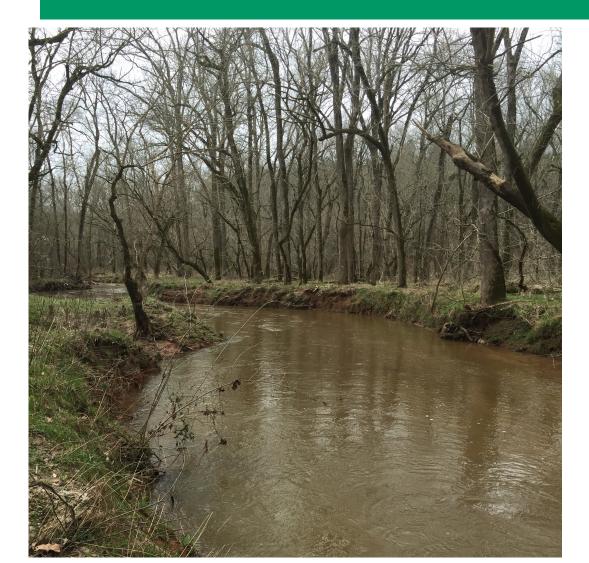
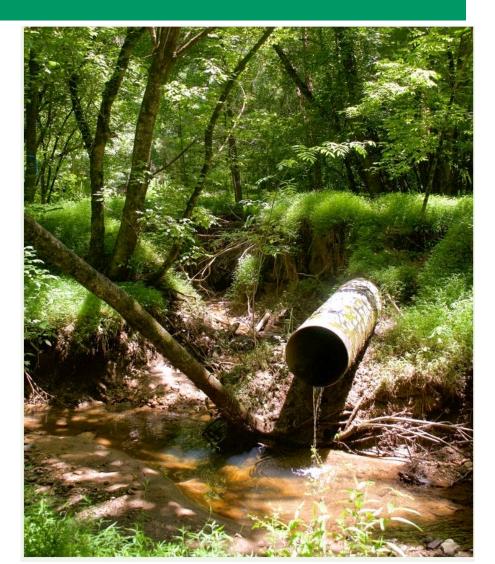
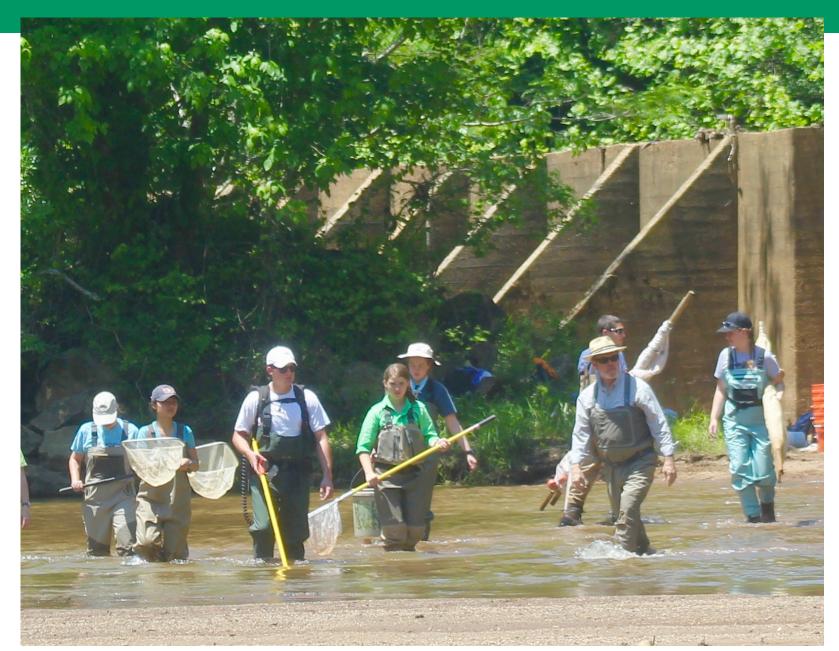
Managing Water Resources– The Forest-Water Interface





Who am I?

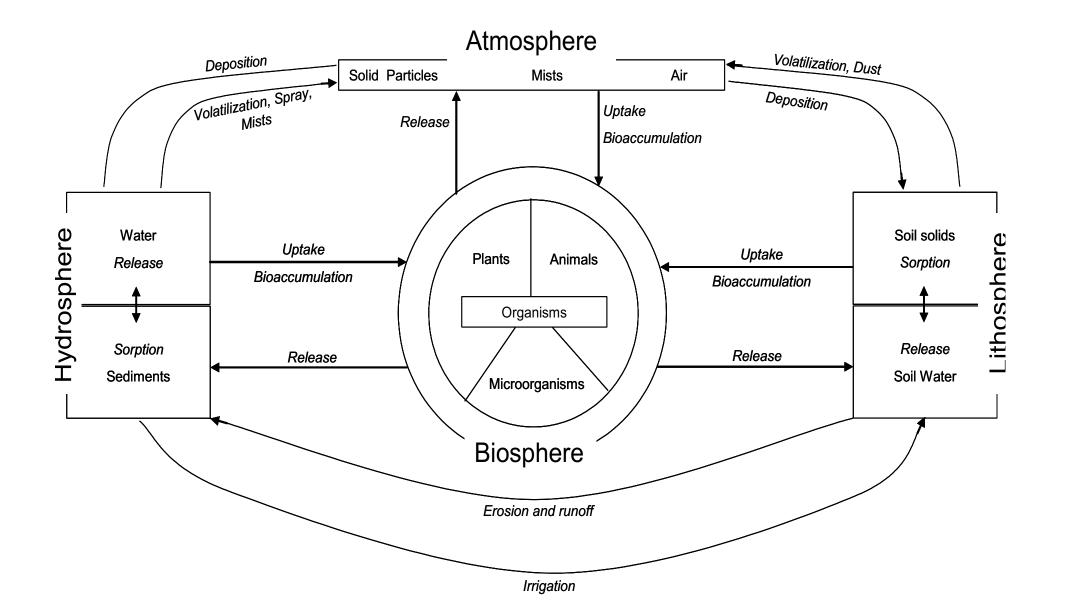


Jay Shelton Fisheries Biologist Warnell School of Forestry and Natural Resources UGA

What I do - Teaching



Ecology - everything is connected, nothing stays where we put it



What I do – Outreach (Pond Management)



Elements of Successful Pond Management

- Planning and pond design
- Stocking strategy objective based
- Fish growth and harvest
- Fish reproduction and population dynamics
 - Recruitment, predation and competition
- Fish monitoring and stock assessment
- Environmental monitoring and management

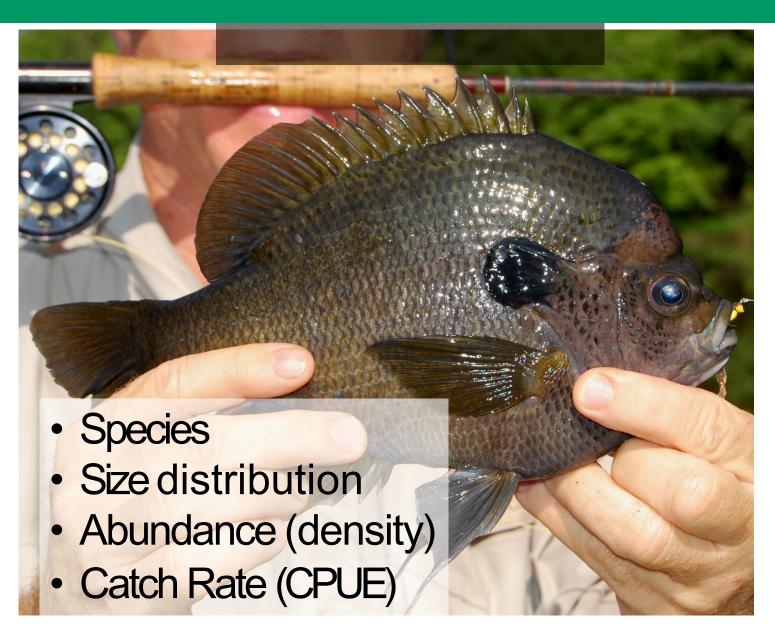
Defining Objectives

Quality Fishing

"I want to take my grand kids fishing with a very high rate of success."



Quality Fishing?



Quality Fishing – All about that bass?



Quality Fishing-All about that bass?



Fishpond Construction and Renovation Planning and Design for Sustainability





Current federal, state
 and local regulations
 make the
 construction of new
 ponds far more
 difficult and expensive

than ever before.



- There are numerous laws and agencies regulating pond construction
 - United States Army Corps of Engineers (USACE)
 - United States Department of Agriculture, Natural Resources Conservation Service (NRCS)
 - State Departments of Natural Resources, Environmental Protection Agencies
 - Local ordinances



Building or Renovating a Pond in Georgia

A Pond Guide for Citizens

Introduction

This guide is for landowners who want to build a new pond or to renovate an existing pond. Part One provides a basic explanation of the steps needed during the planning and designing process. There are Federal, State, and local government agencies that can assist and help with the requirements. Part Two provides information, links, and explanations about why it is important to use this guide when constructing a pond in Georgia.



Aquatic Plant Management

- Light + nutrients + optimal temperature = plants
- Phytoplankton "bloom"
- Filamentous algae
- Macrophytes
- "The good, the bad and the ugly"

Water Quality Management Keeping Fish Alive and Well



Water Quality "The physical, chemical and biological properties of water which regulate its use"

Water Quality Management in Ponds



The University of Georgia College of Agricultural and Environmental Sciences Cooperative Extension Service SOIL, PLANT, AND WATER LABORATORY 2400 College Station Rd. Athens GA 30602

Lab Use Only
LAB#
Received by:
Date and Time:

WATER SUBMISSION FORM Please Note – Retain a copy of this form for your files. Submit one copy per sample.

	Sample location (If different from client's address)
COUNTY:	County:
Client Name:	Name:
Client Address:	Sample Address:
	City, State, Zip:
City, State, Zip:	Other Information
Phone #:	Date Received:
E-mail:	Sample name:
* Note: Test results are sent to submitting county office.	•
TYPE OF SAM	APLE (Check One):
What is the end use of the water:	
Briefly describe any problems and/or reasons for t	testing water (optional):
	esting water (optional):) (Circle all that apply):
) (Circle all that apply):
TEST REQUESTED) (Circle all that apply): I, B, Cu, Cr, Mo, Ni, Si, Na, Zr, Calculated Hardness)
TEST REQUESTED W1 – BASIC TEST (Includes: pH, P, K, Ca, Mg, Mn, Fe, A W2 – GA Expanded Water Test W6 – Nitrate) (Circle all that apply): I, B, Cu, Cr, Mo, Ni, Si, Na, Zr, Calculated Hardness)
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TEST REQUESTED W1 – BASIC TEST (Includes: pH, P, K, Ca, Mg, Mn, Fe, A W2 – GA Expanded Water Test W6 – Nitrate W42 – check all that apply, Arsenic (As) Lead (F W33 – GA EPD Public Water Systems Review & Perm) (Circle all that apply): 1, B, Cu, Cr, Mo, Ni, Si, Na, Zn, Calculated Hardness) : (NO2-N) W7 – Nitrite (NO2-N) Pb) 🔲 Uranium (U) 📄 Other
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Summary

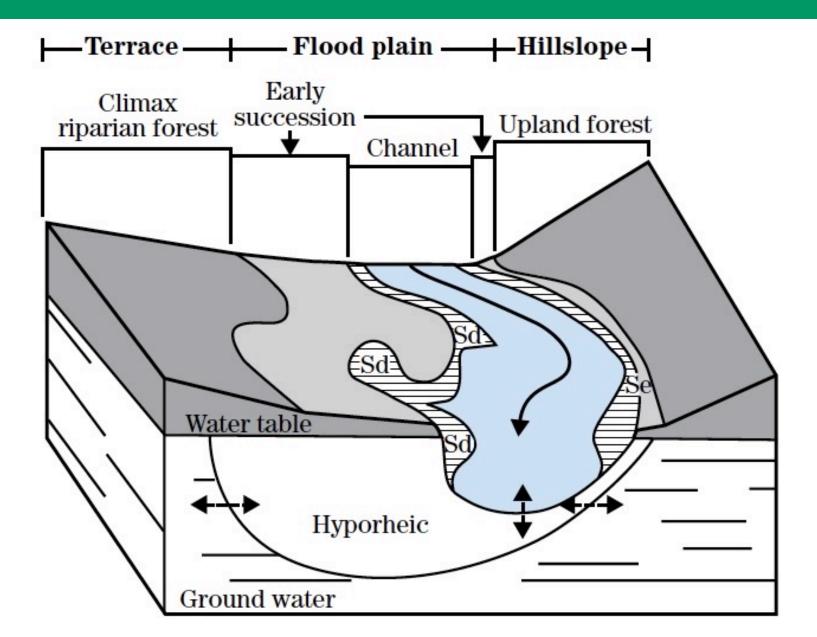
- Pond construction and renovation
 - It's complicated, ask before you act
- Fish Ecology
 - Define your objectives
- Principles of aquatic plant management
 - light + nutrients + optimal temperature
 plants
 - Some are good, some are bad, some are ugly
- Water Quality Management
 - Monitoring is essential



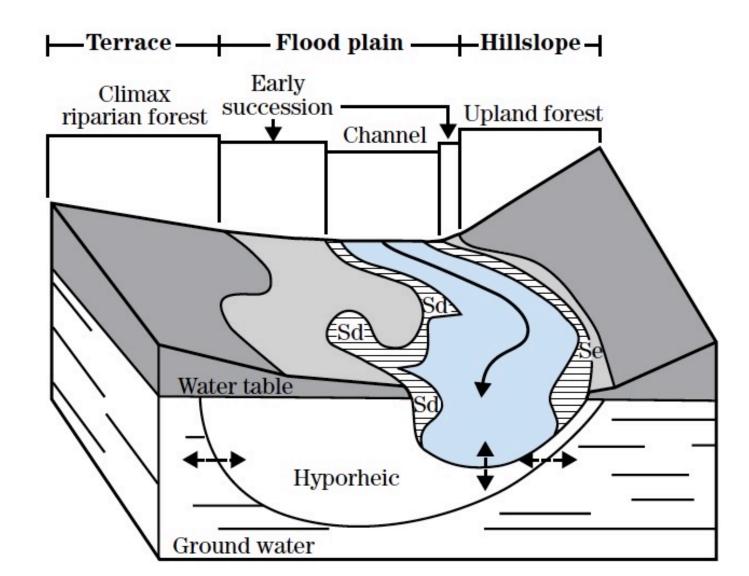
What I do – Outreach (Aquatic Connectivity)



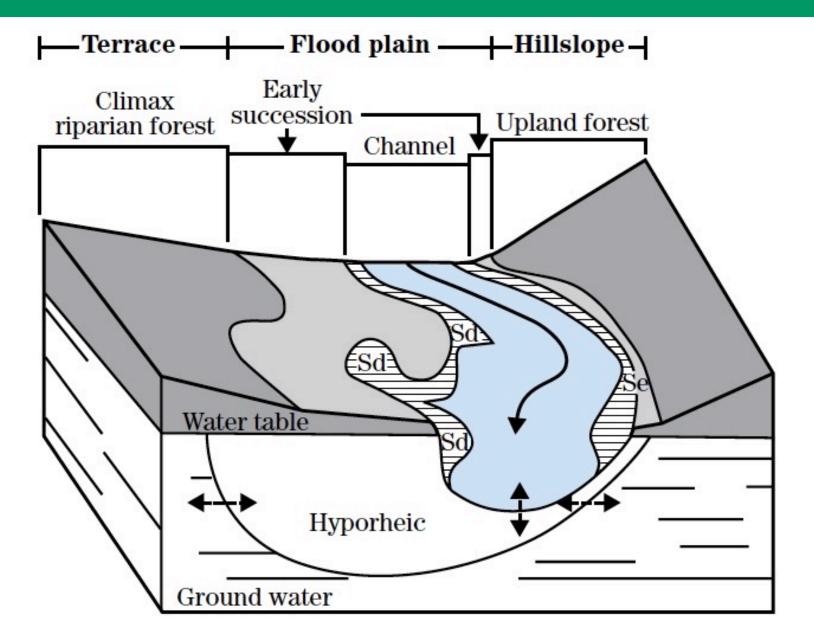
Aquatic connectivity - The natural movement of water and materials between a section of waterway and its floodplain and between the waterway upstream and downstream



Longitudinal Connectivity - The natural movement of water and materials (including sediment, nutrients, carbon and living organisms, etc) between a waterway upstream and downstream.



Lateral Connectivity - The natural movement of water and materials (including sediment, nutrients, carbon and living organisms, etc) between a waterway and its floodplain







https://ga-act.org/

≋

The Georgia Aquatic Connectivity Team

The Georgia Aquatic Connectivity Team (GA-ACT) is a self-selecting group of individuals from a variety of organizations and agencies interested in enabling and increasing the pace of obsolete dam removals and the removal of other barriers to aquatic connectivity in Georgia. Explore our website to learn more.

Georgia Aquatic Connectivity Team Publications



Removal or Modification of Obsolete Dams in Georgia

A Handbook for Project Managers and Dam Owners

> The Georgia Aquatic Connectivity Team June 2020

Georgia's Stream Crossing Handbook

Regulations and ecological considerations







Some of the Many Water Quality Stakeholders

U.S. Environmental Protection Agency U.S. Fish and Wildlife Service U.S. Department of Agriculture, Natural Resources Conservation Service U.S. Army Corps of Engineers GA Department of Natural Resources, Wildlife Resources Division GA Department of Community Affairs, Historic Protection Division GA Department of Natural Resources, Environmental Protection Division The Nature Conservancy **River Keepers** Local municipalities

Our Water Resources

- Perennial streams
- Intermittent streams
- Ditches and canals
- Impoundments (ponds, lakes and reservoirs)
- Wetlands
- Estuaries
- Coastal waters

Water Quality Standards

Legally designated uses that establish the appropriate conditions for a waterbody:

- Drinking Water Supplies
 - Recreation
 - Fishing
 - Wild River
 - Scenic River
 - Coastal Fishing

What is the condition of our streams and rivers?

The NRSA report finds that many of our rivers and streams do not support healthy aquatic communities.

46%

Biological condition: 46% of our nation's rivers and streams are in poor biological condition, with **25%** in fair condition and **28%** in good condition. Benthic macroinvertebrates – e.g., aquatic insects, crayfish, snails and worms that live in submerged vegetation and in the streambed -- are used to assess biological condition. Poor biological condition can lead to loss of fishing and recreational opportunities.

National Rivers and Streams Assessment (US Federal Government including EPA)

How do we know if designated use standards are met?

Water Quality

The physical, chemical, and biological attributes that affect the suitability of water for agriculture, industry, drinking, recreation and other uses

Habitat Assessment

Condition of the natural constituents of the home or environment of an organism.

Biological Assessment

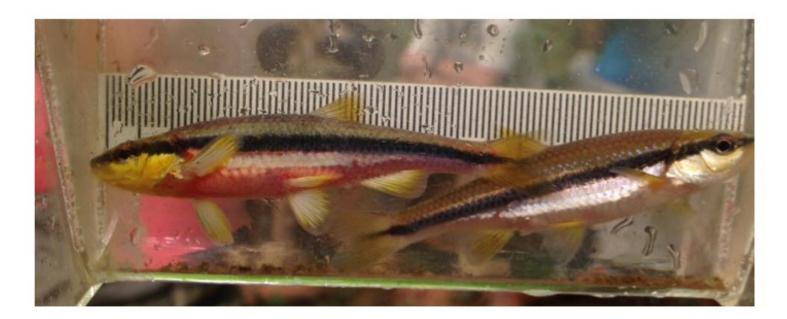
An evaluation of the condition of a waterbody by sampling species that spend all or part of their lives in that waterbody.

Biological Assessments – How do we know?

Benthic Macroinvertebrate Bioassessment Streams in Walton County, GA 2019



Fish Bioassessment Streams in Columbia County, GA 2016



Biological Assessment – Fish IBI (pollution sensitive species)



Sampling Fish Populations





Fish Biological Assessment

• Based on:

Ecoregions of Georgia

Ridge and Valley, Blue Ridge, Piedmont, Coastal Plain, Lower Coastal Plain

Drainage Basin Area (DBA)

Comparisons to Regional Reference Streams

• Fish Index scores range from 0 to 50 Scores are grouped into five categories: Excellent, Very Good, Good, Poor, and Very Poor



Benthic Macroinvertebrate Biological Assessment

- Based on:
 - **Ecoregions of Georgia**
 - Ridge and Valley, Blue Ridge, Piedmont, Coastal Plain, Lower Coastal Plain
 - Drainage Basin Area (DBA)
 - **Comparisons to Regional Reference Streams**
 - Based on sensitivity of organisms to pollution



Factors That Affect Fish and Macroinvertebrate Scores



Sedimentation

Pesticides





Nutrients



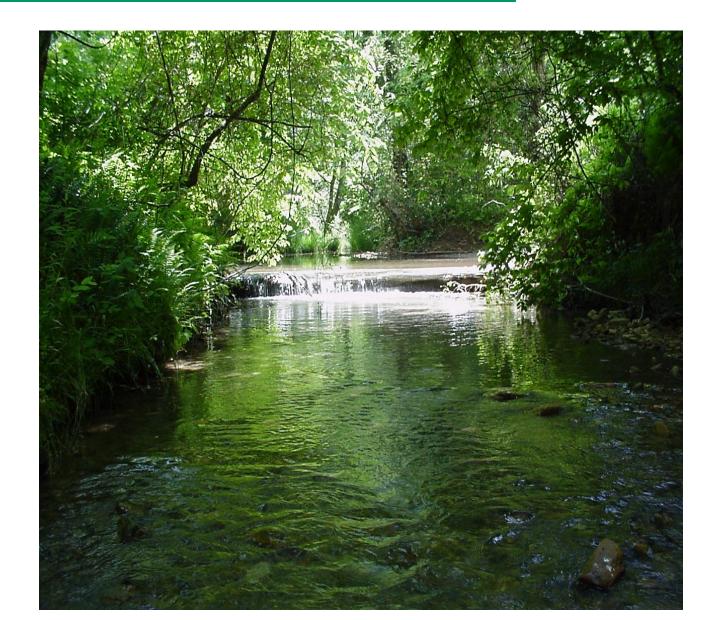
Hydrologic Changes

Perennial Streams

•Well defined channels

•Flow during most of the year

•Aquatic organisms are normally present



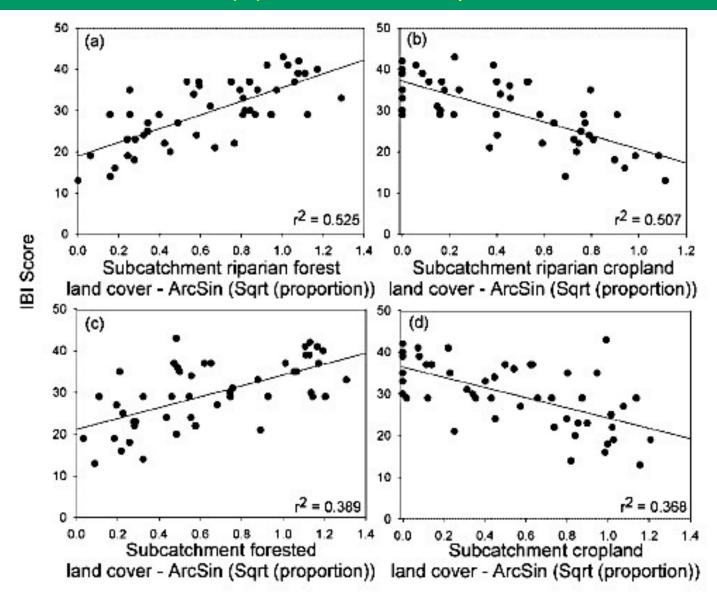
Intermittent Streams

- Well defined channels
- Flow during wet seasons
- Vulnerable to soil erosion and transport issues

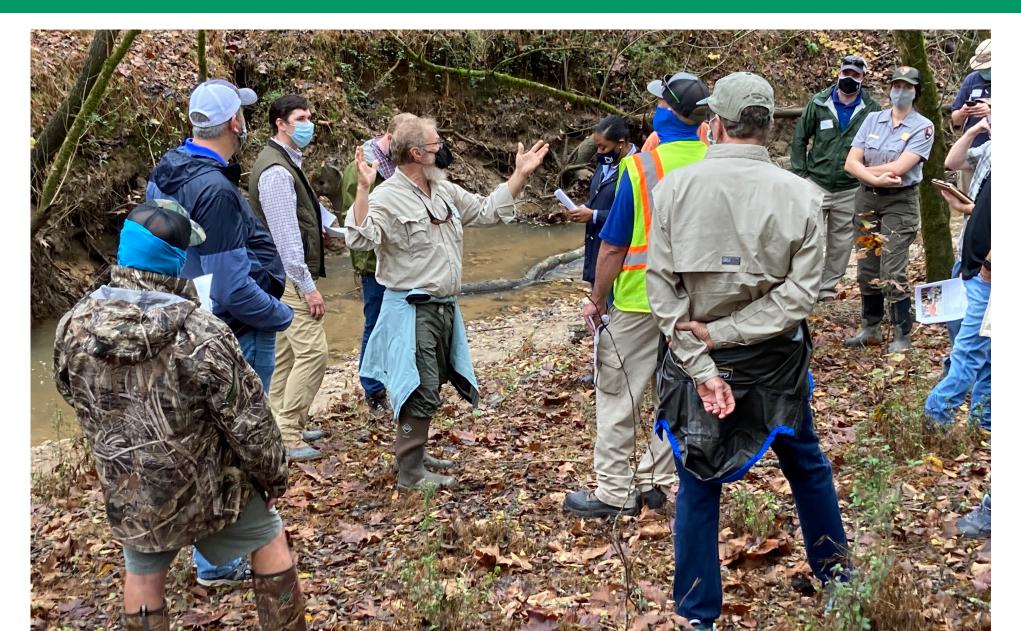




Relationship between fish assemblage IBI and (a) riparian forest land cover (b) riparian cropland land cover (c) watershed forested land cover and (d) watershed cropland land cover

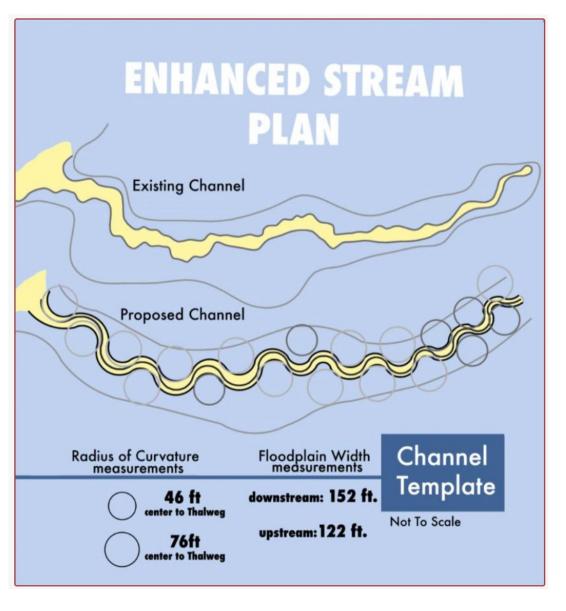


Stream Restoration

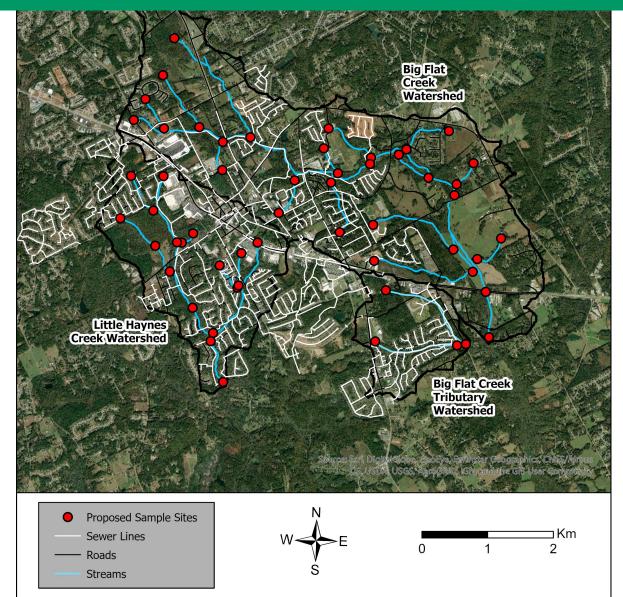


Crayfish Creek Stream Restoration Project

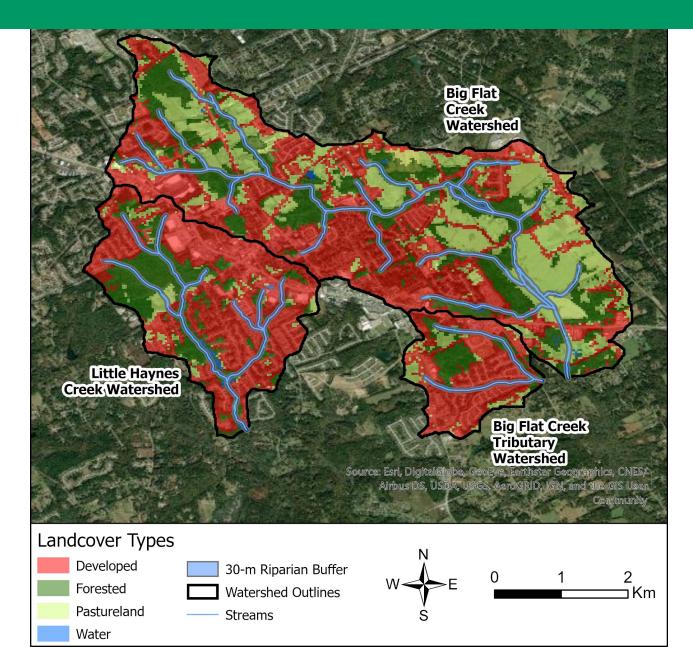




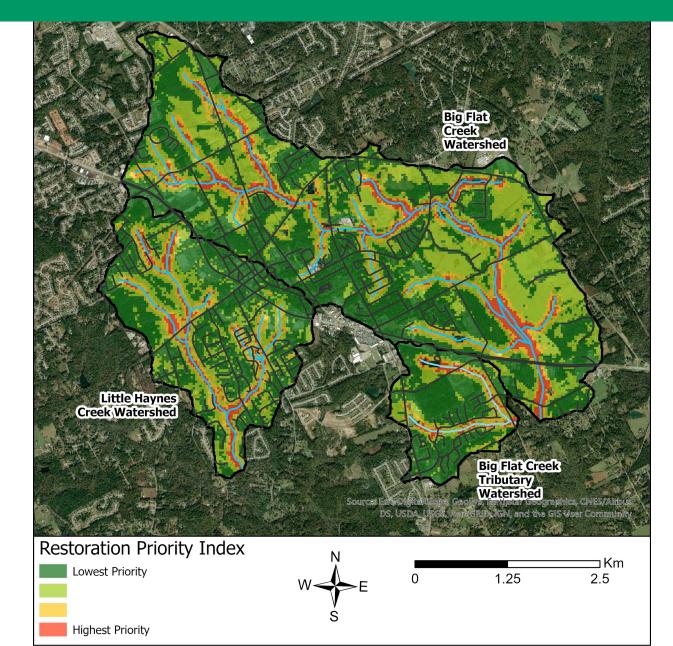
Watershed Management – Big Picture -A watershed is like a quilt



Watershed Management – Big Picture



Watershed Management – Big Picture



Everything is connected, nothing stays where we put it

