



Duck River Mussels

How Freshwater Mussels
Shape Our Water Resources
and Future in Tennessee

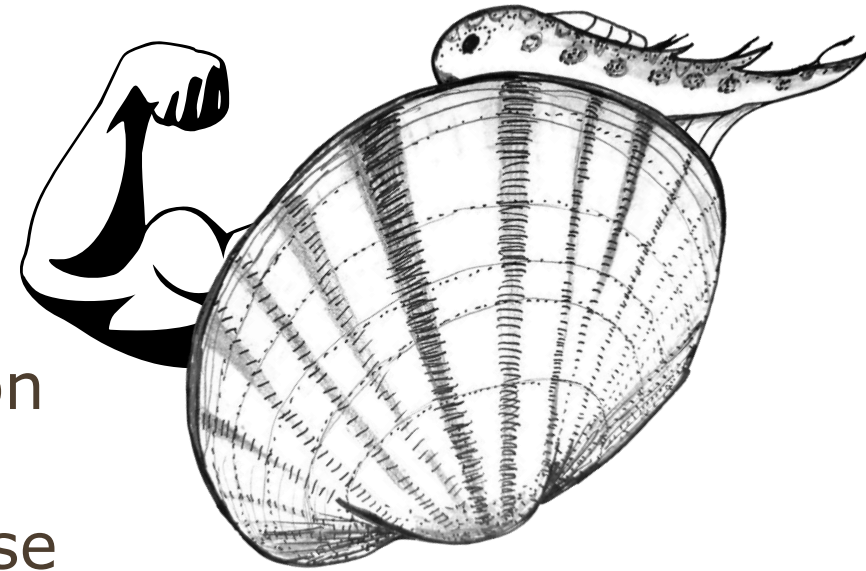
Amanda Rosenberger, PhD

U.S. Geological Survey, Tennessee Cooperative
Fishery Research Unit, Tennessee Tech University



Let's talk Mussels

- The Remarkable Biology of Freshwater Mussels
- What makes and the Duck River Stand Out
- Making Mussels Work for You
 - Water Quality Indicators
 - Groundwater/ Surface water Connection
 - Bellwether of a Changing Environment
 - Integrative Indicators of Wise Water Use



What are we talking about?

- Native freshwater mussels – bivalves, unionids, naiads or clams.

- **Don't confuse with:**

Introduced zebra mussel



Introduced Basket Clam (Corbicula)



Native fingernail clam



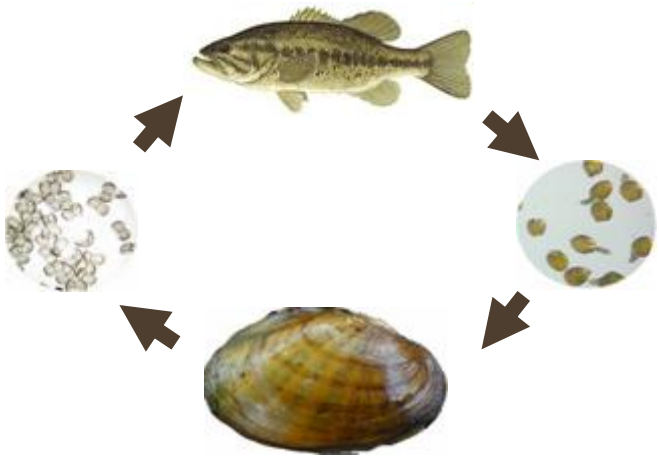
Grocery store mussels



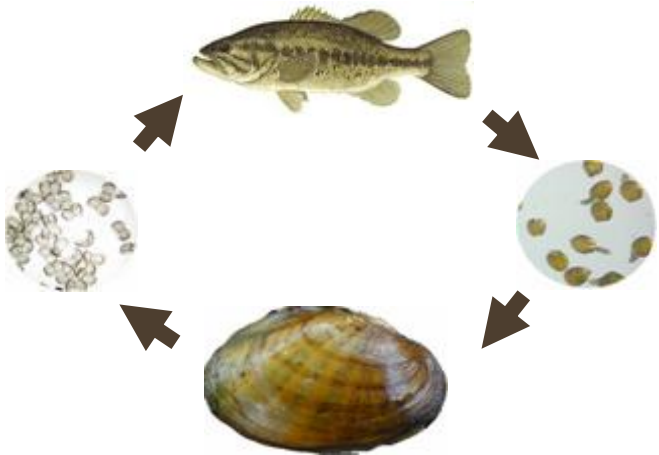
Uh, Remarkable?



Native Mussel Life History



Native Mussel Life History



Native Mussel Life History – Thank you, Chris Barnhart!



Native Mussel Life History



Native Mussel Life History



Native Mussel Life History



Native Mussel Life History



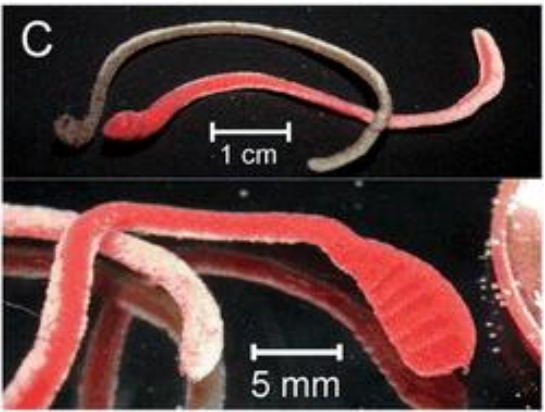
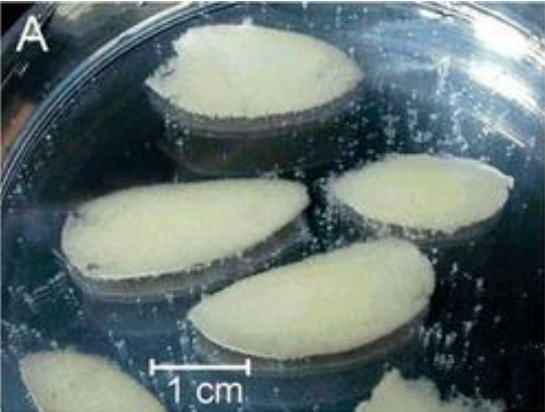
Native Mussel Life History



The Remarkable Biology of Freshwater Mussels



Native Mussel Life History



Native Mussel Life History



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Native Mussel Life History

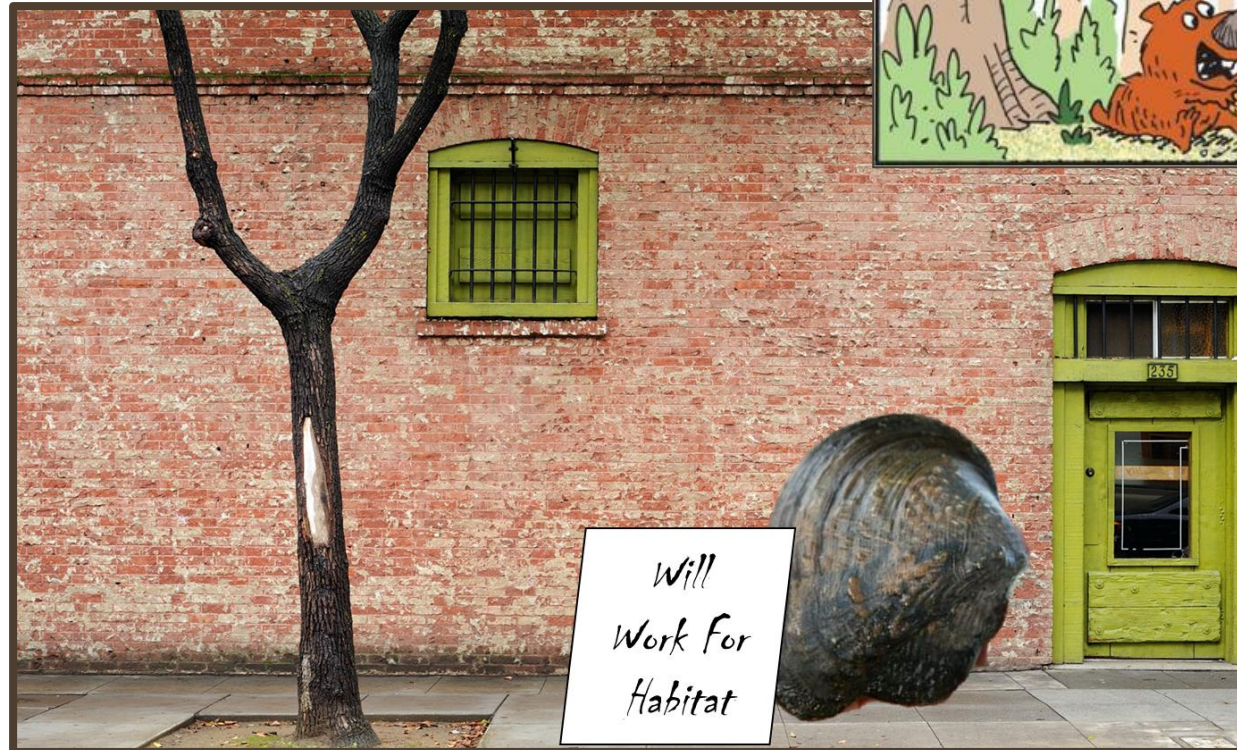


Native Mussel Life History



Freshwater Mussel Biodiversity

- Among the most endangered fauna
- Often overlooked but ecologically crucial
- Challenges in public perception and engagement



Tennessee is a Steward of Unique Biodiversity



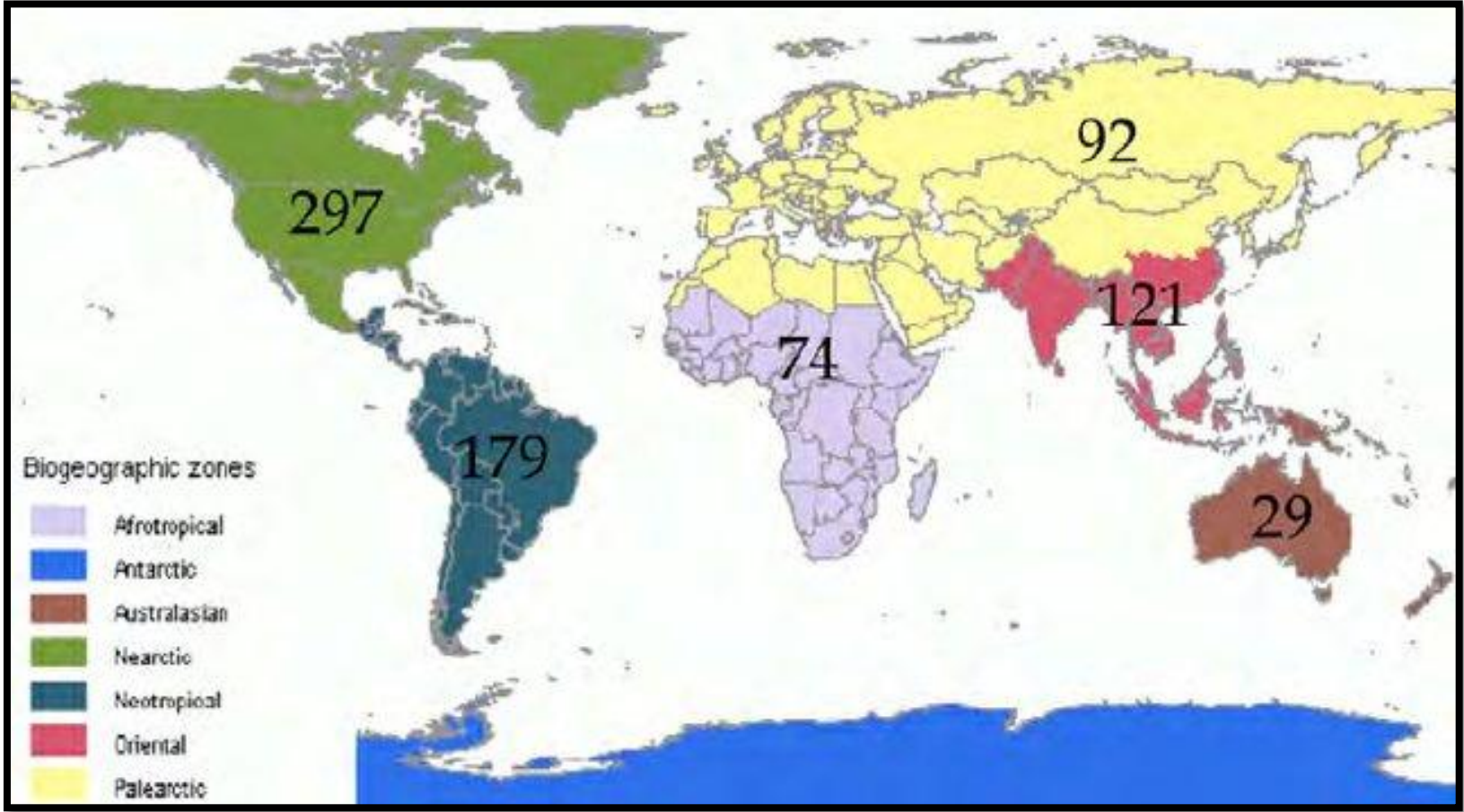
What Makes TN Stand Out?



Tennessee is a Steward of Unique Biodiversity



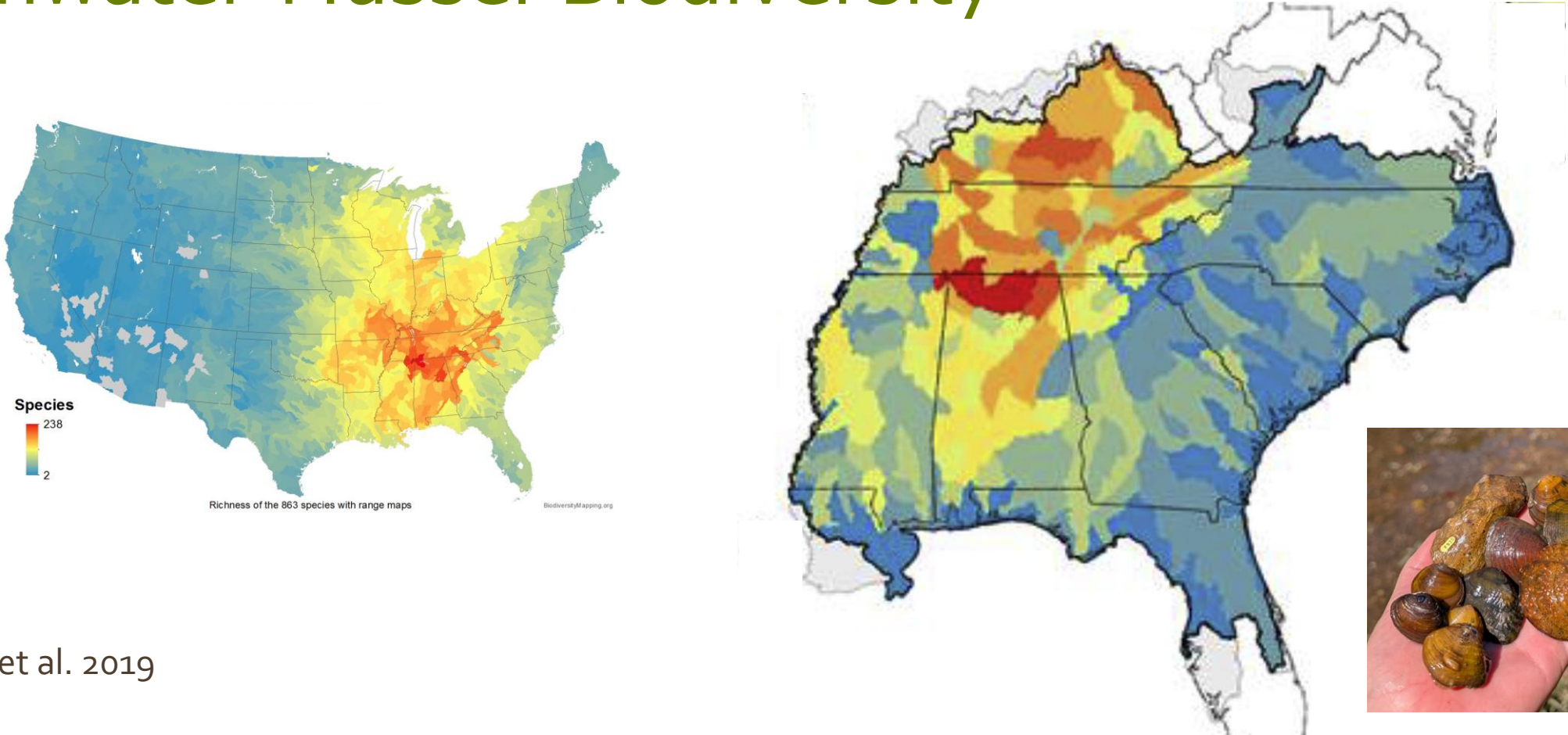
Freshwater Mussel Biodiversity



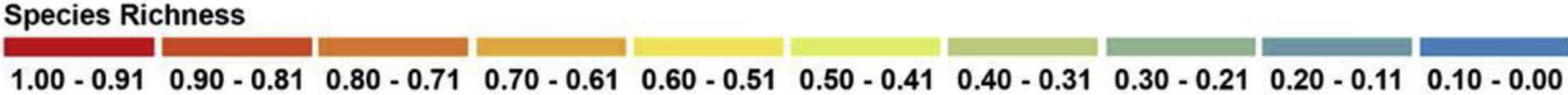
Tennessee is a Steward of Unique Biodiversity



Freshwater Mussel Biodiversity



Elkins et al. 2019



Tennessee is a Steward of Unique Biodiversity



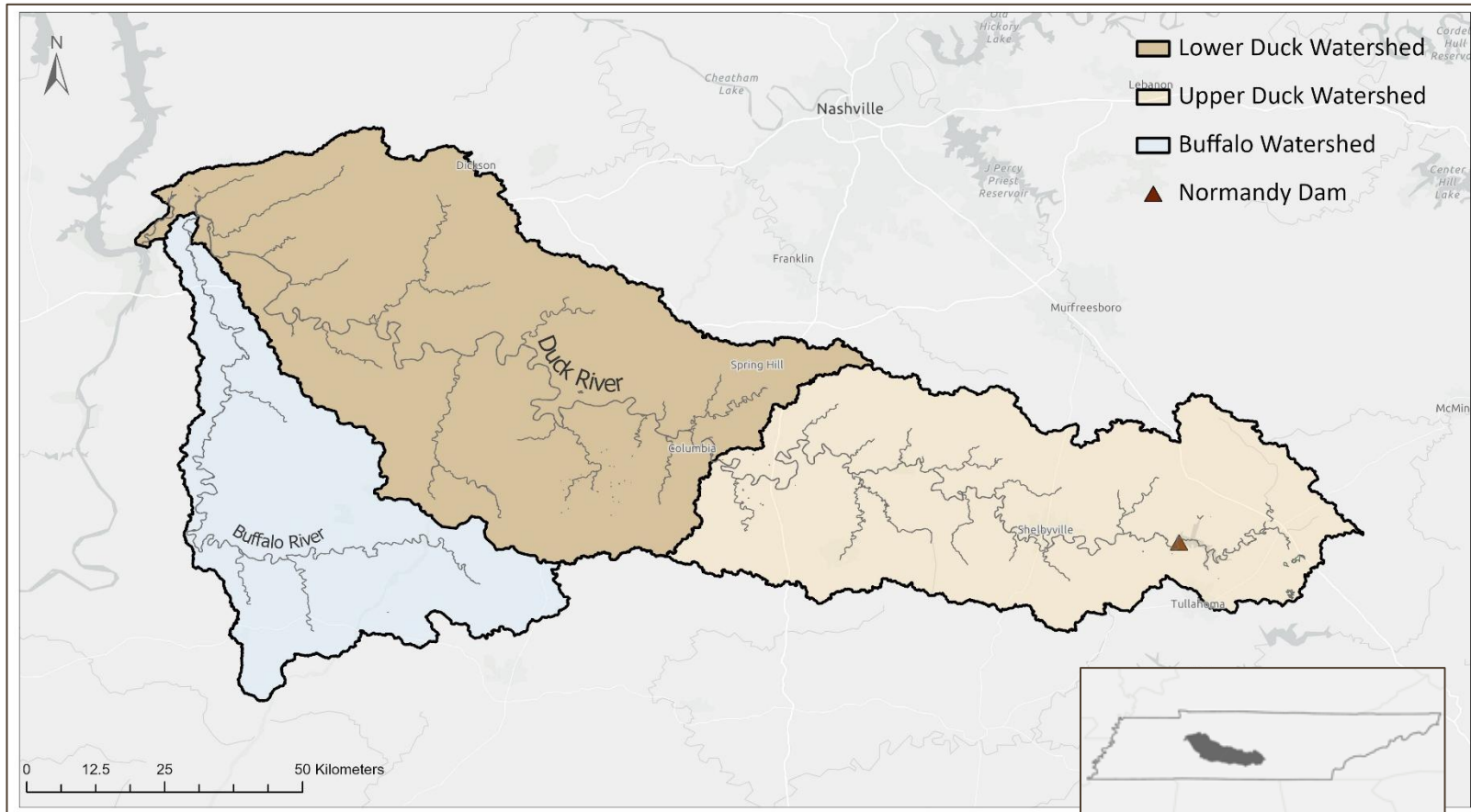
Tennessee Mussel Diversity

141 species historically | 53 federally listed | 13 petitioned



Duck River, Tennessee

150+ species of fish | 60+ extant mussels | 22+ snails



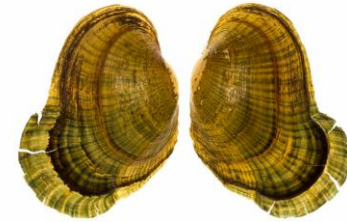
15 Listed Species



Fluted Kidneyshell



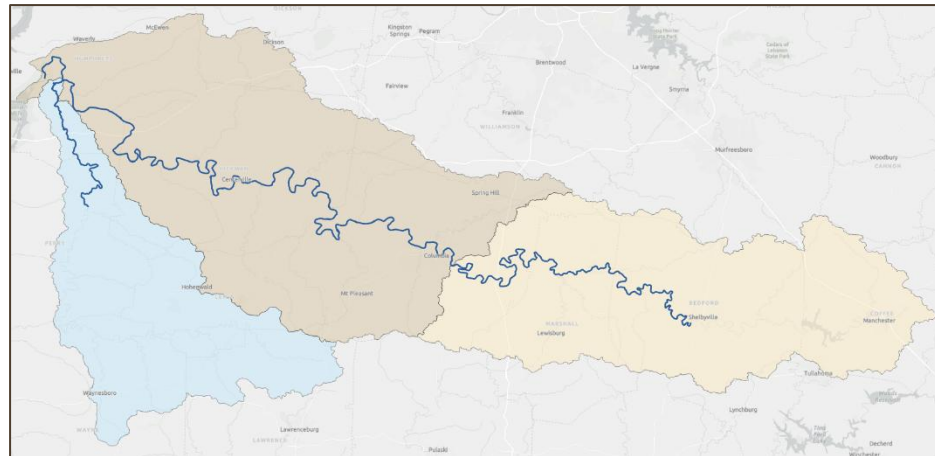
Cumberlandian
Combshell



Duck River
Dartersnapper



Snuffbox

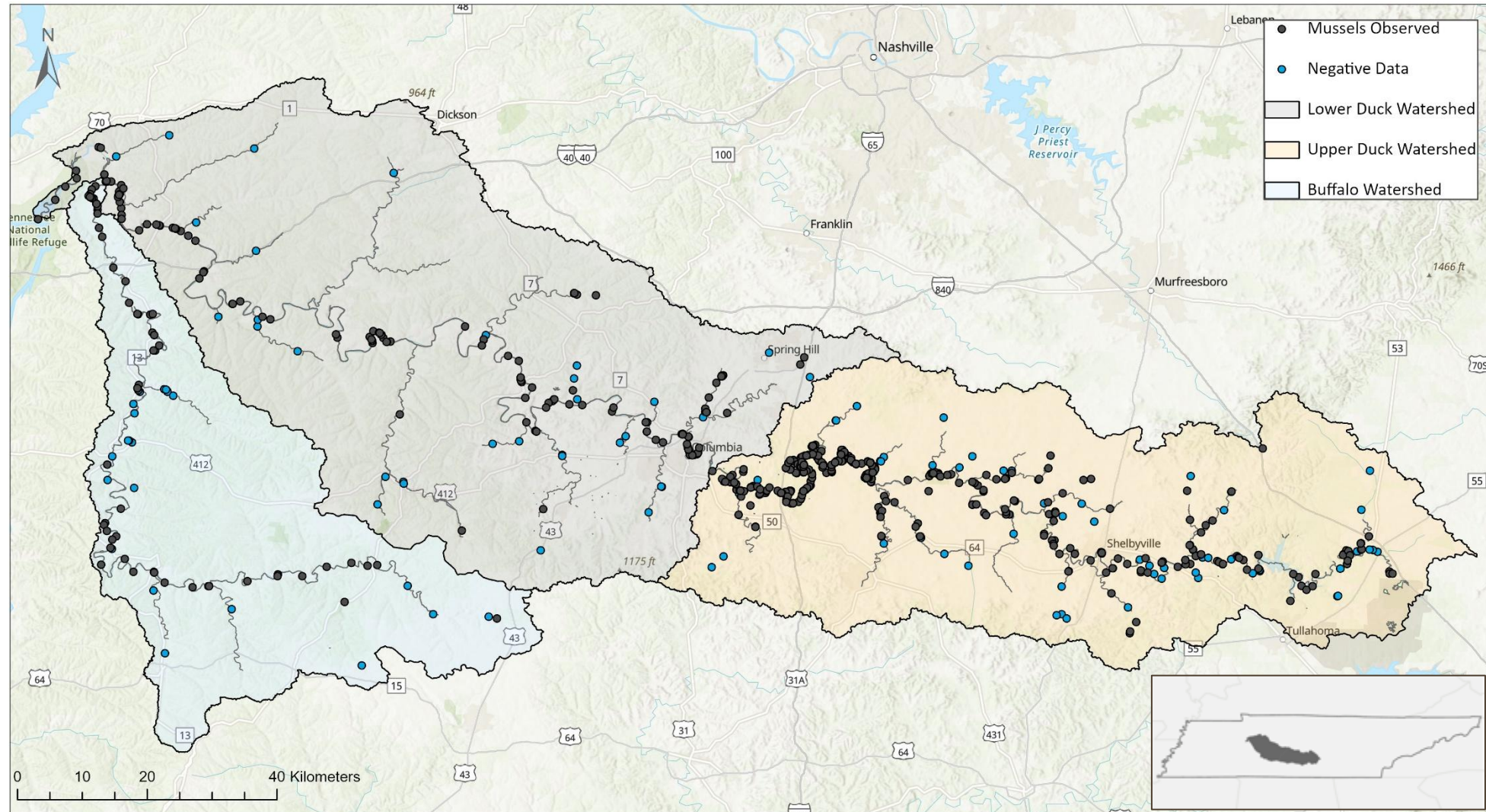


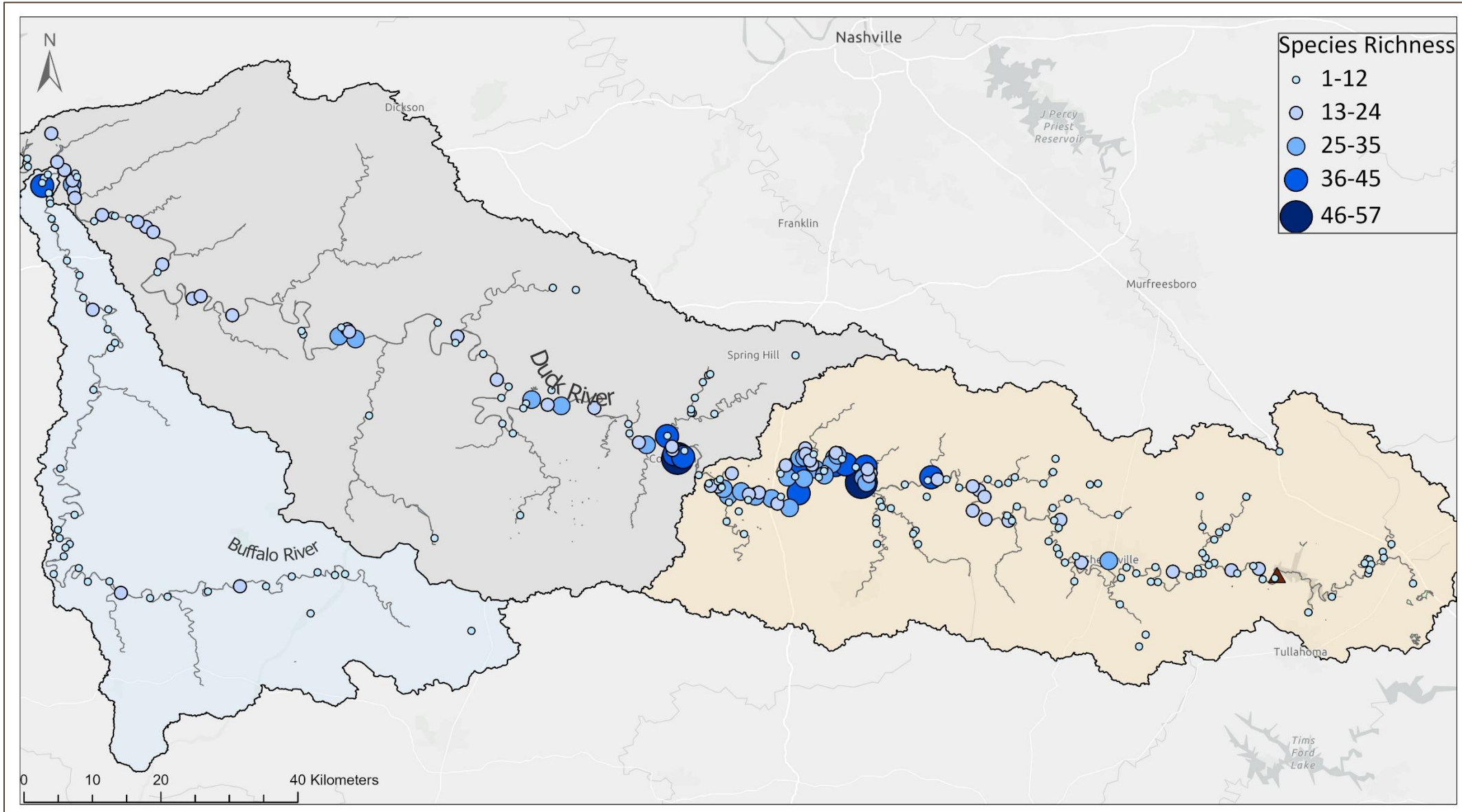
Critical Habitat



Slabside
Pearlymussel

Freshwater Mussel Survey Coverage in the Duck River Drainage

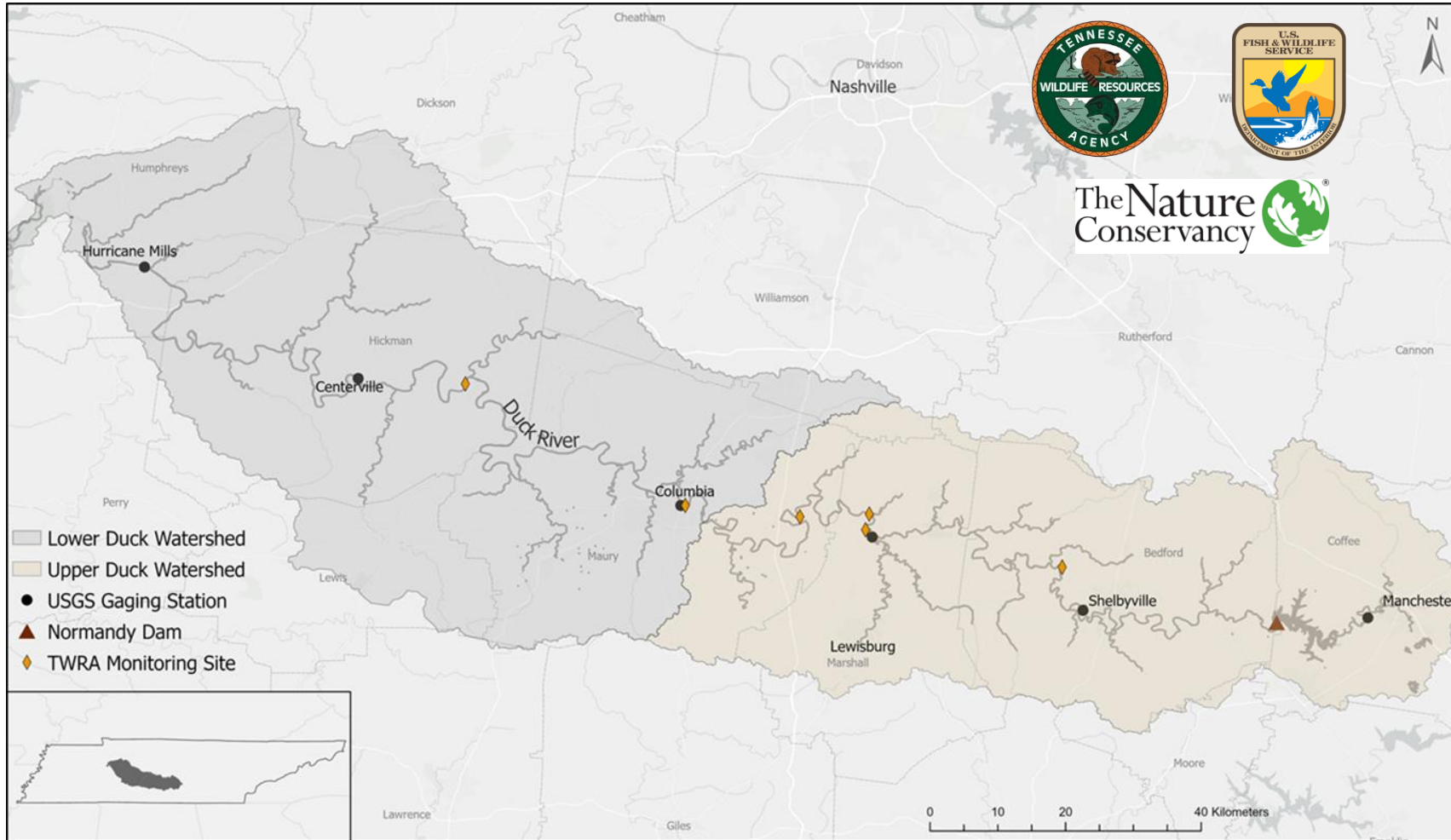




Propagation and Reintroduction



Long-term Monitoring



84° Cloudy

Duck River is the one of the most important in the US

Jun 21, 2024

f x e b i

Eight local water supply utilities want to drastically increase the amount of water in the Duck by an additional 19 million gallons per day. However, the Duck is both a local treasure with limited capacity. This increase will support massive development at protecting the river for current and future generations. It will risk killing the river's populations.

Conservationists challenge state allowing utilities to drain 73 million gallons daily from Duck River

Right now, approximately 54 million gallons of water is drained from the Duck River each day.



Along the Duck River, some water utilities plan to pump out 30% more water to fill the tap. Conservationists worry that will threaten an already strained resource.

ENVIRONMENT

Water wars: groups challenge 'unsustainable' withdrawals from Duck River

Long time residents and conservation groups say industry lured by the state, population growth are draining water at high rates from a river prized for its biodiversity

BY: ANITA WADHWANI - MAY 6, 2024 5:00 AM

X in f e @



John McEwan, whose family has lived on the banks of the Duck River since the 1860s, skips stones on the Duck. (Photo: John Partipilo)

MIDDLE TN Officials defend water from Duck River

by: Davis Nolan
Posted: Apr 3, 2024 / 05:47 PM CDT
Updated: Apr 3, 2024 / 07:26 PM CDT

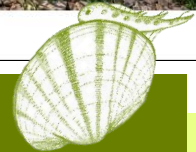
SHARE f x in e

NASHVILLE, Tenn. (WKR) Conservationists are concerned about the Tennessee Department of Environment and Conservation's approval of a new water intake from the Duck River.

It would increase the intake from 54 million gallons per day to 73 million gallons per day, making a total of 32 million gallons per day. The Duck River is considered one of the most important rivers in the state.

| PREVIOUS: Proposals to increase water intake from Duck River

On Wednesday, April 3, the Tennessee Department of Environment and Conservation announced that it had approved the plan. Conservationists who defended the decision said the plan would threaten the river's biodiversity.



Do Something!!



Tennessee is Steward to Unique Biodiversity



Mussels are Ecosystem Engineers



Mussels are Ecosystem Engineers



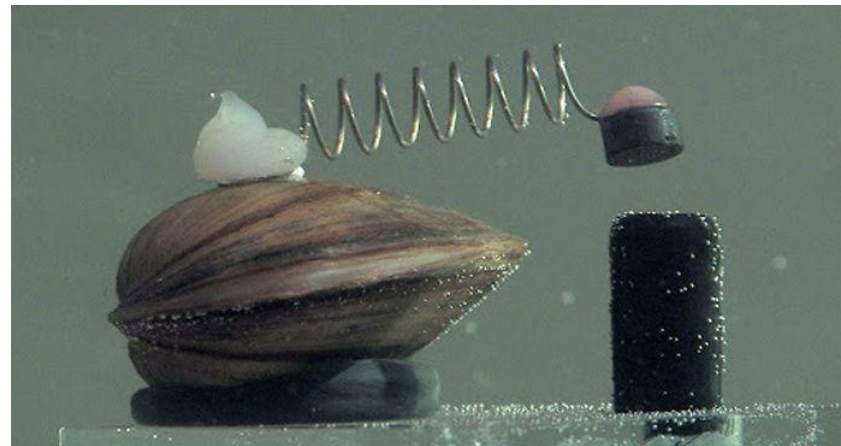
Mussels are Water Engineers

- Stormwater
- Environmental Quality
- Infrastructure
- Agriculture
- PFAS
- Contaminants/ PFAS
- Soil
- Species Diversity
- Urban Streams
- Reservoir Management
- Flooding



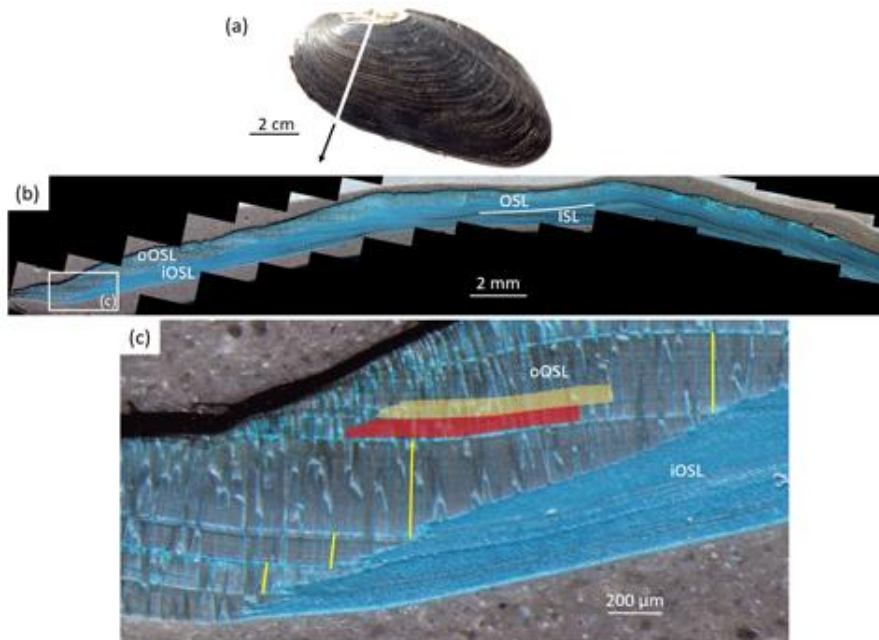
Stormwater, contaminants

- Can help clear suspended solids
- Bioindicators of contaminants
- Can sequester and reroute contaminants
- Targeted and integrative environmental monitors



Flooding, Erosion

- Indicators of bottom conditions, geomorphology
- Physically stabilize stream beds, create heterogeneity
- Records of river history



Freshwater pearl mussels from northern Sweden serve as long-term, high-resolution stream water isotope recorders

Bernd R. Schöne [✉](mailto:bernd.schoene@ecampus.utah.edu), Aliona E. Meret, Sven M. Baier, Jens Fiebig, Jan Esper, Jeffrey McDonnell, and Laurent Pfister





Making Mussels Work for You



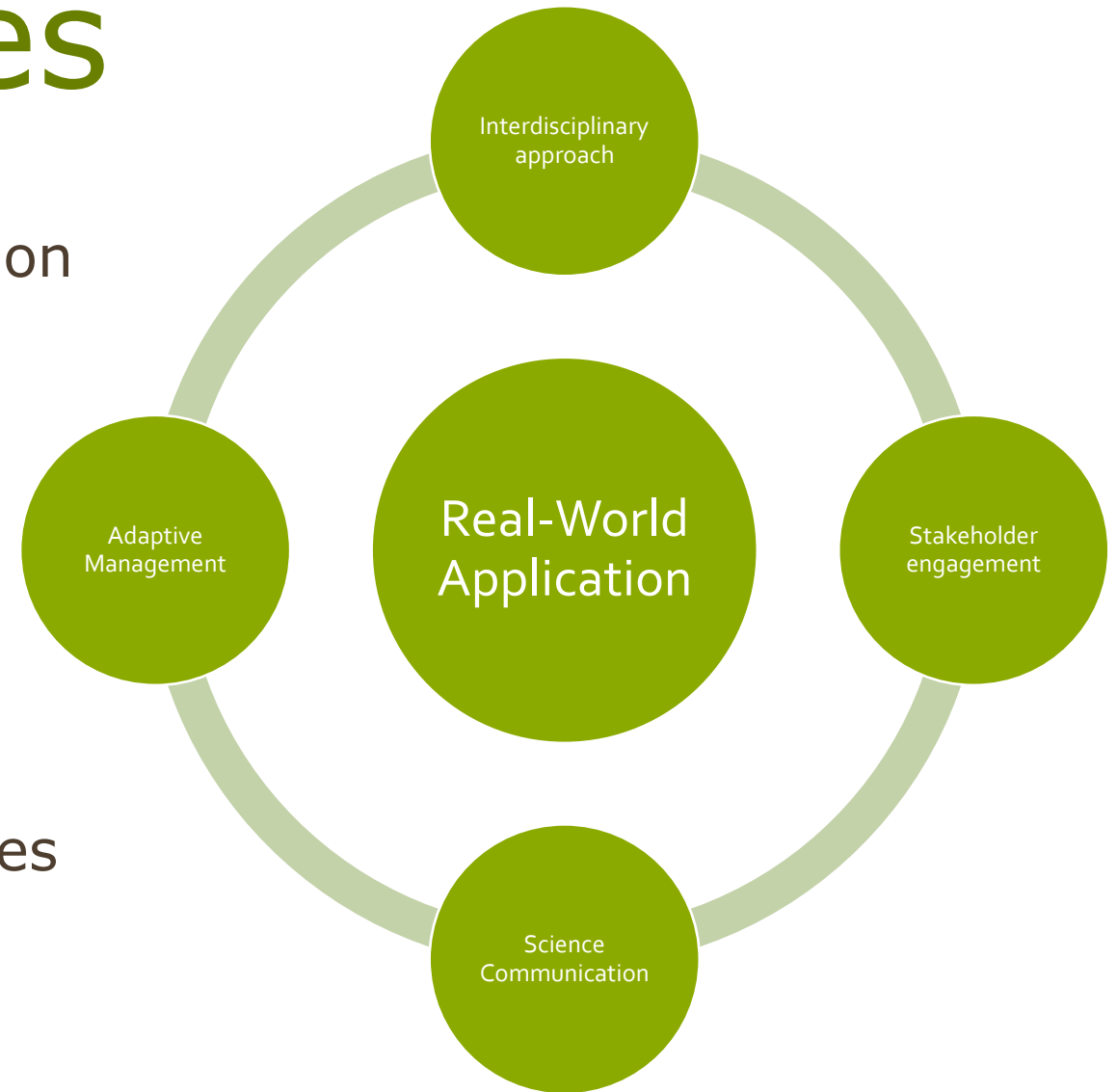
Resource Use

- Support healthy fisheries
- Cultural and historical importance



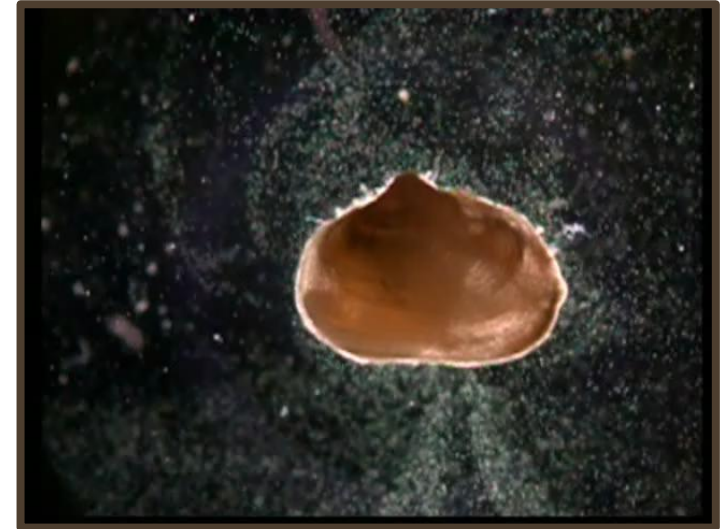
Mussels as Allies

- Biodiversity = resource protection
- Attracting resources
- Mussels as indicators of environmental health – their resilience is ours
- Opportunity for novel approaches



Research Opportunities

- Studies on mussels' role in water filtration
- Economic valuation of ecosystem services
- Mussel bioenergetics
- Flow-geomorphology & hydrology relationships



Some Rosenberger Laboratory Products

- Duck River Mussel Database
- Duck River Historical Analysis and Trends
- Duck River Instream Flow and Freshwater Mussels

Storyboards:

Musseling through Change



Mussels for Clean Water in West TN



Take Homes

- Freshwater mussels have a fascinating ecology and life history.
- Tennessee's richness, natural legacy, and unique status as a biodiversity hotspot provide a mechanism for harnessing our rich heritage to understand and manage water resources wisely and well for current and future generations.
- Research, once employed, can be used to develop novel and collaborative efforts to establish water-wise policy, practice proactive conservation, and educate and empower communities.

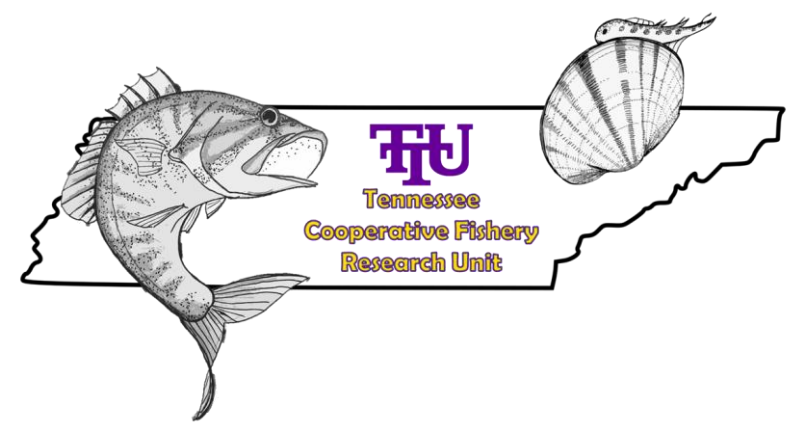


Take Homes

- Mussels are AMAAAAAAYZING!!!
- Tennessee is unique and should be proud of its mussel fauna and biodiversity and use...
- *Mussel Power* to manage our water resources wisely for current and future generations.



It takes a village..



TN students, staff

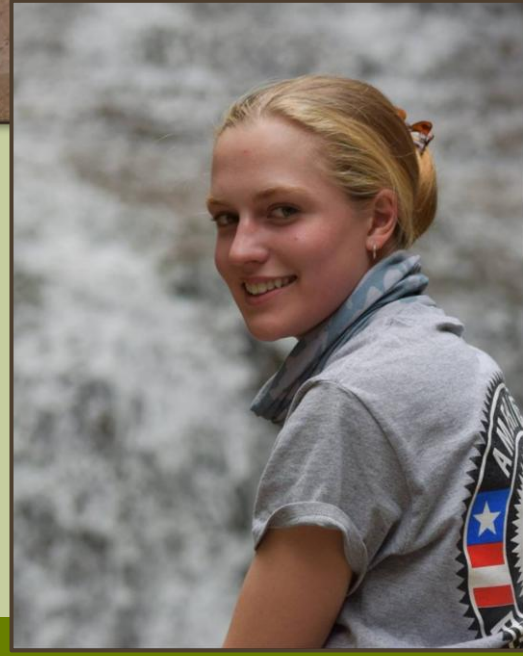
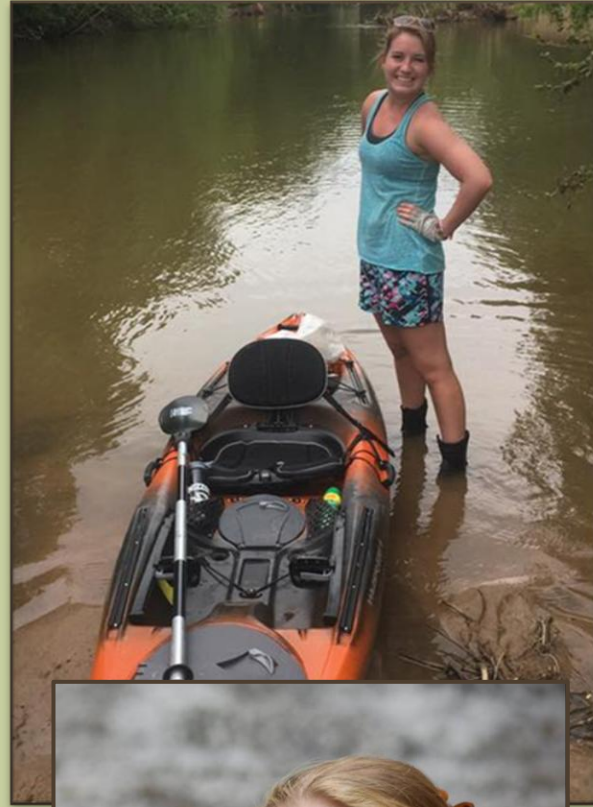
- Kristin Irwin Womble
- Rob Paine

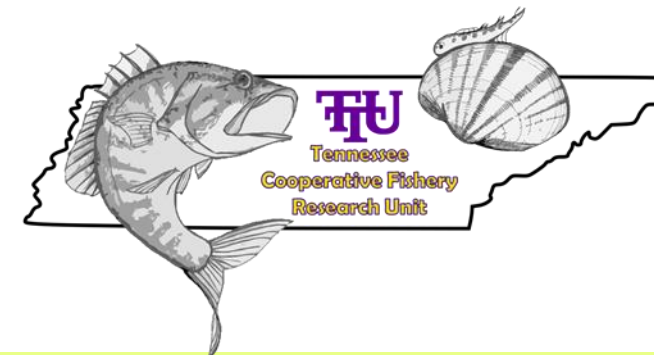
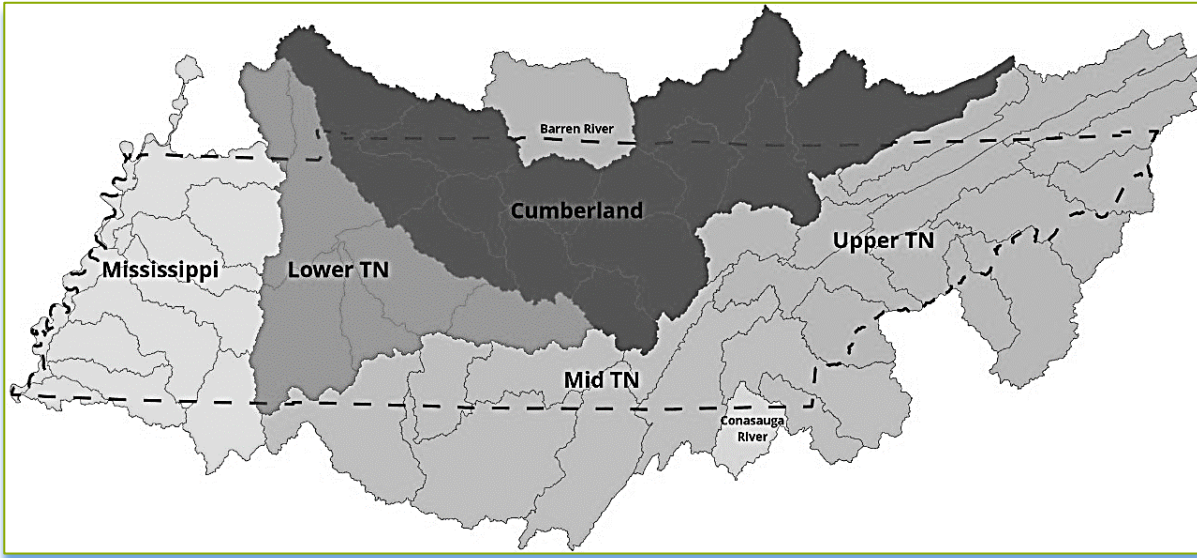
- Matt Schrum
- Kayla Key
- Jordan Holtsworth
- Brittany Bajo
- Jack Fetters
- Katelynn Sallack

Partners

- Brittany Bajo-Walker
- Kayla Key
- Josh Campbell, Chris Simpson, Jason Miller
- Gerry Dinkins
- Andy Ford
- Santiago Martin
- Daniel Elbert
- And so many more...









*This is what was bequeathed us:
This earth the beloved left
And, leaving,
Left to us.
No other world
But this one:
Willows and the river
And the factory
With its black smokestacks.
No other shore, only this bank
On which the living gather.
No meaning but what we find here.
No purpose but what we make.
That, and the beloved's clear instructions:
Turn me into song; sing me awake.*

- David Orr

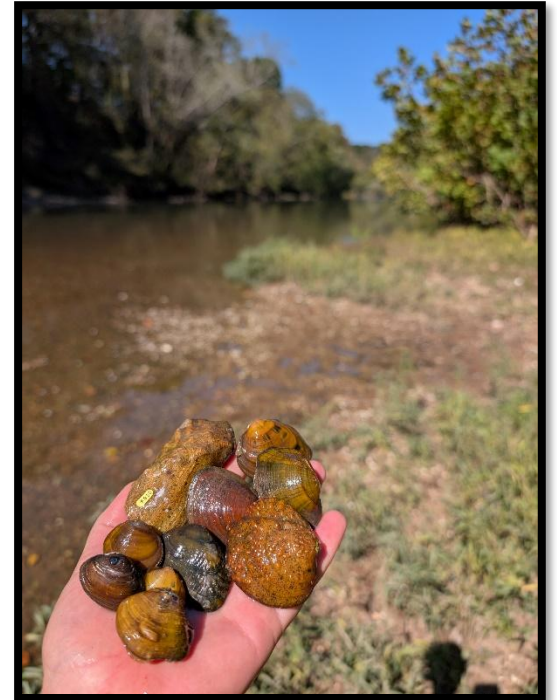


Photo credit: Brittany Bajo, TWRA