



limestone valleys



limestone bluffs along the Tennessee River at Sheffield



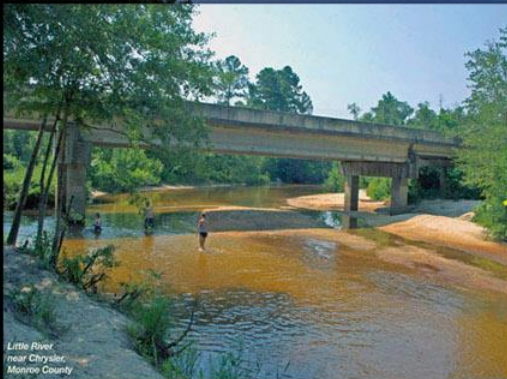
*whitewater canoeing on Bear Creek
Marion County*

hard rock uplands



Alabama River, Monroe County

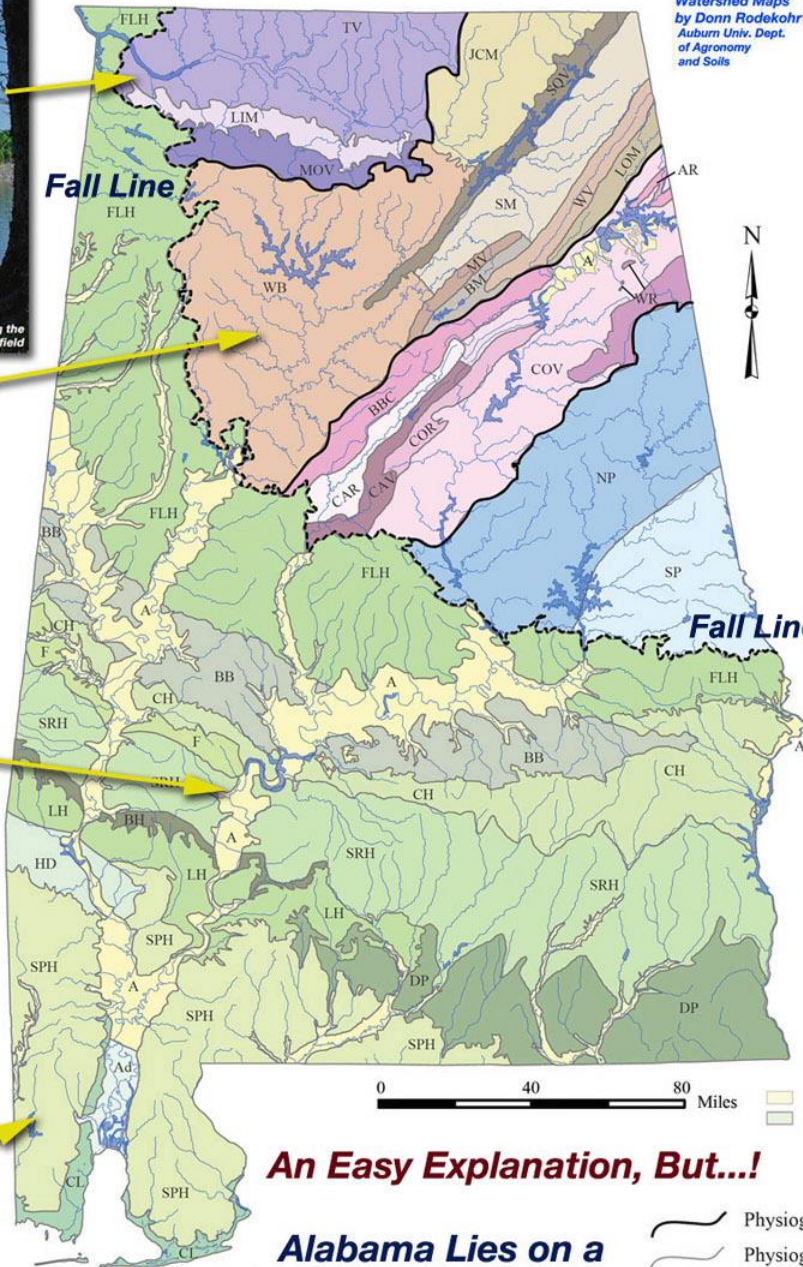
large, meandering Coastal Plain rivers



Little River, near Clayborne, Monroe County

sandy creeks

Alabama River Watershed Maps by Donn Rodekoer Auburn Univ. Dept. of Agronomy and Soils



Highland Rim (HR)

- Tennessee Valley (TV)
- Little Mountain (LIM)
- Moulton Valley (MOV)

Cumberland Plateau (CP)

- Jackson County Mountains (JCM)
- Sequatchie Valley (SQV)
- Sand Mountain (SM)
- Wills Valley (WV)
- Lookout Mountain (LOM)
- Warrior Basin (WB)
- Murphrees Valley (MV)
- Blount Mountain (BM)

Alabama Valley and Ridge (AVR)

- Armuchee Ridges (AR)
- Birmingham-Big Canoe Valley (BBC)
- Cahaba Ridges (CAR)
- Cahaba Valley (CAV)
- Coosa Ridges (COR)
- Coosa Valley (COV)
- Weisner Ridges (WR)

Piedmont Upland (PU)

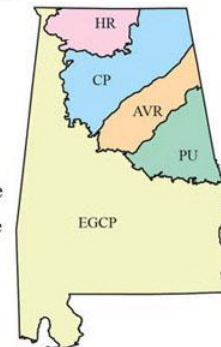
- Northern Piedmont Upland (NP)
- Southern Piedmont Upland (SP)

East Gulf Coastal Plain (EGCP)

- Fall Line Hills (FLH)
- Black Belt (BB)
- Chunnuggee Hills (CH)
- Southern Red Hills (SRH)
- Flatwoods Subdistrict (F)
- Buhrstone Hills Subdistrict (BH)
- Lime Hills (LH)
- Hatchetigbee Dome Subdistrict (HD)
- Southern Pine Hills (SPH)
- Dougherty Plain (DP)
- Coastal Lowlands (CL)

Physiographic sections

- Alluvial (A)
- Alluvial deltaic Plain (A)



- Physiographic section line
- Physiographic district line
- - - Fall Line
- ~ Streams

An Easy Explanation, But...!

Alabama Lies on a Geographical as Well as Geological "Sweet Spot"

Coastal Plain

Appalachian uplands

**fewer
habitats**

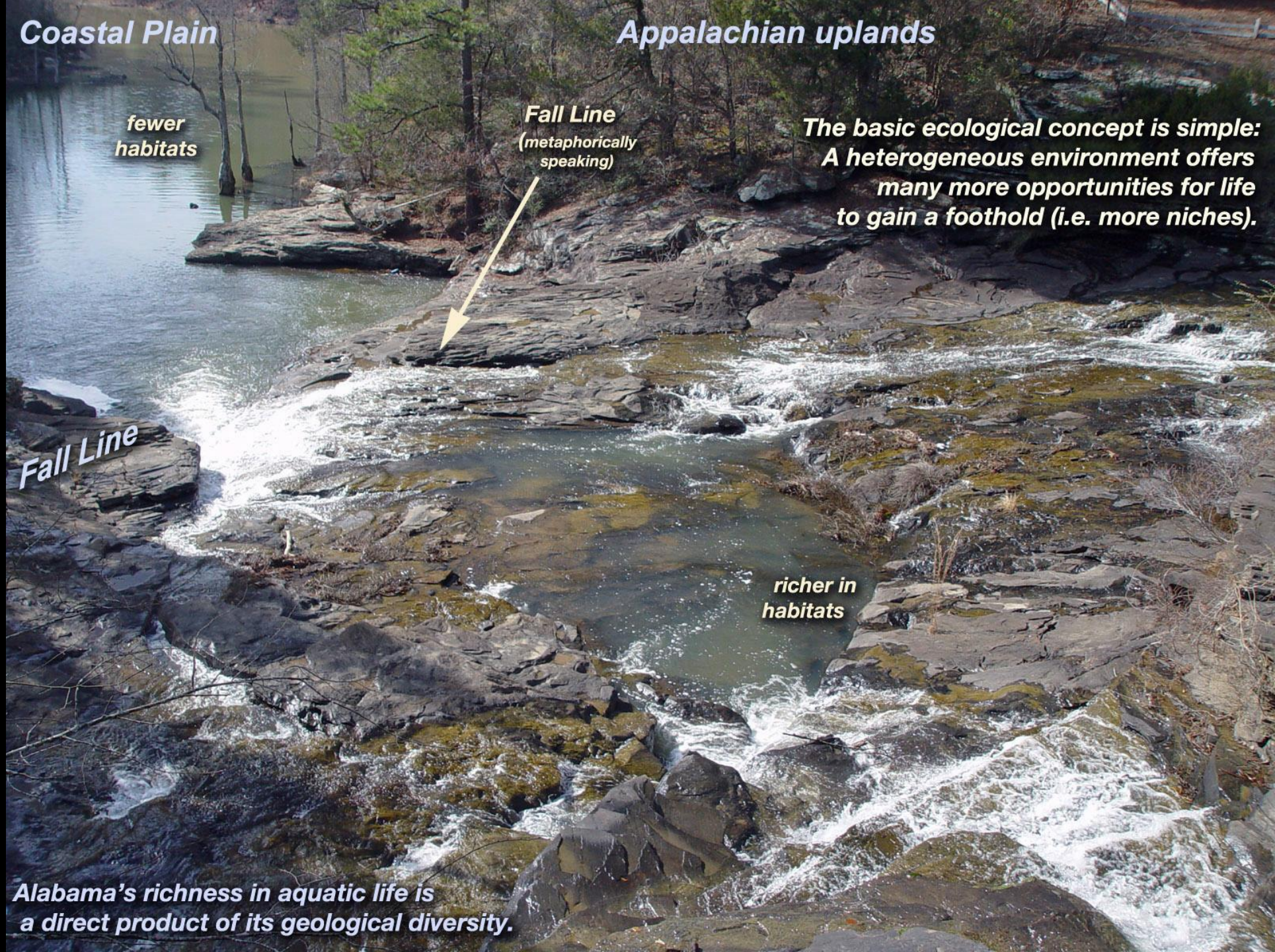
Fall Line
(metaphorically
speaking)

**The basic ecological concept is simple:
A heterogeneous environment offers
many more opportunities for life
to gain a foothold (i.e. more niches).**

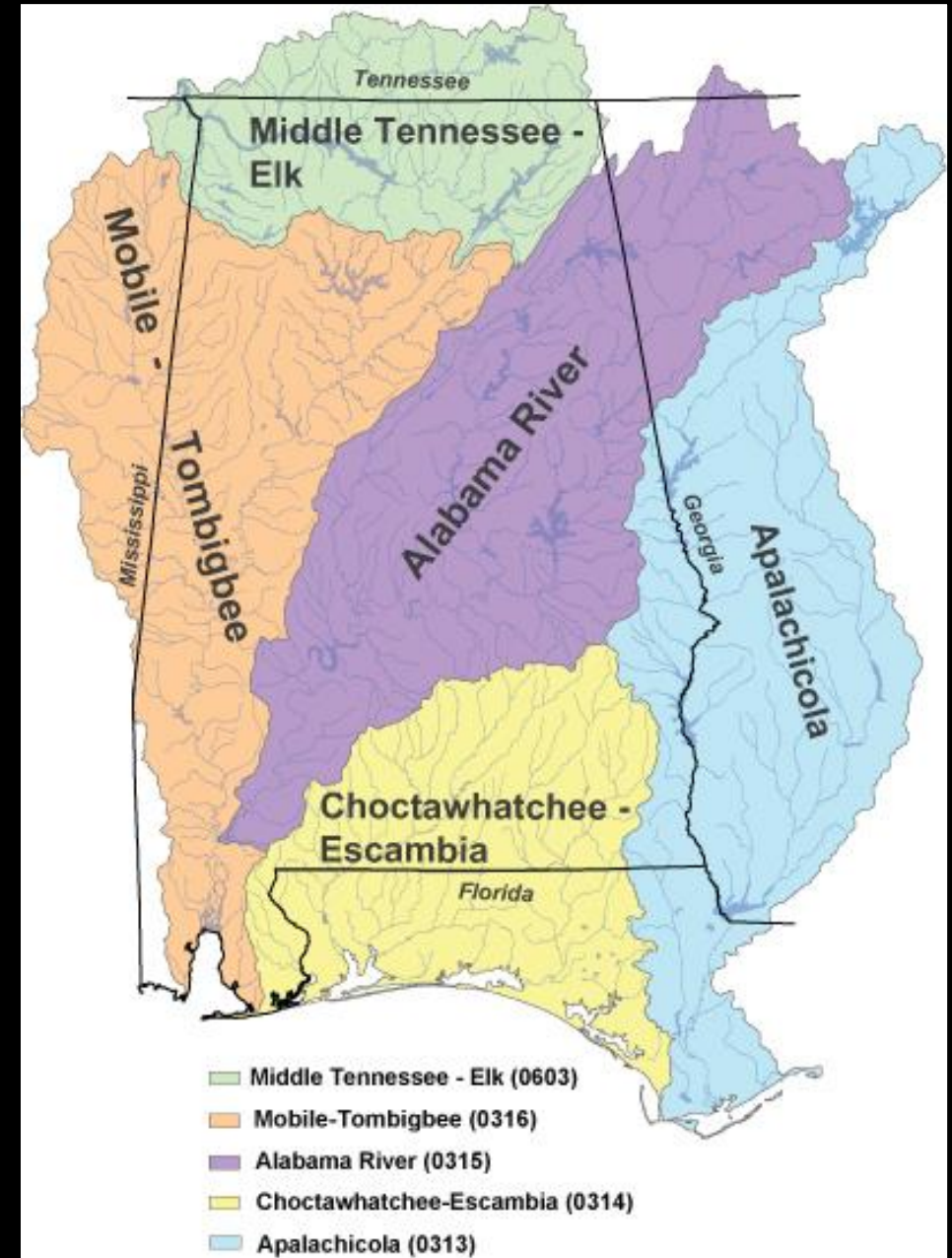
Fall Line

**richer in
habitats**

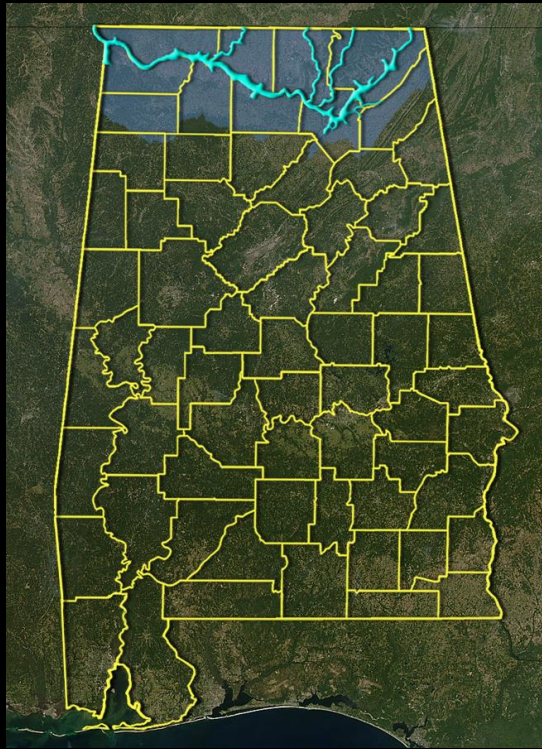
**Alabama's richness in aquatic life is
a direct product of its geological diversity.**



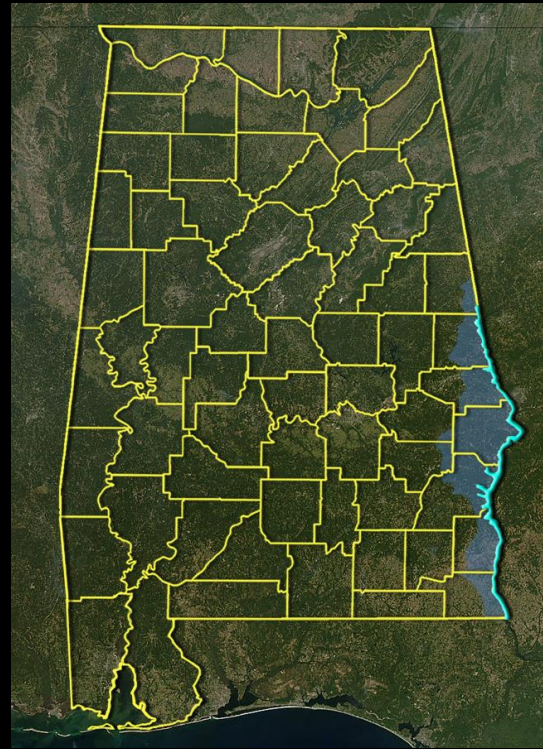
- 64 types of terrestrial ecosystems
- 25 forests and woodlands
- 11 wetlands
- 7 glades and prairies
- More than 132,000 miles of rivers and streams
- Several dozen marine ecosystems



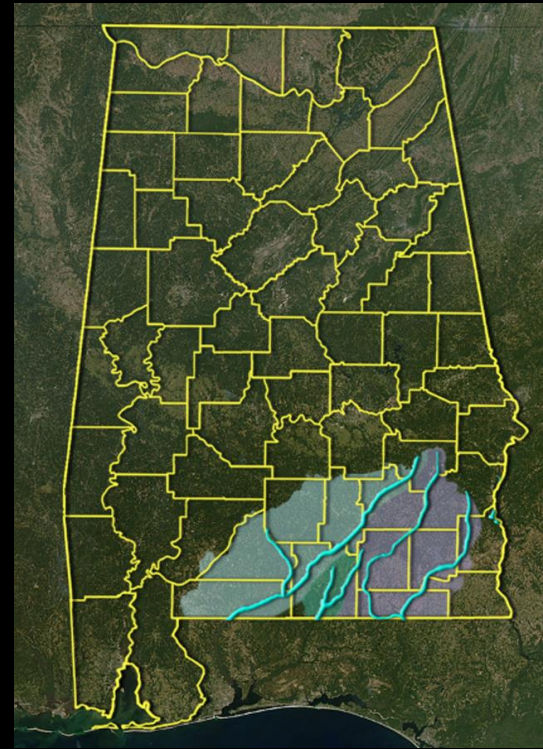
10% of freshwater in the US begins and/or flows through Alabama



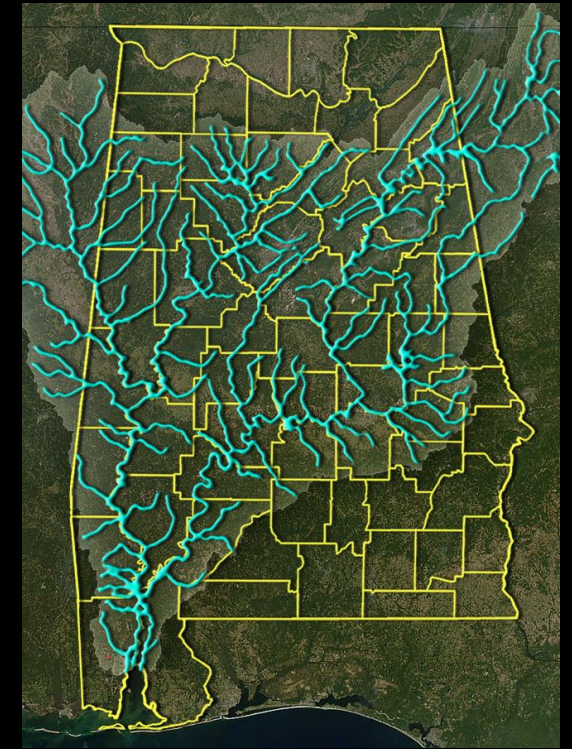
Tennessee



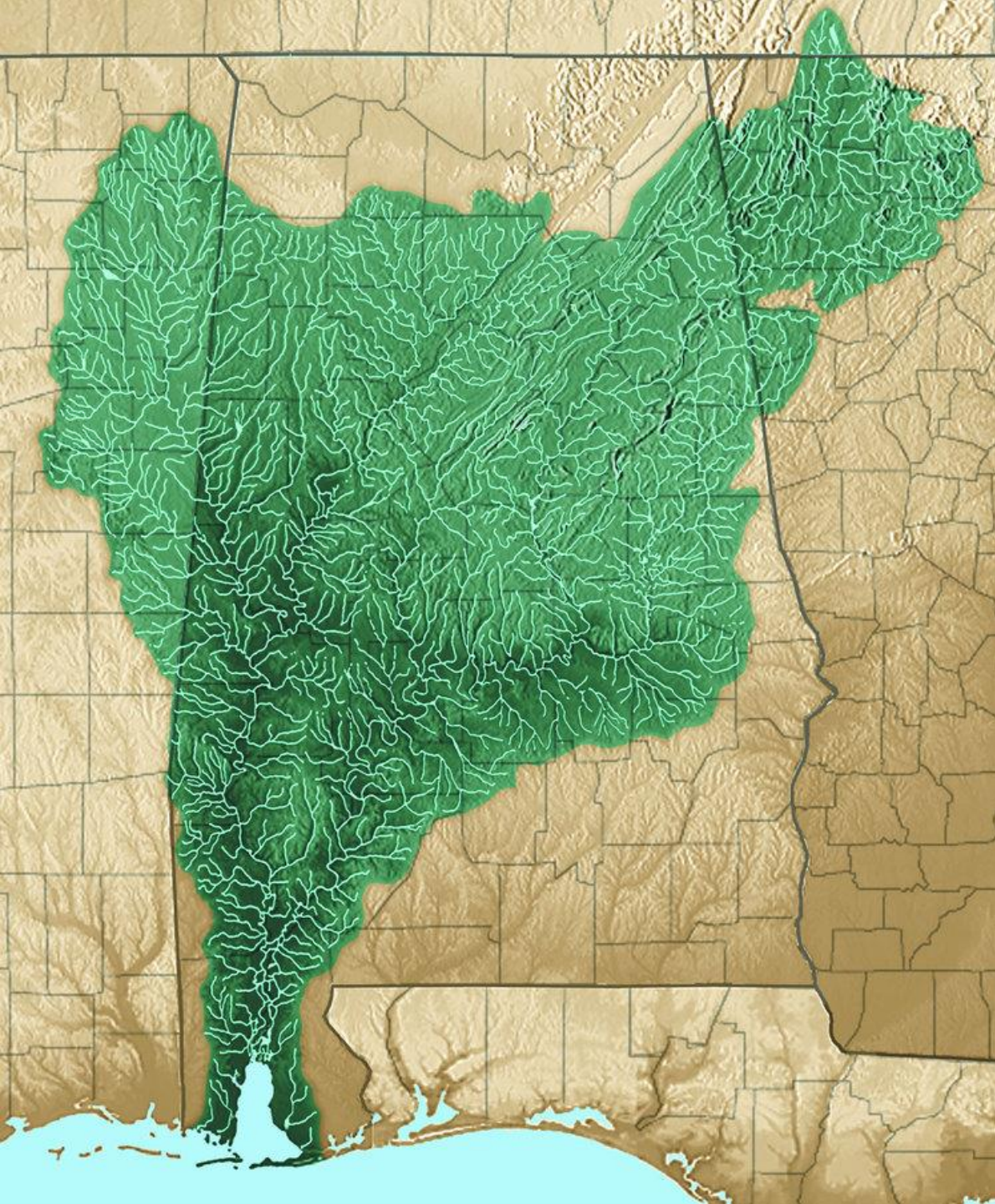
Apalachicola



Choctawhatchee-
Escambia



Alabama &
Mobile-Tombigbee



The Greater Mobile Basin

Alabama River and Mobile-Tombigbee River Basin

Drains parts of Tennessee, Georgia, Mississippi

65% of land area for the state of Alabama

6th largest basin in the US based on size

4th largest basin in the US based on discharge

Mobile-Tensaw River Delta

**The most biodiverse watershed in
the United States
and in some cases, the world!**

AMERICA'S AMAZON

Alabama the Beautiful

14
river basins
form the
waterways of
Alabama.



10%
of the freshwater resources
in the continental United
States flow through or
originate in Alabama.

51
miles of
shoreline in
Alabama.

There are more than
132,000
miles of rivers and
streams in Alabama.

5 marine
turtle species
or **83%** of U.S.
species



200 marine
fish species
or **18%** of U.S.
species



Red Snapper



That's enough
to circle the
Earth **5x**!

97
freshwater
crayfish species



or **24%** of North
American species

312
freshwater
fish species



or **35%** of North
American species

202
freshwater
snail species



or **29%** of North
American species

31
freshwater
turtle species



or **63%** of North
American species

186
freshwater
mussel species



or **61%** of North
American species

Native to Alabama

Alabama Ranks #1 in the U.S. for freshwater crayfish, fish, snail, turtle, and mussel species!

FRESHWATER FISH DIVERSITY*

Rank	State	Species
1	Alabama	339
2	Tennessee	313
3	Georgia	290
4	Kentucky	262
5	Mississippi	242

*Includes introduced, exotic, diadromous, and select nonfish species.



70% of the species in Alabama that are federally listed as endangered or threatened are aquatic.

ALABAMA AQUATIC SPECIES AT RISK*

Fauna Type	Species
Freshwater Crayfish	44
Freshwater Mussel	103
Freshwater Fish	63
Freshwater Snail	52
Freshwater Turtle	6
Marine Turtle	5

*Greater Conservation Need (GCN) list per the 2015 Alabama State Wildlife Action Plan.

Suggested Reading List:



CONTRIBUTORS:



GET INVOLVED

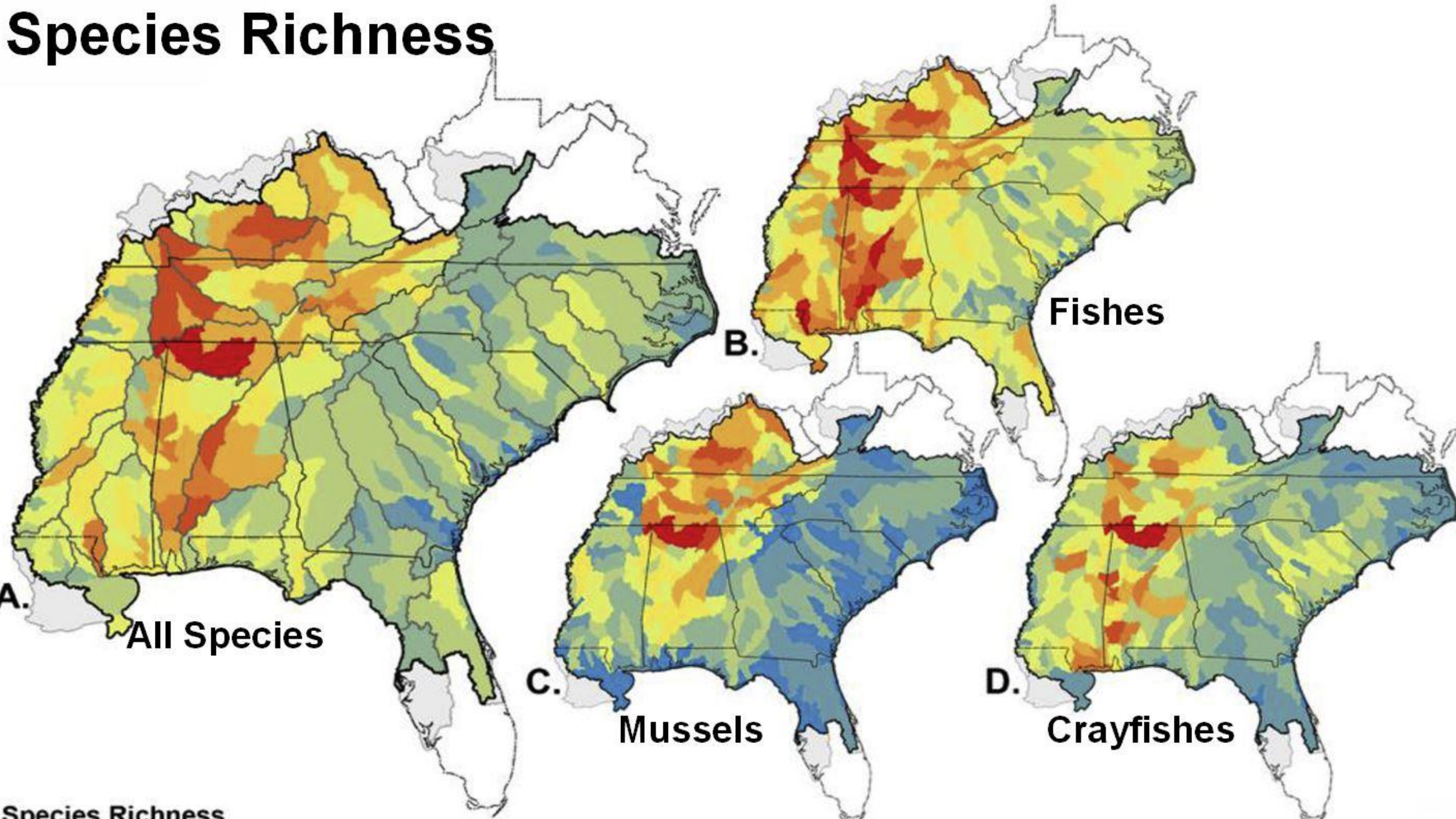
Get certified as a volunteer water monitor.



Alabama Water Watch is a program in the Auburn University Water Resources Center which receives support from the Alabama Agricultural Experiment Station and the Alabama Cooperative Extension System.

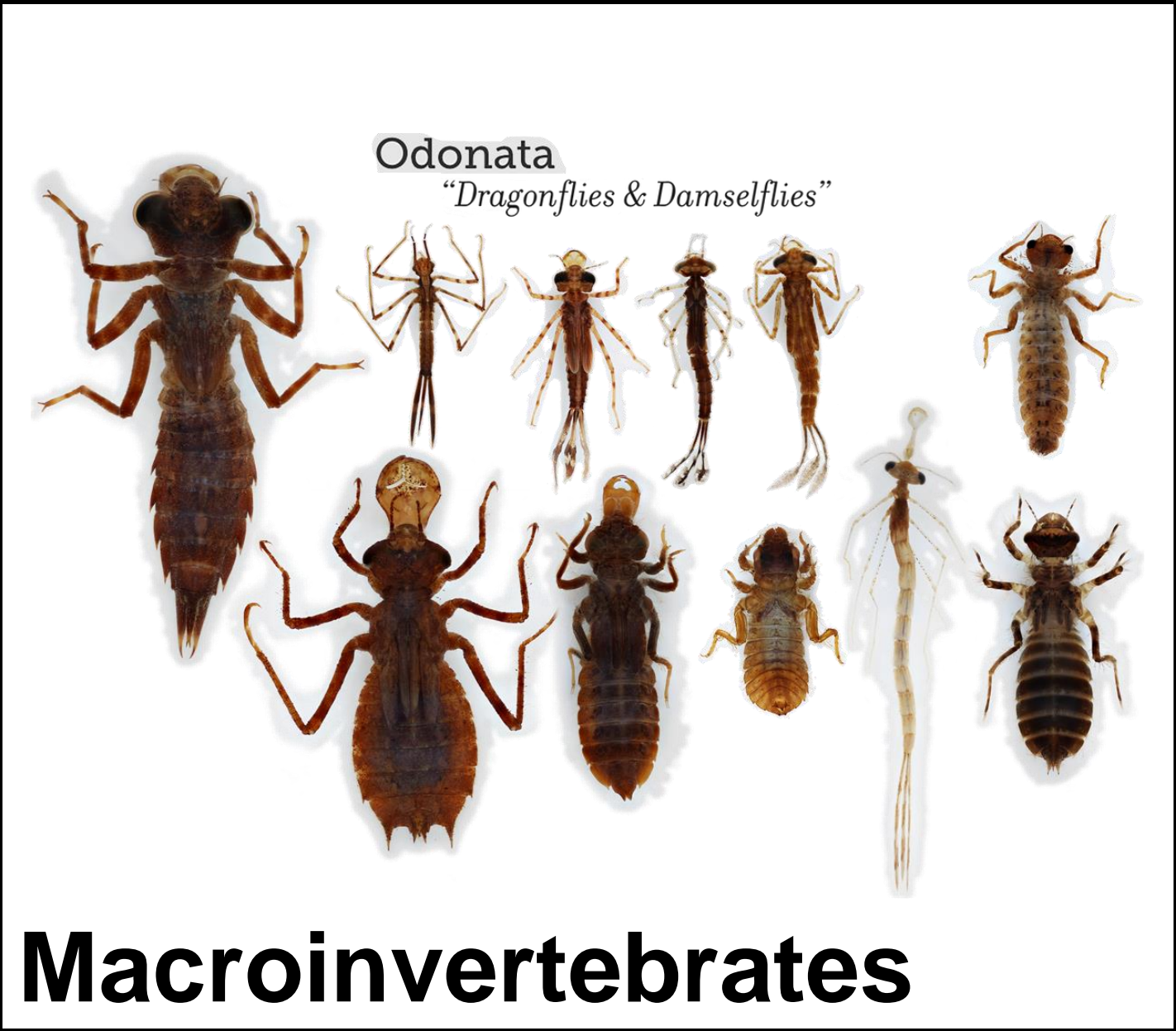
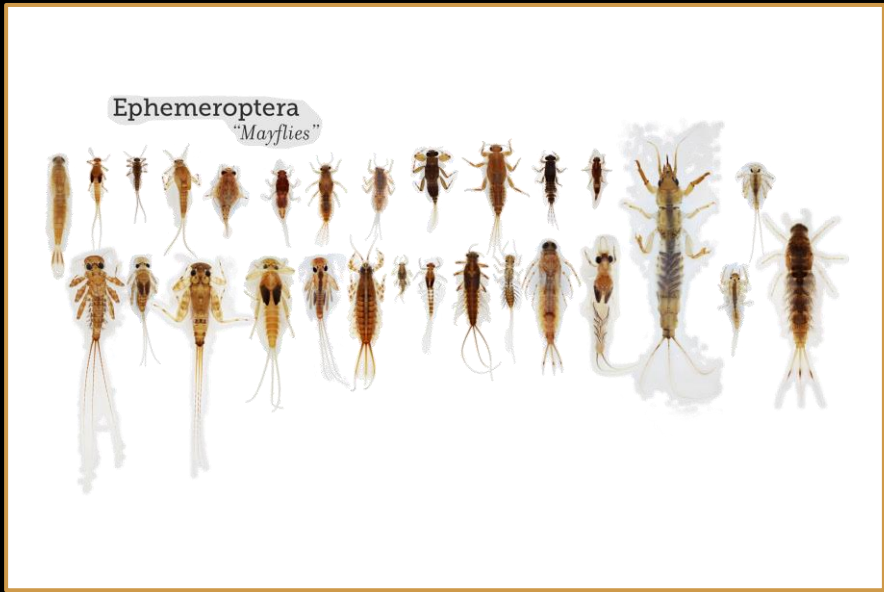
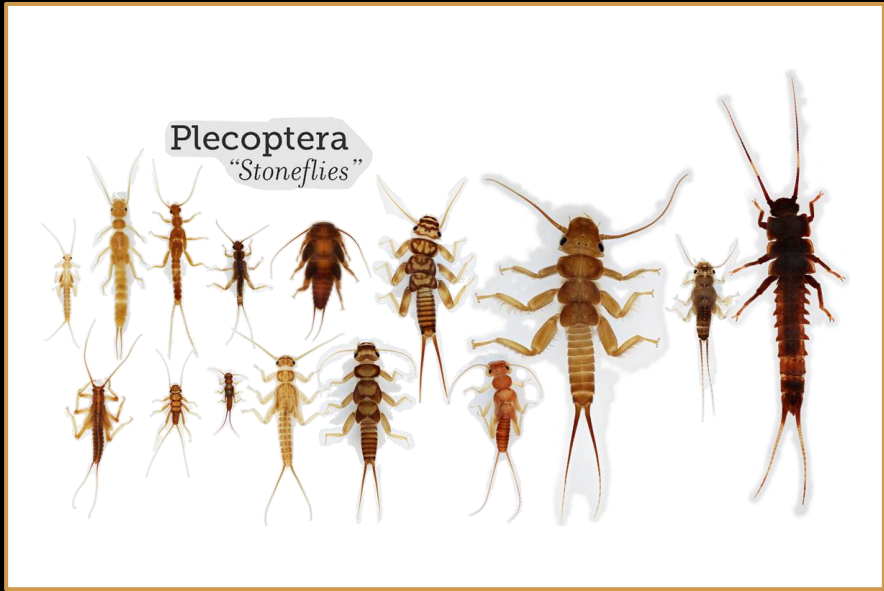


Species Richness



Plant Diversity





Macroinvertebrates



100 species



200 marine fish species

339 freshwater fish species

539 species



312 endemic freshwater fish species



AMPHIBIANS OF ALABAMA



© ROGER HALL - INKART.NET

73 species



30 species of frogs
43 species of salamanders



203 species



31 species

Other species of reptiles:

Lizards = 12

Snakes = 49



Alligator = 1 (but do we really want more?)



186 species

Wake Up Call

Greatest single mass extinction event in North American history
40 freshwater species lost

2nd in the nation for number of taxa lost to extinction

4th in number of at-risk taxa



What's At Risk

Alabama Aquatic Species at Risk

• Crayfish	44
• Mussels	103
• Freshwater Fish	63
• Freshwater Snails	52
• Aquatic Turtles	6
• Marine Turtles	5



70% of federally listed endangered or threatened species in Alabama are aquatic



North River SHU Project

GEOLOGICAL SURVEY OF ALABAMA

Aquatic Species Conservation in the Mobile River Basin The North River Strategic Habitat Unit

by Patrick E. O'Neil, Stuart W. McGregor, and E. Anne Wynn of the Geological Survey of Alabama and Jeffrey R. Powell of the U.S. Fish and Wildlife Service



Berry H. (Nick) Tew, Jr.
State Geologist

- Explanation**
- Streams
 - Major roads
 - County lines
 - 300(d) listed segments
 - Critical habitat segments
 - Towns
 - Mussel sampling stations
 - Recent IBI monitoring site
 - Historic IBI monitoring site
- Geology Map Units**
- Coker Formation
 - High terrace deposits
 - Pittsville Formation (upper part)
 - Wetbeds

BIOLOGICAL CONDITIONS

The North River watershed encompasses an area of 425 square miles and includes Lake Tuscaloosa, a public water supply reservoir that services Tuscaloosa County. The North River flows through two physiographic sections, the Cumberland Plateau and the East Gulf Coastal Plain. The northern and eastern parts of the North River and Lake Tuscaloosa drain into the Mississippi River.

WATER QUALITY

Water quality in the North River/Lake Tuscaloosa watershed is controlled by interaction of the surface and groundwater hydrogeologic system. Shale and sandstone in the Pittsville Formation and sand and gravel in the Coker Formation have different controlling influences on surface and groundwater flow, which affect the transport of pollutants into Lake Tuscaloosa. Low-flow sampling during

Watershed Management Plan

<http://www.northriverwatershed.org/>

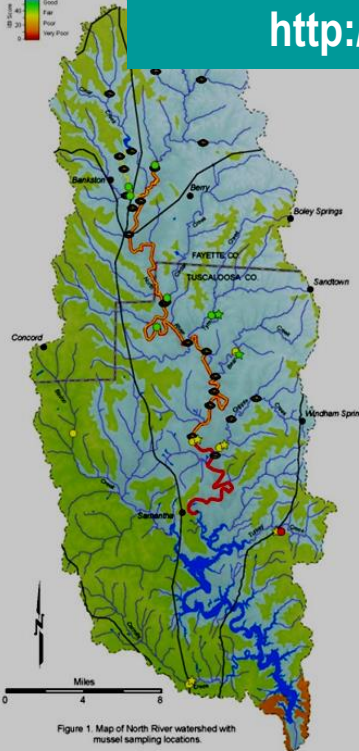


Figure 1. Map of North River watershed with mussel sampling locations.

During the spring and summer of 2008, mussel sampling in the North River system yielded 15 species, with 13 represented by live animals or fresh dead shells and two represented by weathered dead shells only (McGregor and Wynn, 2008). A total of 149 mussels either live or fresh dead were collected. One live and one fresh dead specimen of *Pleurobema furum* were collected at one tributary station and one live or fresh dead specimen of *Hamula perovialis* was collected at each of three stations, two in a tributary and one in the main channel. Shallow bed sediment quality was also determined from a composite grab sample from each of four stations. Low concentrations of constituents potentially toxic to freshwater mussels suggested no immediate concern to the health of the mussel population.

The biological condition of selected streams was evaluated by calculating the Index of Biotic Integrity (IBI) using fish community sampling data. The IBI is a biological assessment tool based on the health and ecological stability of the resident fish community (O'Neil and Shepard, 2000). Both historic (1979-88) and recent (2008-09) sampling data was used to calculate IBIs for the North River watershed. For biological condition overall, most streams rated in the fair IBI range with a few sites in the good IBI range. Biological condition has improved with time at some sites and declined at other sites.

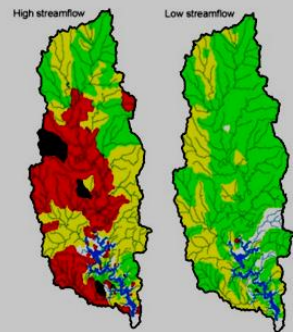
The declining status of mussel populations and the general overall fair biological status for fish communities is attributable primarily to degraded habitat conditions in the upper watershed. Excessive sedimentation from poor land use practices can be observed throughout the upper watershed and is a common link between degraded mussel populations and impaired fish communities.

Table 1. Comparison of mussel population status between two sampling periods in the North River system.

Species	Conservation	North River Status	
		1979-88	2008-09
<i>Ambloplites rupestris</i> - Threespine	P4	1	1 wd
<i>Ambloplites rupestris</i> - Royal Darter	P2	1	4
<i>Epiplatys spilargenteus</i> - Alabama Stickleback	P1	1	4
<i>Epiplatys spilargenteus</i> - Delicate Stickleback	P1	2	34
<i>Hamula perovialis</i> - Orange-spined Noddy	T, P2	13	3
<i>Hamula perovialis</i> - Southern Noddy	P4	10	3
<i>Lamprolaima</i> - Southern Fathead	P3	31	23
<i>Lamprolaima</i> - Yellow Stickleback	P6	1 wd	2
<i>Pleurobema furum</i> - Dark Pigtoe	E, P1	25	2
<i>Pleurobema furum</i> - Giant Pigtoe	P5	1	1 wd
<i>Quadrula asperata</i> - Alabama Crab	P9	20	12
<i>Quadrula venusta</i> - Pigtoe	P4	3	12
<i>Strophitus subvirens</i> - Southern Crankshell	P3	80	27
<i>Musculista lateralis</i> - Flathead	P6	7	17
<i>Villosa</i> - Life Spine	P5	8	17
<i>Villosa</i> - Southern Barbow	P5	12	10
TOTAL		199	149

1. Endangered, Threatened, P1 highest conservation concern; P2 high conservation concern; P3 moderate conservation concern; P4 low conservation concern; P5 lowest conservation concern.
2. Total live animals and fresh dead shells, except wd = weathered dead shells, not included in totals.
3. From McGregor and Pierson (1999).

Figure 2. Occurrence of *E. coli* bacteria in the North River watershed during high and low streamflows (O'Neil and others, 2006).

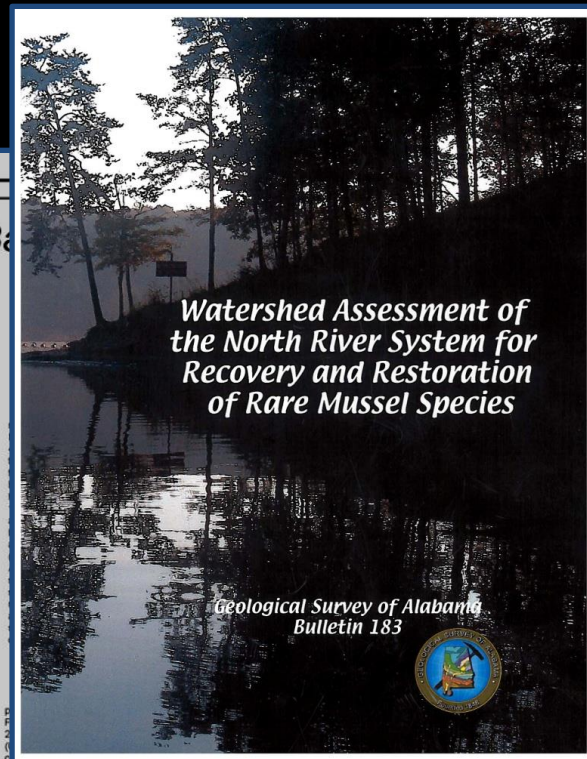


E. coli bacteria concentrations (cfu/100 mL)

- 1-200
- 201-1,000
- 1,001-10,000
- 10,001-20,000

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Watershed Assessment of the North River System for Recovery and Restoration of Rare Mussel Species

Geological Survey of Alabama
Bulletin 183

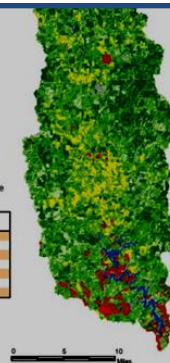


and land cover classes were identified using the spectral properties of the imagery. Urban and mining areas were isolated using historical topographic maps from the 1970s and aerial photography from 2006 (USDA, 2006). Classes were further modified with the aid of ancillary GIS layers. NPDES mining sites (ADEM, 2007) and GNIS (USGS, 2009b) populated areas were digitized and clipped out of the imagery. The USGS National Land Cover Database (USGS, 2003) was also referred to during the classification process. Percent coverage of land cover classes is shown in table 2.

Table 2. Percent coverage of land cover classes in the North River watershed, 1974 and 2005.

Category	1974	2005	Percent change
Open water	2.28	1.93	-15.4
Evergreen	20.45	27.44	34.2
Agriculture	6.52	8.38	11.8
Mixed forest	59.56	49.45	-17.0
Developed	1.16	1.62	52.9
Transitional vegetation	7.29	10.78	47.9
Wetlands	0.70	0.20	-71.4

- Explanation**
- Open water
 - Evergreen
 - Agriculture
 - Mixed forest
 - Developed
 - Transitional vegetation
 - Mining



North River SHU Sediment Pits

45 basins have been installed since 2011 in
Fayette and Tuscaloosa Counties

TOTAL Measurable Sediment Reduction =
500 tons



Recognizing the Economics



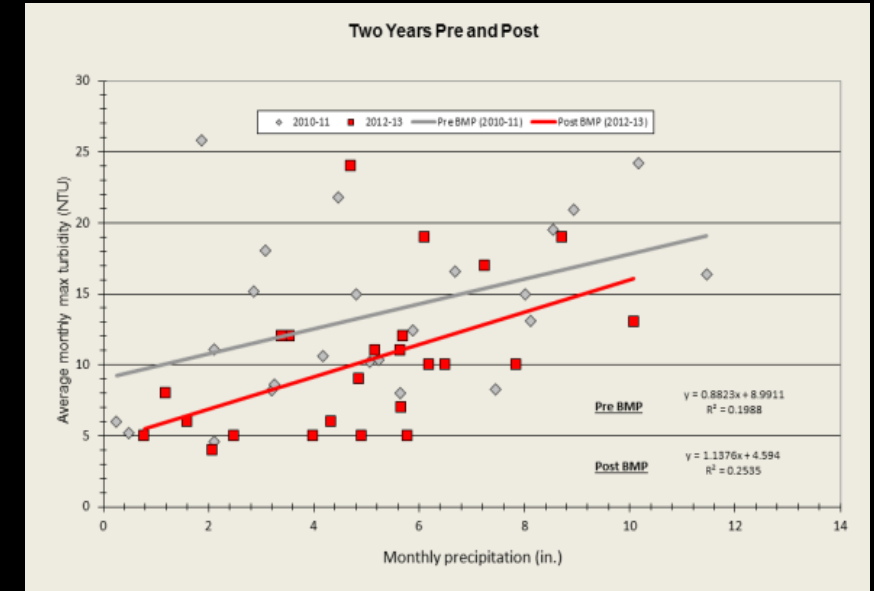
Photo credits to Dr. Guenter Schuster (Eastern Kentucky University - retired)

- In 2010 and 2012, the Alabama Field Office funded 2 studies to assess the populations of 6 crayfishes from the CBD mega-petition list found in AL
- Based on the results, CBD has withdrawn 6 crayfishes from the petition (along with several freshwater snails)
- Combined, the 2 studies cost \$50,000
- Savings of ~\$800K by this early action and working with partners

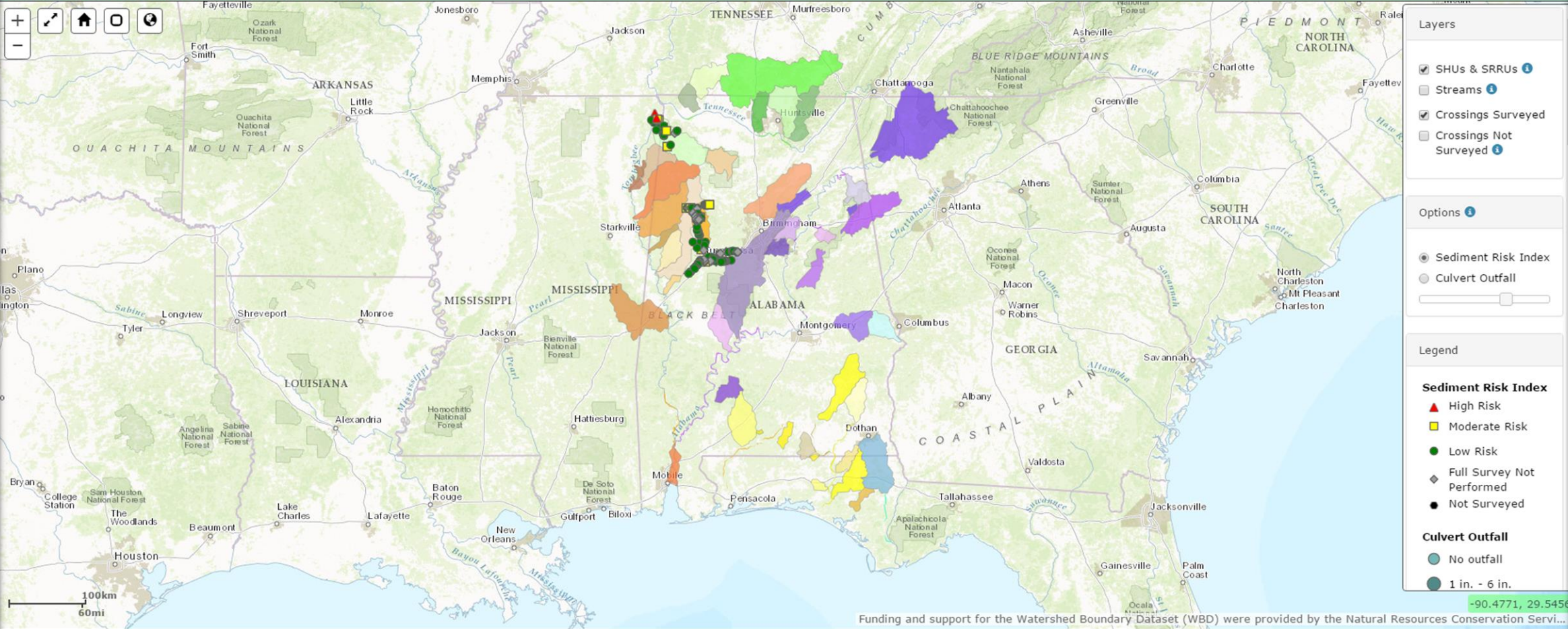
Ecosystem services

- Since 2011, 45+ sediment pits installed in the North River watershed
- Reduced turbidity in drinking water source
- Saved the Town of Berry ~\$20K/year in chemical costs

Town of Berry, Alabama



Alabama Rivers and Streams Network SHU Mapper



Funding and support for the Watershed Boundary Dataset (WBD) were provided by the Natural Resources Conservation Servi...



Alabama Rivers and Streams Network

@alabamariversandstream
snetwork

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Reach even more people in United States

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Alabama Rivers and Streams Network
Published by Rebecca Bearden [?] · August 5 at 9:48pm ·

Congratulations to Dr. Pat O'Neil, Deputy Director of the Geological Survey of Alabama, and recipient of the 2016 Water Conservationist of the Year

Non-Profit Organization

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HOW TO GET INVOLVED

ALABAMA RIVERS AND STREAMS NETWORK

BROWSE BY TOPIC

Mission Statement

Interactive Map

Strategic Habitat Units

Educational Materials

Success Stories

Why It Matters

In The News

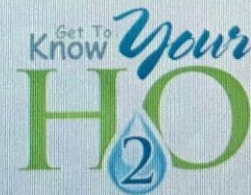


WATER IS AN IMPORTANT PART OF OUR LIVES

Let's **Admit** it...nothing is as refreshing as a glass of cool water on a hot Alabama day. Although most of us don't think about where our water comes from, we expect it to be clean and safe for ourselves and our families.

Doing **YOUR** part to help keep our water clean and safe is easier than you might think. If each person does their part, we can make a huge difference...one person and one drop at a time.

Still unsure? See how water affects our jobs, our economy, our health, our real estate prices, and more.



IN THE NEWS

Conservationists from across the nation attend a SHU-focused watershed restoration class in Shepherdstown, WV

The Terrapin Creek Strategic Habitat Unit was the focus of the 2019 Restoration Policy, Planning, and Partnering course...

Southeast Aquatics Fund to help conservation, species protection in north-central Alabama

Alabama Rivers and Streams Network



Why the SHU Process works

Working together in a non-adversarial manner (i.e., “Conservation without Conflict”) by growing relationships- based on trust, transparency, humility, and ALWAYS searching for common ground and solutions