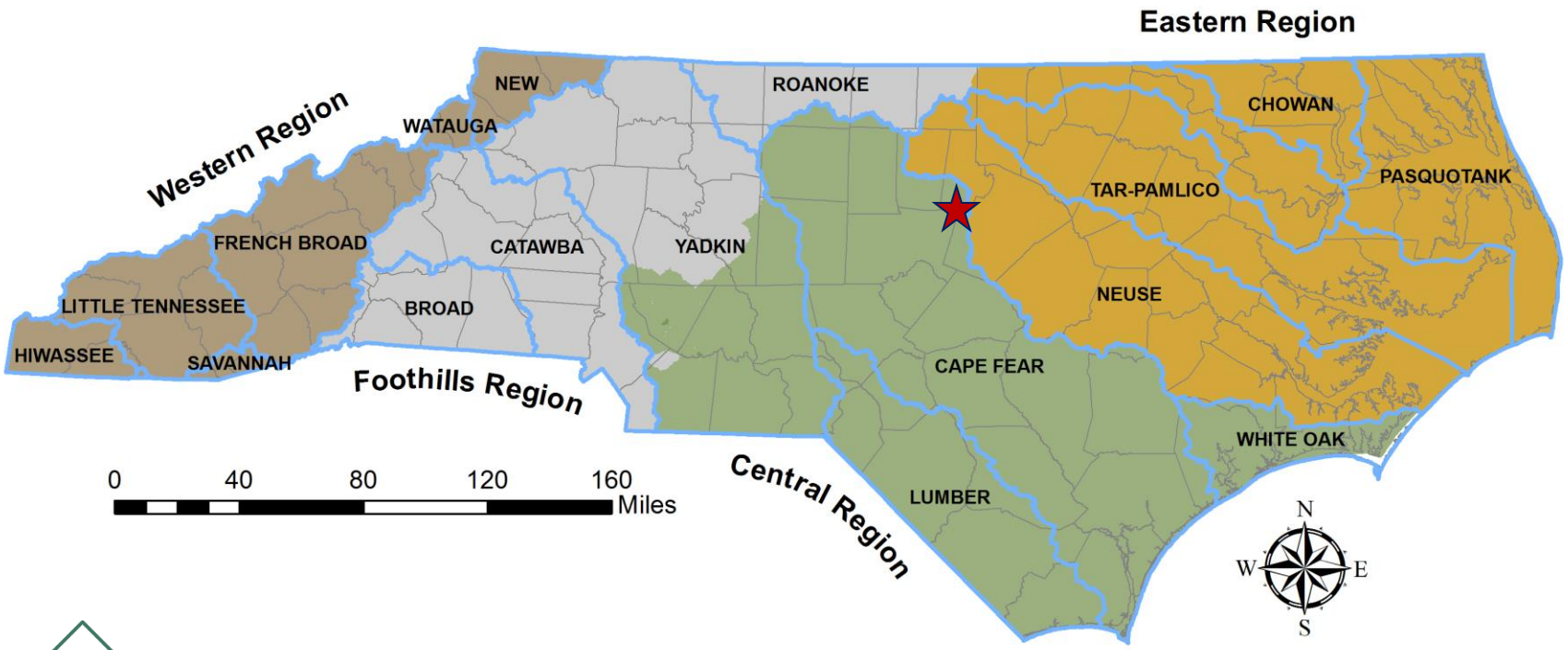
The Foundation of Life:
Water, Wildlife, and You



Brena Jones
Aquatic Wildlife Diversity Program
brena.jones@ncwildlife.org

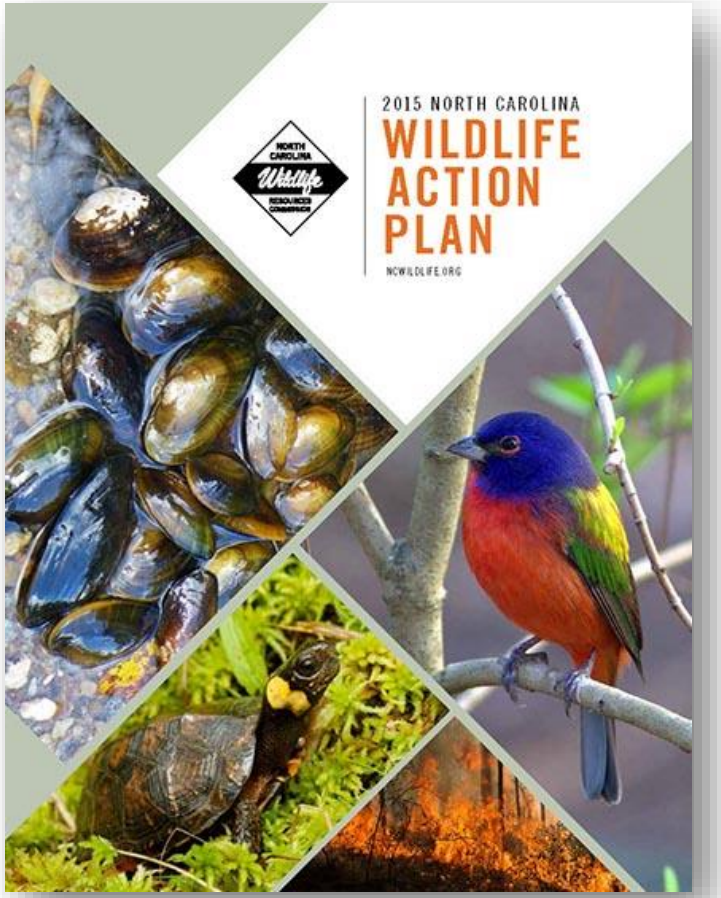
Aquatic Wildlife Diversity: Who & Where Are We?



NORTH CAROLINA Wildlife RESOURCES COMMISSION

Goals of Wildlife Diversity

- Improve understanding of species diversity & enhance decision-making ability
- Conserve & enhance habitat & communities
- Foster partnerships
- Support educational efforts
- Support & improve regulations & habitat protection programs



NORTH CAROLINA Wildlife RESOURCES COMMISSION

Major Collaborators





























Robust Redhorse



Magnificent Ramshorn



Rayed Pink Fatmucket

All (aquatic) creatures great and small



Waccamaw Crayfish

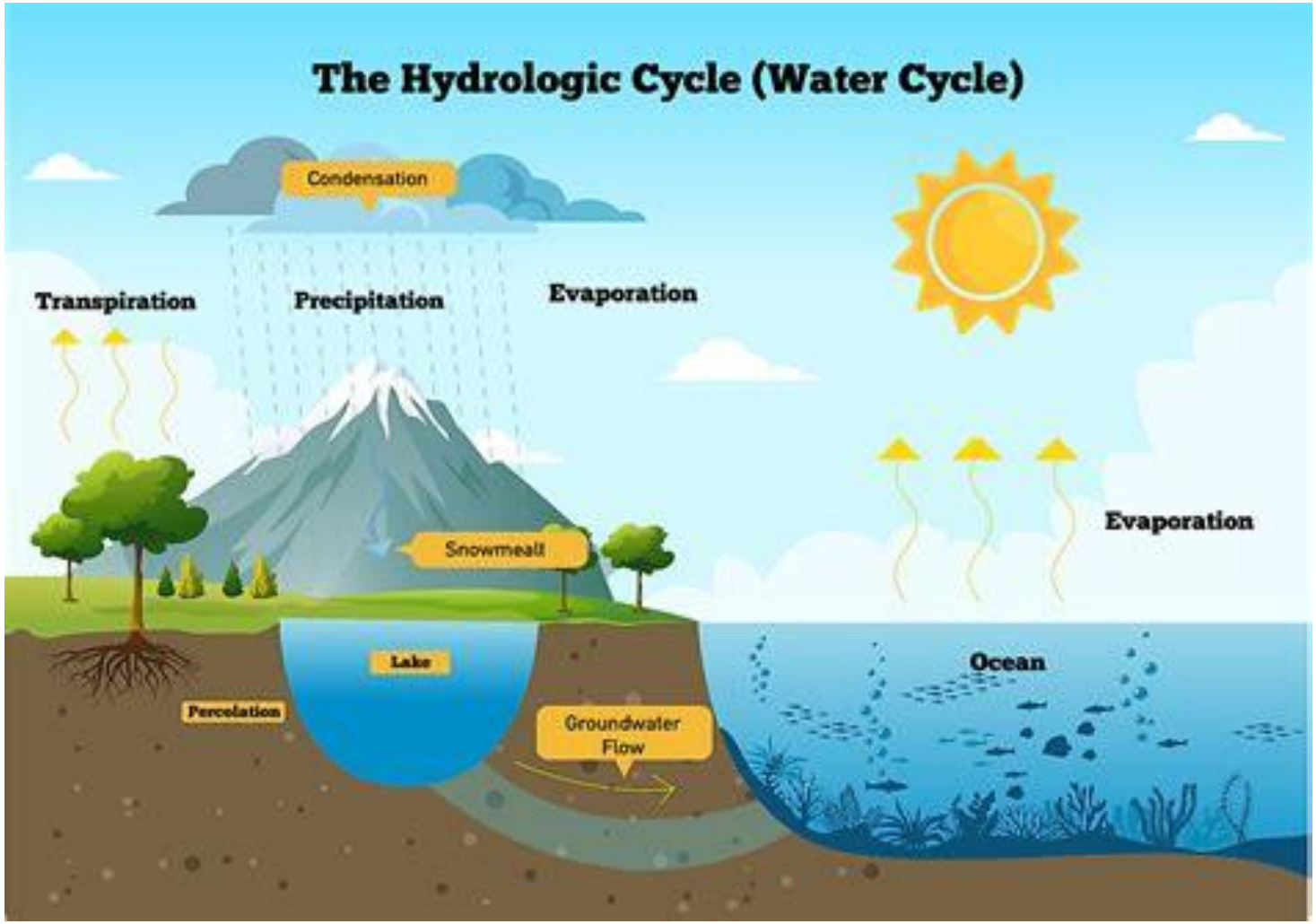
What habitats are important to these species?

- Streams/Rivers
- Forests
- Riparian habitats



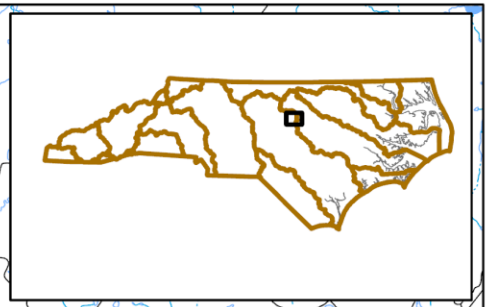


NORTH CAROLINA Wildlife RESOURCES COMMISSION



NORTH CAROLINA Wildlife RESOURCES COMMISSION

Watersheds



Chapel Hill

N

Major Rivers

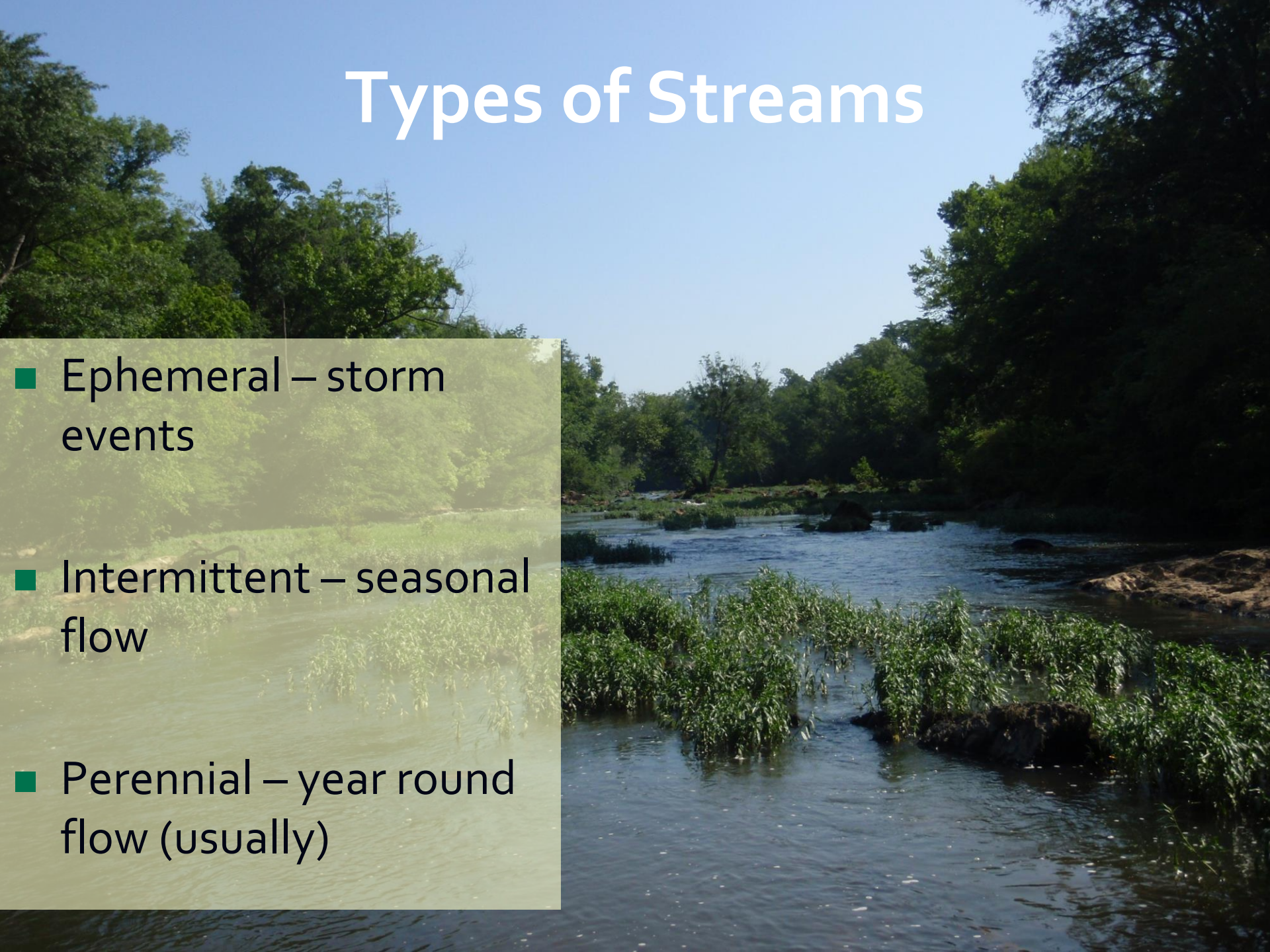
River Basins

0 1 2 3 5 6

Kilometers

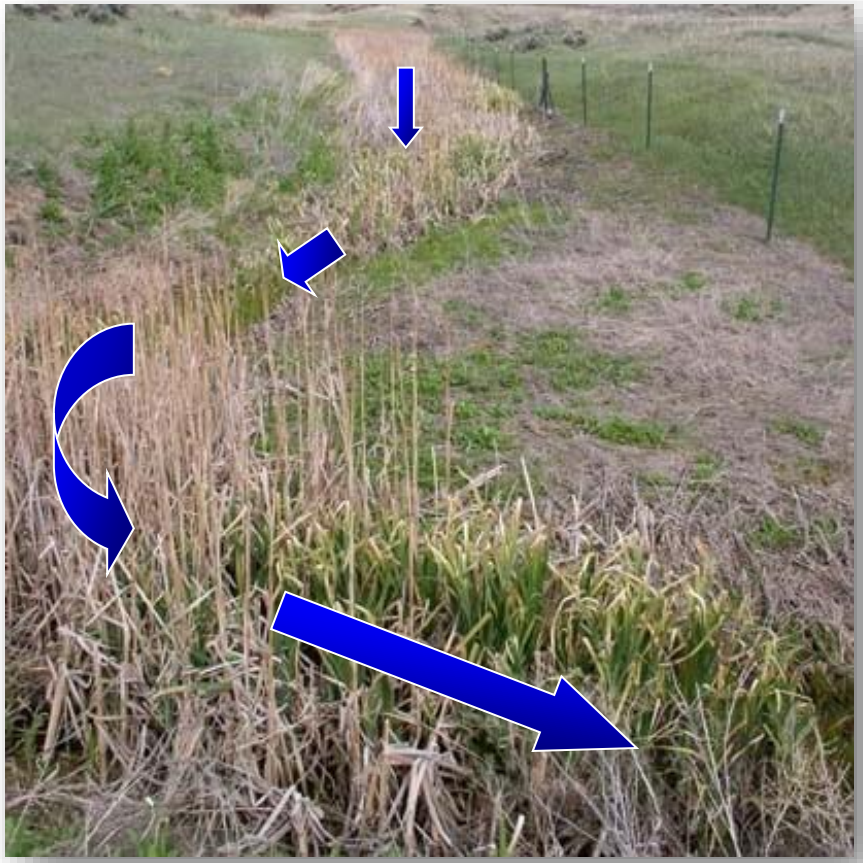


Types of Streams



- Ephemeral – storm events
- Intermittent – seasonal flow
- Perennial – year round flow (usually)

Ephemeral



- Carries storm flow to intermittent stream
- Processing organic material
- Retaining sediment

NORTH CAROLINA Wildlife RESOURCES COMMISSION

Intermittent

- Flood control
- Water supply
- Nutrient & sediment storage
- Energy/food source
- Woody material source
- Organism reproduction and rearing



Rough Channels

- Slows down water
- Sediment drops out
- Water absorbs

NORTH CAROLINA Wildlife RESOURCES COMMISSION

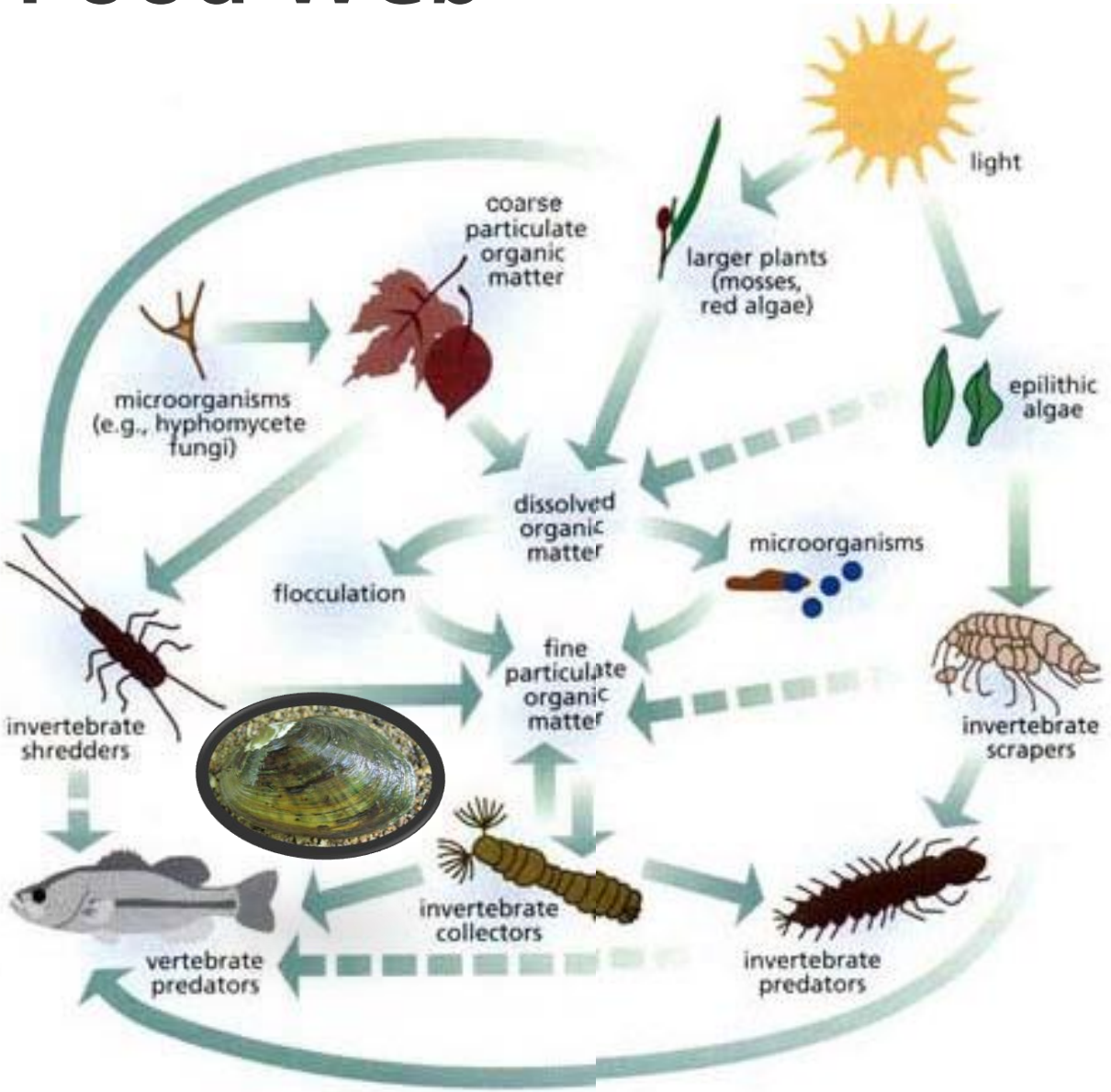


Photo Copyright 1999, Center for Watershed Protection



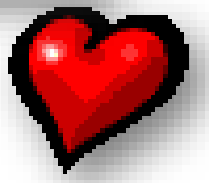
Photo Copyright 1999, Center for Watershed Protection

Aquatic Food Web



Biota Reproduction and Rearing







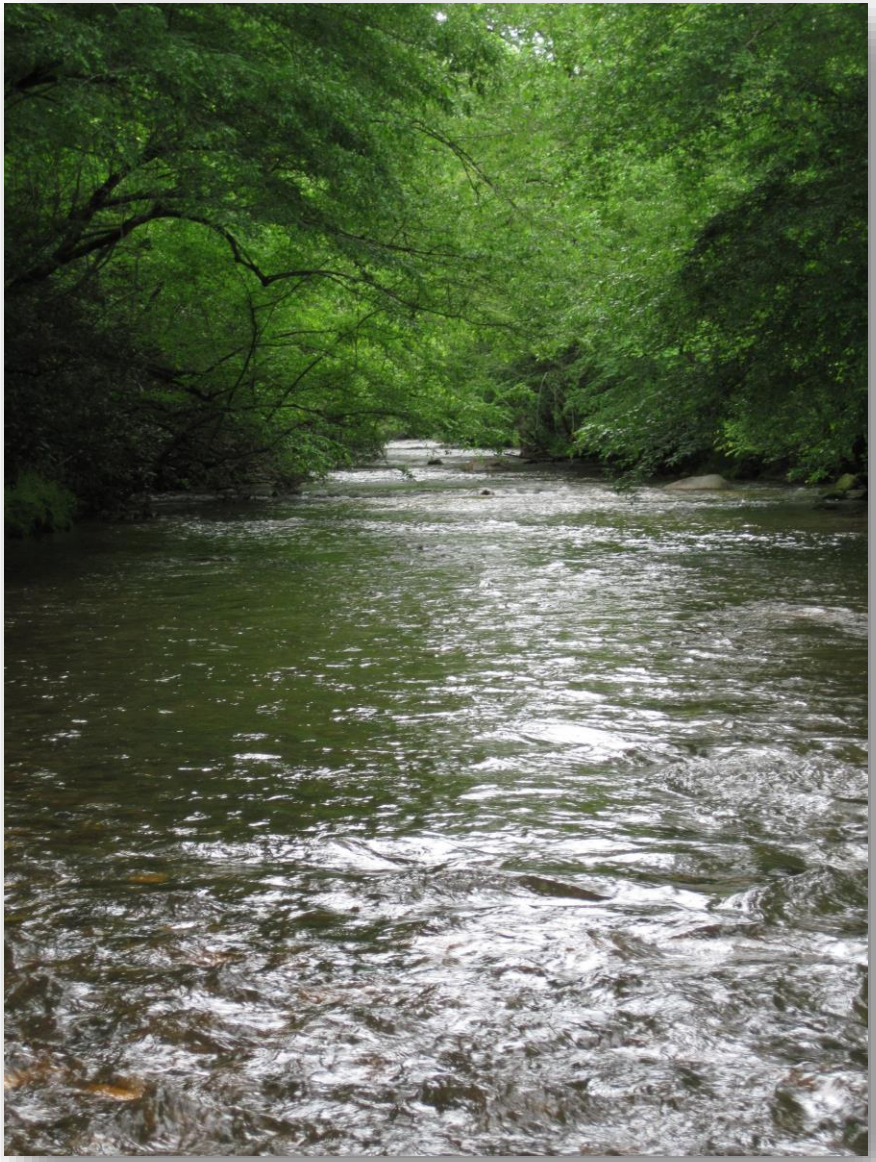








NORTH CAROLINA Wildlife RESOURCES COMMISSION



Perennial

- Water intake
- Habitat
- Recreation
- Summer organism refuge

NORTH CAROLINA Wildlife RESOURCES COMMISSION

Summary

- A stream is only as healthy as its small upstream channels
  - Ephemeral & intermittent channels are much more than drains
- An intact food web of native species is an important indicator of the health of the stream
  - Losing species and diversity = losing drinking water, human community health, and recreational opportunities

Freshwater Mussels

- Considered most endangered animals in N. America

- ~ 12% of our nation's mussel fauna → EXTINCT
- Over 70% → endangered, threatened, of special concern

IN NEED OF IMMEDIATE ACTION TO HALT DECLINE

- World's greatest diversity of freshwater mussels → SE United States



NORTH CAROLINA Wildlife RESOURCES COMMISSION

- North Carolina: 64+ species of native mussels recorded
- At least 10 species (16%) have already become EXTINCT/EXTIRPATED from the state
- 45 species (87% of the surviving species) are considered to be RARE/IN NEED OF CONSERVATION



NORTH CAROLINA Wildlife RESOURCES COMMISSION

RARE MUSSEL SPECIES



Atlantic Pigtoe - FT
(*Fusconaia masoni*)



Creeper – ST
(*Strophitus undulatus*)



Yellow Lampmussel - SE
(*Lampsilis cariosa*)



Savannah Lilliput – SE
(*Toxolasma pullus*)

Eastern Creekshell
(*Villosa delumbis*)



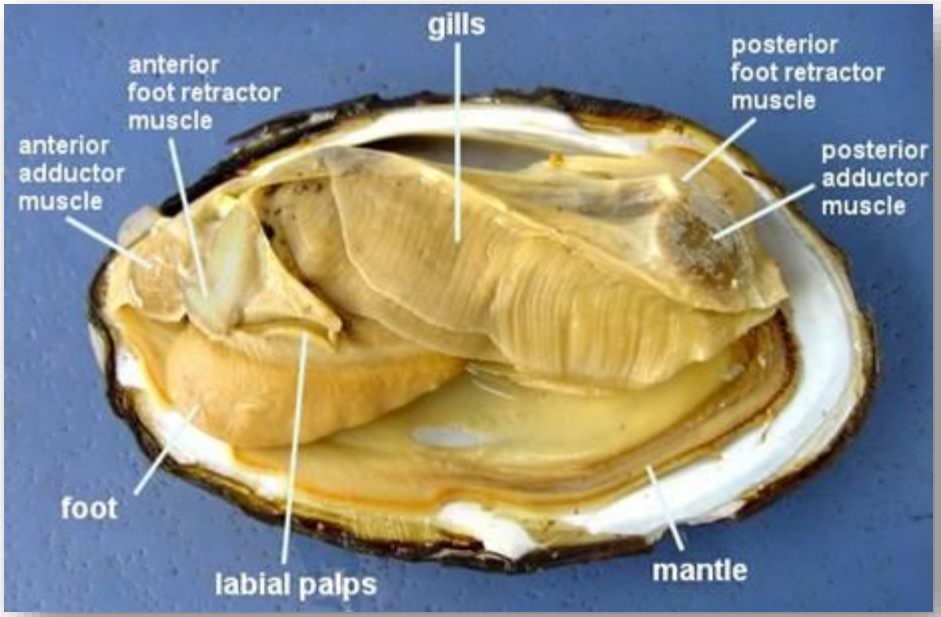
Brook Floater - SE
(*Alasmidonta varicosa*)

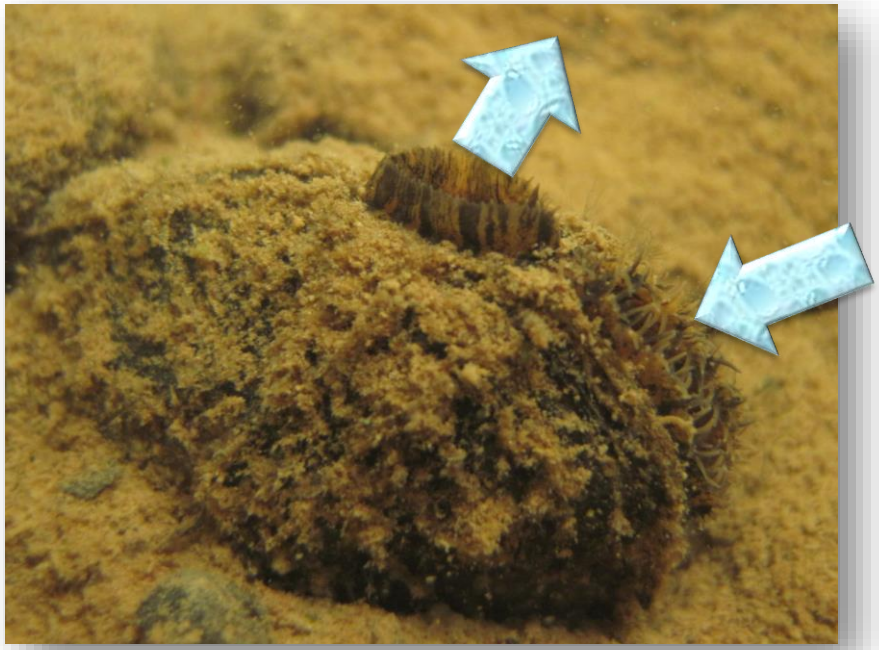


Notched Rainbow - ST
(*Villosa constricta*)



Deceptively Simple Design





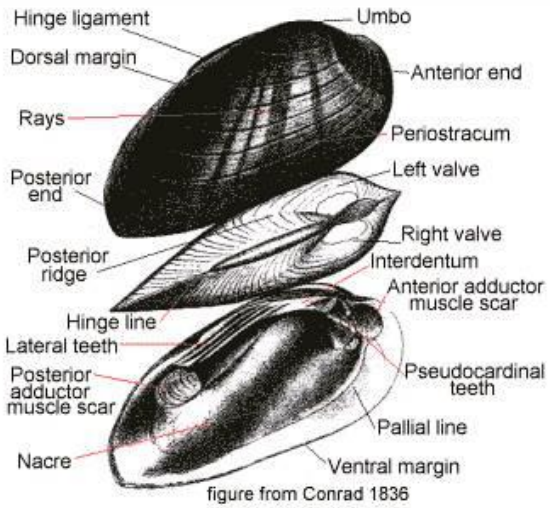
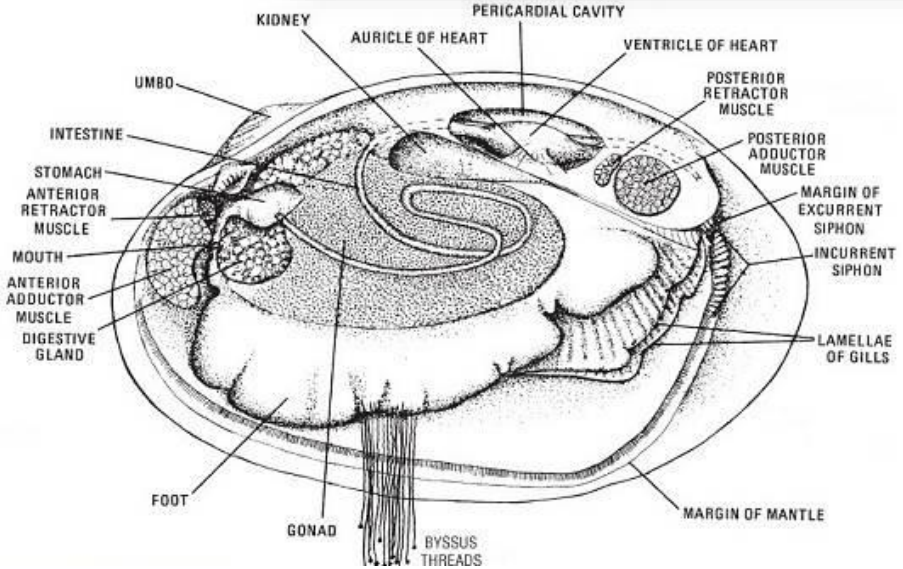
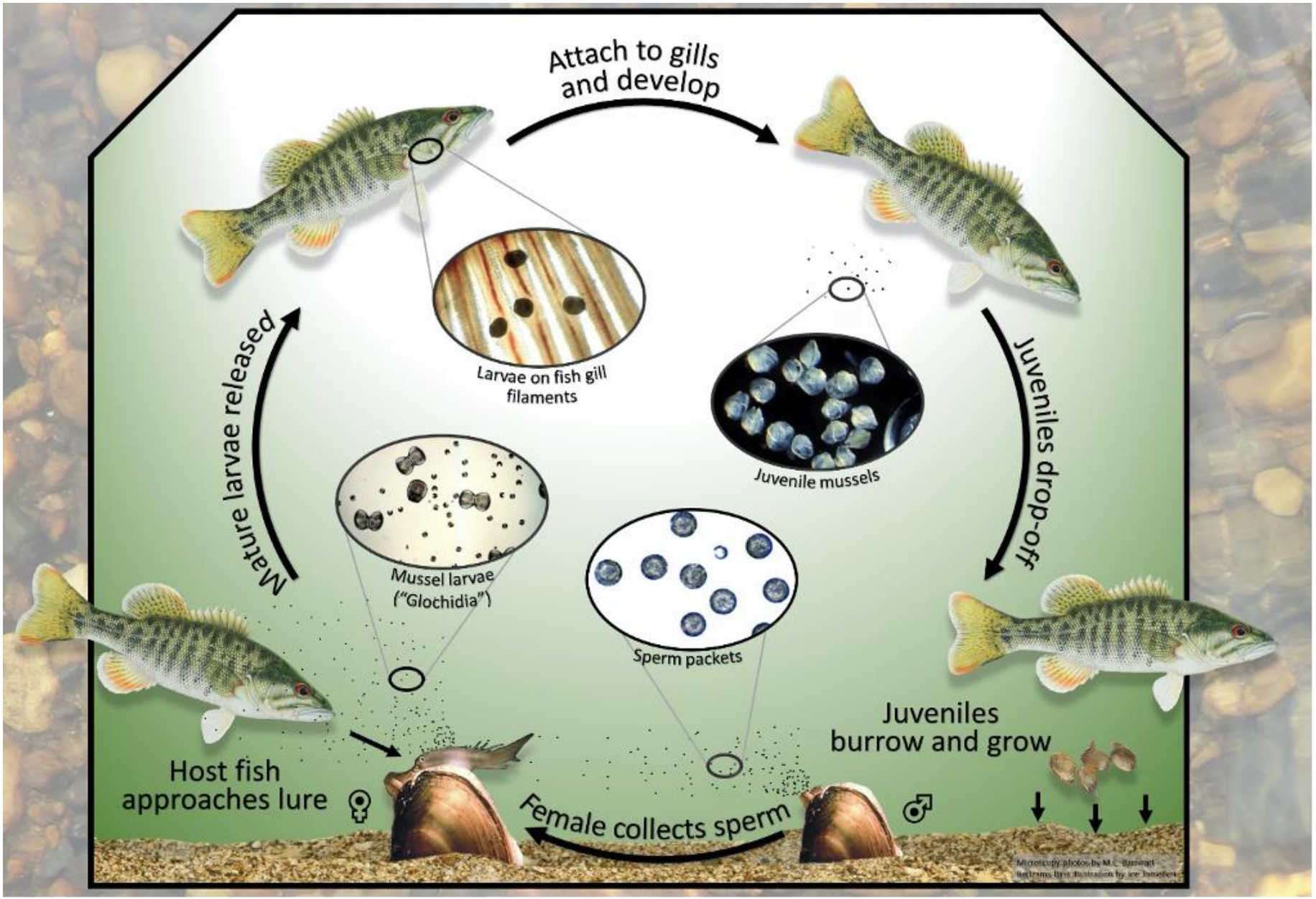


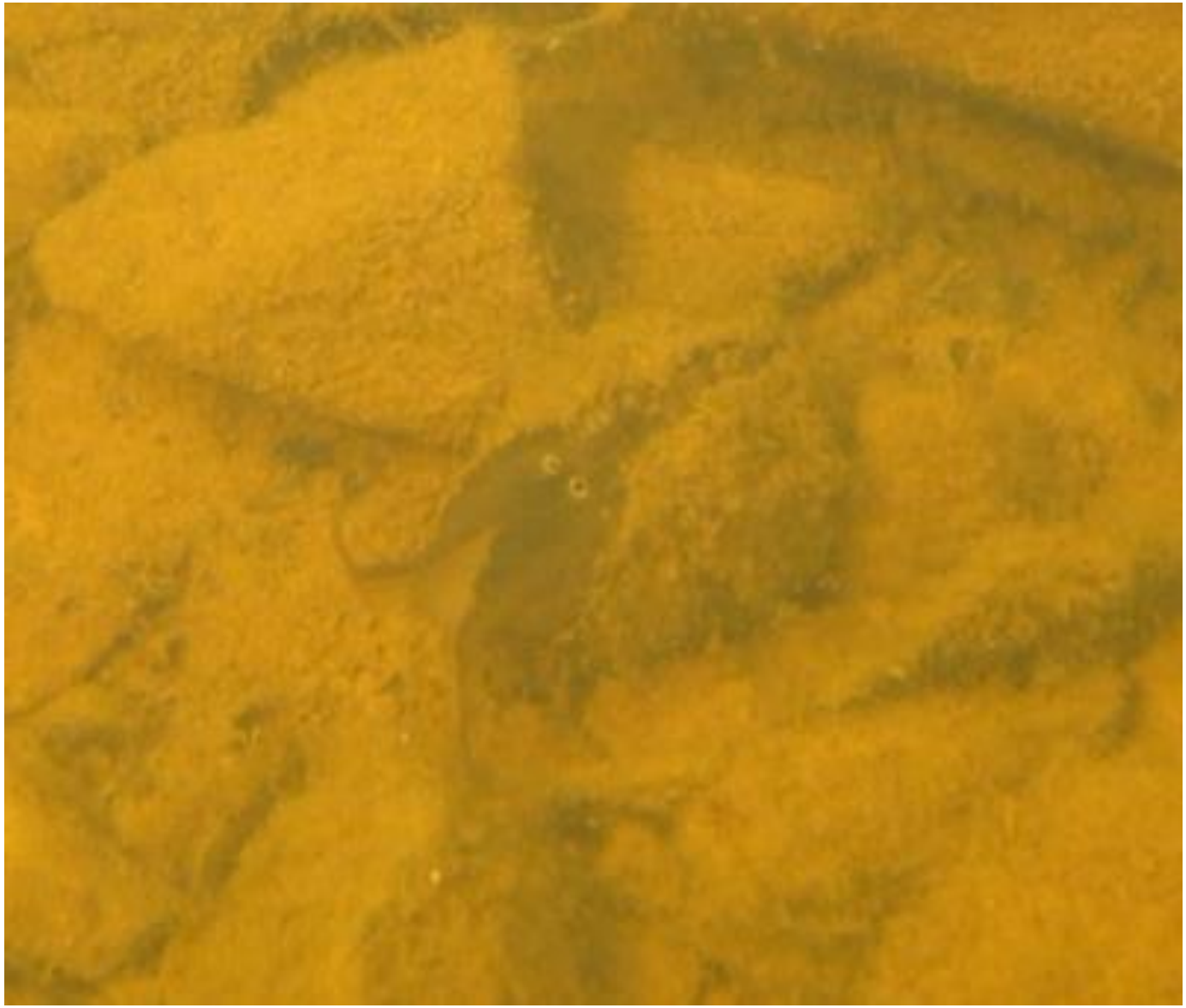
figure from Conrad 1836



Circle of Life




Hey baby, nice valves!



NORTH CAROLINA Wildlife RESOURCES COMMISSION



NORTH CAROLINA Wildlife RESOURCES COMMISSION

Female-Produced Lures




© M. C. Barnhart 2000


© M. C. Barnhart 2000

Punctured lure releases glochidia



Glochidia encyst on gills as benign parasites



NORTH CAROLINA Wildlife RESOURCES COMMISSION

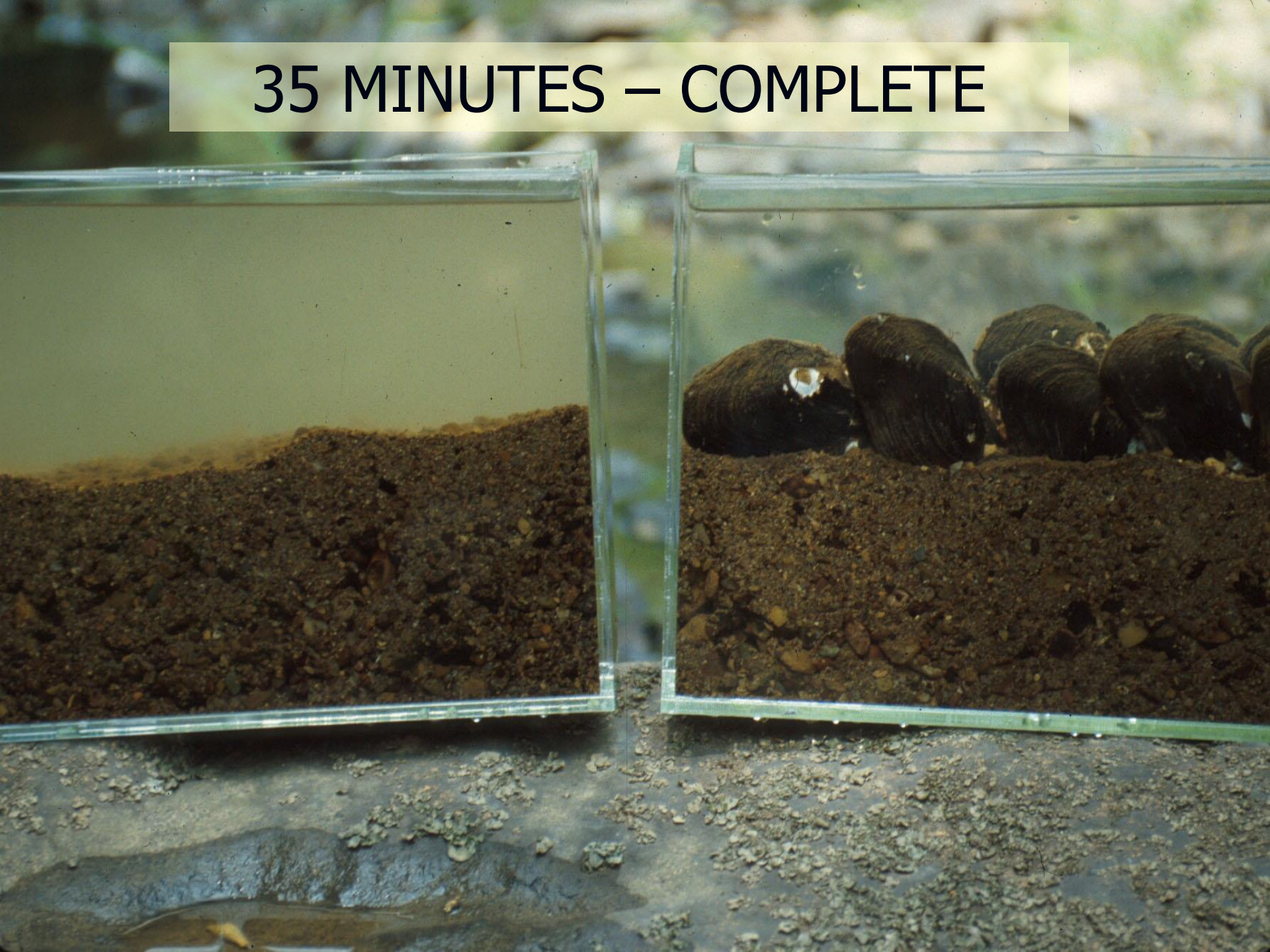
Develop independently to adulthood





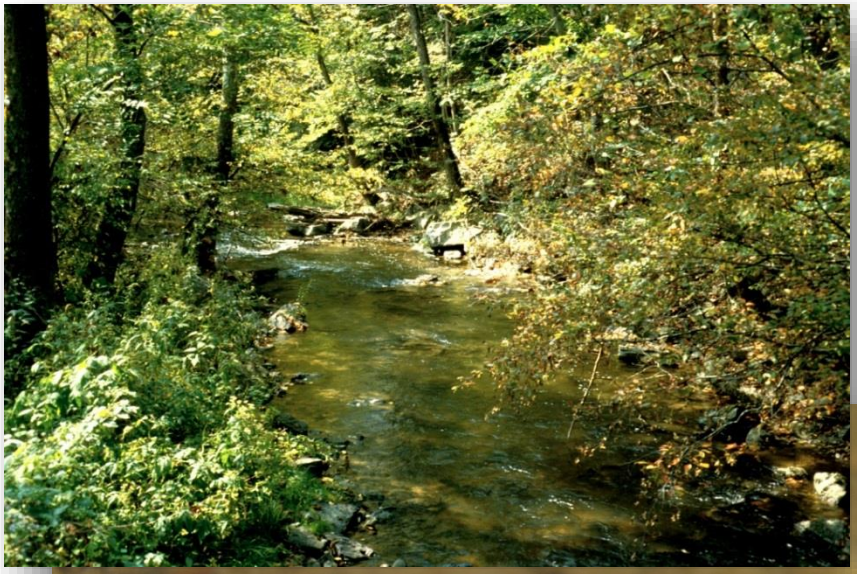
Benefits of Freshwater Mussels

35 MINUTES – COMPLETE




FOOD FOR WILDLIFE

Excellent Indicators of Stream Integrity





- Life cycle - fish host
- Food source
- Sedentary
- Long lived
- Sensitive to habitat degradation
- Sensitive to pollution

NORTH CAROLINA Wildlife RESOURCES COMMISSION

What Does NCWRC Do With Mussels?

- Mussel surveys
  - Distribution, density, diversity
- Augmentation, reintroduction
- Genetic research: taxonomy, population genetics
- Snorkel, SCUBA, viewscope, tactile

















NORTH CAROLINA Wildlife RESOURCES COMMISSION

Magnificent Ramshorn Project

- Endangered aquatic snail
- Endemic to NC Coastal Plain ponds in lower Cape Fear basin
- Extirpated from wild since 2004
- Three captive populations
- Life history & habitat research
- Reintroduced in fall 2023



Photo by Johnathon Gruenke



Photo by Johnathon Gruenke

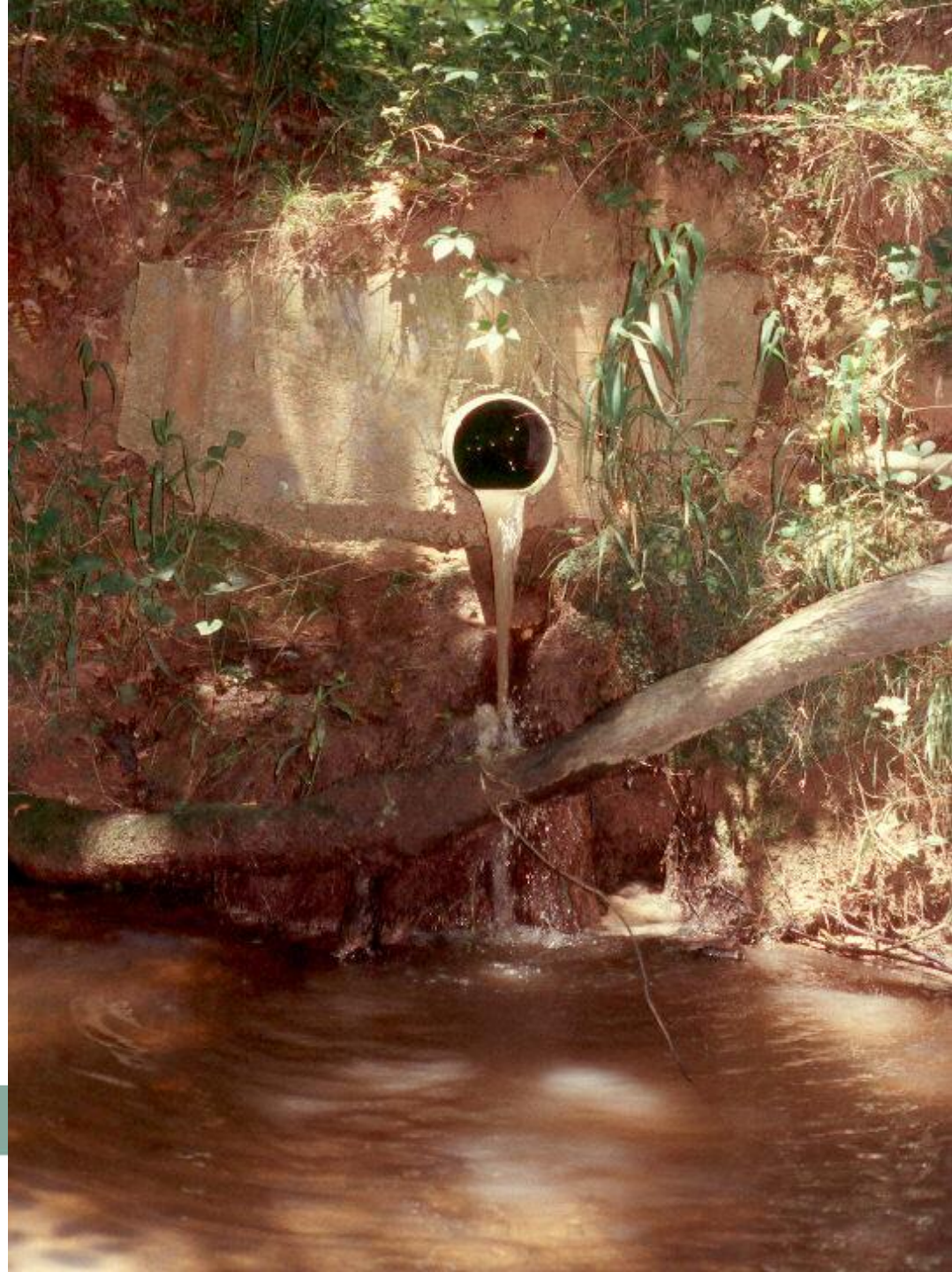




Threats to Freshwater Mussels and Other Watershed Wildlife

Problem: Poor Wastewater/ Stormwater Management

- 303(d) listed streams local to Durham:
  - Third Fork Creek
  - Booker Creek
  - Little Creek
  - Bolin Creek
  - Ellerbe Creek
  - Lick Creek
  - Little Lick Creek
  - Knap of Reeds Creek

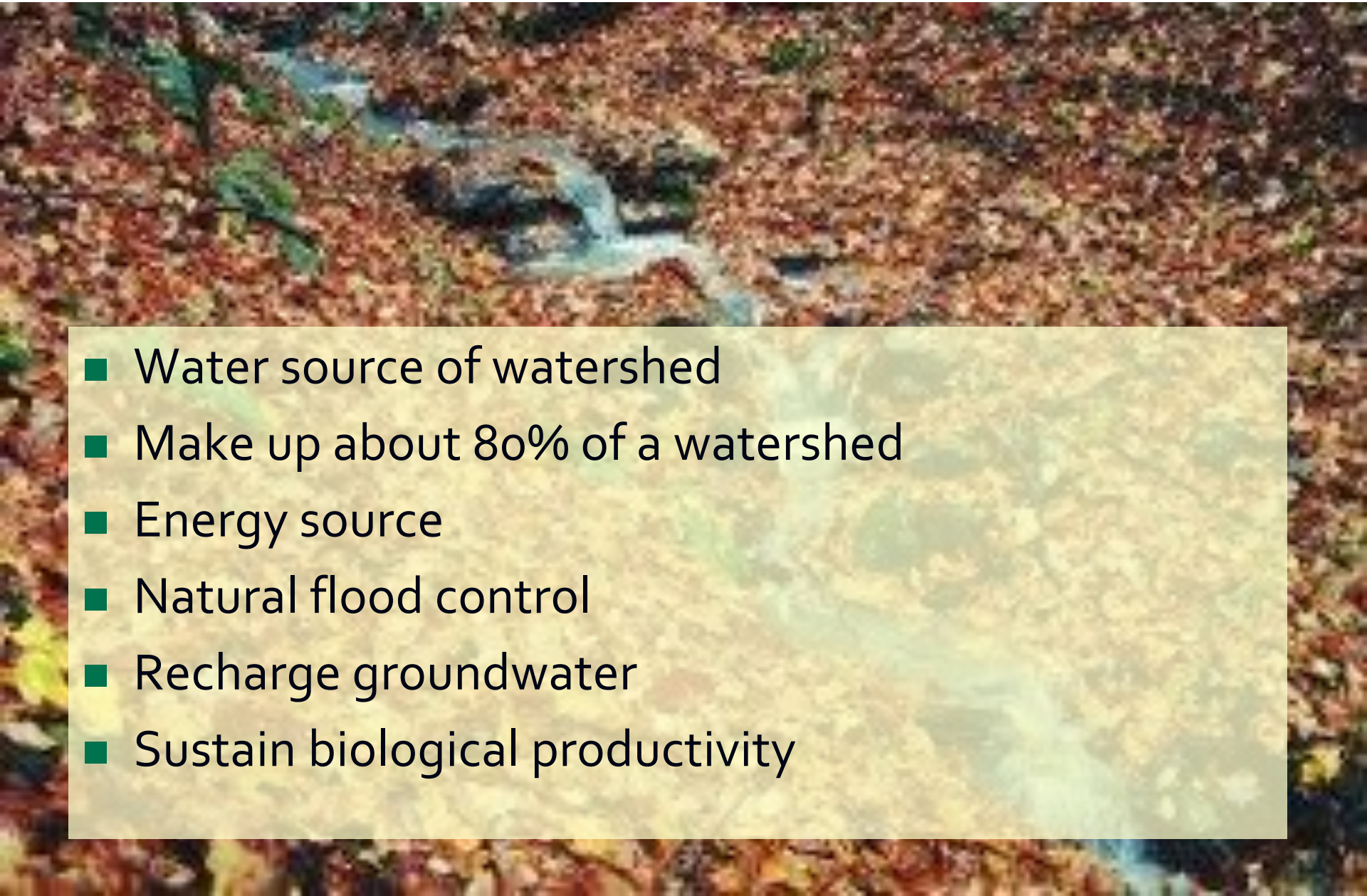


Impacts of Poor Water Quality

- Mussels
  - Smothered by sediment
  - Killed by waterborne toxins
  - Unable to breathe → low DO
  - Unable to reproduce if fish hosts lost
- Humans
  - Illnesses result from elevated bacterial/chemical/metal levels in water, many unregulated, poorly understood
  - Lost drinking water sources
  - Quality of life declines as natural areas disappear

- Amphibians (salamanders, frogs)
  - Absorb toxins through moist skin
  - Unable to survive if habitats dry
- Birds
  - Starve if mussel, fish, amphibian food sources disappear
  - Biotoxins in prey tissue concentrate in bird tissue after consumption
- Plants
  - Toxins in soil/water cause death
  - Withdrawing water table and disappearing shade trees = loss of habitat

Problem: Loss of Headwater Streams



- Water source of watershed
- Make up about 80% of a watershed
- Energy source
- Natural flood control
- Recharge groundwater
- Sustain biological productivity

Problem: Loss of Forested Riparian Buffer

- Pollutant filter
- Bank stabilizer
- Nutrient and shade provider
- Recreation uses
- Improve air quality/lower ozone levels
- Maintain stable water flows
- Provide sources of large woody debris
- Facilitate the exchange of groundwater and surface water



NORTH CAROLINA Wildlife RESOURCES COMMISSION

Problem: Movement Barriers

- Dams
- Improperly installed culverts
- Poorly designed road crossings



- Block gene flow & physical movement
- Alter hydrology & sediment transport
- Create bed/bank erosion



NORTH CAROLINA Wildlife RESOURCES COMMISSION

Problem: Poor Construction Practices



Problem: Poor Agricultural Management



Problem: Irresponsible Recreational Use




Problem: Urbanization →
Increase in Impervious Surface

What is impervious surface?





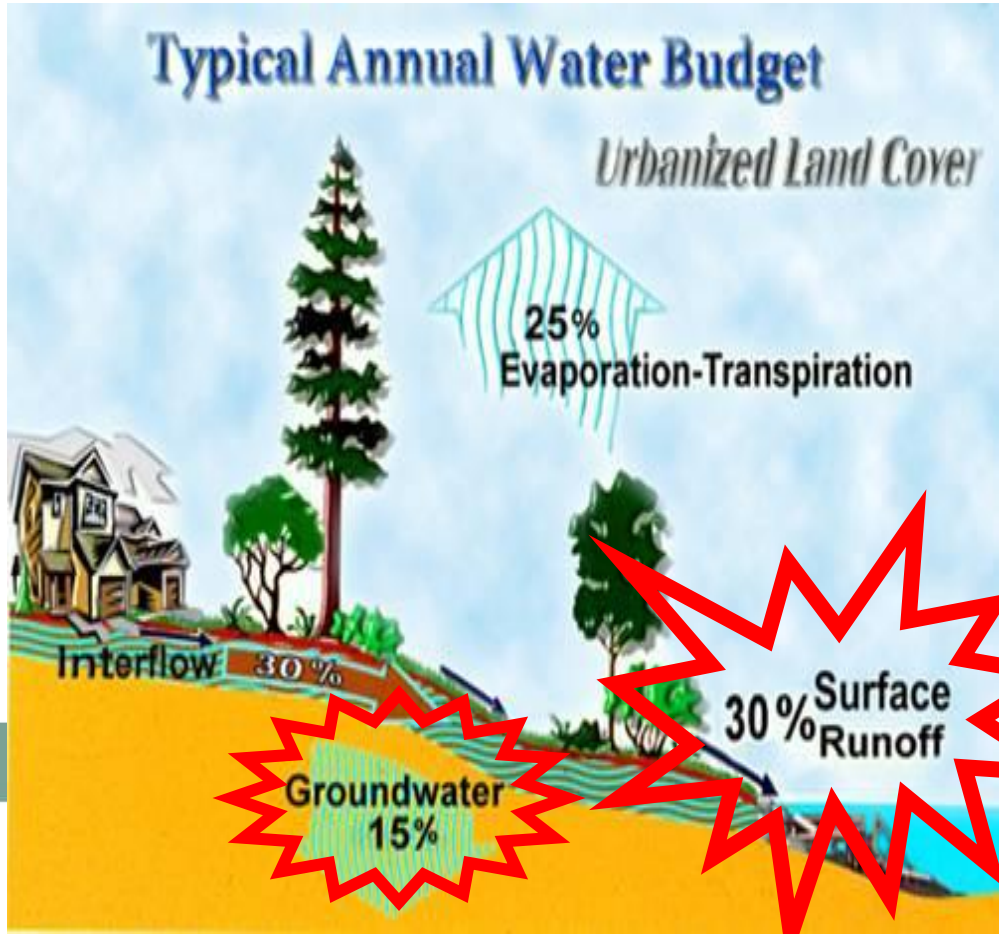


NORTH CAROLINA Wildlife RESOURCES COMMISSION

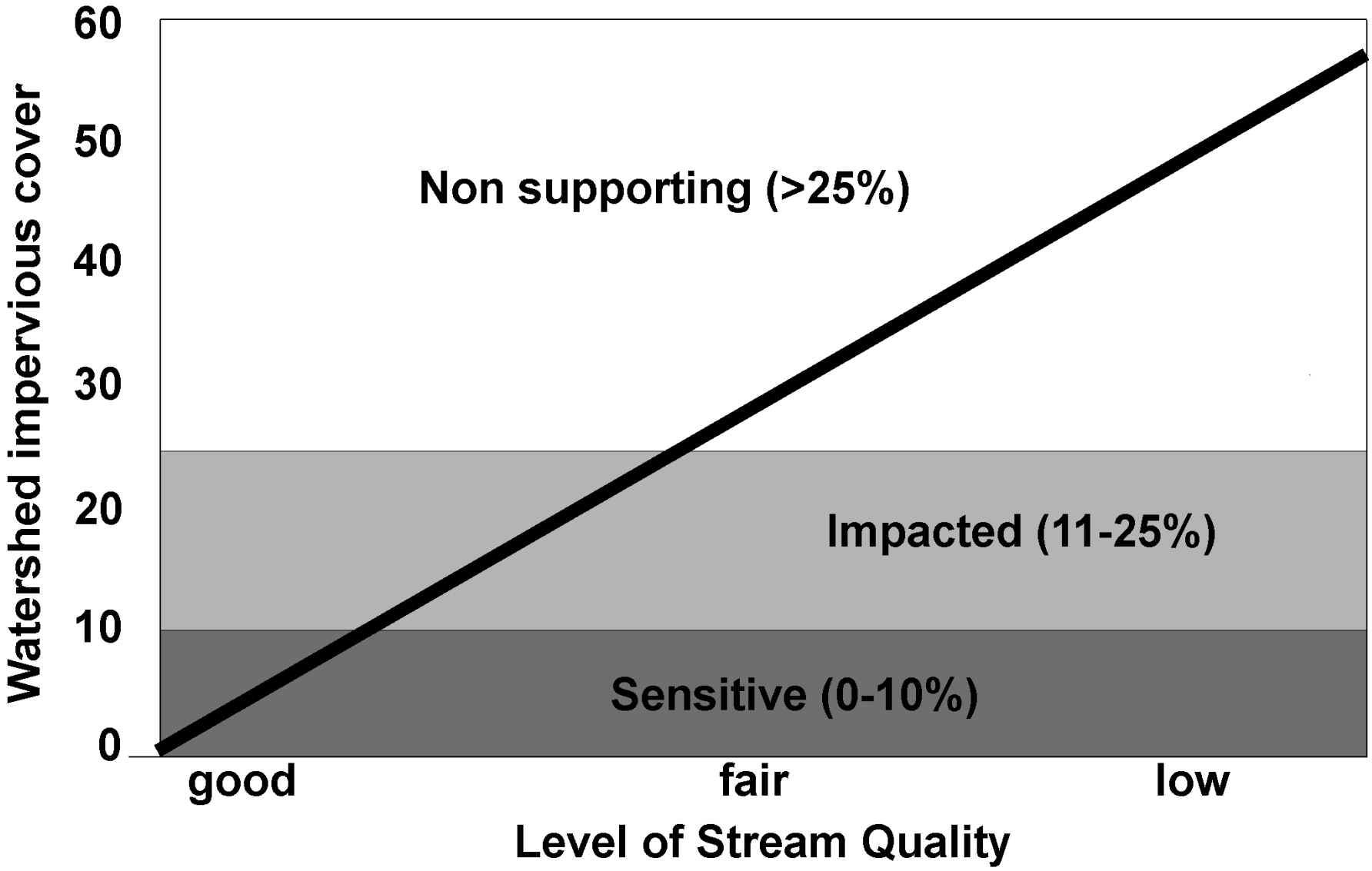
Construction Impacts on Soils

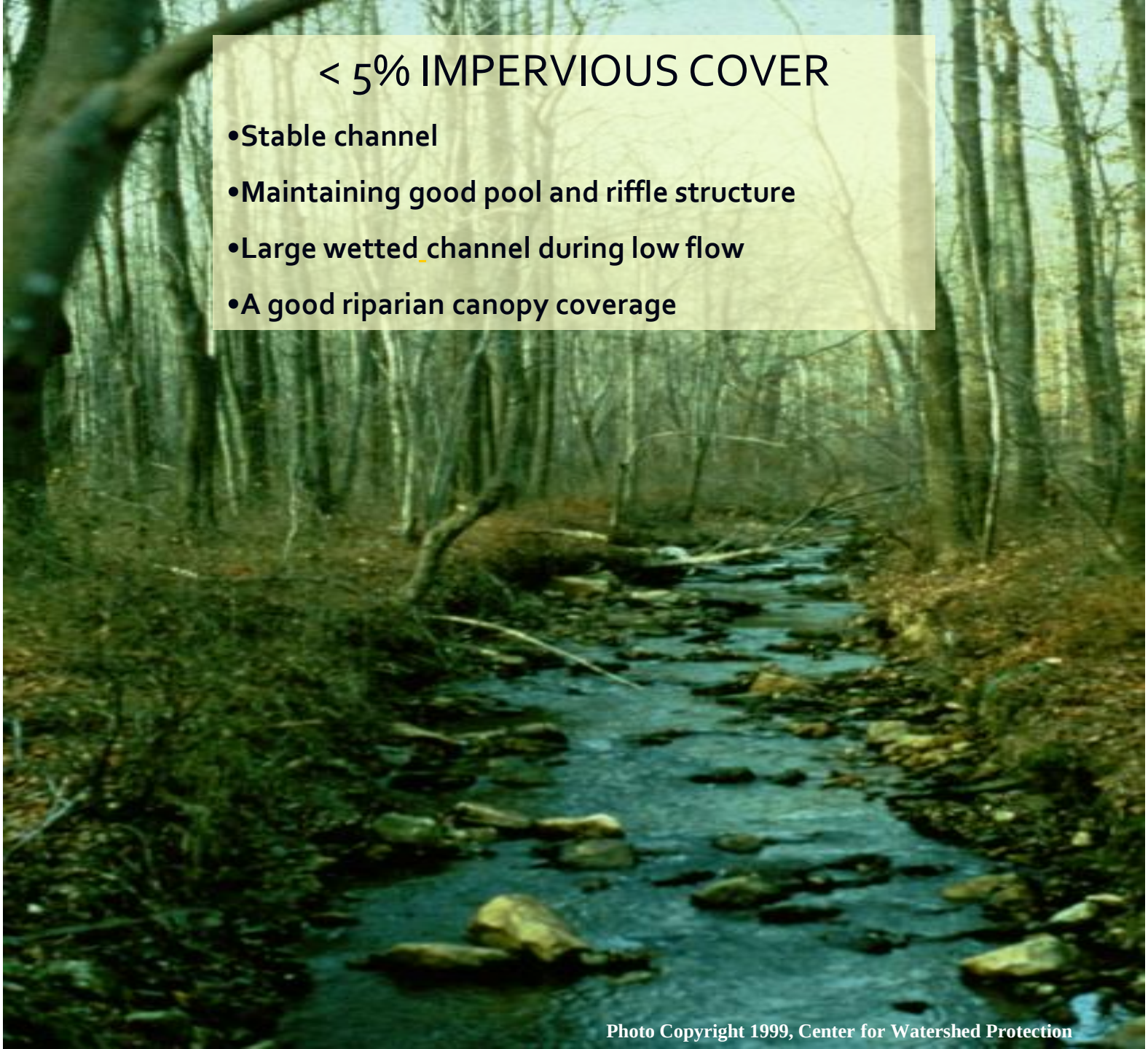


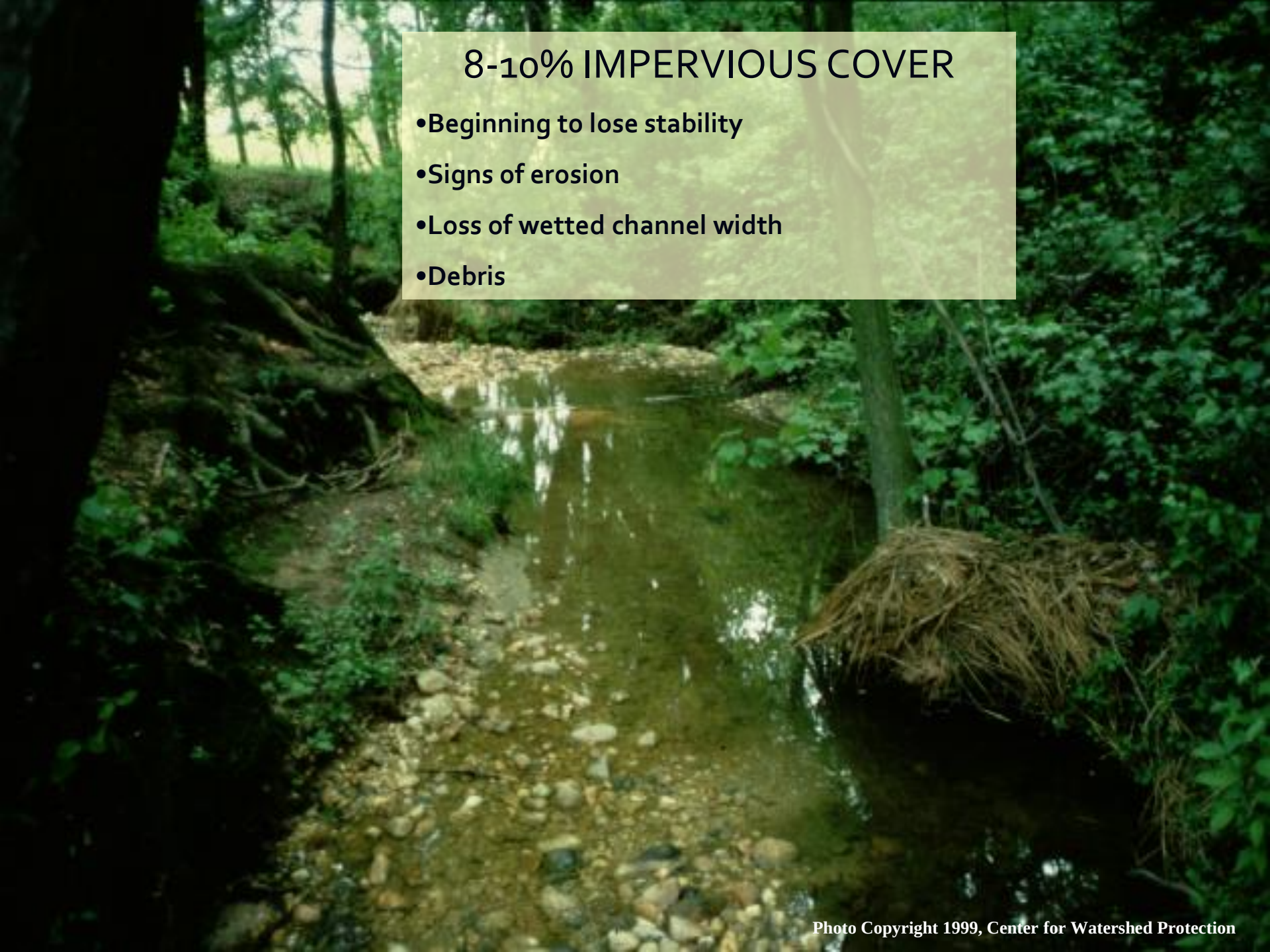

Typical Annual Water Budget
Forested Land Cover
37.4 %
Evaporation-Transpiration
Interflow
25.7%
Surface
0.3% Runoff
Groundwater
36.6 %


Typical Annual Water Budget
Urbanized Land Cover
25%
Evaporation-Transpiration
Interflow
30 %
30 %
Surface
Runoff
Groundwater
15%

Relationship Between Impervious Cover and Stream Quality

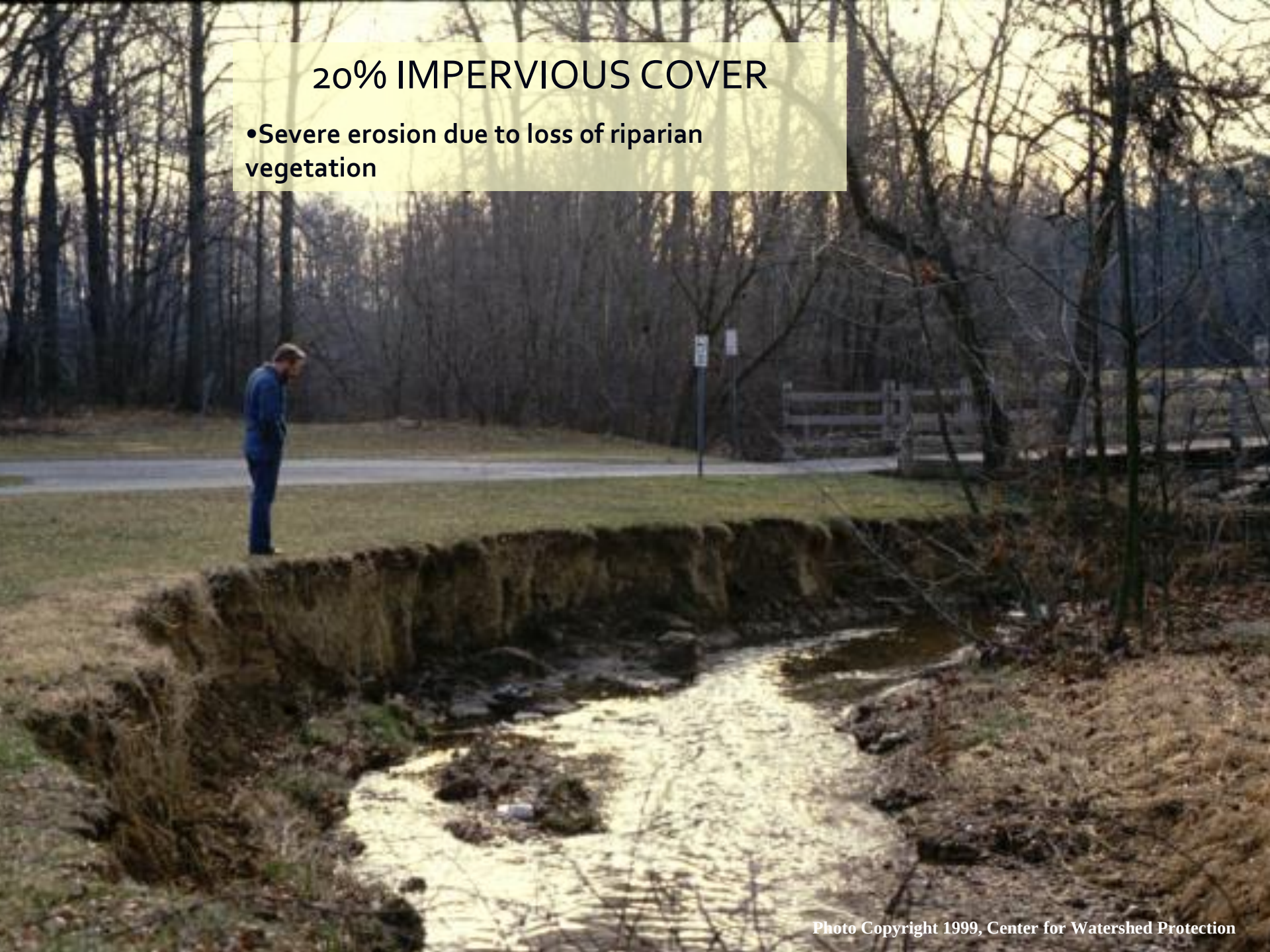



< 5% IMPERVIOUS COVER
•Stable channel
•Maintaining good pool and riffle structure
•Large wetted channel during low flow
•A good riparian canopy coverage
Photo Copyright 1999, Center for Watershed Protection


8-10% IMPERVIOUS COVER
•Beginning to lose stability
•Signs of erosion
•Loss of wetted channel width
•Debris
Photo Copyright 1999, Center for Watershed Protection


10% IMPERVIOUS COVER
•~2x original width
•Many exposed tree roots
•Pool/riffle structure lost
Photo Copyright 1999, Center for Watershed Protection


20% IMPERVIOUS COVER
•Active erosion
•Decreased substrate quality
•Large amount of sediment/debris in system
Photo Copyright 1999, Center for Watershed Protection


20% IMPERVIOUS COVER
•Severe erosion due to loss of riparian vegetation
Photo Copyright 1999, Center for Watershed Protection


30% IMPERVIOUS COVER
•~5-10x original width
•Severe erosion
•Debris
Was once in floodplain
At 30% impervious cover:
•100 year flood DOUBLES
•10 year flood DOUBLES
•1 year flood INCREASES 10X
Photo Copyright 1999, Center for Watershed Protection

Increased nutrients → Eutrophication → Fish Kills





Photo Copyright 1999, Center for Watershed Protection



Photo Copyright 1999, Center for Watershed Protection



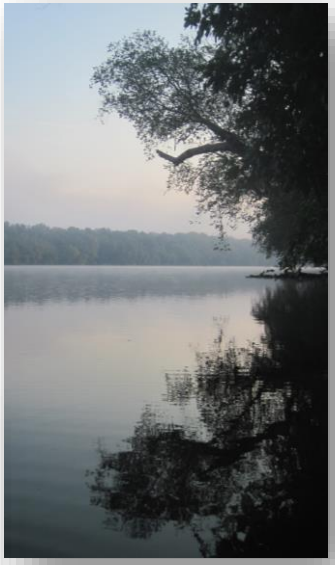
Photo Copyright 1999, Center for Watershed Protection

Can we change course?



Embrace Multi-Pronged Strategies







To better protect our:

- Drinking water
- Water quality
- Streams
- Wildlife habitat
- Watershed hydrology

To reduce infrastructure costs

To make our communities more attractive

- **$10 billion per year** to provide clean drinking water
- Watershed protection critical, including enforcement

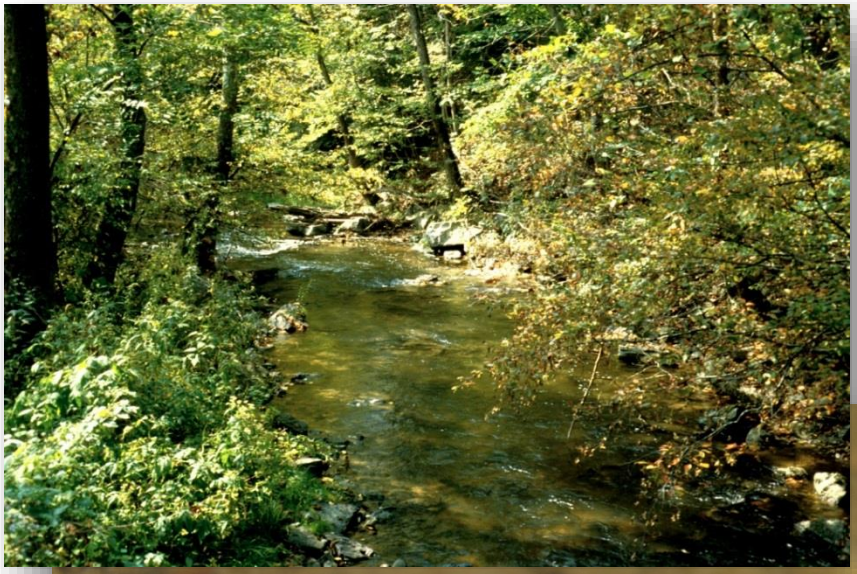
NORTH CAROLINA Wildlife RESOURCES COMMISSION

Don't ecologically sound practices cost more?

- No – actually proven more cost effective then conventional practices
- Continued erosion of "natural capital" undermines community & society viability
- Reduces cost of supplying clean water & supply risk
- Reduces flooding and severe storm damage
- Moderates temperature and reduces pollution

NORTH CAROLINA Wildlife RESOURCES COMMISSION

Vulnerable & Valuable





- Life cycle - fish host
- Food source
- Sedentary
- Long-lived
- Sensitive to habitat degradation
- Sensitive to contaminants

NORTH CAROLINA Wildlife RESOURCES COMMISSION

How Can Citizens Participate?

- Financial Support
  - NC Tax/Other donations (www.ncwildlife.org/Donate)

- Community Support
  - VOTE! locally and nationally
  - Support **US Recover America's Wildlife Act** & NC's Land for Tomorrow
  - Get involved with local planning efforts
  - Report to NCDEQ if you see large amounts of sediment (or other issues) in a stream

- Make your home water-friendly
  - NEVER release any aquarium pets into the wild or translocate wildlife or plants
  - Provide native plants & habitats for food, water, & shelter
  - Conserve water; wash vehicles with recycled water
  - Only use fertilizer if needed, test soil first
  - Avoid chemical herbicides/pesticides; if used, follow label directions precisely
  - Fence livestock out of streams
  - Keep ATVs & vehicles out of streams

- Share what you've learned with others!!

Questions??



Brena Jones
Aquatic Wildlife Diversity Program
www.ncwildlife.org
brena.jones@ncwildlife.org