



The Effects of Fly Ash Release from the TVA Kingston Steam Plant on Fish

TVA-Kingston Fly Ash Release
Environmental Research Symposium
August 2-3, 2011

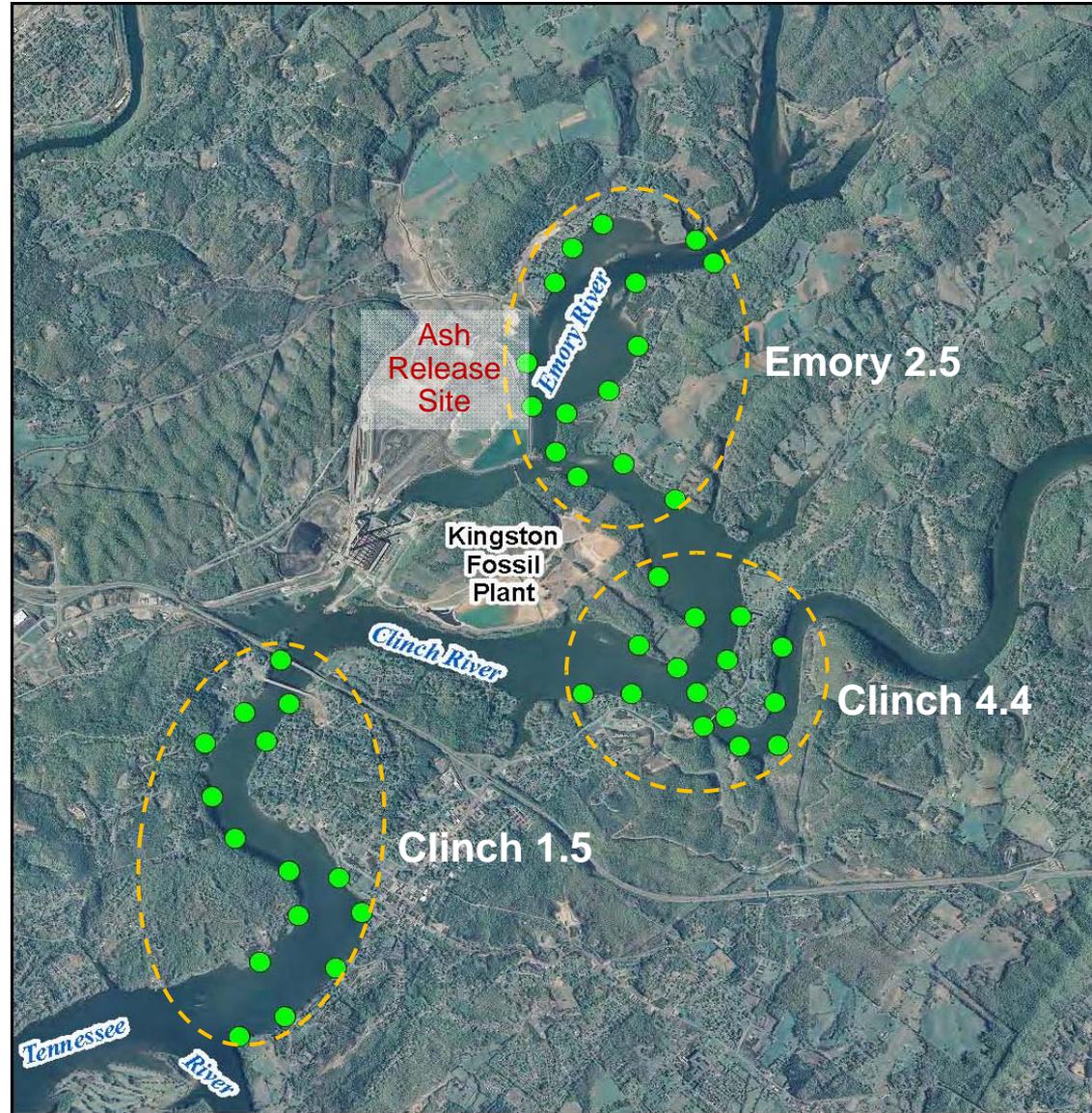
Donny Lowery,
Kurt Lakin and Tyler Baker

- Fish Community Survey
- Spring Sport Fish Survey



Methods

- Fish assemblage sampled at 3 sites in autumn 2009 and 2010
- Two sites (*Clinch 4.4* and *1.5*) sampled in 2001, 2003, 2005, and 2007
- Fifteen 300-meter electrofishing runs and ten overnight, experimental gill net sets per site
- All fish identified, enumerated, and visually inspected for general health



- Community results evaluated using multi-metric scoring method (Reservoir Fish Assemblage Index or RFAI)
 - Species Richness and Composition
 - Trophic Composition
 - Fish Health and Abundance
- Developed in early 1990s as part of TVA's Valley-wide Vital Signs Monitoring Program



Fish Community Survey

Environment & Technology

August 2011

Species Richness and Composition Metrics

1. Total number of species
2. Number of centrarchid species
3. Number of benthic invertivore species
4. Number of intolerant species
5. Number of top carnivore species
6. Percent tolerant individuals
7. Percent non-native species
8. Percent dominance by one species

Trophic Composition Metrics

9. Percent individuals as omnivores
10. Percent individuals as top carnivores

Abundance Metrics

11. Average number per run

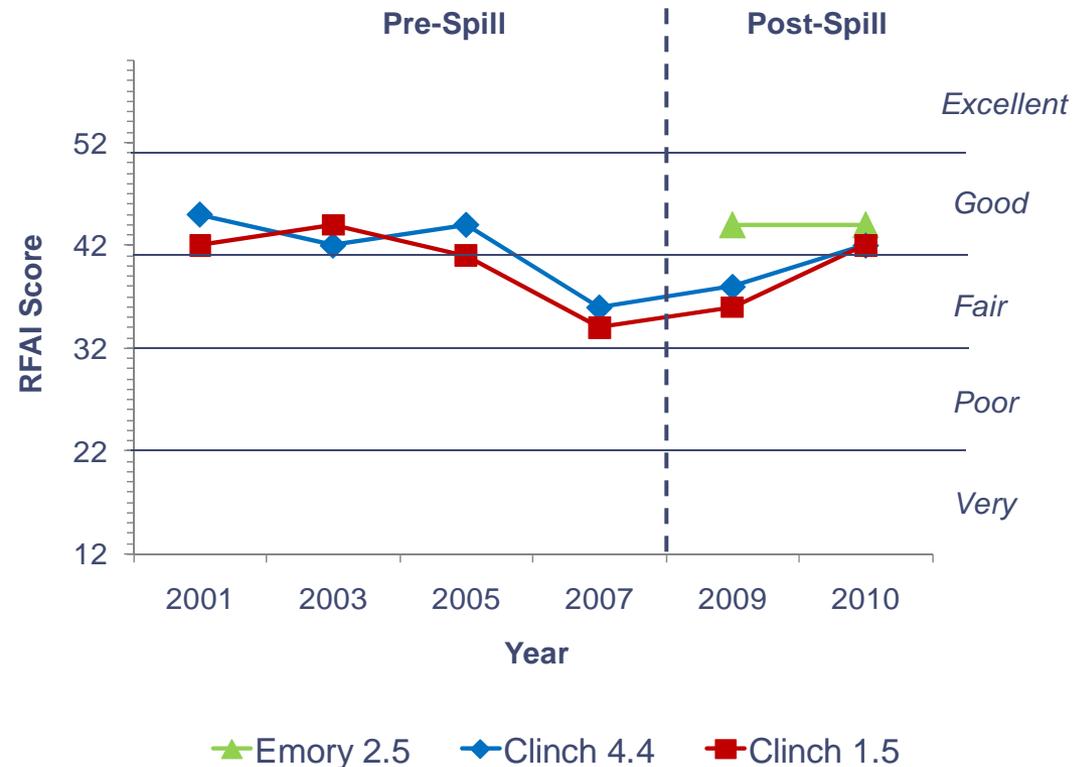
Fish Health Metrics

12. Percent individuals with anomalies

Results

- RFAI scores rated Fair to Good; highest scores nearest spill area
- In 2009, *Emory 2.5* scored higher in number of native species, number of benthic invertivores, and % non-native species
- In 2010, RFAI scores and individual metric scores very similar among sites

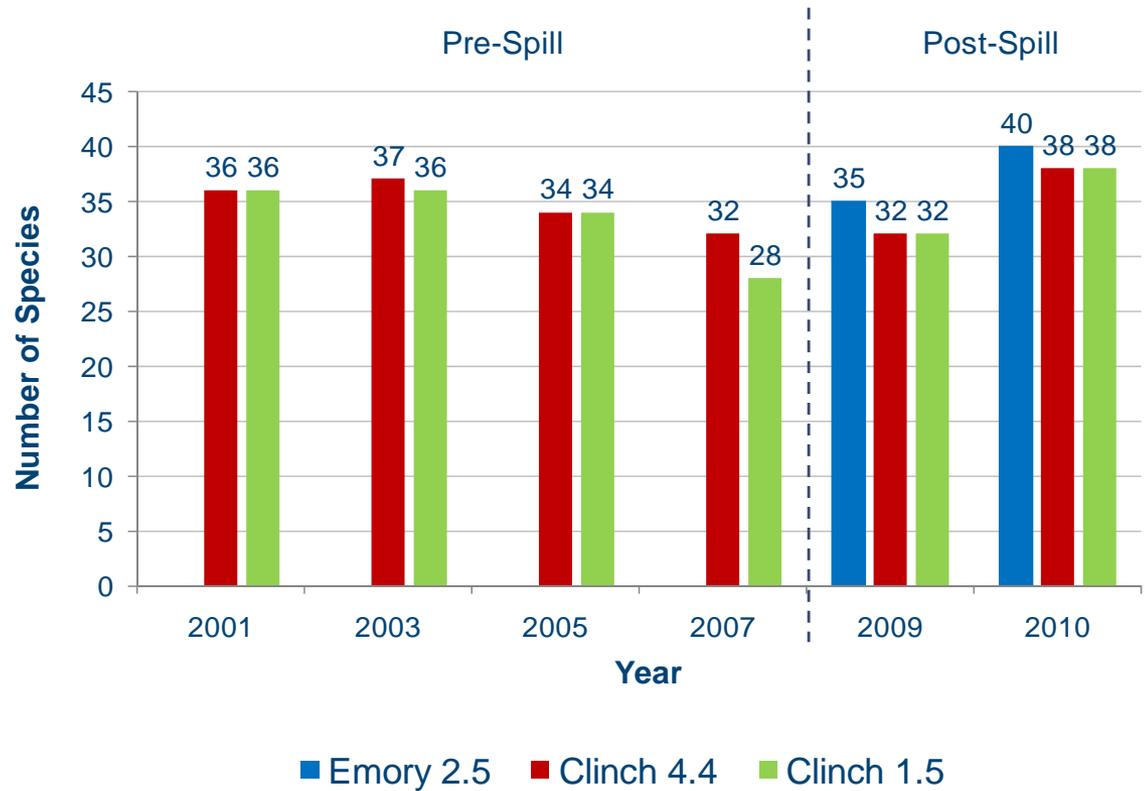
Reservoir Fish Assemblage Index Scores 2001-2010



Results

- Species richness in 2009 and 2010 similar to that observed prior to the spill
- Greatest number (40) at immediate near-field site (*Emory 2.5*) in 2010
- Differences in “incidental” species with historic median catch rates of 0 to 1

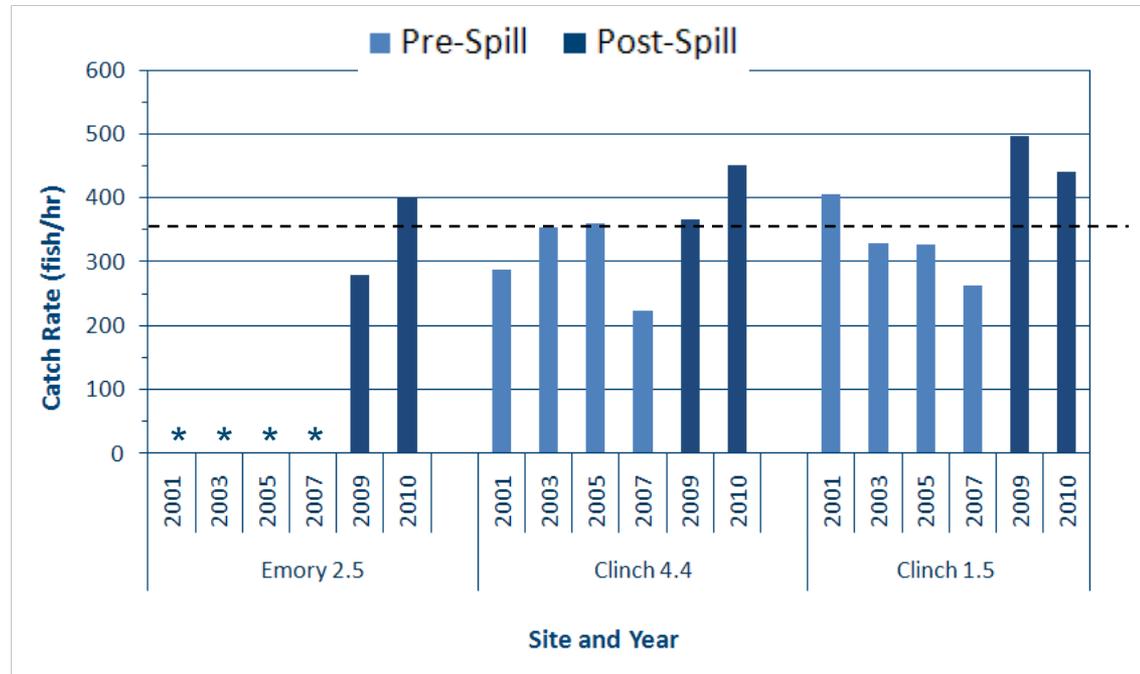
Fish Species Richness 2001-2010



Electrofishing Catch Rate 2001-2010

Results

- Catch rates in 2009 and 2010 similar to that observed prior to the spill
- Overall, highest catch rates in 2010

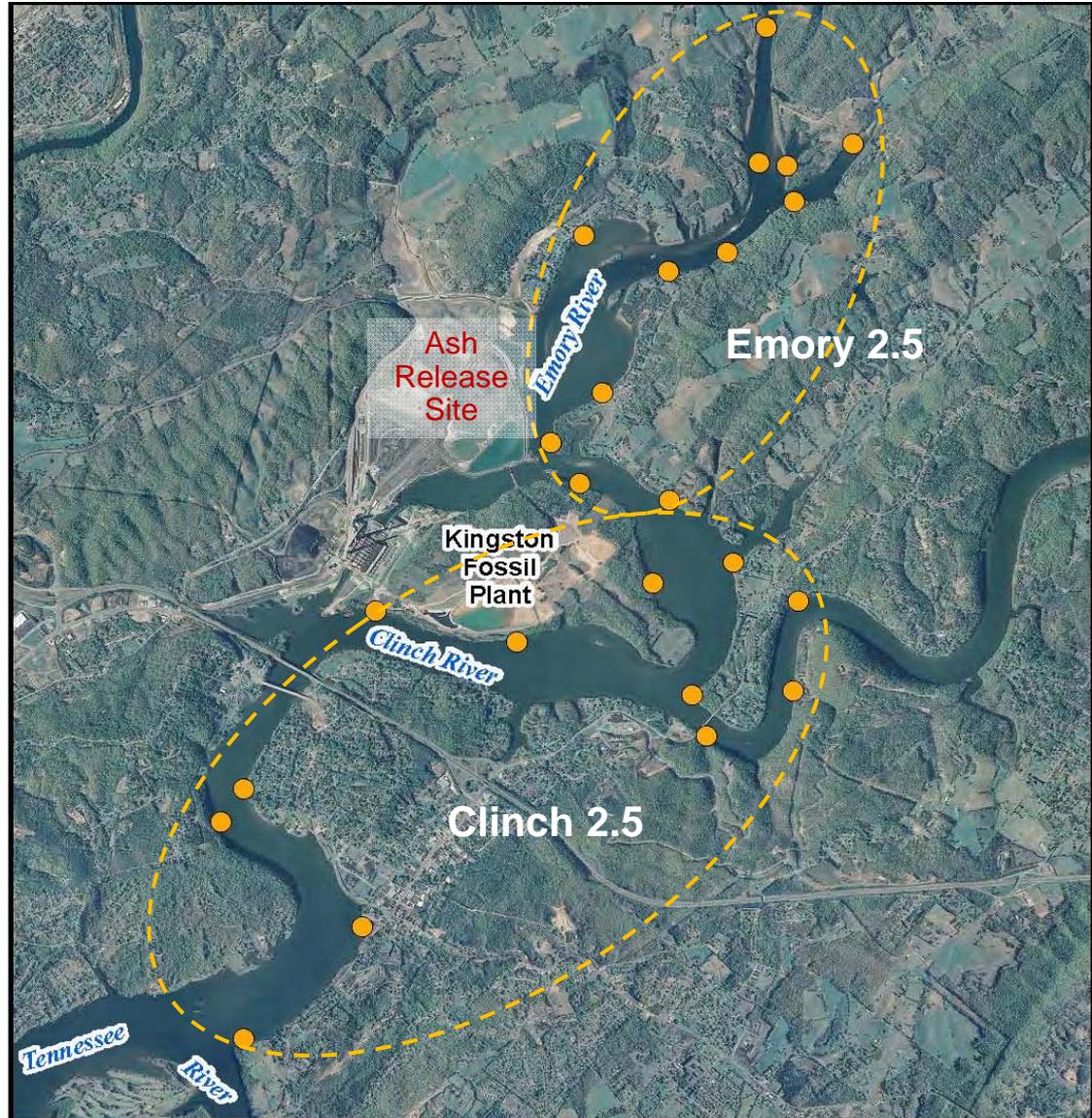


--- Long-term Average Catch Rate

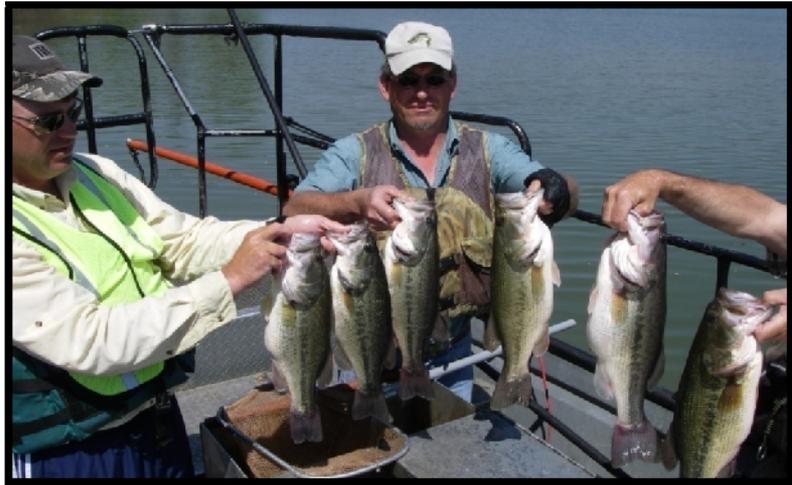
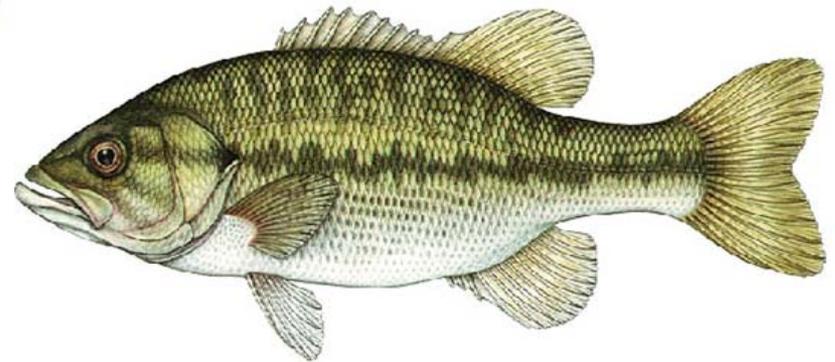
* Not Sampled

Methods

- Quantitative survey of black bass at 2 sites in spring 2009 and 2010
- One site (*Clinch 2.5*) sampled as part of TVA's Valley-wide Monitoring Program in 2002, 2003, 2004, and 2005
- Twelve 30-minute electrofishing runs at fixed stations at each site
- All bass measured, weighed, enumerated, and visually inspected for general health



- Black bass
 - Largemouth bass
 - Smallmouth bass
 - Spotted bass



- Population dynamics

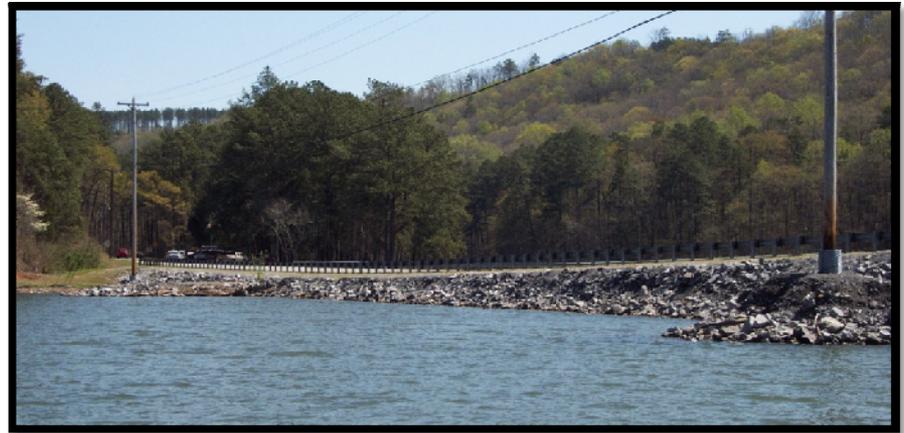
- Catch rate
- Length frequency
- Age and growth
- Relative weight
- Year class strength
- General health
- Provides base line data on sport fish populations







Aquatic Vegetation



Rip Rap



Boat Docks



Rock/Bluff



Spring Sport Fish Survey

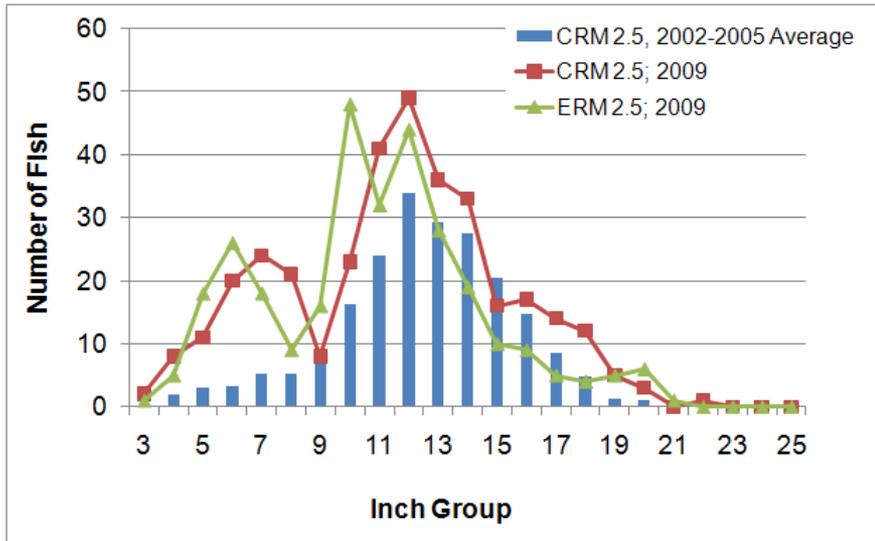
Results

- Six years of data from *Clinch 2.5*; 2009 and 2010 catch rates highest observed
- Catch rates at *Emory 2.5* in 2009 and 2010 slightly lower than at *Clinch 2.5*, but similar to Clinch River's long-term average of 51.2 fish/hr
- Anomalies observed in 1.3 to 2.8% of bass collected in 2009 and 2010; lower than 2002-2005 average of 3.7% for *Clinch 2.5*

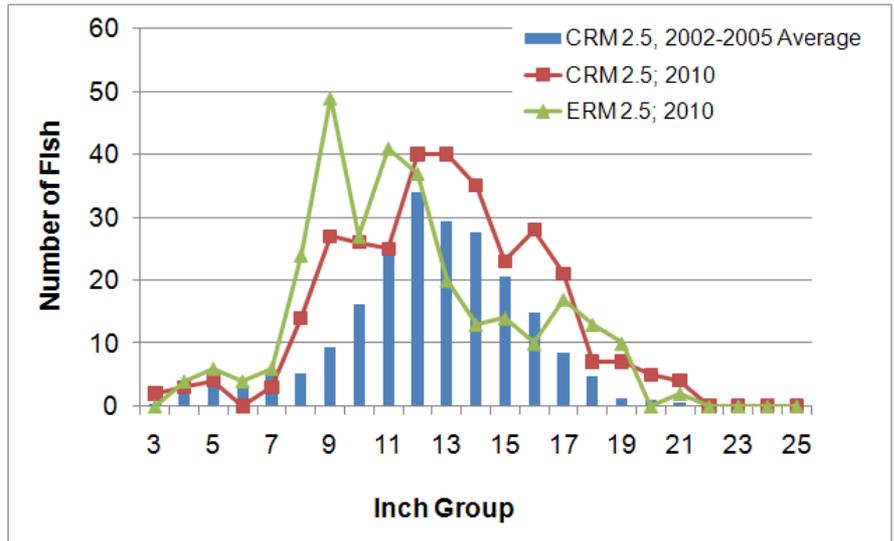
Spring Sport Fish Survey Catch Rates and Percent Anomalies

River	Year	Total # of Black Bass Collected	Catch Rate (no./hr.)	Total Anomalies
EMORY	2009	319	53.2	4 (1.3%)
	2010	304	50.7	8 (2.6%)
CLINCH	2002	311	51.8	7 (2.3%)
	2003	289	48.1	11 (3.8%)
	2004	256	42.7	14 (5.5%)
	2005	252	42.0	8 (3.2%)
	2009	376	62.7	9 (2.4%)
	2010	357	59.7	10 (2.8%)

Length Frequency Histograms for Largemouth Bass



Spring 2009



Spring 2010