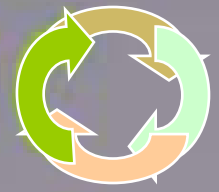
Conservation and Recovery of Imperiled Aquatic Fauna in the Clinch and Powell Rivers

Applying the Five Elements of Strategic Habitat Conservation

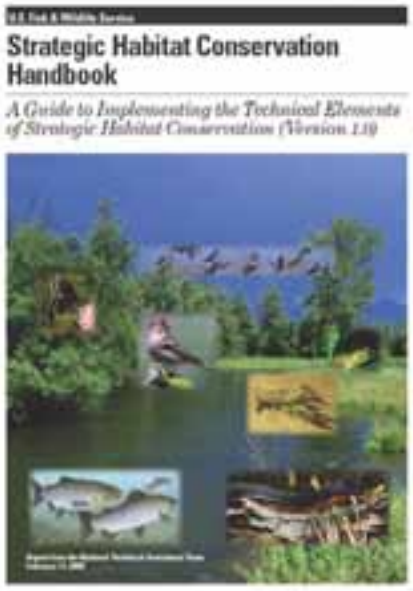
- *Biological Planning*
- *Conservation Design*
- *Conservation Delivery*
- *Assumption-driven Research*
- *Outcome-based Monitoring*

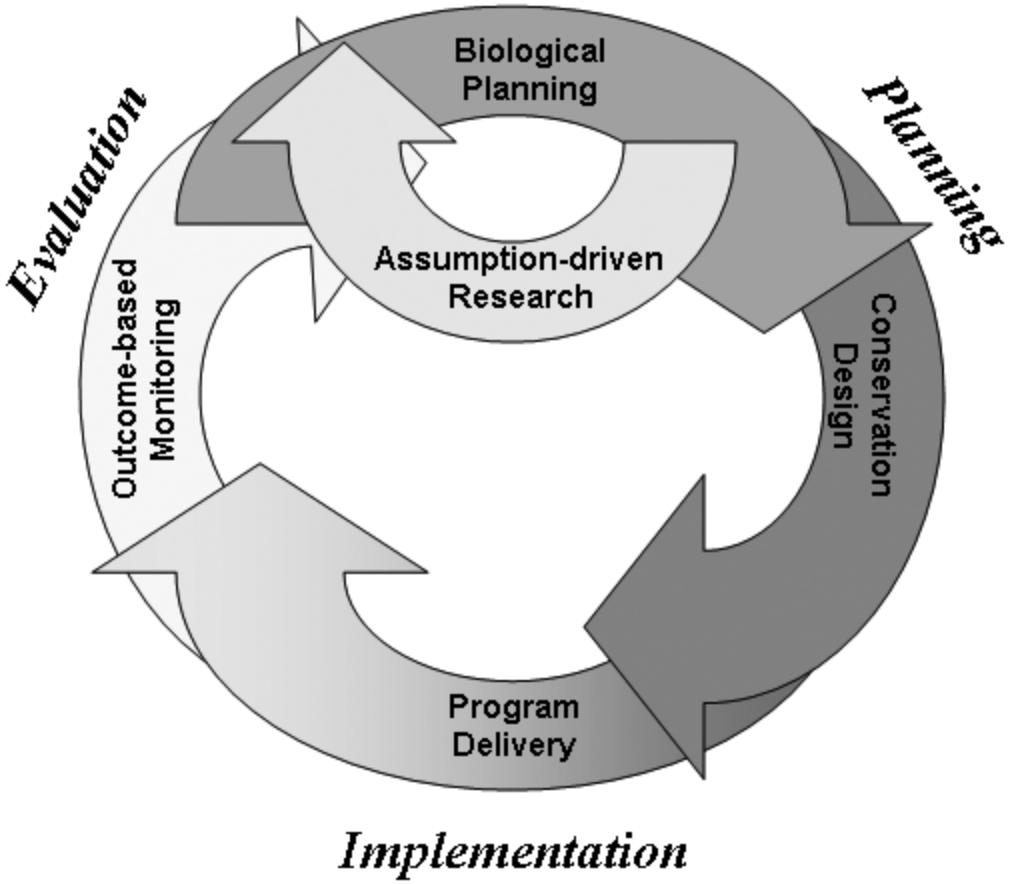


Southwestern Virginia Field Office

Forward in the SHC Handbook :

"…no single office is likely to apply all elements of the SHC framework. Even a dedicated team of conservation planners and researchers that can perform the technical elements of SHC will not deliver conservation programs. **Implementation of the full framework will require a Service-wide commitment that will benefit from an integration of program offices providing different but complimentary functions**…"

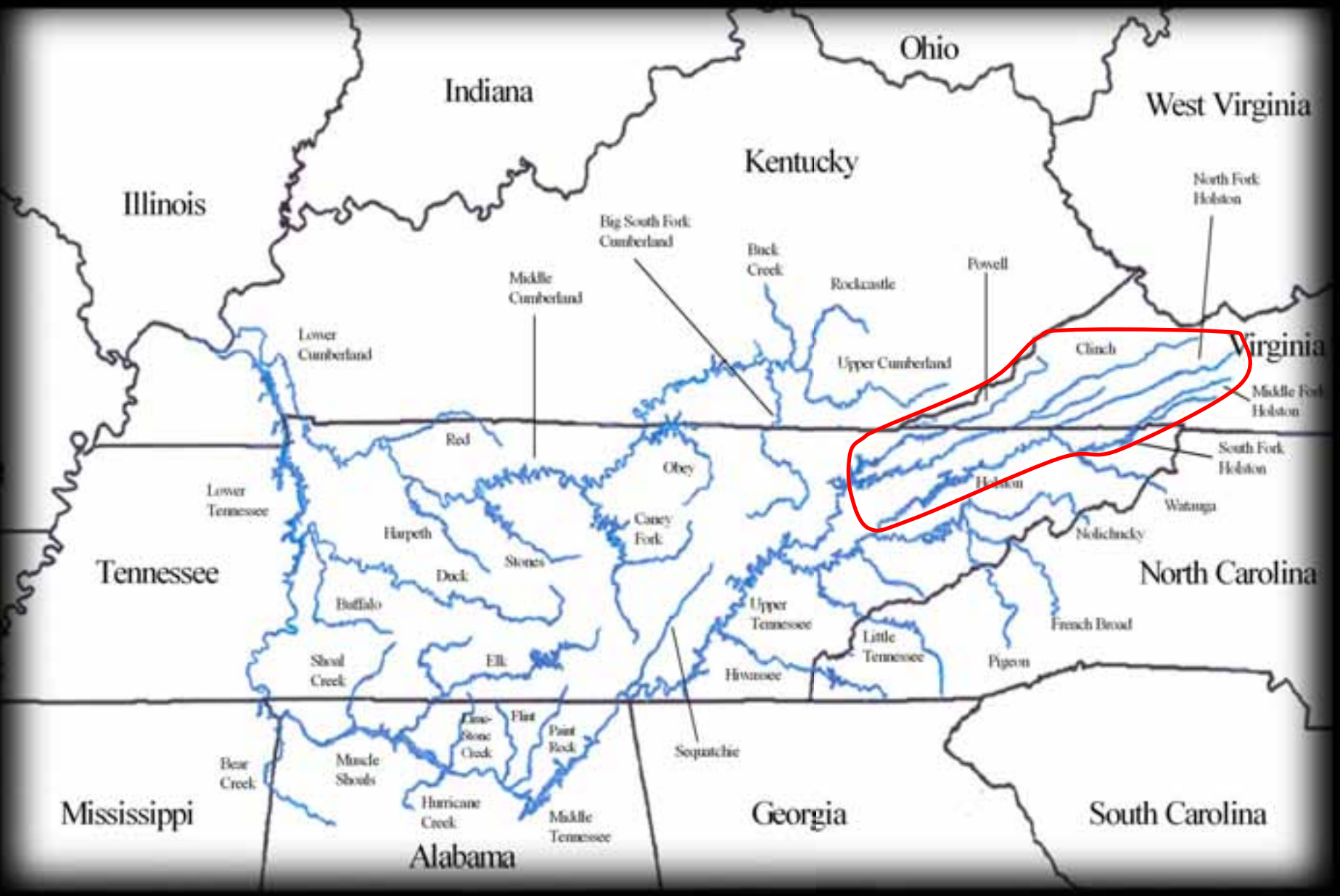




LCC Geographic Areas

Map Produced: January 20, 2010. S. Hanlon, US Fish and Wildlife Service, Southwestern Virginia Field Office, Abingdon, Virginia

Tennessee and Cumberland Rivers Eco-Region



Clinch-Powell River System

- Very high species diversity:
  - 45 extant mussels
  - 130 fishes
  - 12 crayfishes
  - 12 snails
  - > 300 aquatic insects

- 25 federally listed threatened and endangered species and > 200 river miles critical habitat

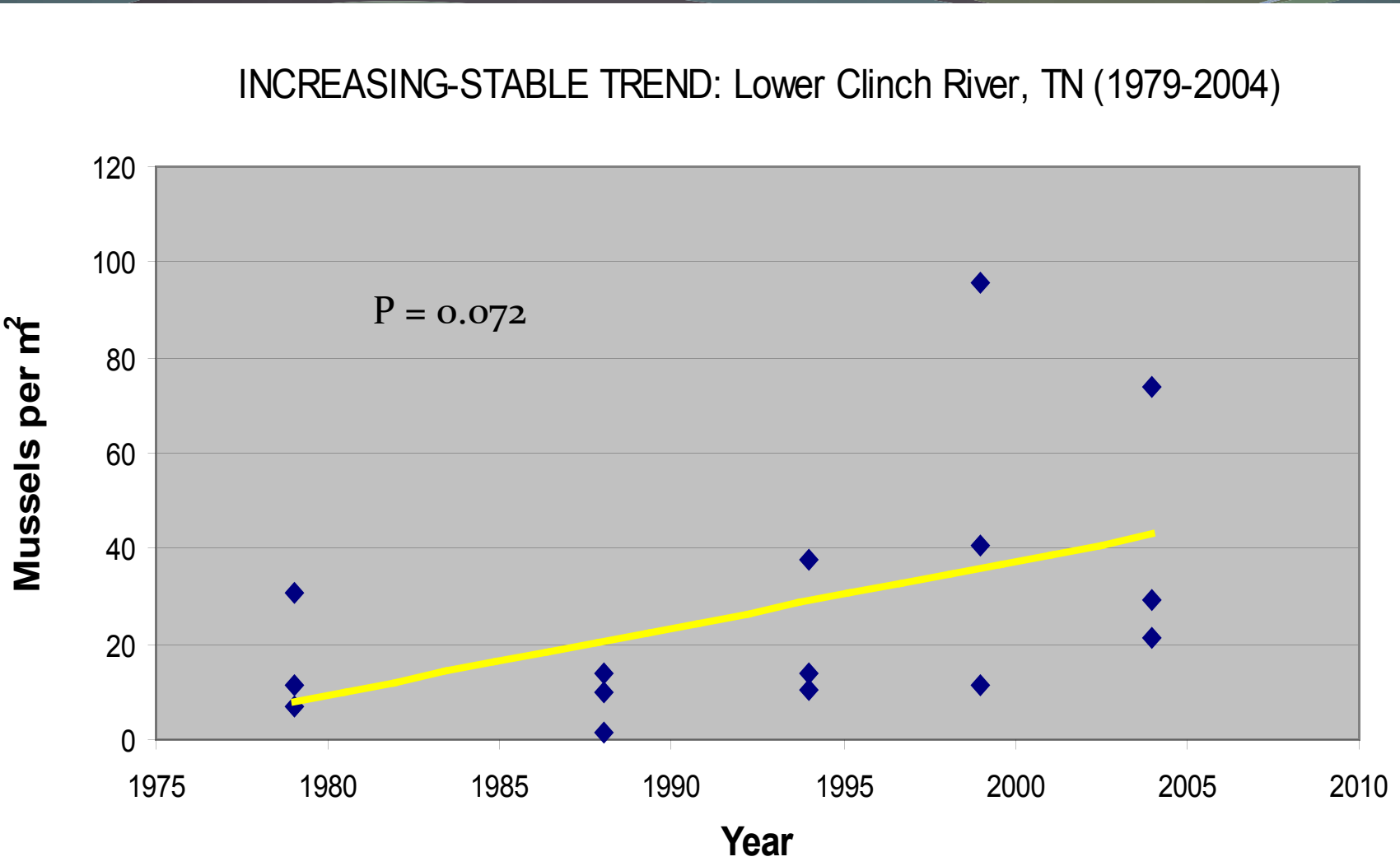
- Broodstock for restoration efforts

- Globally significant fauna

Research and Monitoring Informs Biological Planning

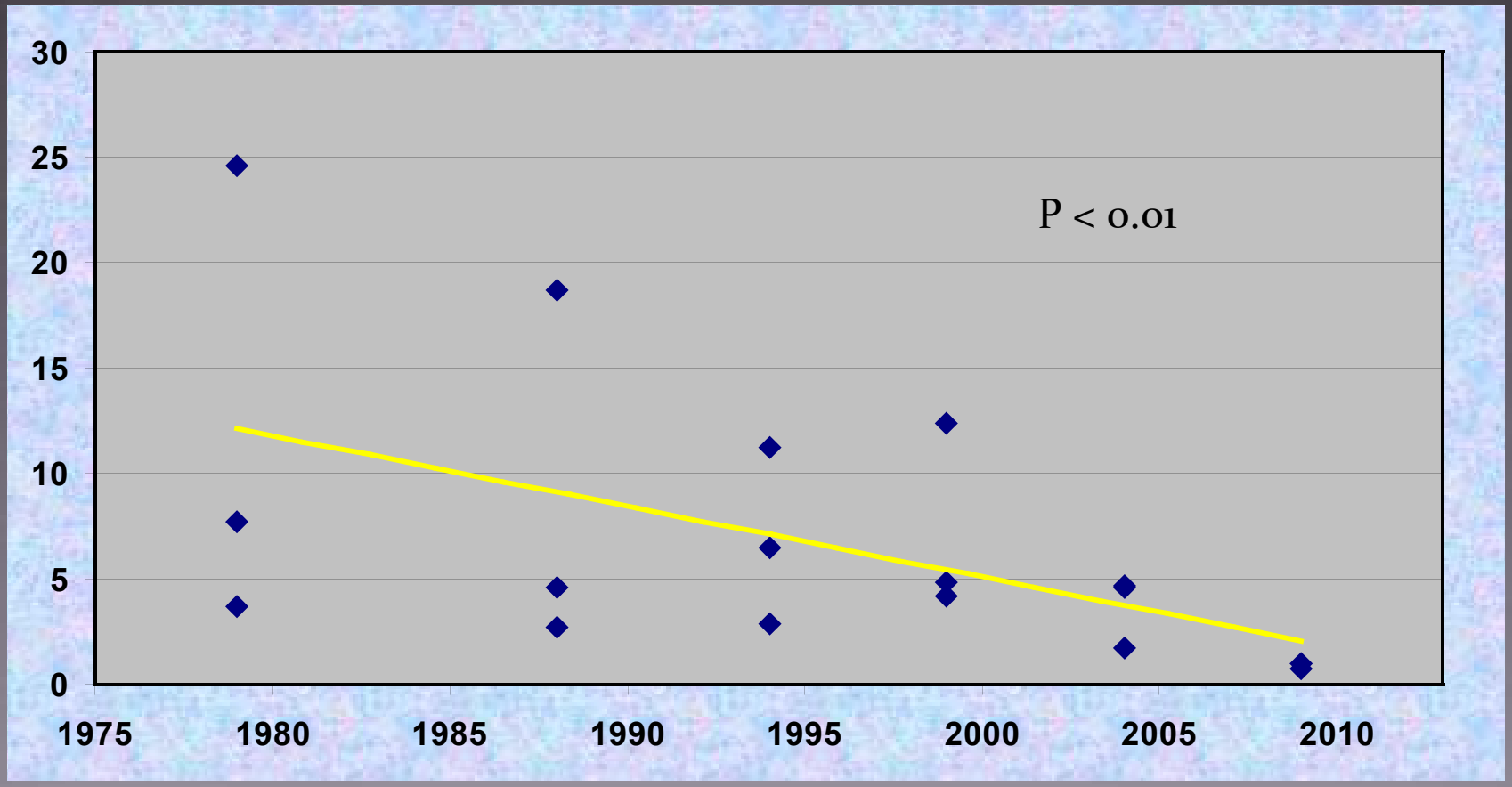
- Decades of data for mussels and fish
- Growing body of water quality data
- Fish & mussel propagation techniques
- Mussel toxicity testing

N. Eckert, C. Kane, R. Helm



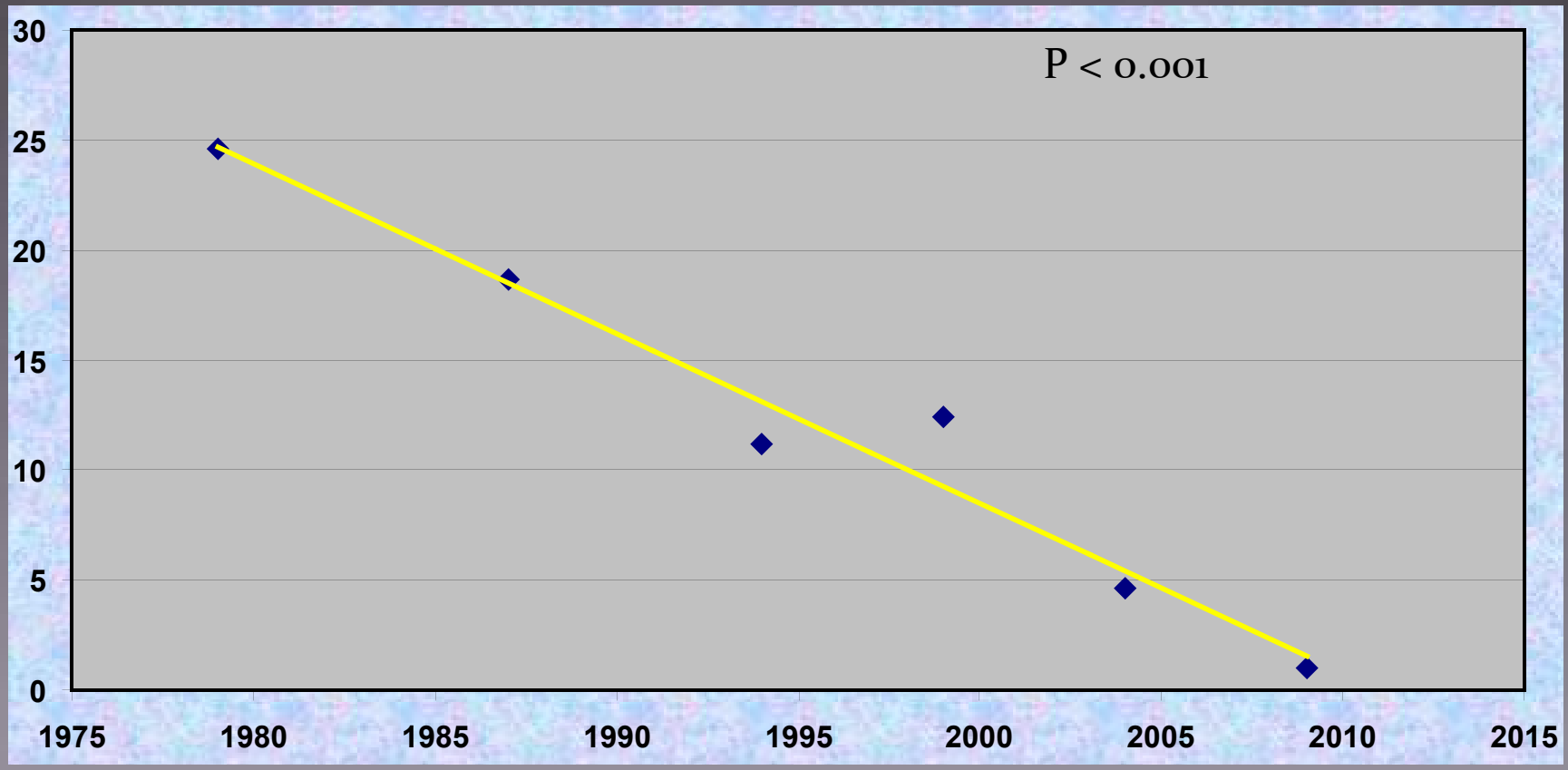
At investigated sites, total mussel abundance has increased 2.5-fold

Middle Clinch River, VA 1979-2009

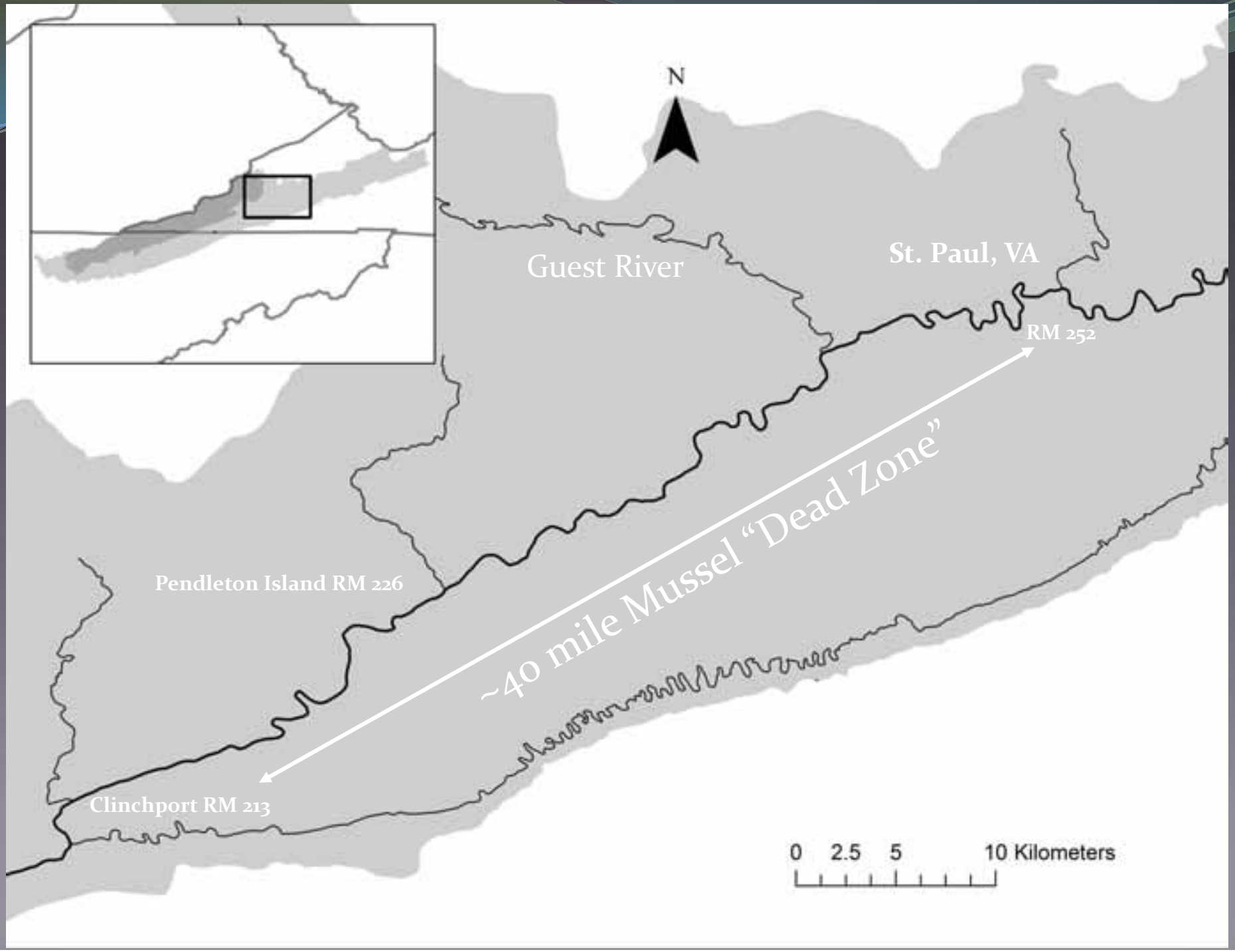


At investigated sites, total mussel abundance has decreased 80%.

Pendleton Island, VA 1979-2009



Total mussel abundance has declined by 96%


N
Guest River
St. Paul, VA
RM 252
~40 mile Mussel "Dead Zone"
Pendleton Island RM 226
Clinchport RM 213
0 2.5 5 10 Kilometers

JUVENILE RECRUITMENT: Endangered Oyster Mussel

About the species

Indicator species

High annual levels (7-46%) in lower Clinch River, TN

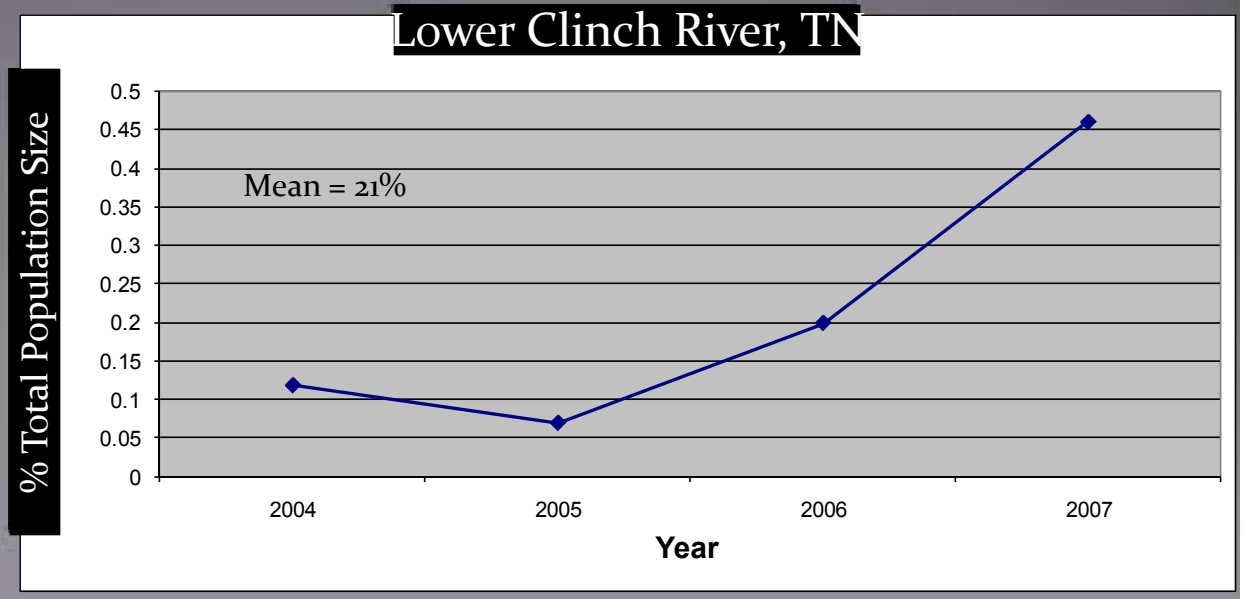
A sign of healthy mussel populations for other species

Species extirpated from many river reaches:

- Powell River
- Upper Clinch River, VA

juvenile mussels

Female mussel attracting host fish



4 Threatened, 1 Endangered Fish, & Crit. Hab. in UTRB, VA

Aquatic Habitat Affected by Prevalent Appalachian Land-Uses

What about Climate Change?

Goal: Develop an integrated conservation approach that analyzes and plans for the impacts of climate change on aquatic species, such as prolonged drought, increased temperatures, and extreme storm events.

Strategies:

- *Design several protocols to guide regulatory programs at the state and federal level to consider climate change in loan/grant application reviews and permit decisions for aquatic habitats.*

- *Initiate a new partnership with USGS and state water quality authorities to target collection of water quantity and quality data.*

- *Initiate a new partnership to develop better nutrient management and sediment and erosion control standards.*

- *Take an ecosystem view of green energy development and work with corporations as partners.*

- *Work with partners to collect GIS and other technical data to help identify critical habitat restoration and protection needs and focus USFWS PFW/Recovery and partner resources on these sites.*

Research Needs for Biological Planning & Conservation Design

- Identify factors limiting populations
  - *Pollutant impacts to all life stages of fish and mussels*
  - *Downstream impoundments and habitat fragmentation*
  - *Physical alterations to streams*
- Map quality habitat for imperiled species
- Develop models for habitat and water quality

Assumption-Driven Research

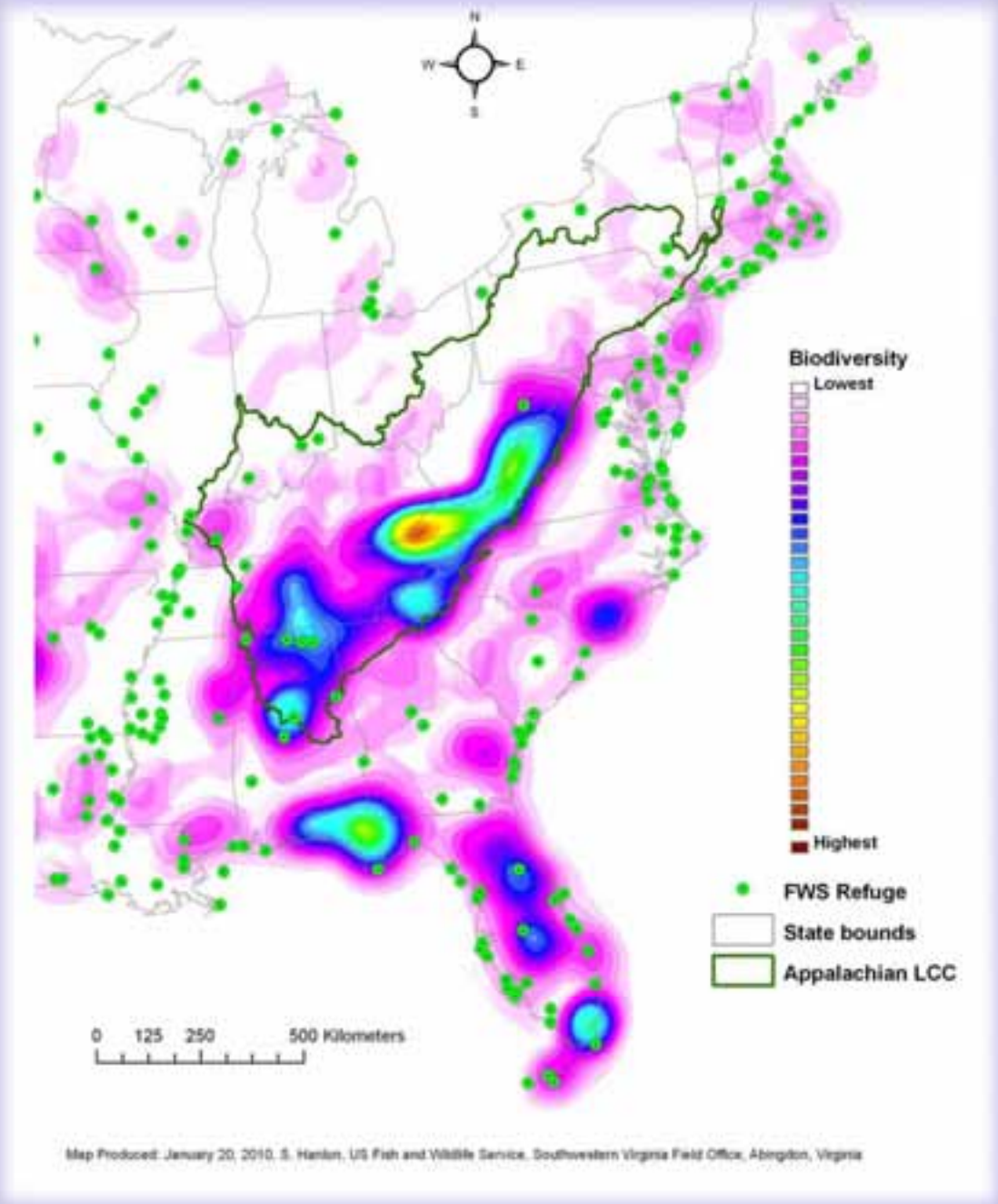
Key Questions

1) Are declines related to contemporary stressors or past disturbances?

2) What effect do tributary streams have on water quality in the main river channel?

3) How should water quality be monitored to track contaminants?

Wavy-rayed lampmussel



Biological Hotspots and NWRs in the Appalachian LCC

Conservation Design Considerations

Conservation Delivery

Accomplished w. input of multiple partners
Create & enhance fish & mussel pops.
Quantitative monitoring to:
- document success
- performance criteria

Releasing yellowfin madtoms

MUSSEL PROPAGATION FACILITIES

- Two facilities in Virginia and WSSNF required to cover workload
  Most funding provided through avenues such as NRDAR

Aquatic Wildlife Conservation Center, VDGIF, Marion

The Freshwater Mollusk Conservation Center is managed by the USGS Virginia Coop Research Unit at Virginia Tech

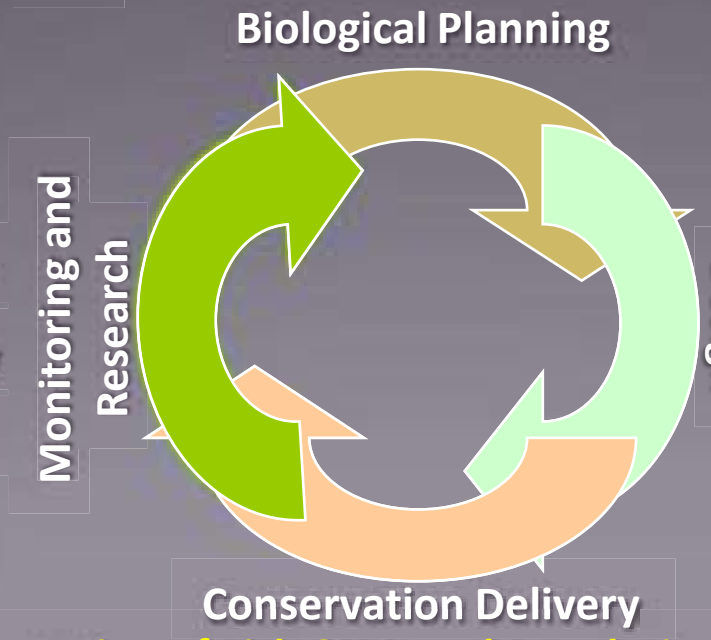
PROPAGATION OF ENDANGERED MUSSELS

SPECIES:

Oyster mussel	224,790
Combshell	81,867
Tan riffleshell	49,039
Purple bean	22,334
Fanshell	11,918
Snuffbox	4,116
Cumberland bean	1,249
Dromedary	851
Little-wing pearlymussel	569
Birdwing pearlymussel	44
Cracking pearlymussel	5
TOTAL RELEASED	396,782

Fish & Mussel Recovery in the SHC Framework

- *Fish and Mussel Recovery Plans*
- *Cumberlandian Region Population Restoration Plan*
- *MRG*



- *Fish & Mussel Surveys*
- *Mussel Toxicity Testing*
- *Propagation research*

- *Augmentation Sites*
- *Land use & Other Maps*

- *Augmentation of Fish & Mussel Populations*
- *Guidelines To Assist Regulators In Protecting Water Quality*