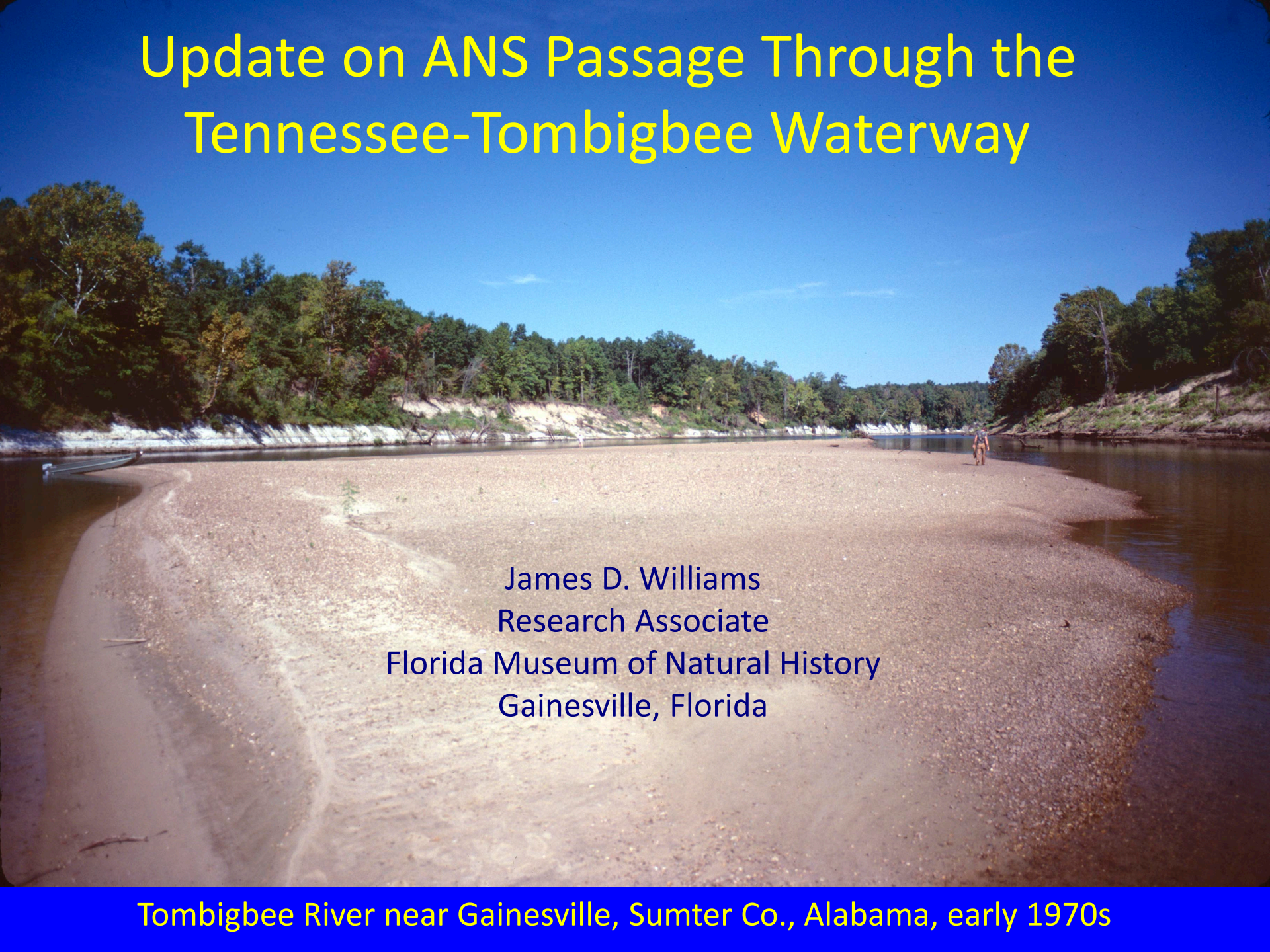


Update on ANS Passage Through the Tennessee-Tombigbee Waterway



James D. Williams
Research Associate
Florida Museum of Natural History
Gainesville, Florida

Tombigbee River near Gainesville, Sumter Co., Alabama, early 1970s

Tennessee-Tombigbee Waterway



Construction started 1972

Opened in 1985

A “short cut” from the Ohio and upper Mississippi Rivers to the Gulf of Mexico

Project cut across the divide between Tennessee and Tombigbee basins, connecting two isolated and evolutionarily different faunas



Aquatic Diversity – Mobile and Tennessee Basins

Mobile Basin - Alabama, Georgia, Mississippi, and Tennessee

Fishes – 180 (Tombigbee ~120) (~15% of US)

Aquatic Turtles – 12 (Tombigbee 9)

Mussels – 75 (Tombigbee ~46) (~25% of US)

Snails – 121

Crayfishes – 58 (Tombigbee ~25) (15% of US)

Tennessee Basin - Alabama

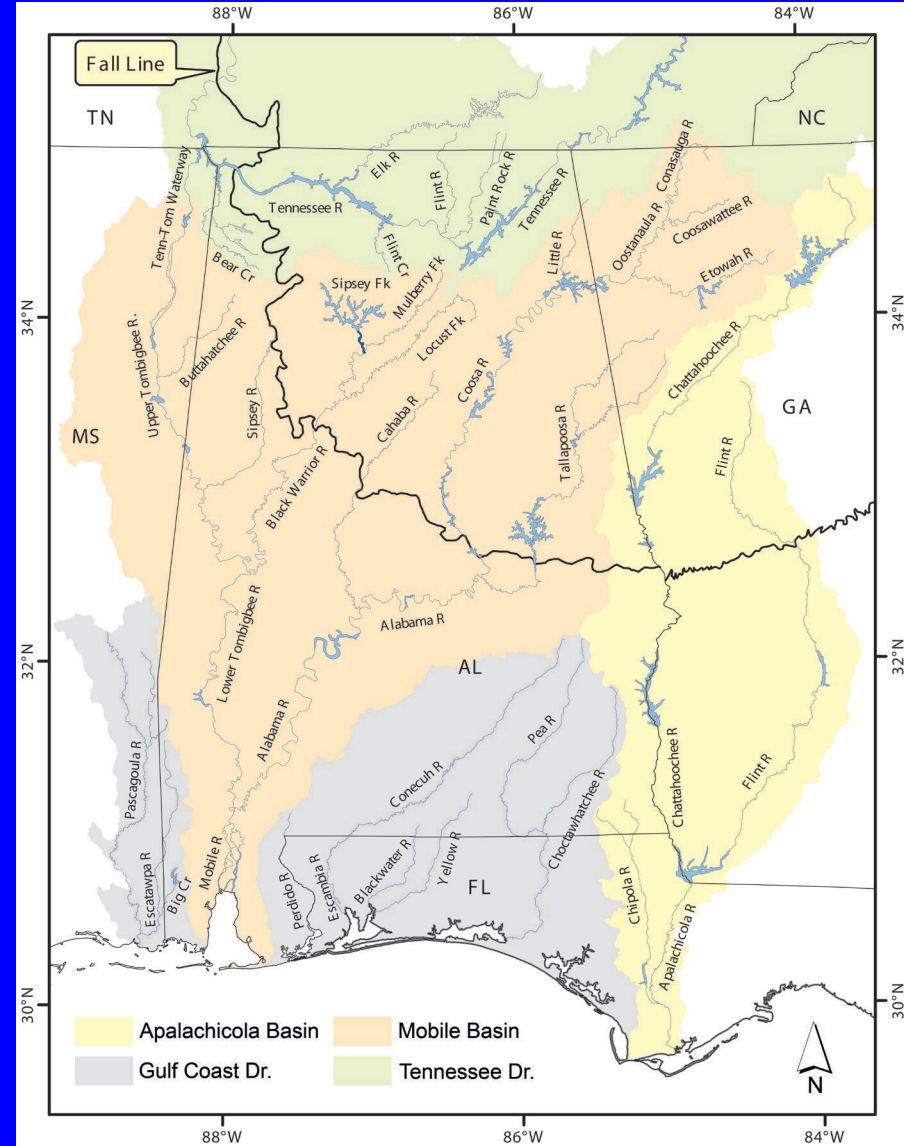
Fishes – 162 (lower Tennessee ~115)

Aquatic Turtles – 10 (lower Tennessee 10)

Mussels – 93 (lower Tennessee ~25)

Snails – 59

Crayfishes – 47



Note: Numbers of species are from various sources and are approximate.

Tenn-Tom Waterway Statistics

10 locks and dams

Locks 600 ft long x 110 ft wide

Tow size 8 barges/lockage

Waterway 300 ft wide

Waterway 9 to 12 ft deep

Whitten Lock (Bay Springs) 84 ft

Montgomery Lock E 30 ft

Rankin Lock D 30 ft

Fulton Lock C 25 ft

Wilkins Lock B 25 ft

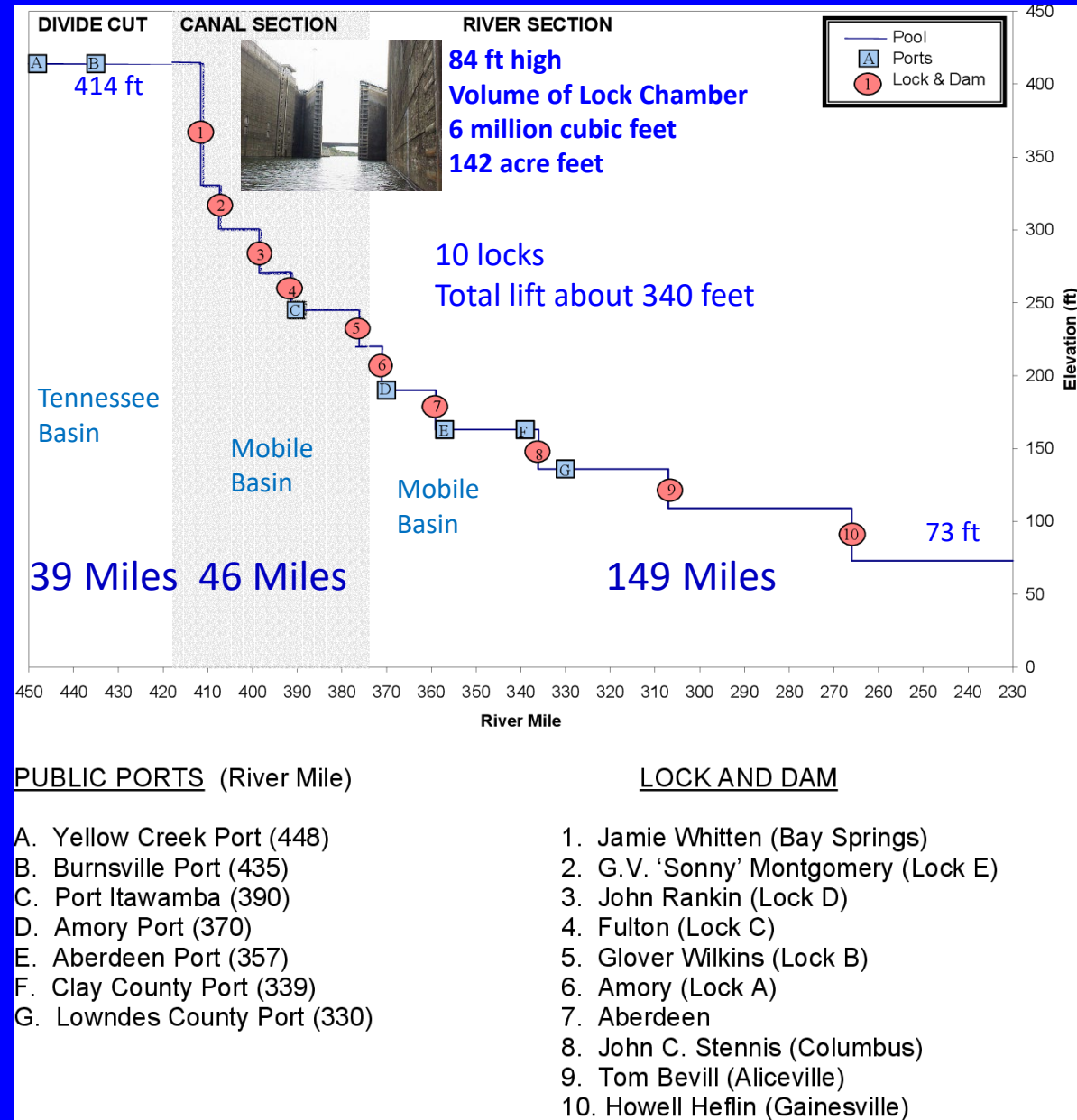
Amory Lock A 30 ft

Aberdeen Lock and Dam 27 ft

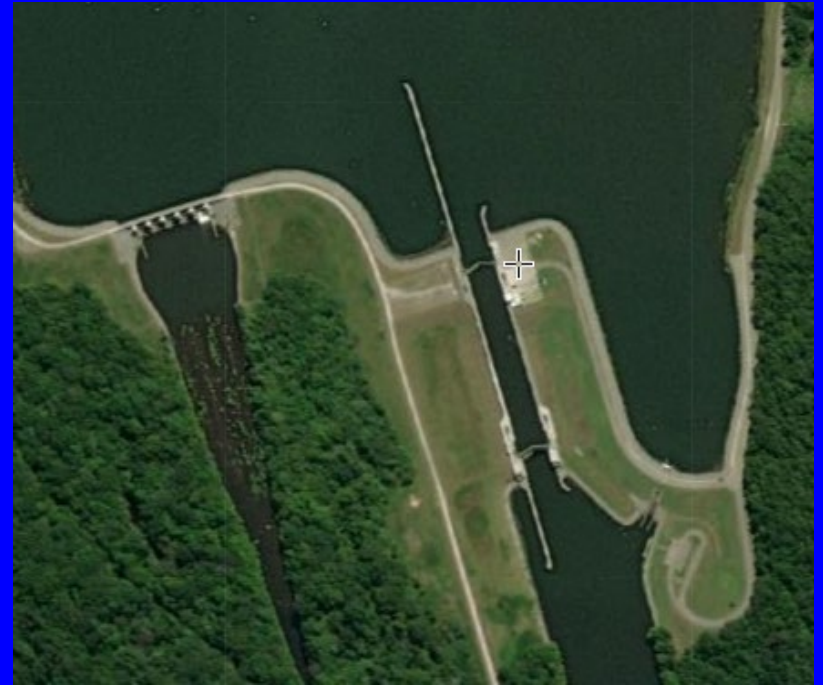
Columbus Lock and Dam 27 ft

Aliceville Lock and Dam 27 ft

Gainesville Lock and Dam 36 ft



Water Control Structures in the Canal Reach of the Tennessee-Tombigbee Waterway



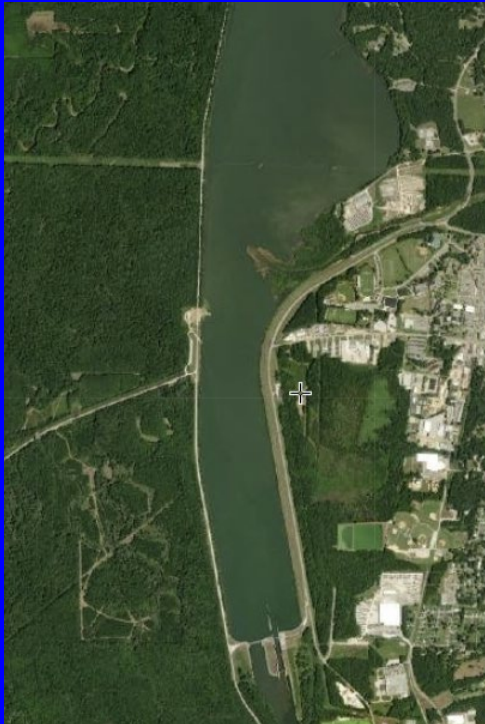
Lock E Tennessee-Tombigbee Waterway
Sonny Montgomery Lock



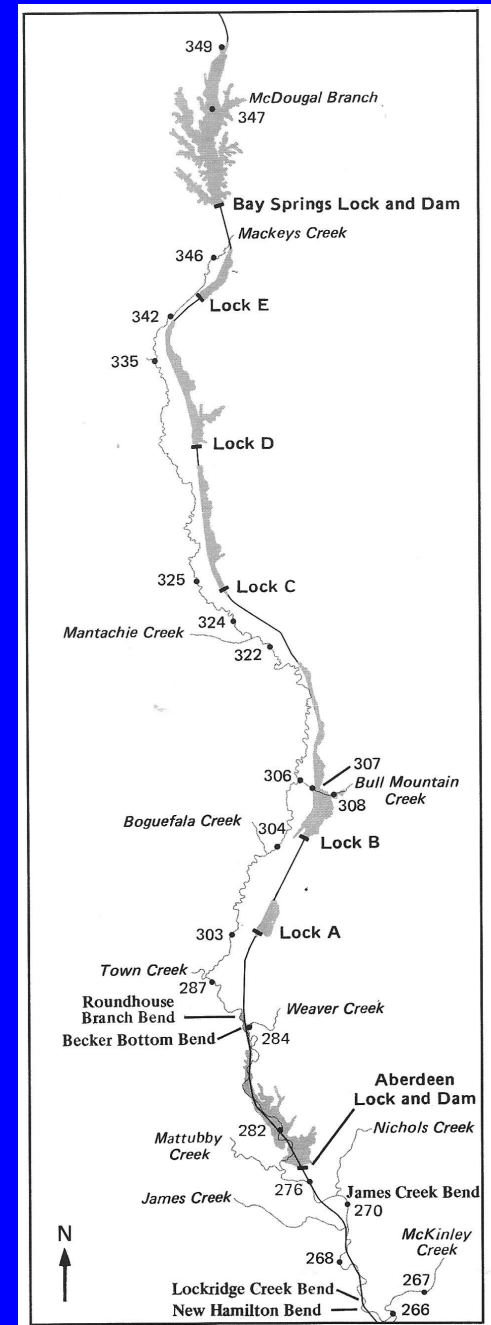
Canal Section of Tenn-Tom Waterway

Note old Tombigbee River
channel west of canal

Example of canal reach
between Rankin Lock D
and Fulton Lock C



Map from Boschung 1989



They're here...

Silver Carp, *Hypophthalmichthys molitrix*

Tenn-Tom Waterway, reservoir behind Sonny Montgomery Lock and Dam (Lock E) located 4 river miles below Bay Springs Lock, Prentiss County, MS.

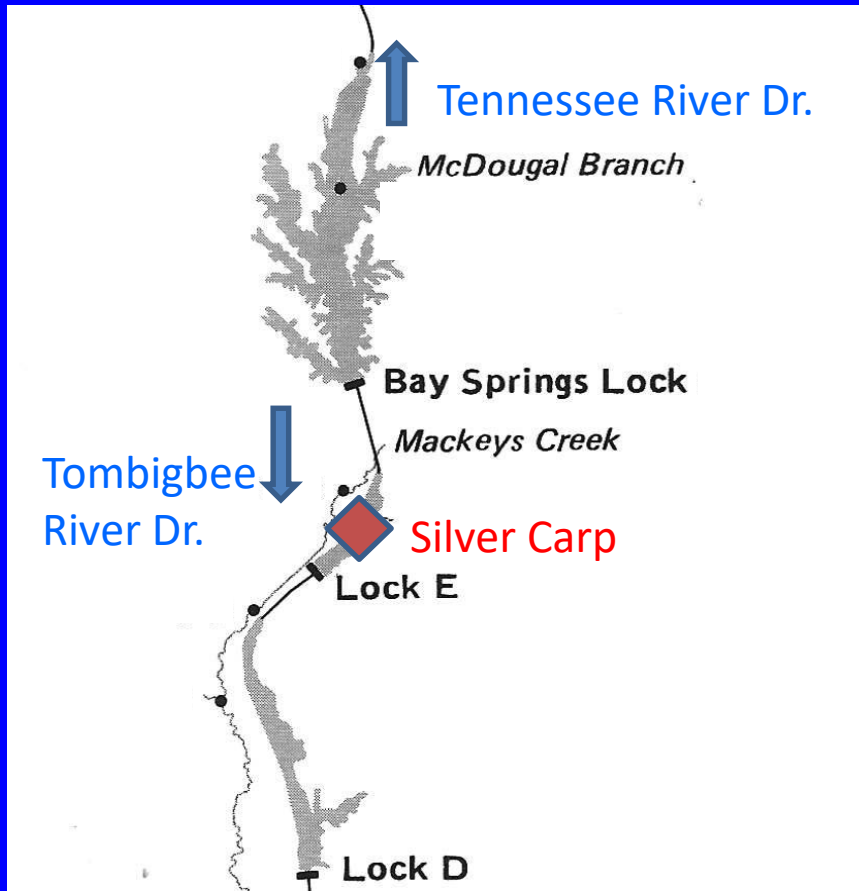
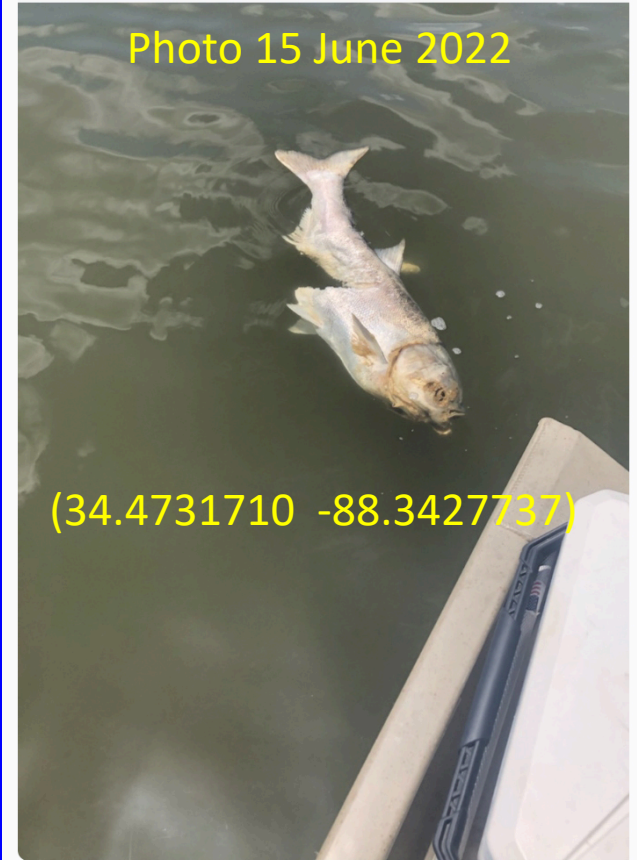


Photo 15 June 2022



(34.4731710 -88.3427737)

Silver Carp? Floating in the TTW pool above Montgomery lock and dam.

Photo by Dr. Will Selman,
Millsaps College, Jackson, MS.

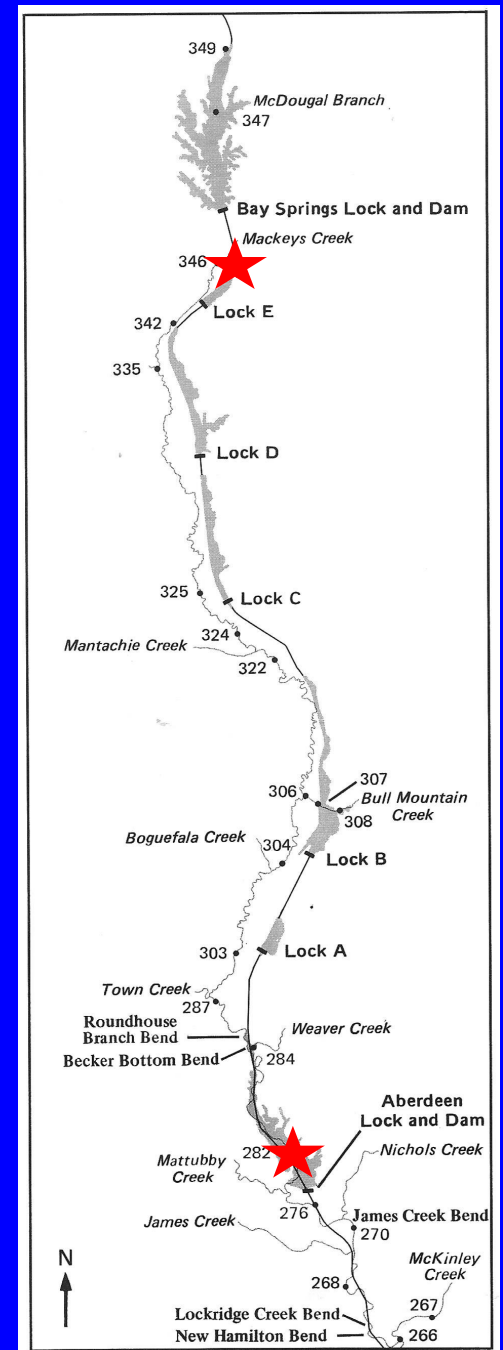
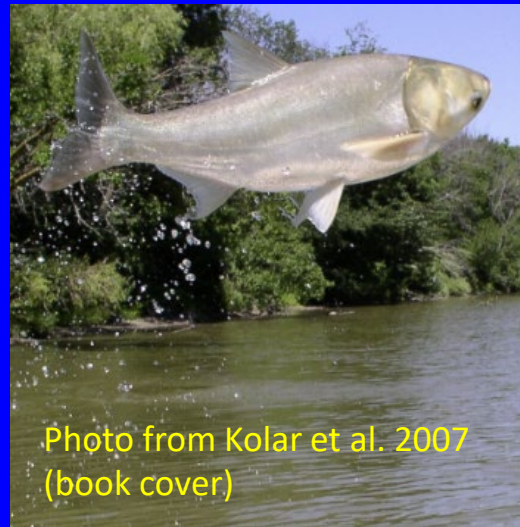
They're here.....

Silver Carp, *Hypophthalmichthys molitrix*

Early June 2022 – USACE employee forwarded a report to Caleb Aldridge, USFWS, of a “jumping carp” in Aberdeen Lake

Aberdeen Lake at RM 357.5 (~55 RM downstream of Bay Springs Lock) in the Tenn-Tom Waterway

There is a 50% probability that 20 Silver or Bighead Carps could establish a permanent population (Great Lakes)



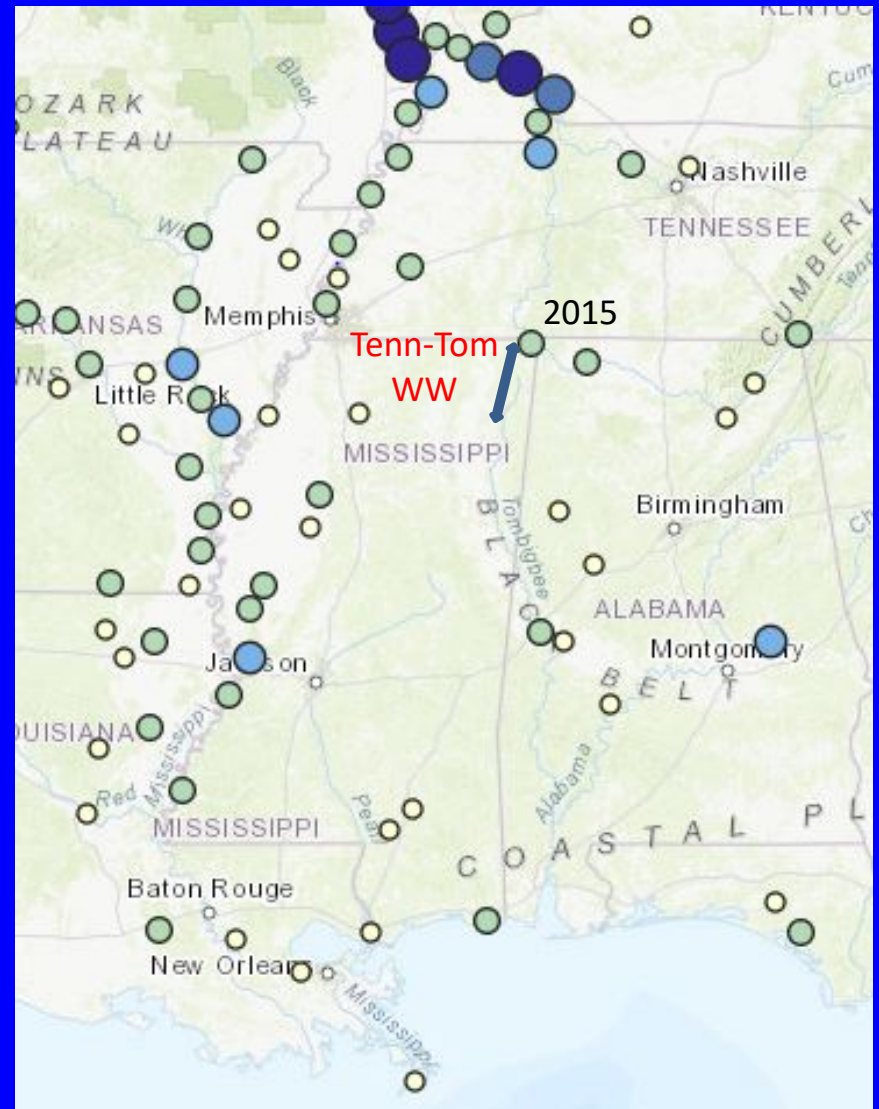
Foreign Nonindigenous Fishes

Family Cyprinidae

Bighead Carp

Hypophthalmichthys nobilis

Nearest record ~40 RM from Bay Springs Lock



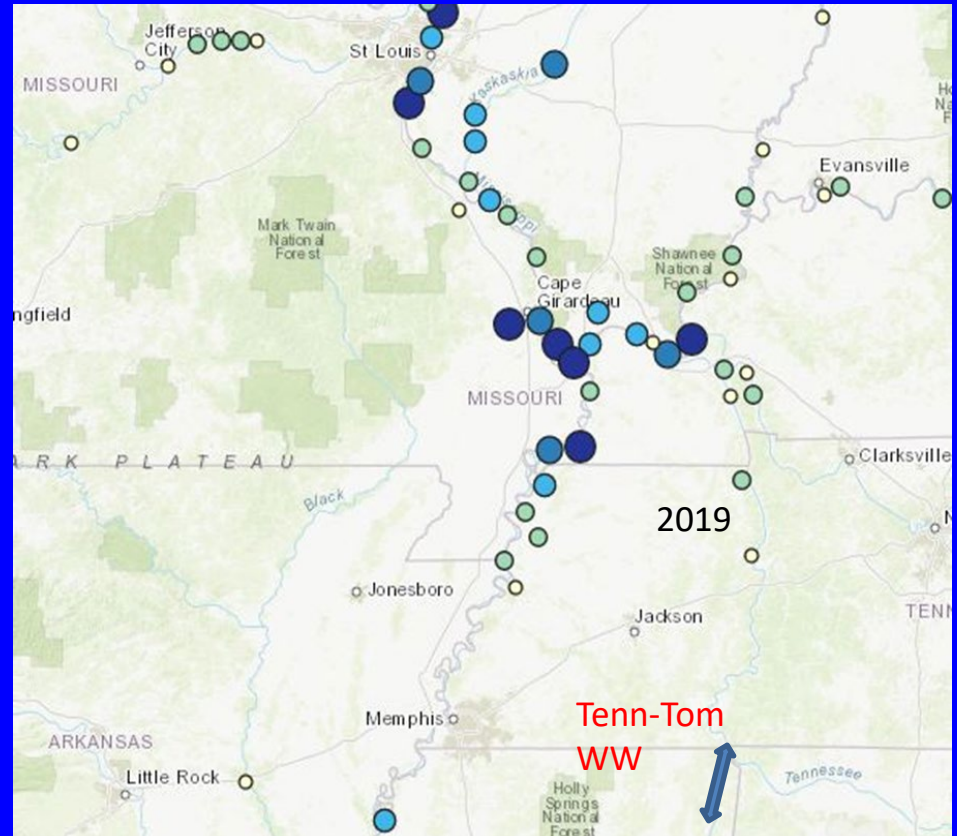
Foreign Nonindigenous Fishes

Family Cyprinidae

Black Carp

Mylopharyngodon piceus

Nearest record ~150 RM from Bay Springs Lock



Common name

Goldfish

Grass Carp

Common Carp

Scientific name

Carassius auratus

Ctenopharyngodon idella

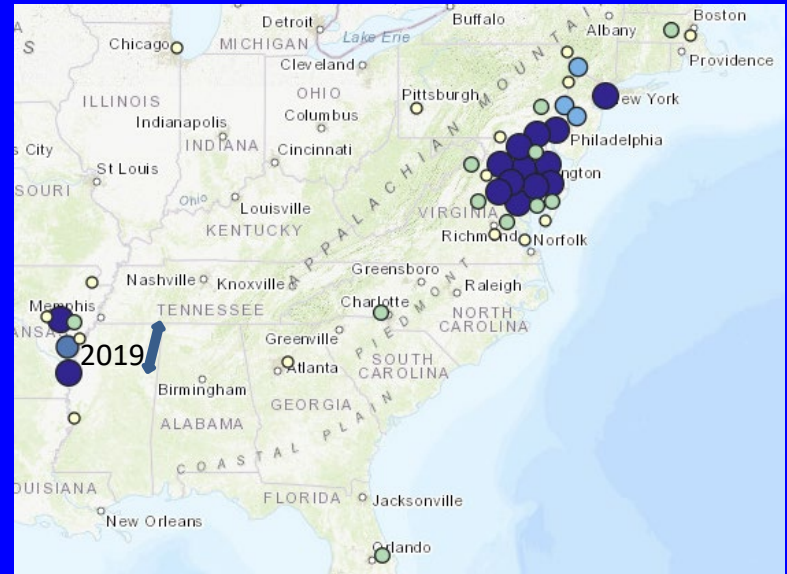
Cyprinus carpio

Foreign Nonindigenous Fishes

Family Channidae

Northern Snakehead, *Channa argus*

Nearest record ~600 RM from Bay Springs Lock



Family Gobiidae

Round Goby, *Neogobius melanostomus*

Nearest record ~500 RM from Bay Springs Lock



Invasive Carp Action Plan for Fiscal Year 2022

March 2022

Invasive Carp Regional Coordinating Committee

Section 4.0 –NATIONWIDE AND BINATIONAL INVASIVE CARP MANAGEMENT

2022 Action Plan is funded by combination of \$262,980,344 in agency funding plus \$21,000,000 in Great Lakes Restoration Initiative funds.

Plan does include research, deployment, and evaluation of a BAFF system at Kentucky and Barkley Locks on Tennessee and Cumberland Rivers.

Tagging and monitoring above and below Barkley and Kentucky dams is currently ongoing.

++++++

Preliminary results – Carps most active movement upstream is between July-October.



Asian Carp Early Detection and Monitoring Plan for Tennessee-Tombigbee Waterway

Mississippi DWFP and USFWS biologists, in Fall 2021, developed an early detection monitoring protocol to detect movement of invasive carp on the Tenn-Tom Waterway downstream of Bay Springs Lock.

Mississippi DWFP has included the Tenn-Tom lakes on a rotating basis in their fisheries monitoring project (using electrofishing gear).

This sampling began in February 2022 on pools above Lock D and Lock E with plans to continue downstream in the Tombigbee River.

To date no carp have been detected during this effort, but both agencies continue monitoring.

Silver Carp Detection Project

Receiver Locations in Yellow Creek Embayment

MDWFP Tennessee Tombigbee Waterway and Pickwick Lake Receiver Locations



Map from Bryant Haley, MDFWP

16 Silver Carp detected by Goat Island receiver, 4 were tagged by MDWFP in 2019. Three of the four were tagged in Indian Creek and one in Panther Creek (data from Bryant Haley, MDWFP).



Goat Island Receiver Summary

Year	Month	n	transmitters
2019	November	2	1
2019	December	47	1
2020	February	1354	1
2021	July	914	1
2022	January	1558	2
2022	March	4750	4
2022	April	103	2
2022	February	3612	4
Note: n= total number of receiver hits, transmitters = unique individuals			

Bay Springs Receiver Summary

Year	Month	n	transmitters
2020	May	1	2
2020	August	2	1
Note: n= total number of receiver hits, transmitters = unique individuals			

Native Aquatic Species Invasions via the Tennessee-Tombigbee Waterway

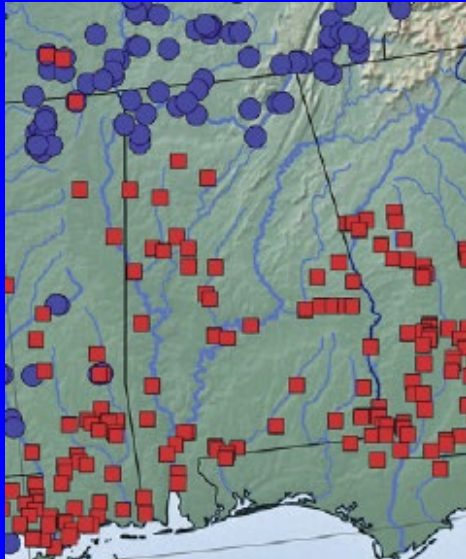
All native species, whether endemic to the Tennessee basin, Tombigbee basin, or more widespread occurring on both sides of the drainage divide, are at risk.

- The two basins are inhabited by evolutionarily distinct aquatic communities
- Movement, via the waterway, of aquatic species across drainage divide has potential to negatively impact native species and their environments
- Possible outcomes include hybridization and ecological interactions (e.g., competitive displacement, predator-prey relationships)
- While threats of natives crossing the divide may appear subtle, they have the potential to significantly impact biodiversity on both sides of the divide

Rhymer, J.M., and D. Simberloff. 1996. Extinction by hybridization and introgression. *Annual Reviews Ecology Systematics* 27:83–109.

Competitive Interaction of Silversides Genus *Labidesthes* & *Menidia*

Brook Silverside, *Labidesthes sicculus*



Brassy Silverside, *Labidesthes vanhyningi*

Inland Silverside, *Menidia audens*



Introduced into Tennessee R. drainage 1991.

By 2011 found throughout the entire Tennessee River mainstem.

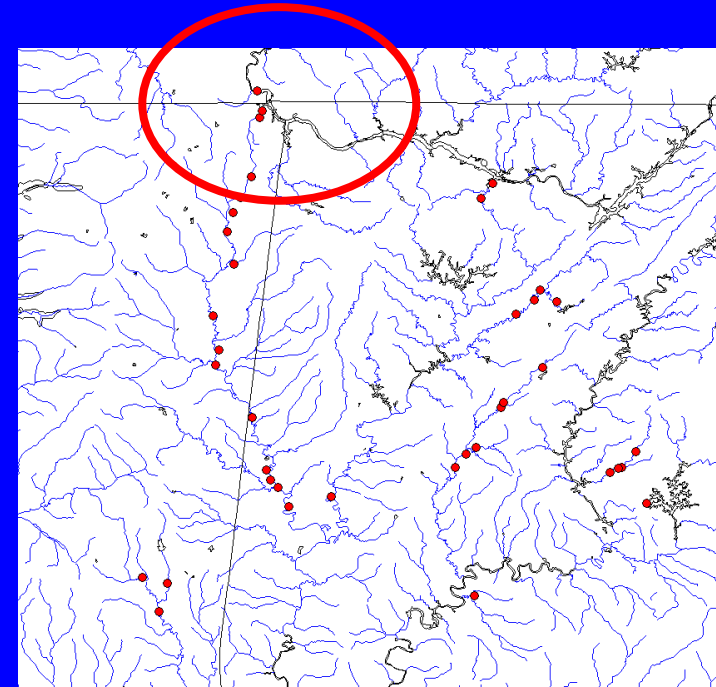
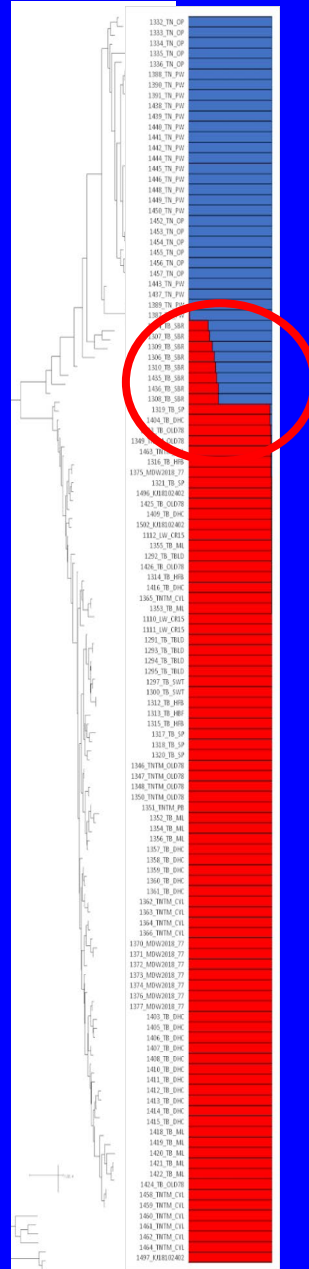
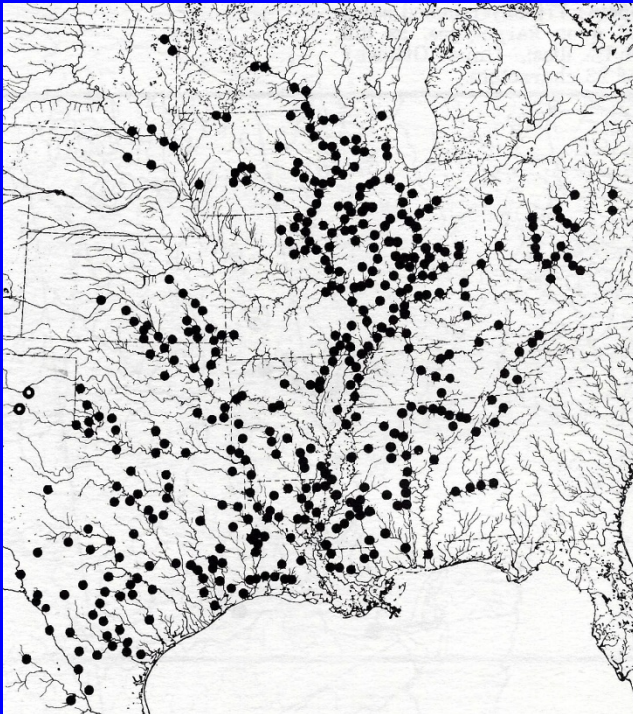
By 2011 invaded mainstem Tenn-Tom Waterway.

In the past decade *Menidia* has almost completely replaced *Labidesthes* in the Tombigbee mainstem.

Diet overlap between the two silversides at sites of co-occurrence was greater than expected.

Minnows and Carps (Family Cyprinidae)

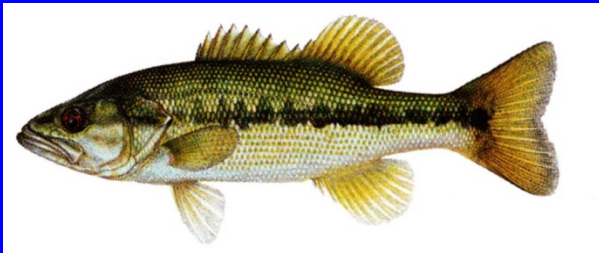
Bullhead Minnow
Pimephales vigilax



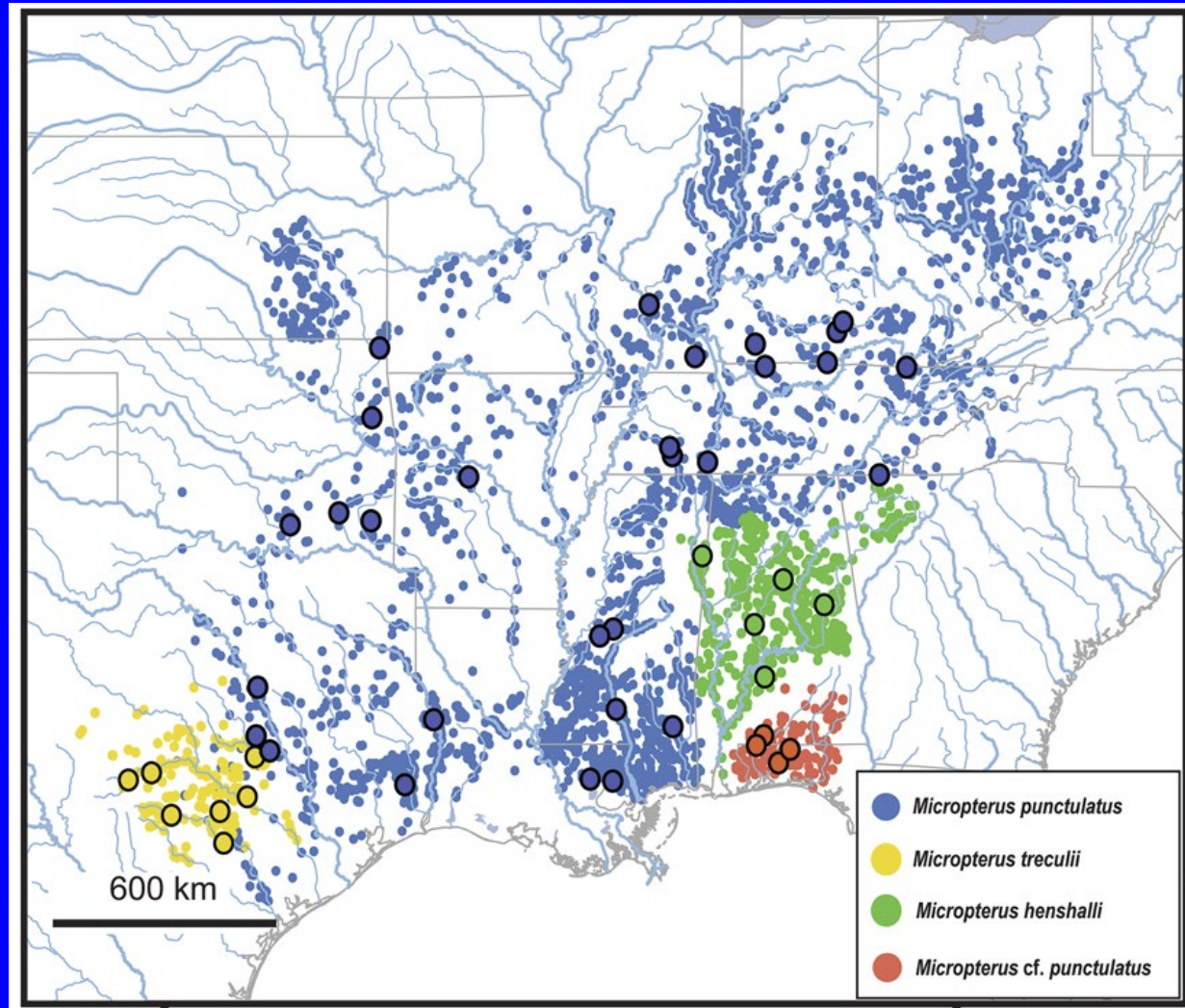
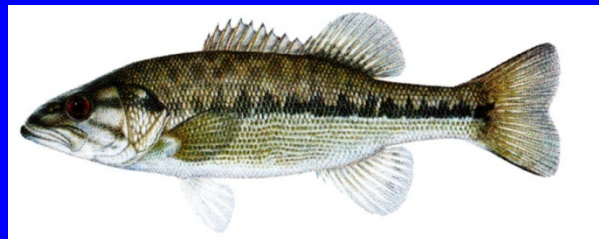
Black Basses

Family Centrarchidae

Spotted Bass
Micropterus punctulatus



Alabama Bass
Micropterus henshalli



Map from Kim et al. 2022

Native and Invasive Map Turtles

Black-knobbed Map Turtle
Graptemys nigrinoda

Native to Tombigbee River,
endemic to Mobile Basin



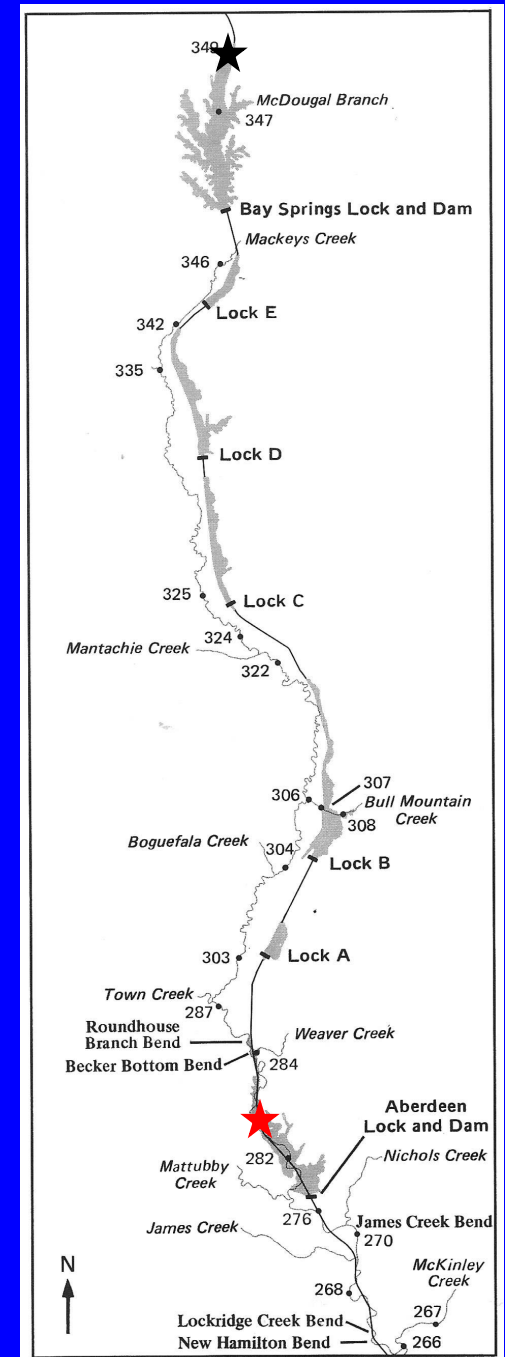
Ouachita Map Turtle
Graptemys ouachitensis

Widespread in Mississippi
basin including Tennessee
River drainage, invasive in
Tombigbee River



★ = native *ouachitensis*

★ = nonnative *ouachitensis*



Native Fishes... Magnitude of the Problem

For the purpose of this exercise, the Tennessee-Tombigbee Waterway area was defined as Tennessee River and Pickwick Reservoir (Yellow Creek and Bay Springs Reservoir) and Tombigbee River drainage from Aberdeen, MS, upstream to base of Bay Springs Lock.

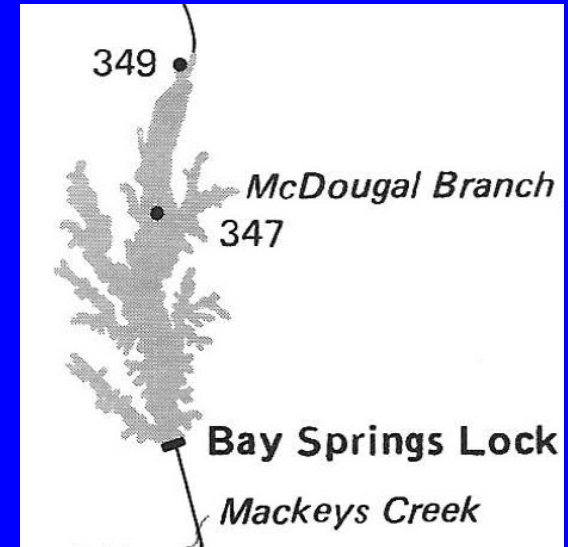
Native fishes of the Tennessee-Tombigbee Waterway area (170 species):

- 80 occurred in both Tennessee and Tombigbee River drainages
- 42 occurred only in Tombigbee River drainage
- 48 occurred only in Tennessee River drainage

Bay Springs Lock was built on Mackeys Creek (Tombigbee headwaters). When lock gates closed all aquatic organisms upstream were instantaneously transferred to Yellow Creek, trib of Pickwick Reservoir on the Tennessee River.

Native fishes transferred during Tennessee-Tombigbee Waterway construction (50 species):

- 38 occurred in Tennessee and Tombigbee River drainages
- 12 occurred only in Tombigbee River drainage



Recommended Actions for Detection and Prevention of Invasive Fishes Moving via Tennessee-Tombigbee Waterway

1. Corps of Engineers and U.S. Coast Guard should temporarily close Bay Springs Lock to all noncommercial traffic. Traffic analysis revealed 40% of the Bay Springs Lock traffic was recreational.

This action would result in a 40% reduction in risk of aquatics moving across the divide and buy time until barriers are developed and installed.

2. Begin eDNA survey for foreign invasive species at multiple sites on the waterway from Bay Springs to Gainesville Lock and Dam in Alabama. If this activity obtains a positive hit, then the shocking boats and net boats should be contacted.
3. Organize and initiate assembly of a DNA library (utilizing tissue snips of fishes, mollusks, turtles, crayfishes, and other aquatic organisms on both sides of the divide).

4. Perform biological survey of fishes, mollusks, and crustaceans in (at a minimum) Yellow Creek embayment drainage as well as the upper Tombigbee River drainage above Columbus Lock and Dam. (Opportunity to collect tissue samples for DNA library.)
5. Establish an online clearing house for published and unpublished reports on biology and ecology of Tenn-Tom Waterway. Assemble museum records for specimens cataloged in collections from the lower Tennessee River drainage from Kentucky Dam upstream to Wilson Dam.

Continue...

State and Federal agencies should continue current monitoring program and prepare to increase effort if invasives are found below Bay Springs Lock.

117TH CONGRESS }
2d Session

HOUSE OF REPRESENTATIVES

{ REPORT
117-347

WATER RESOURCES DEVELOPMENT ACT OF 2022

JUNE 7, 2022.—Committed to the Committee of the Whole House on the State of the Union and ordered to be printed

Congressional authorization.

The Committee recommends \$500,000 for the Corps, in partnership with other Federal partners, to begin planning, design, initial engineering and project management for construction of carp barriers in the Mississippi River basin and the Tennessee-Tombigbee Waterway.

06/08/2022 Passed House and forwarded to Senate.

Congressional appropriation pending.

Acknowledgements

Alabama Department of Conservation and Natural Resources

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Angie Rodgers and Matt Wagner

US Geological Survey

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Andrea Fritts - Upper Midwest Environmental Sciences Center

Wes Daniel and Nate Johnson - Wetland and Aquatic Research Center

Questions??

