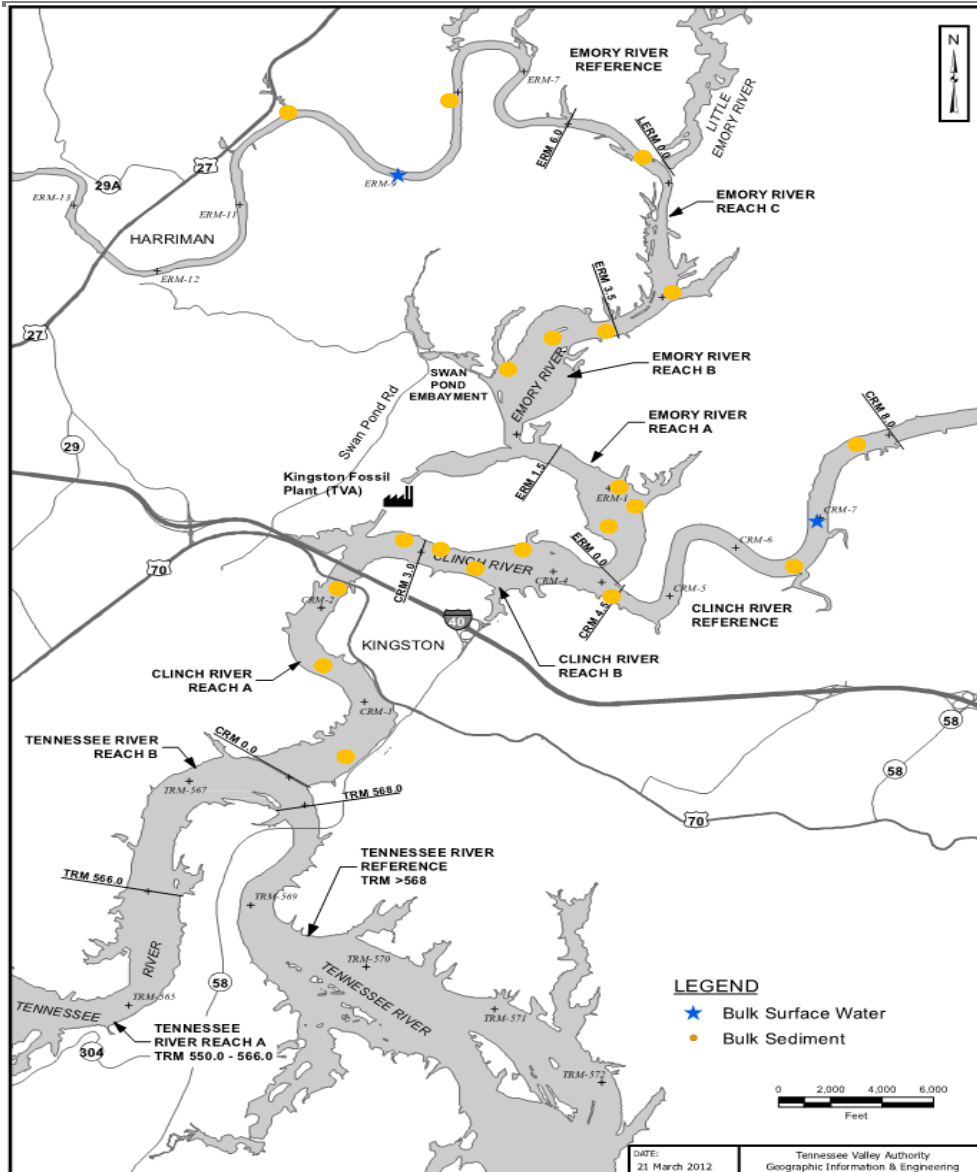
What are their limitations?

- Process changes the sediments
- Sensitive test organisms
- Effects on individuals Vs effects on populations
- Lab effects > real-world effects (usually)



www.glec.com

TVA Laboratory Sediment Toxicity Tests



- **Sediment** samples collected from 18 areas in Emory and Clinch Rivers

- ★ **Water** for the laboratory toxicity tests collected from an upstream reference area in each river

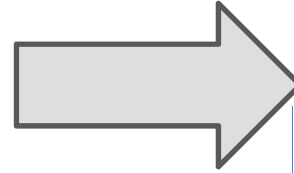
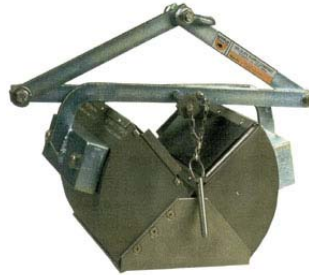
Selection of sampling sites based on:

- % Ash results
- Samples from each reach
- Grain sizes

TVA Laboratory Sediment Toxicity Tests

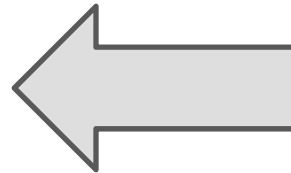


Collected sediments at each location



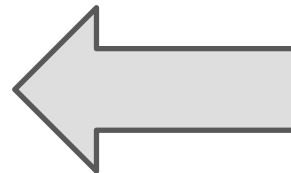
Chemistry Lab:

- % Ash
- Metals , Organics
- Grain sizes, Organic Carbon



Sub-samples sent to labs

Tox Testing Lab



Combined & mixed buckets of sediment

Laboratory Sediment Toxicity Tests Results



TYPE OF TEST:

- 10-day (screening) and 28-day (long term)

RESULTS:

- No Effect, **S** : Effect in screening **L** : Effect in long term test

Biomass and Growth both reduced by 25%

EMORY RIVER

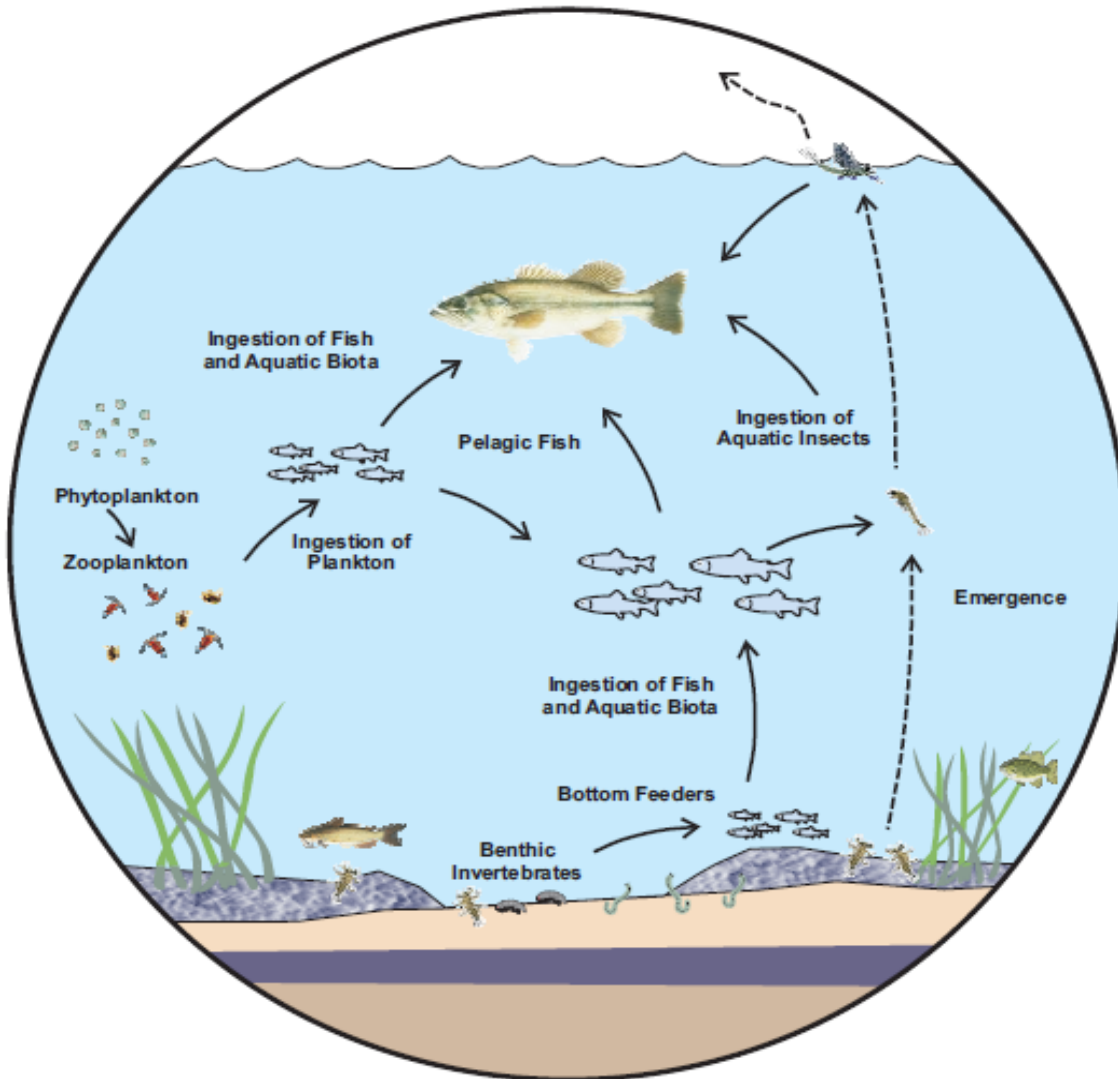
% Ash	1	26	42	43	49	53	64	88
Survival	-	-	-	-	-	-	S	SL
Biomass/ Emergence	S	S	L	SL	S	S	SL	SL



CLINCH RIVER

% Ash	20	22	24	28	32	34	39	41
Survival	-	L	-	-	-	-	-	-
Biomass/ Emergence	-	L	-	-	-	-	S	S



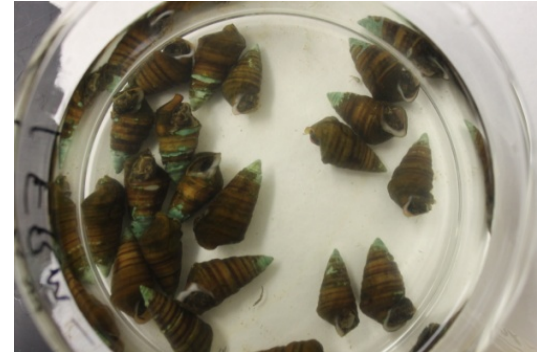


Measurements
of
Exposure Pathways



Measurements of
bioavailability

TVA Benthic Invertebrate Investigations



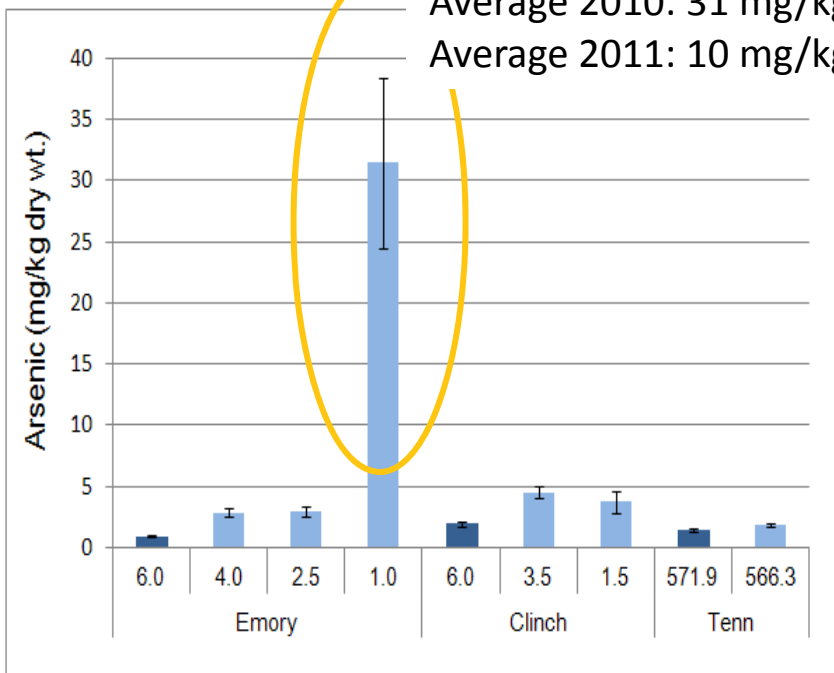
Play Invertebrate Video

2010 Mayfly Nymphs (Depurated)

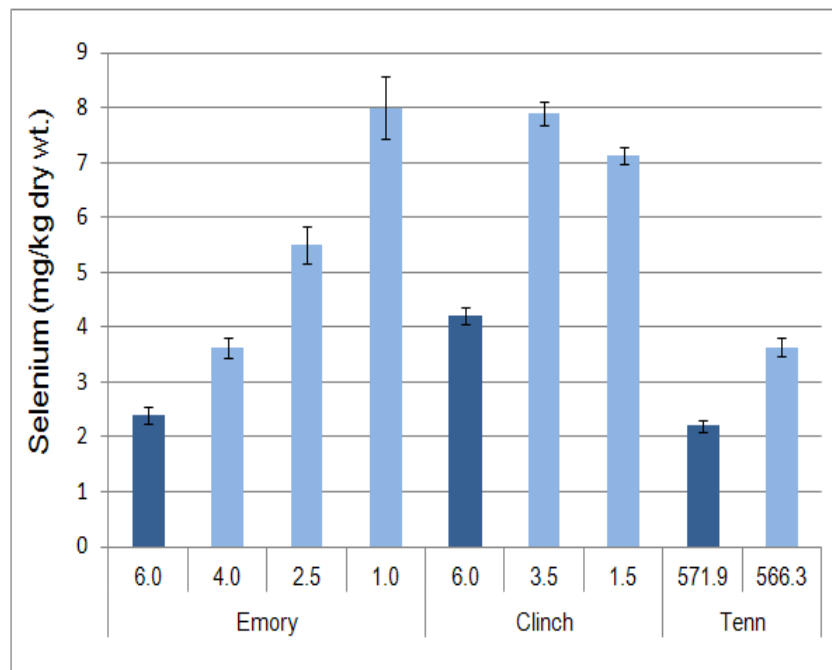


Arsenic

Average 2010: 31 mg/kg
Average 2011: 10 mg/kg



Selenium

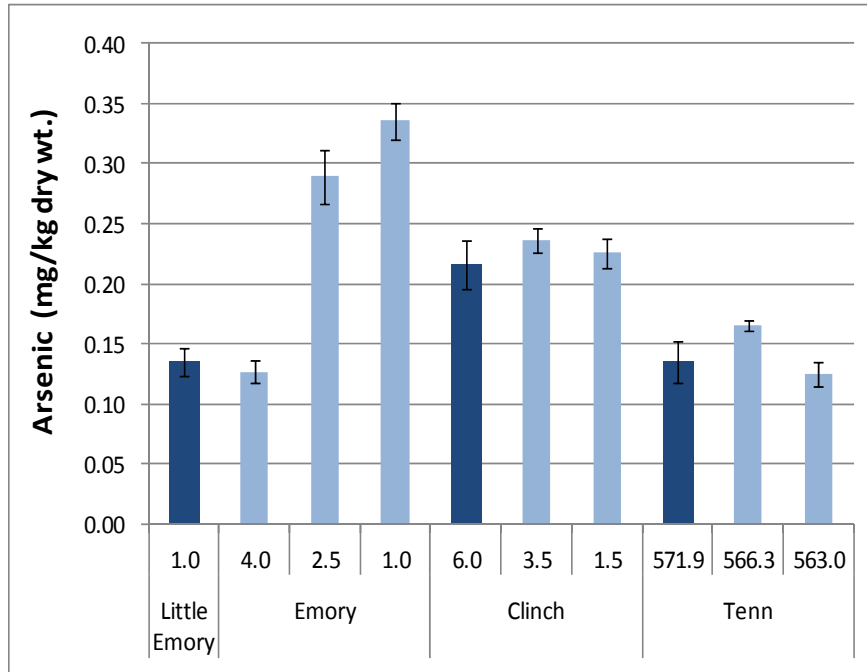


Reference Impacted

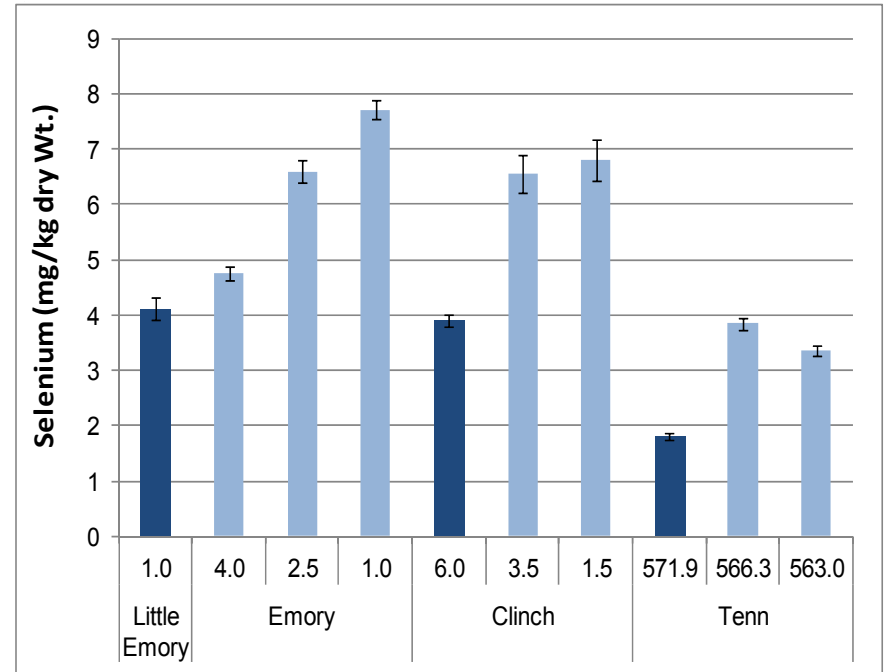
2009-2011 Mayfly Adults



Arsenic



Selenium



Reference
 Impacted

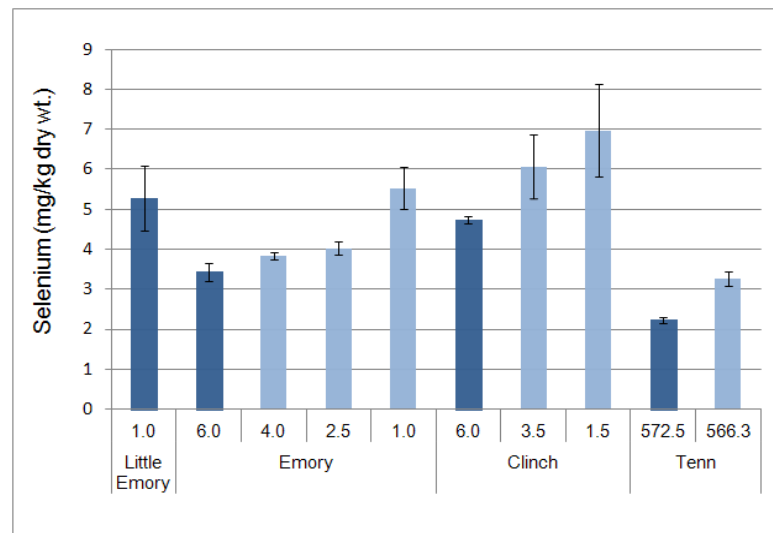
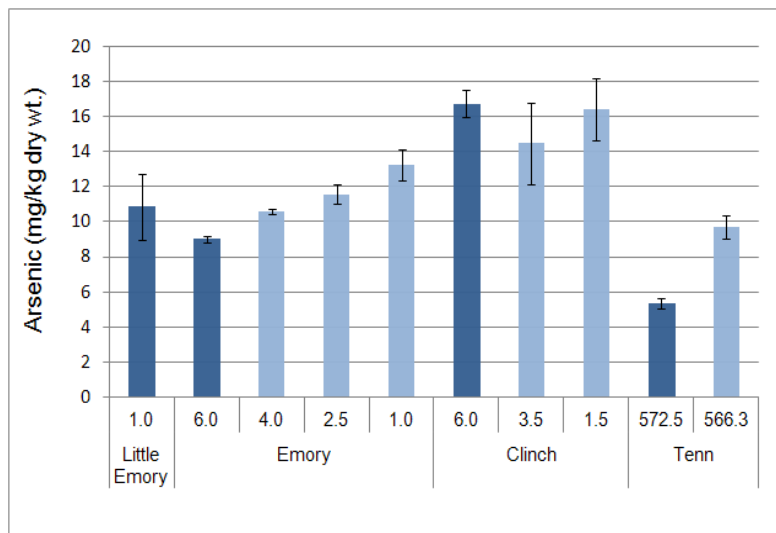
Benthic Invertebrate Bioaccumulation- Snails

2010 Snails (Depurated)



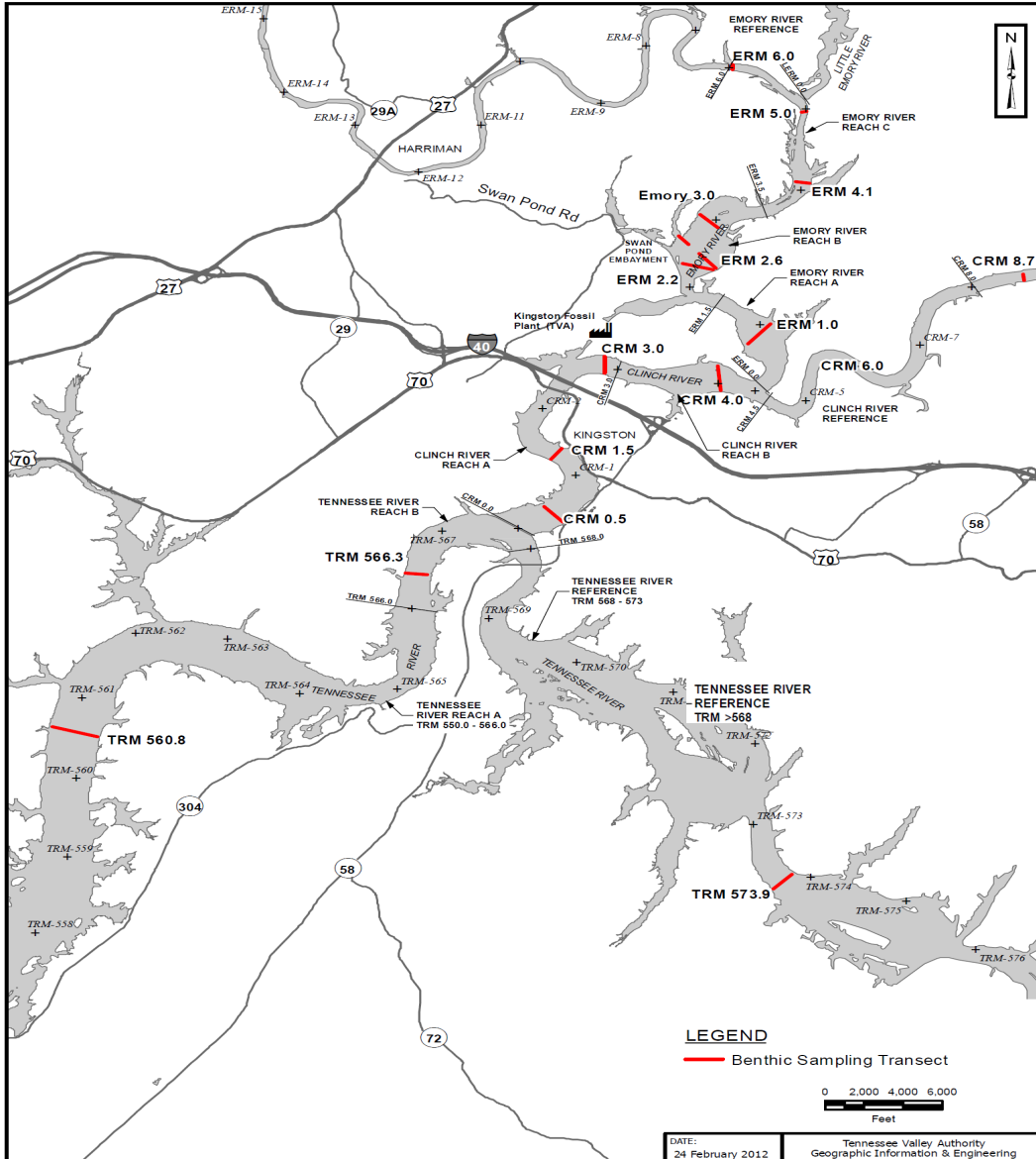
Arsenic

Selenium



Reference Impacted

TVA Benthic Invertebrate Community



TVA's Valley-Wide Vital Signs Monitoring Program (31 Reservoirs monitored)

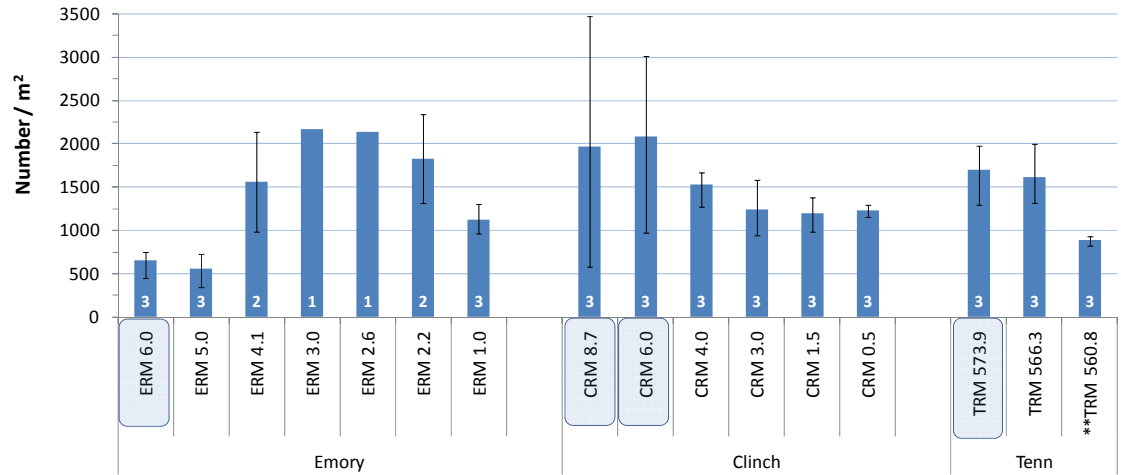
- Reservoir benthic community surveys added in the Emory, Clinch, and Tennessee
 - 11 sites, January 2009
 - 13 sites, December 2009
 - 15 sites, December 2010



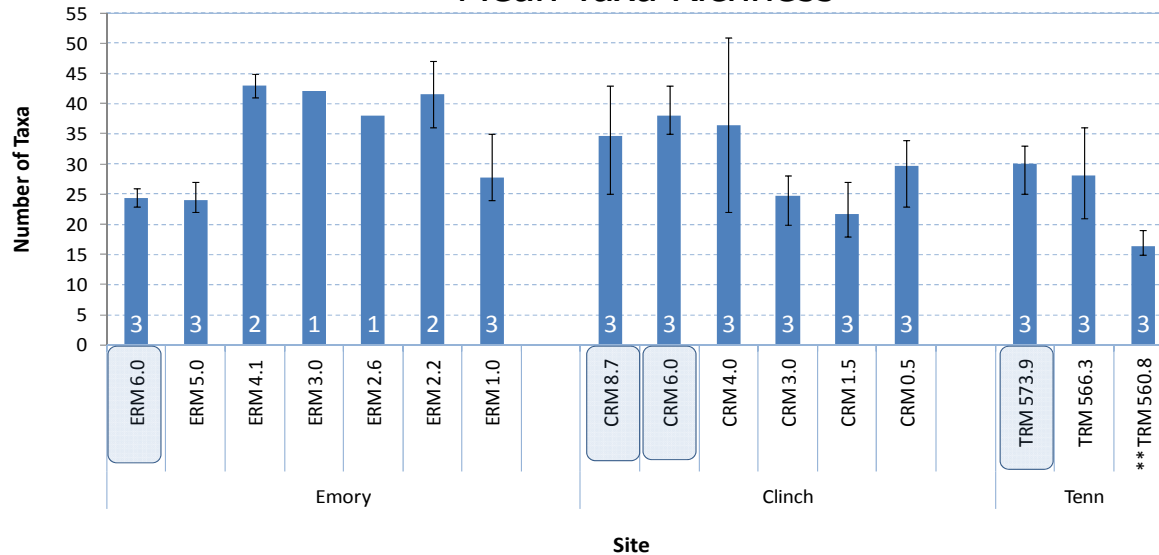
Benthic Invertebrate Community

Benthic Community 2009 and 2010

Mean Population Density



Mean Taxa Richness



"Reference" Sites

Mean (± Min and Max))

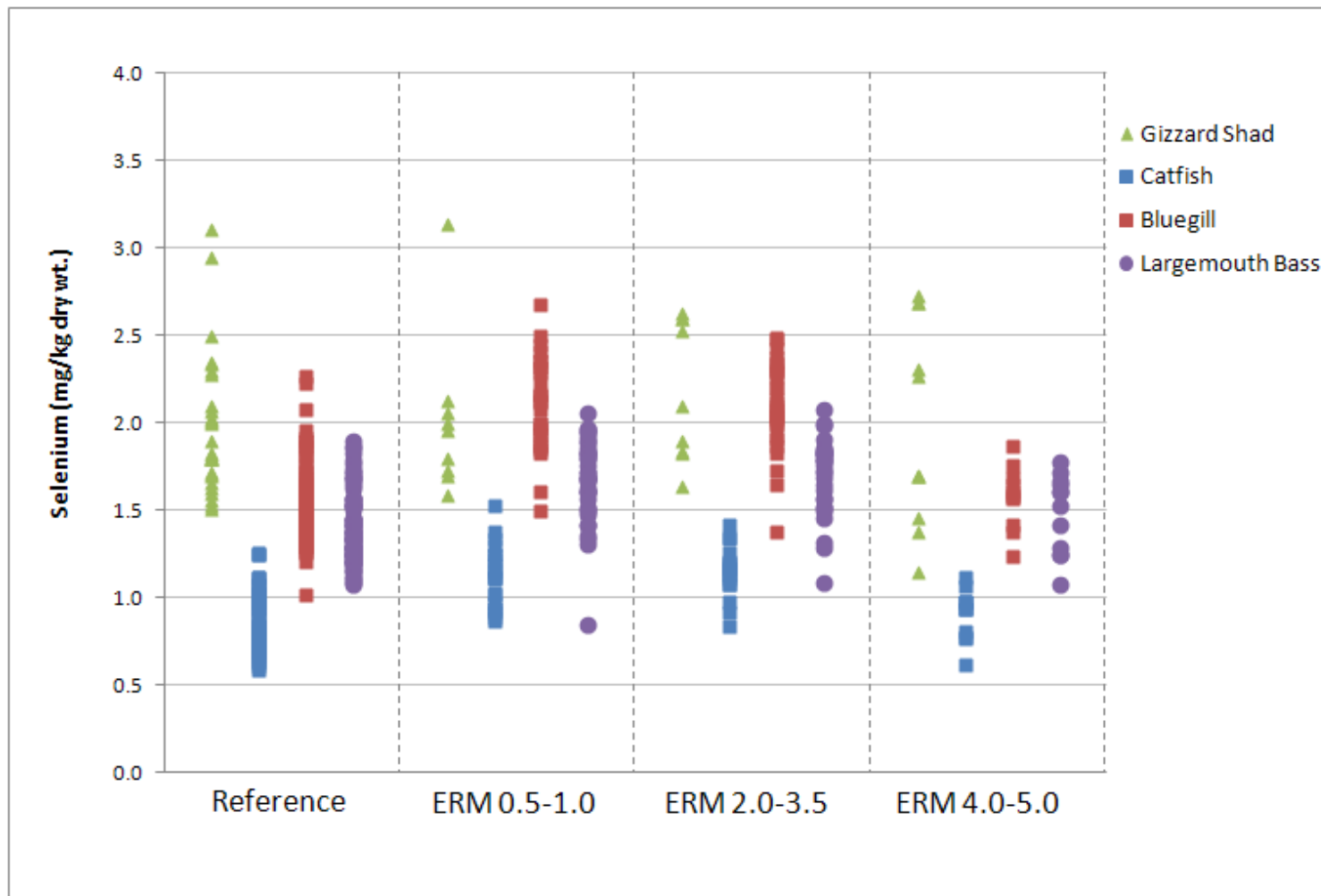


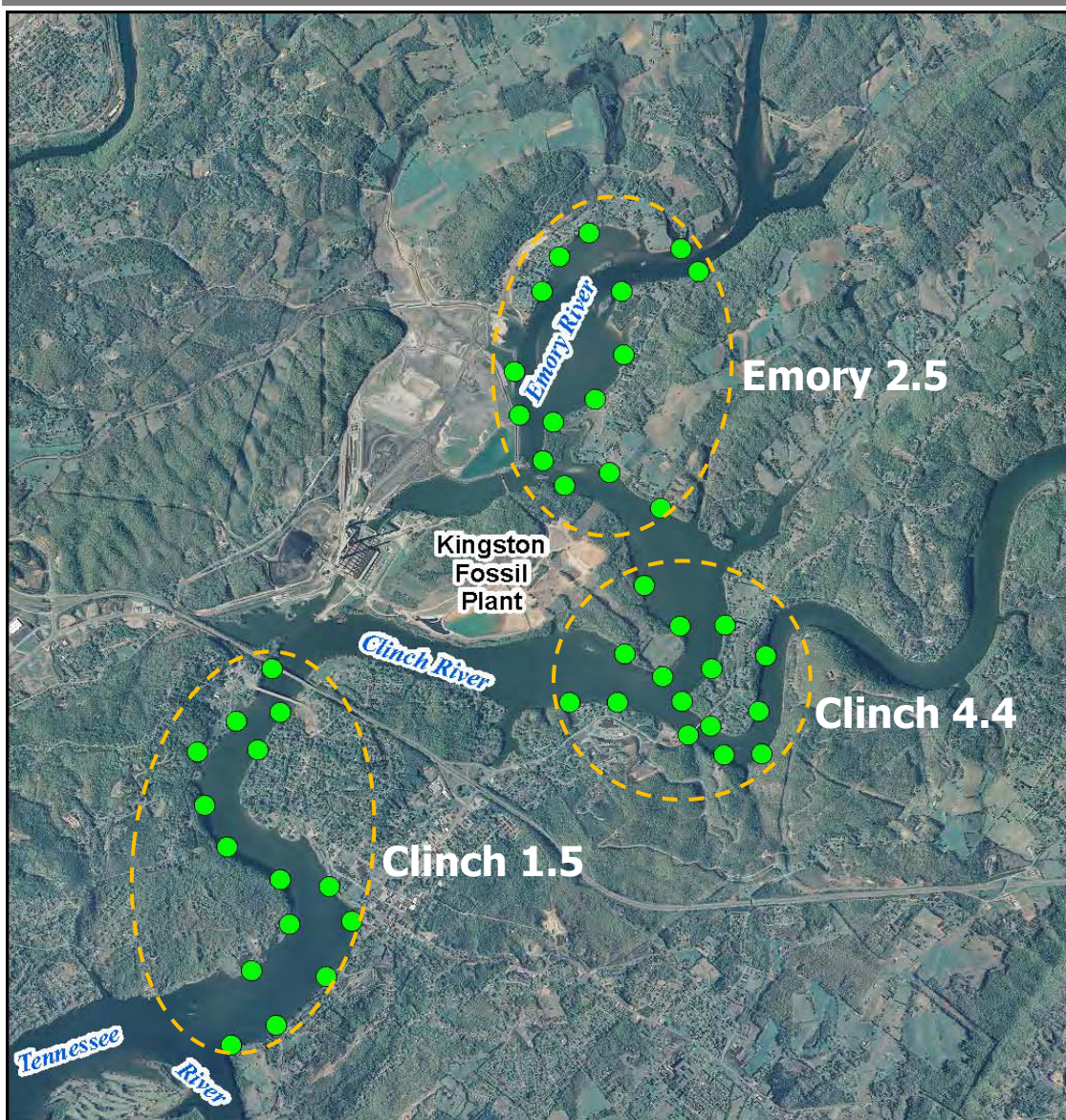
[Play Fish Video](#)



Fish Bioaccumulation

Whole-body Selenium Concentrations in Fish Spring 2009 - Spring 2011





Reservoir Fish Assemblage Index

- Evaluation of the fish community

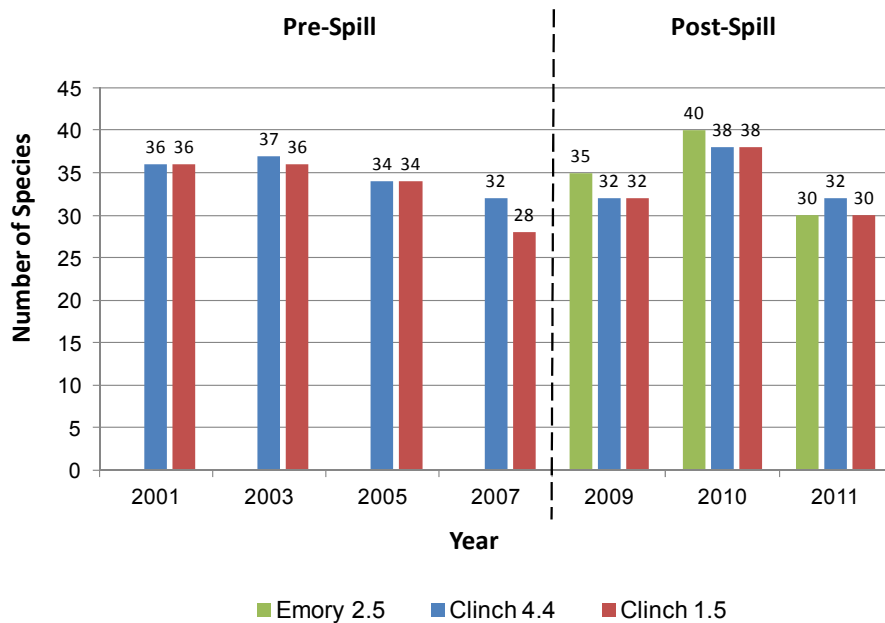
Spring Sport Fish Survey

- Quantitative survey of black bass populations

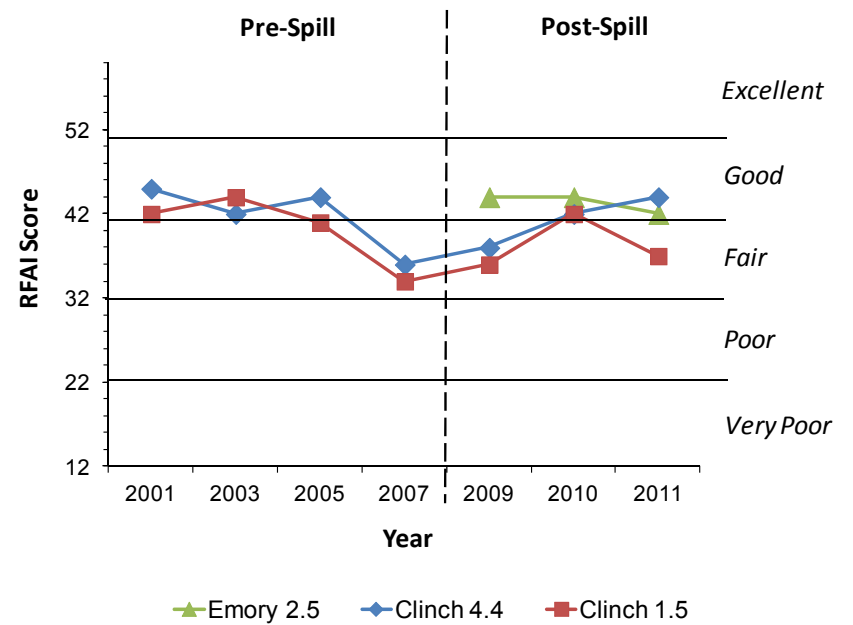


Fish Community Assessment 2001-2011

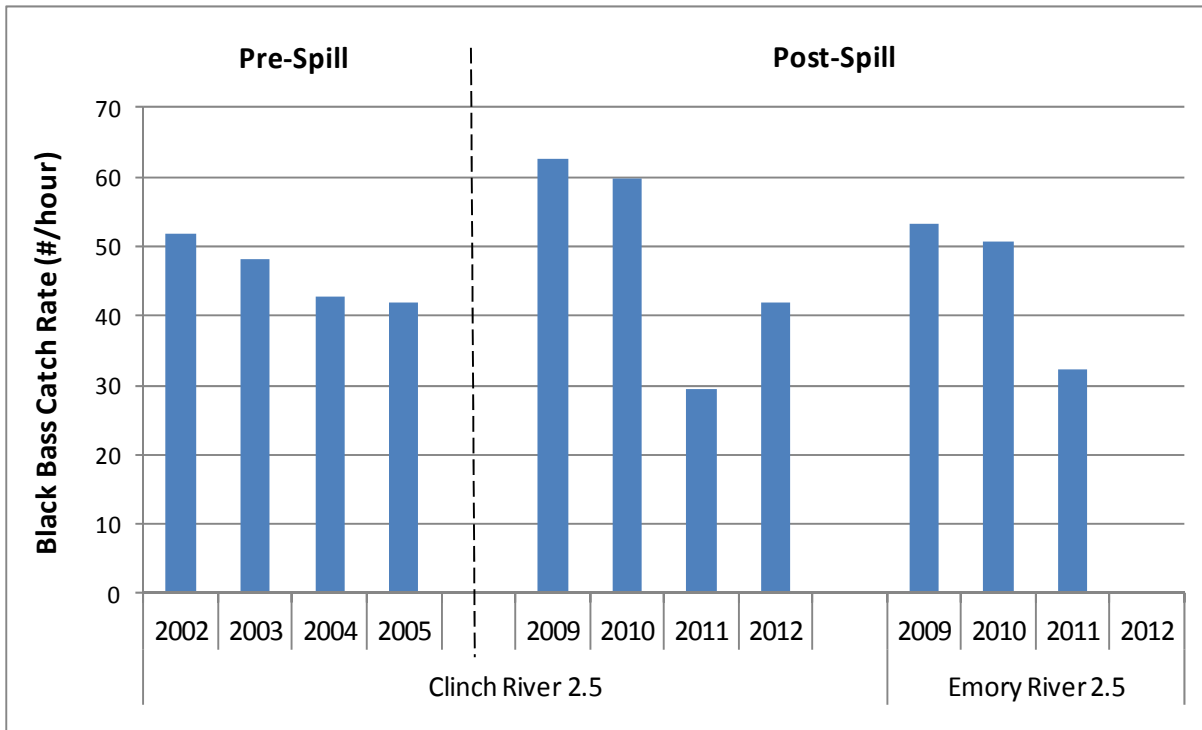
Fish Species Richness



Reservoir Fish Assemblage Index Scores



Spring Sport Fish Survey Black Bass Catch Rates





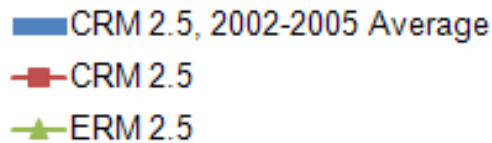
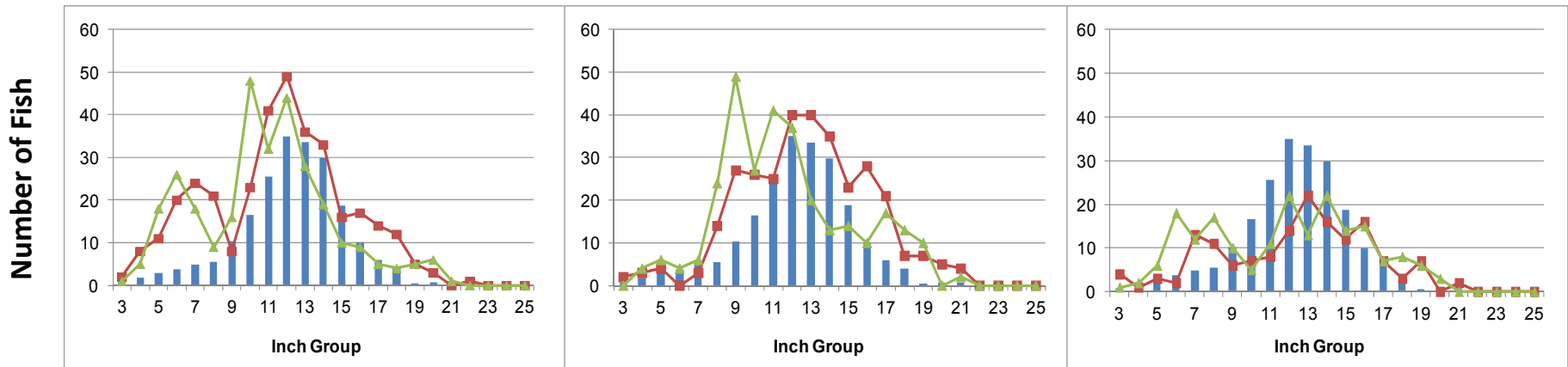
Spring Sport Fish Survey

Length Frequency of Largemouth Bass

2009

2010

2011



- **Laboratory sediment toxicity:**
 - **Moderate effects observed for Emory River sediment samples**
 - **Minimal effects observed for Clinch River sediment samples**
- **Invertebrates and fish bio-accumulating ash-related contaminants**
- **Invertebrate community field observations:**
 - **No apparent ash-related effects on community structure or composition**
- **Fish community and sport fish population observations:**
 - **No apparent effects on catch rates, diversity, reproductive competence**



Preview of “Upcoming Attractions”

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

QUESTIONS?

