Strengthening Resiliency Through Nature-Based Solutions

Michele Eddy
Senior Research Environmental Engineer
Center for Water Resources

RTI INTERNATIONAL

Nature-Based Solutions

"Sustainable planning, design, environmental management and engineering practices that weave natural features or processes into the built environment" – FEMA, 2020

"Actions to protect, sustainably manage, and restore natural or modified ecosystems, that address societal challenges effectively and adaptively, simultaneously providing human well-being and biodiversity benefits" – IUCN

"NBS use or mimic natural processes to enhance water availability (e.g., soil moisture retention, groundwater recharge), improve water quality (e.g., natural and constructed wetlands, riparian buffer strips), and reduce risks associated with water-related disasters and climate change (e.g., floodplain restoration, green roofs)." – UN World Water Development Report, 2018

NBS Types and Practices in Action

Restoration

- Floodplain Restoration
- Riparian Vegetation Restoration
- Natural Channel Design
- Wetland, Prairie, Forest Restoration

Conservation/ Preservation

- Floodplain Preservation
- Riparian Vegetation Conservation
- Open Space Preservation
- Preservation of Natural Lands

Agricultural Conservation Practices

- Water Storage
- Vegetation Establishment
- Livestock Access Control
- Crop Management

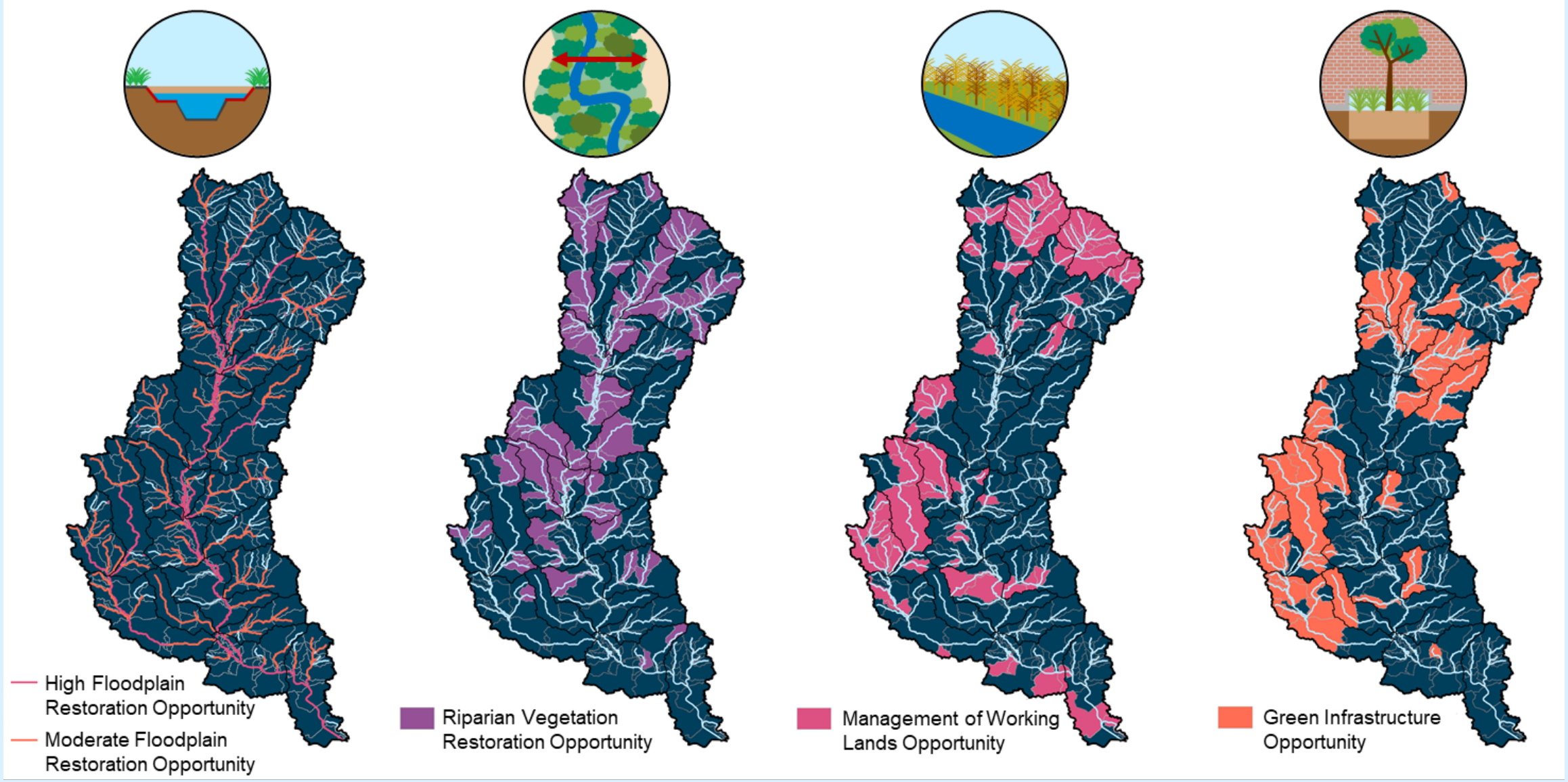
Green Infrastructure

- Green Infrastructure
  - Bioretention
  - Infiltration Trench
  - Stormwater Pond
- Stormwater Park

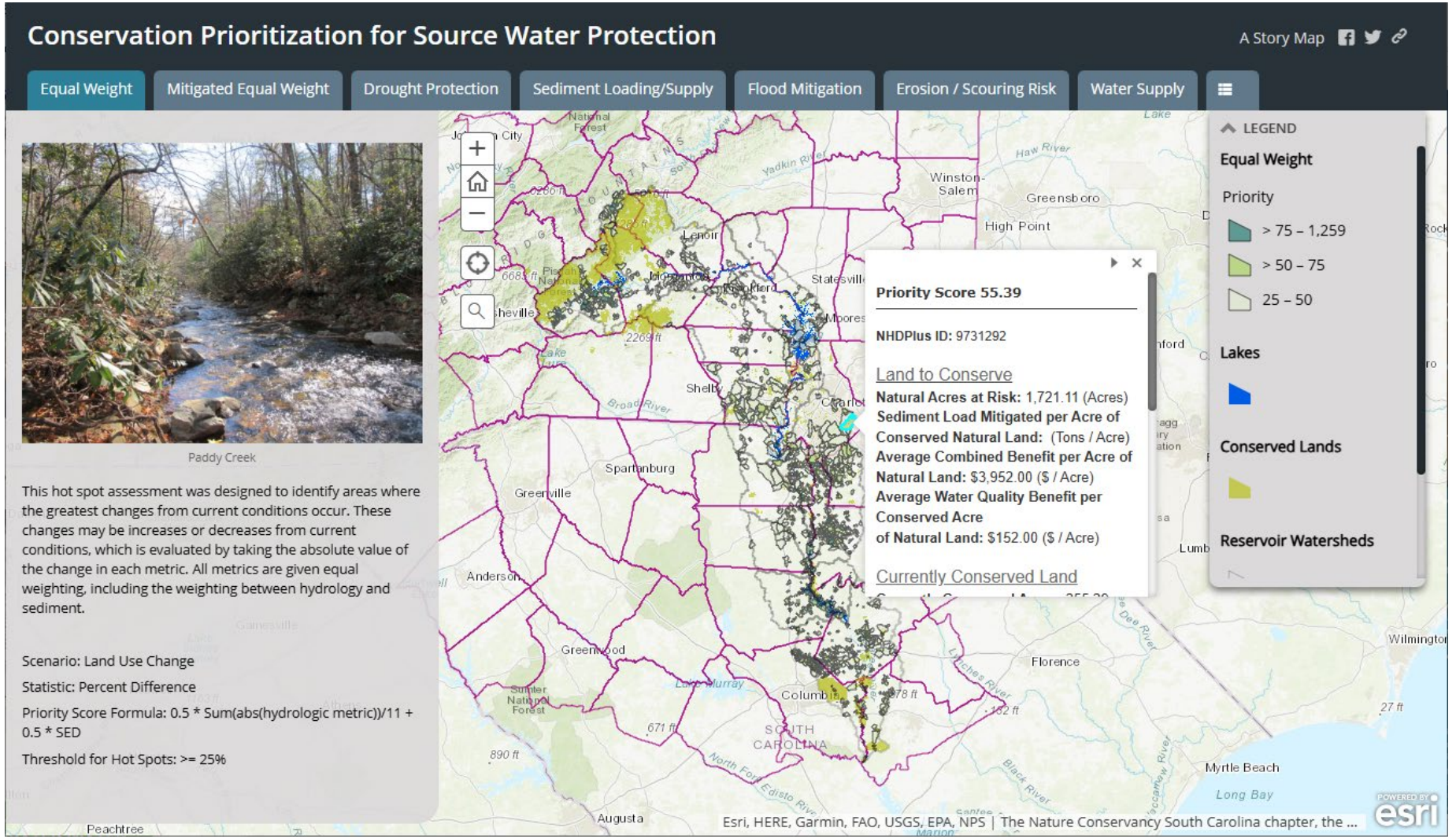
Protection of Wetland Migration Corridors

- Protection of Wetland Mitigation Corridors

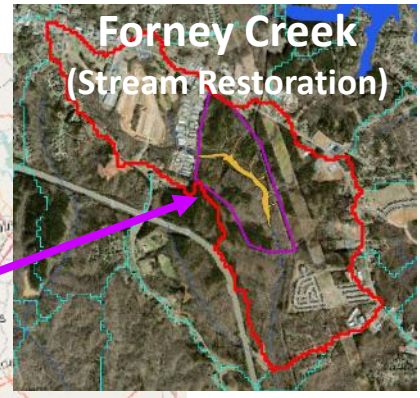
Mapping Opportunities for NBS

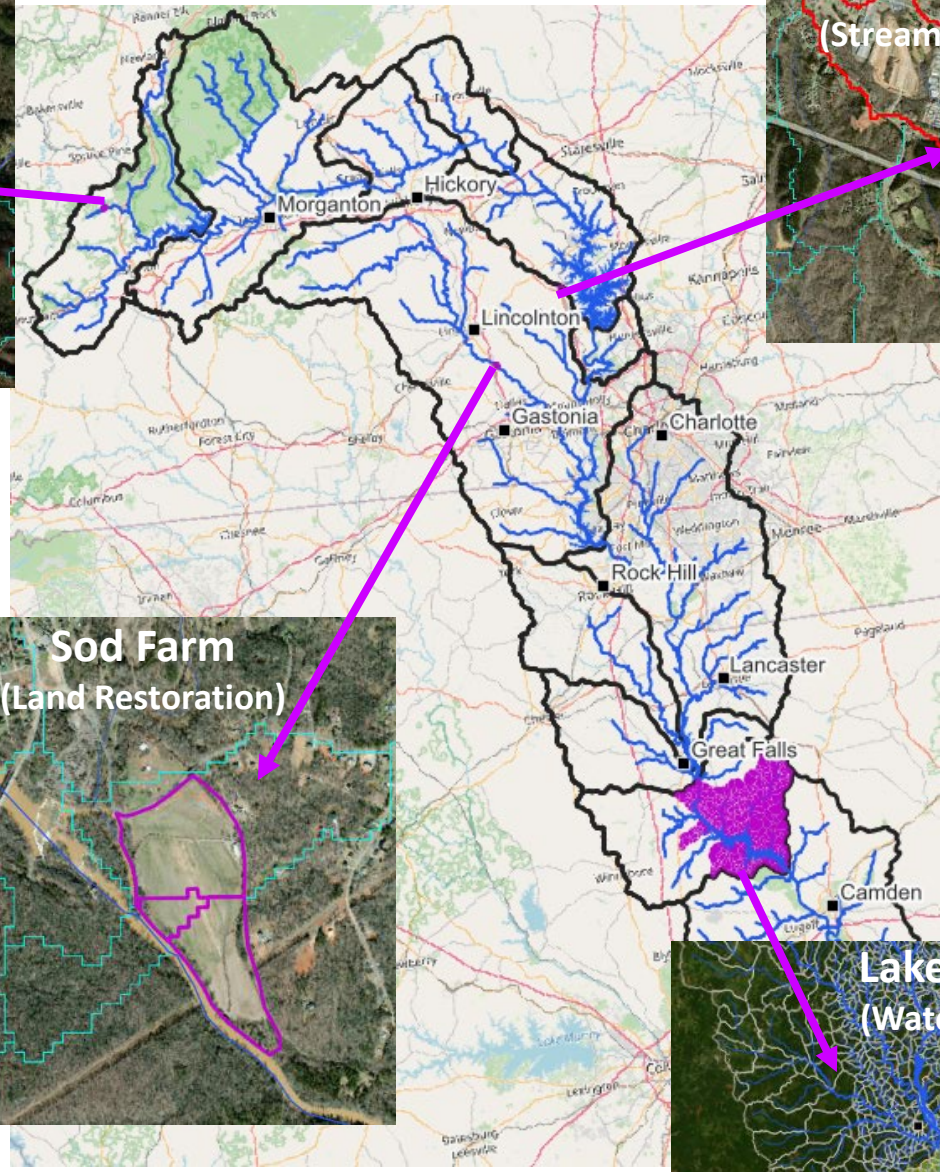


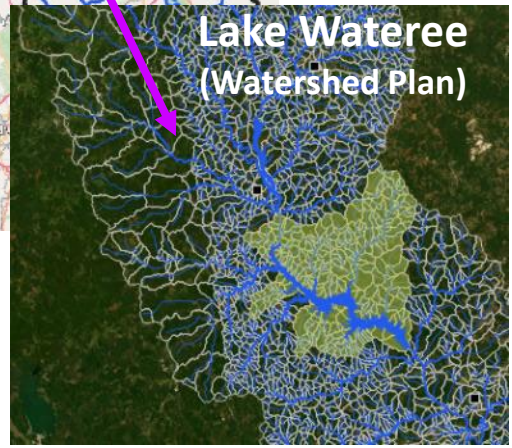
How it Started: Prioritizing and Valuing Natural Lands for Conservation



How it's Going: Integrated Water Resources Plan







1. Conducting basin-wide scenarios focused on **conservation**, **riparian buffer preservation**, and **agricultural conservation practices** implementation
2. Using modeling to evaluate the benefits of specific project actions underway by local conservation groups and supported by the CWWMG Source Water Protection Committee

*Picture insets not on same scale

Stream Restoration: Forney Creek

Catawba Lands Conservancy

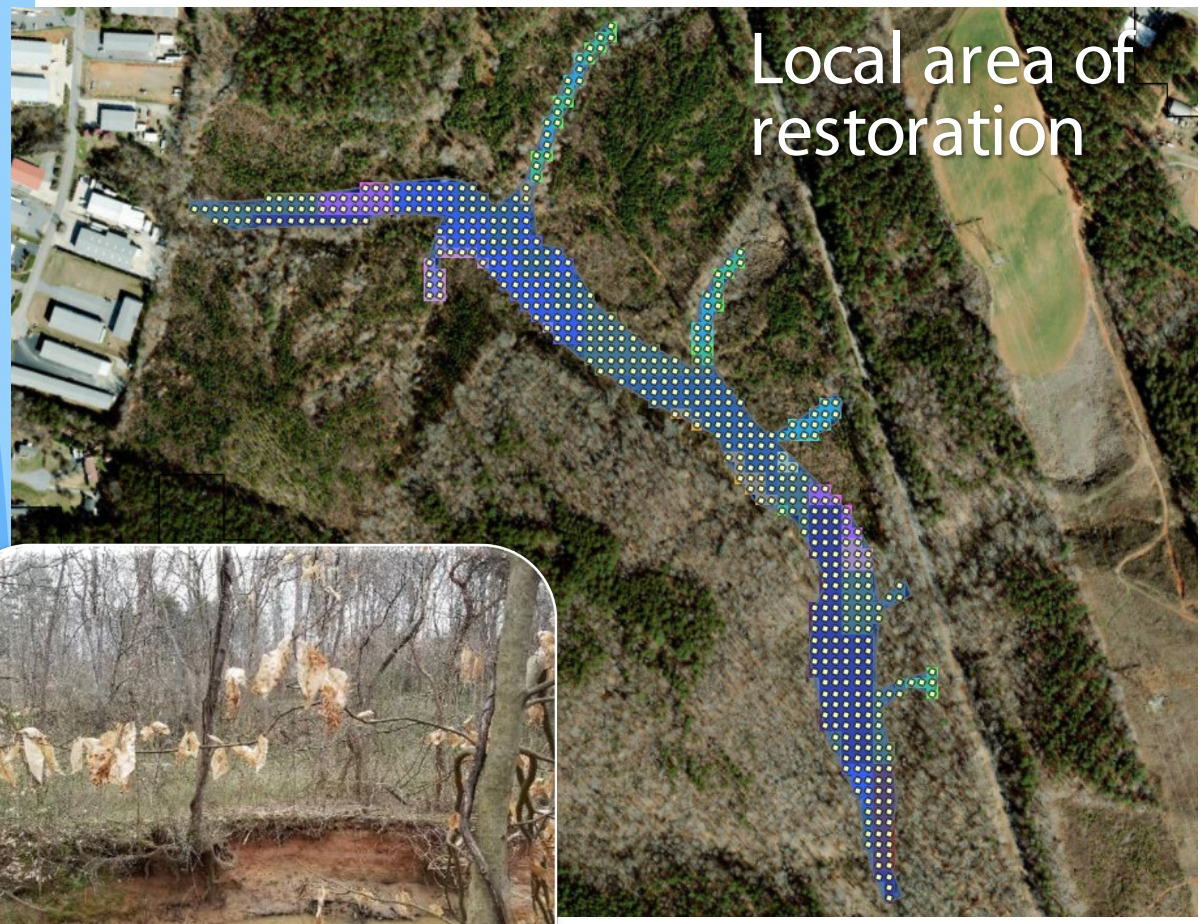
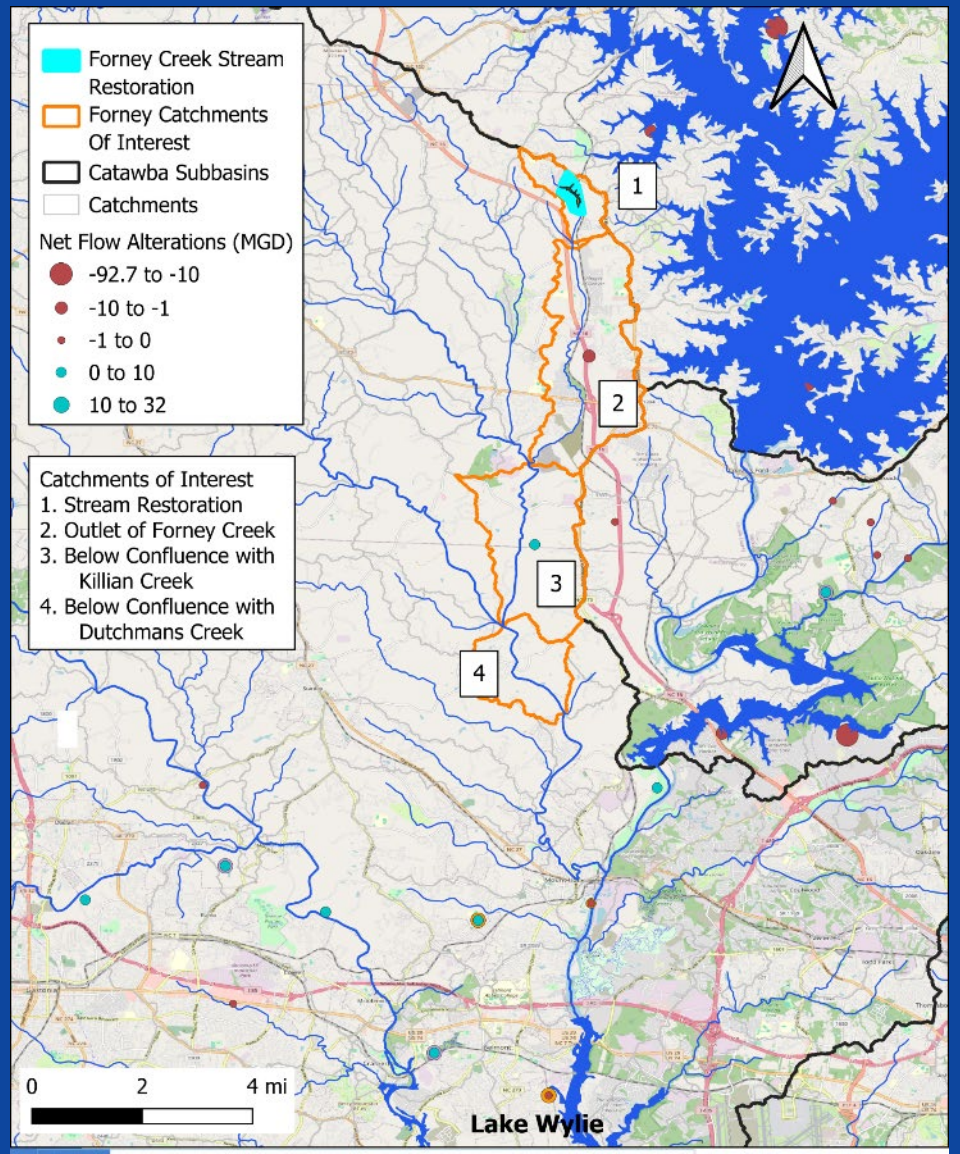


Photo source: Catawba Lands Conservancy

Regional Context

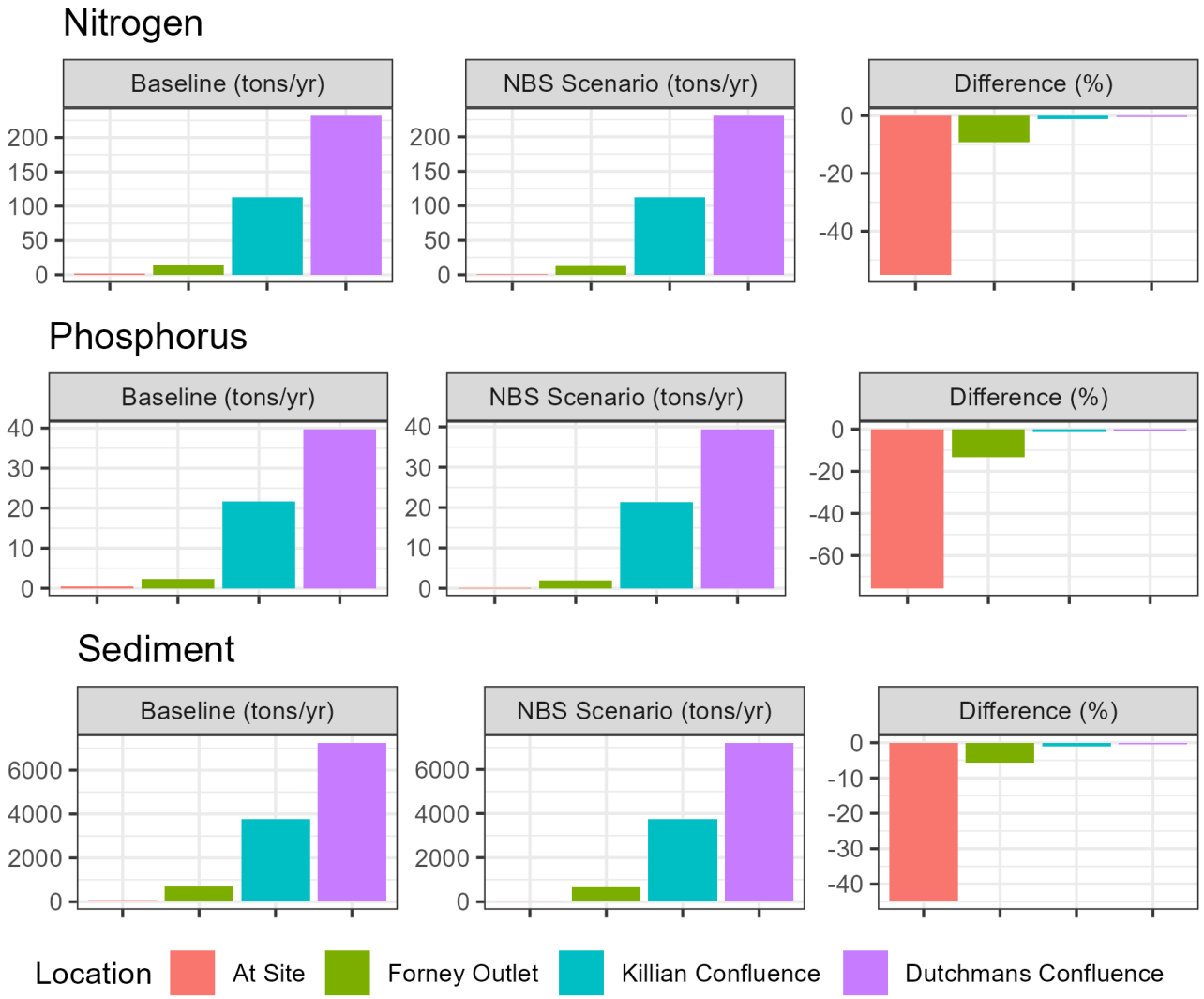


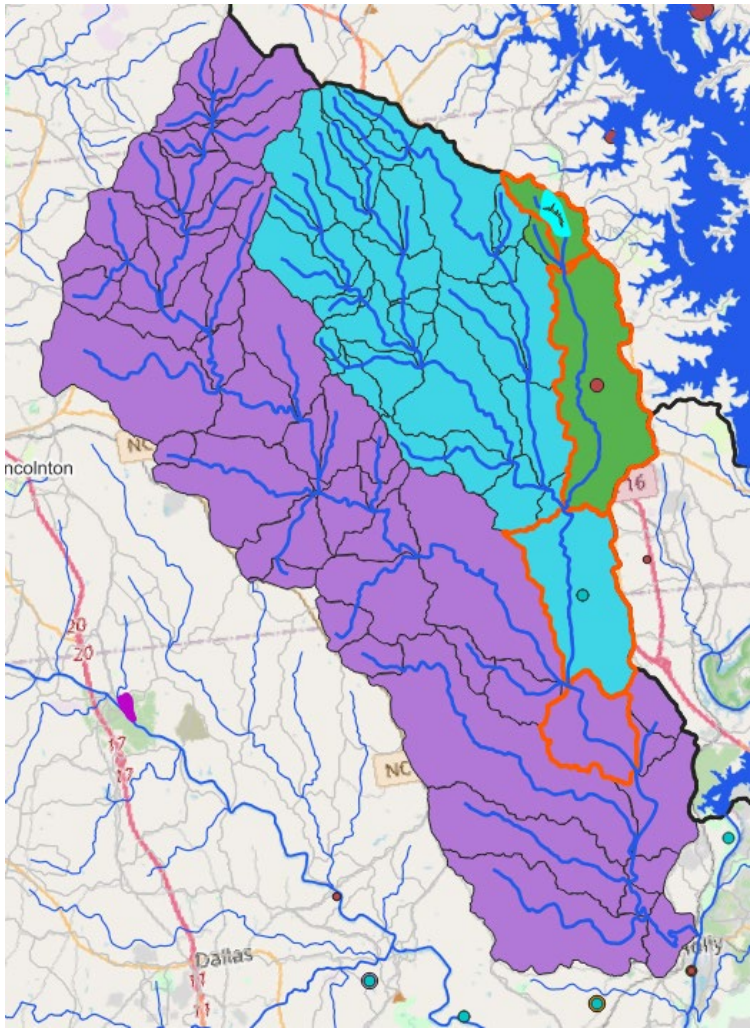
Catawba-Wateree Water Management Group
INTEGRATED WATER RESOURCES PLAN

FORNEY CREEK CASE STUDY

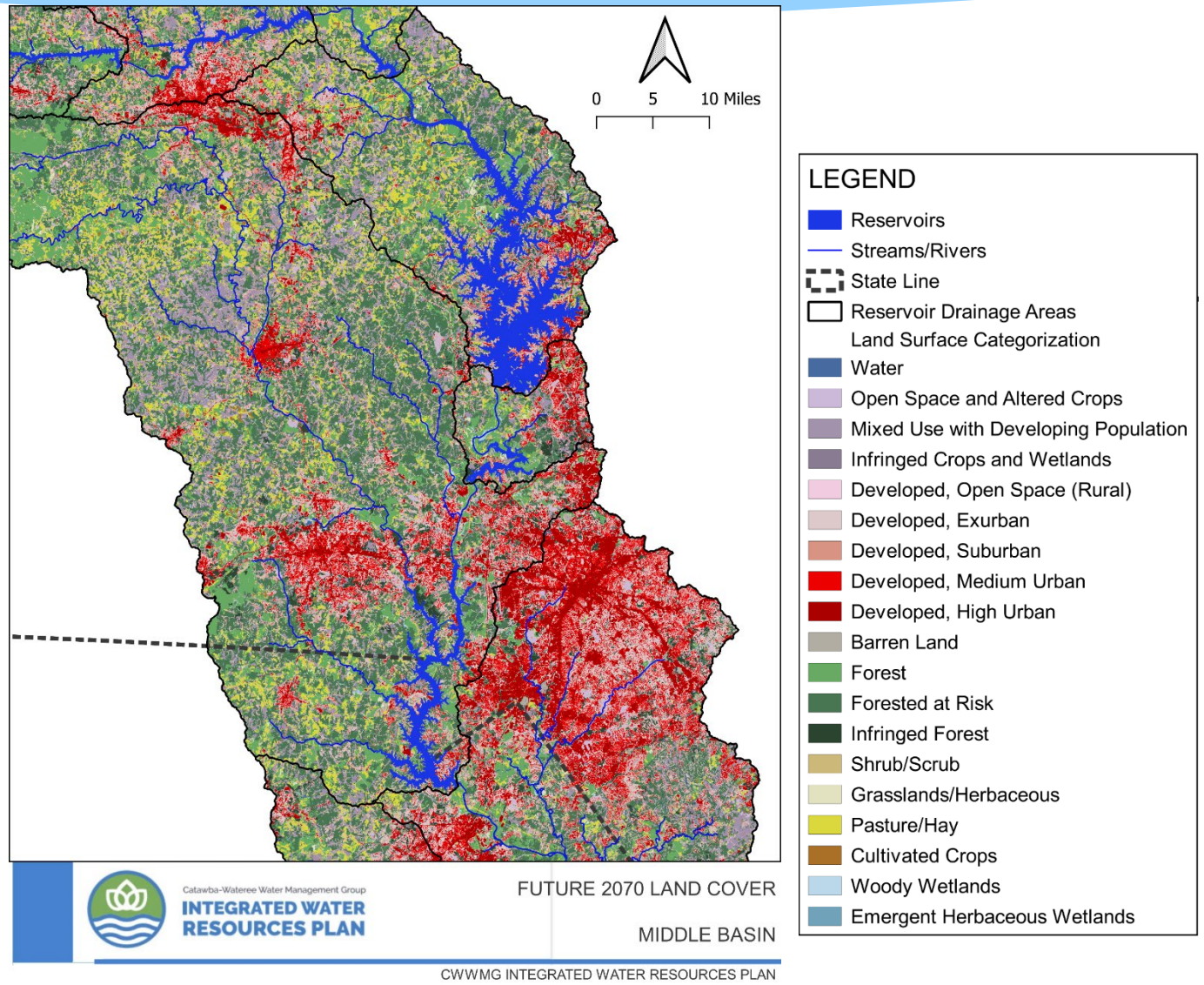
CWWMG INTEGRATED WATER RESOURCES PLAN

Benefits of Forney Creek Stream Restoration





Looking Forward in the Catawba (and elsewhere)….



- Where are you seeing changes?
- What programs already exist?
- What are the opportunities for NBS in your area?
- Who are the partners needed to take action?
- And don't forget maintenance and public outreach!

Thank you!

Michele Eddy, mceddy@rti.org

Ciara Pickering
Sarah Bates
Scott Sheeder
Nathan Ellermeier
George Van Houtven
Ben Lord

For more information:

https://waterfall.rti.org

The Water Research Foundation Project #4702
https://www.waterrf.org/

NBS Explorer

RTI INTERNATIONAL

Partnerships Advancing Nature Based Solutions

Catawba Wateree

Water for All Summit

Nancy Daly, Wake County Water Resources Program Manager

April 3, 2025

WAKE COUNTY
NORTH CAROLINA

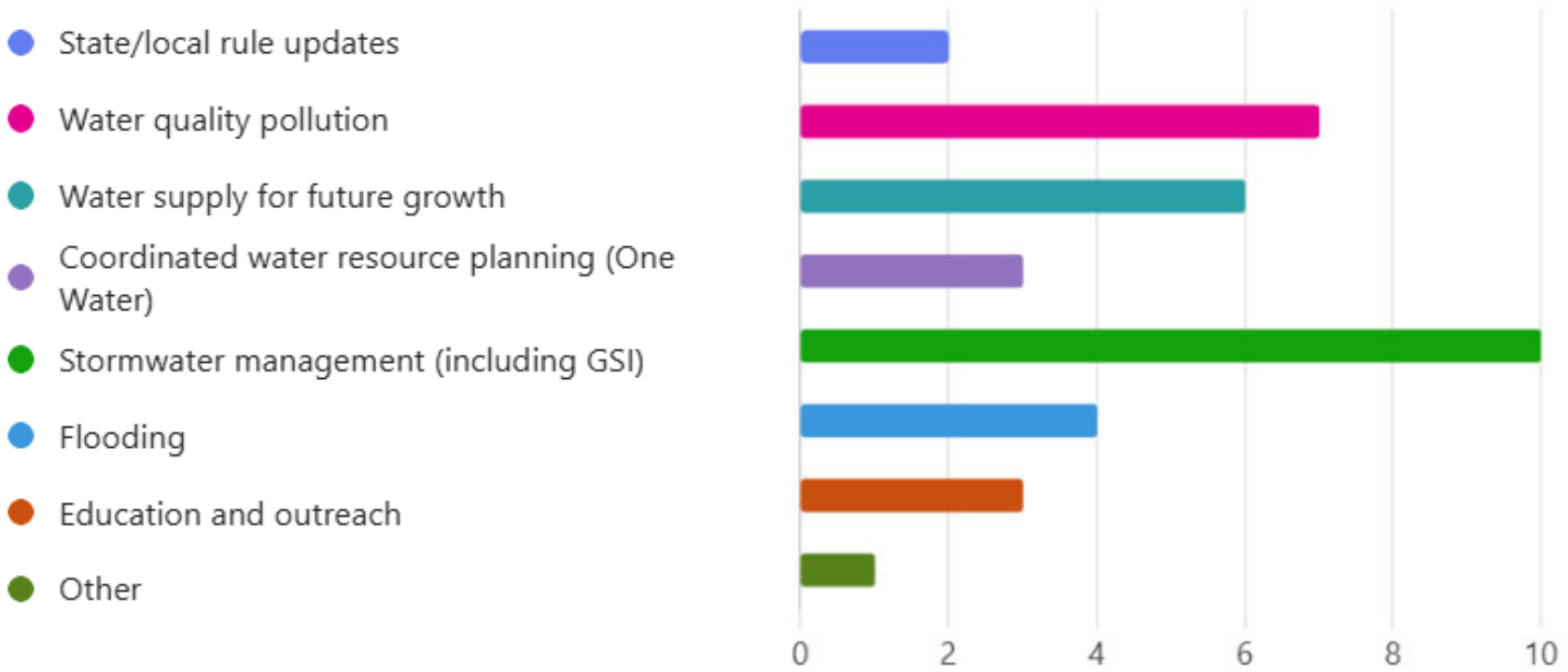
WAKE COUNTY
WATER
PARTNERSHIP

Wake County Water Partnership

Membership

- BOC Representative
- Environmental Advocacy
- Private Water Provider
- Municipal Representatives (12)
- Citizen Appointees (4)
- Private Well Owner
- Wake SWCD
- Agricultural Community
- Academic Expert
- Building and Real Estate
- County Staff (Non-Voting)

2025 Top Priorities



We teamed up with the City of Raleigh to produce a video showcasing how GSI benefits your community and the environment! Learn more about GSI and the importance of routine maintenance practices in the above video above and in this GSI Maintenance fact sheet.

GSI Maintenance

- Interviews on GSI practices
  - Faith leader
  - WCPSS Administrator
  - Maintenance Contractor
  - Resident
- Social Media posts
  - Instagram
  - Facebook

Stormwater and GSI Resources

Stormwater and GSI Best Practices

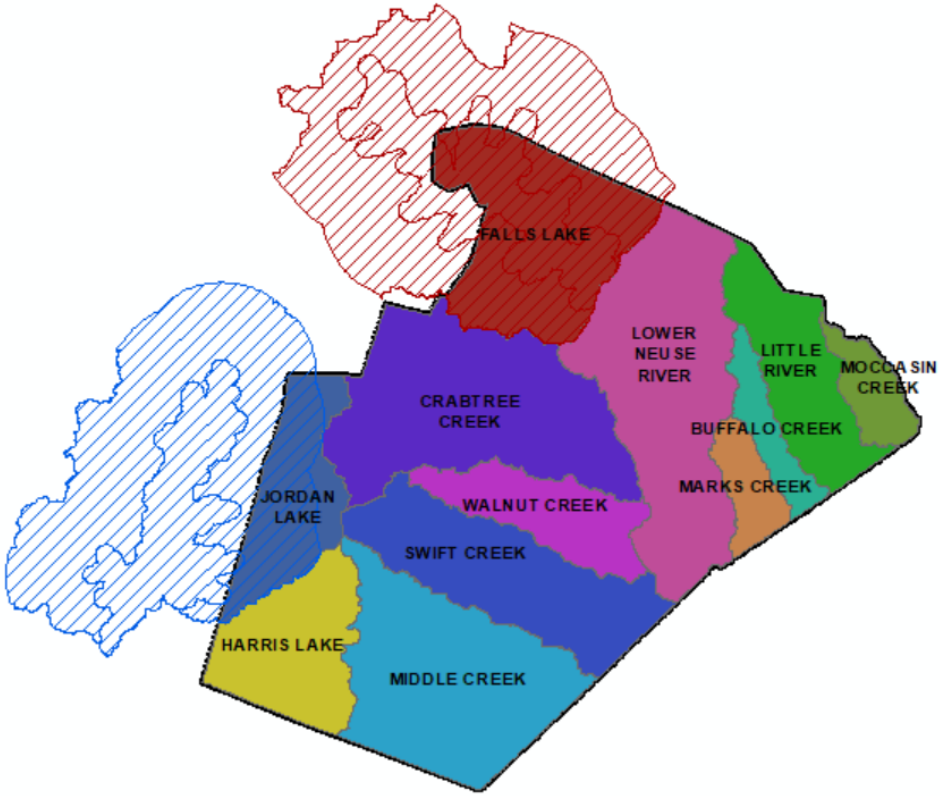
- Policies
- Modeling
- Maintenance
- Partnerships
- Research

https://wake.gov/gsi

Project Partnerships

One Water in Wake County

- Upper Neuse River Basin Association (UNRBA)
  - Falls Lake Watershed
- Jordan Lake One Water
  - Jordan Lake Watershed
- Walnut Creek Urban Water Federal Partnership
  - Walnut Creek Watershed
- Wake One Water



Wake Soil & Water Conservation District

Wilkinson Stream Restoration	• Critical Watershed Area • ~200 ft stream restoration • ~12 tons sediment removal
Clark Sellers Stream Restoration	• Protected Watershed Area • ~150 ft stream restoration • ~29 tons sediment removal
Northern Wake Fire Station #2	• Protected Watershed Area • Convert dry detention to bioretention • New bioretention installation • 89% nitrogen reduction; 87% reduction in phosphorous

Stream Restoration-Falls Lake Watershed

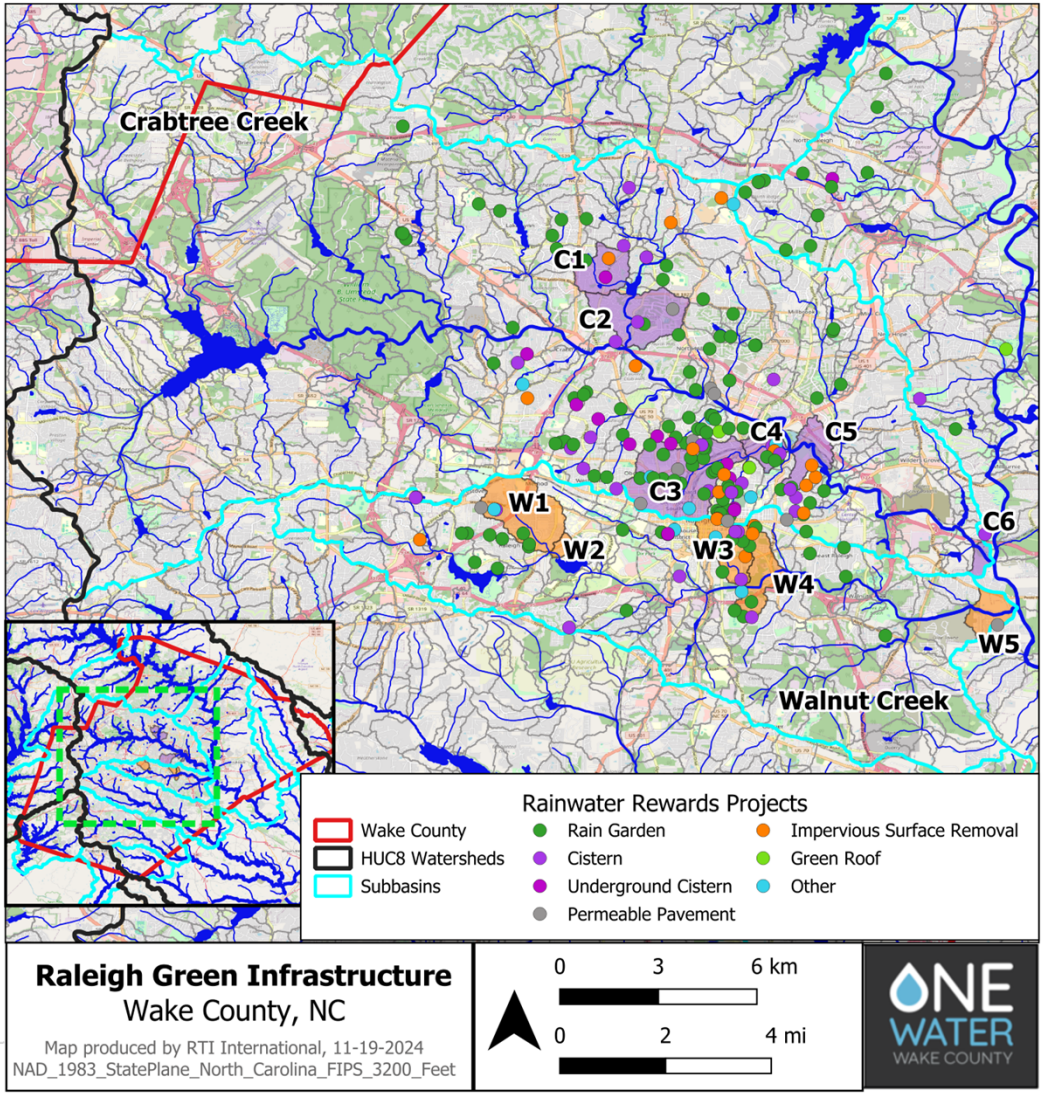
NC Dept. of Transportation

- GSI projects in development
  - Wake Tech Community College
  - Town of Cary
  - Town of Morrisville
  - Town of Holly Springs

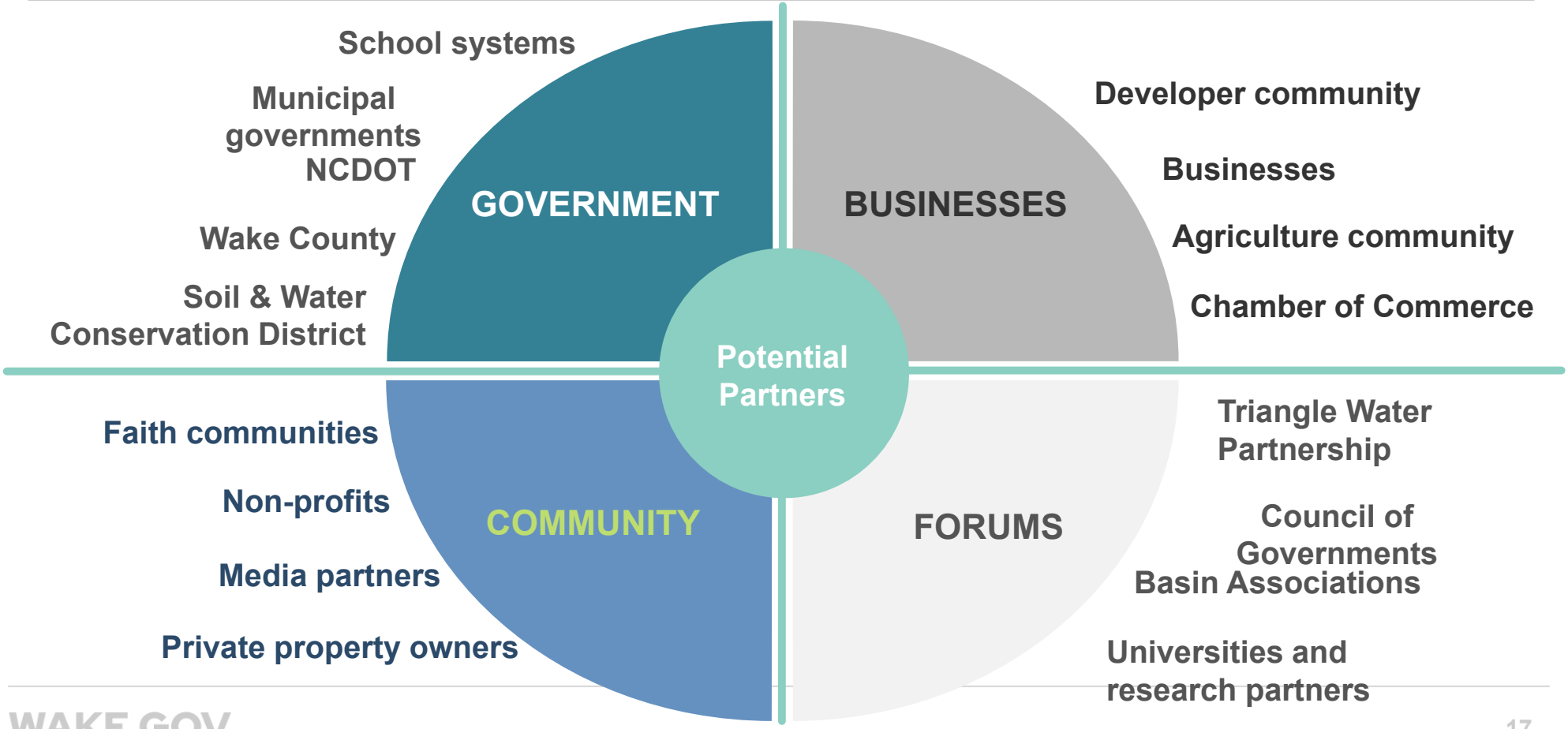
Raleigh Rainwater Rewards-Walnut Watershed

Does it make a difference?

Does it make a difference?



One Water Partnerships



Acknowledgements

- **Wake County Water Partnership**
- **GSI Subcommittee**
  - Ben Mills, former Co-Chair, Morrisville Stormwater Engineering Manager
  - Billy Lee, Cary, former Chair, Cary Stormwater Operations Manager
  - Leah Harrison, Chair, Garner Town Engineer
- **NCDOT**
  - Andy McDaniel, NCDOT Highway Stormwater Program Manager (Retired)
- **Wake Soil and Water Conservation District**
  - Teresa Furr, Wake SWCD Director
- **Wake One Water Project Team**
  - Tetra Tech, Hazen and Sawyer, RTI

WAKE.GOV

CONSERVE:

An Arkansas Case Study

Raven L. Lawson

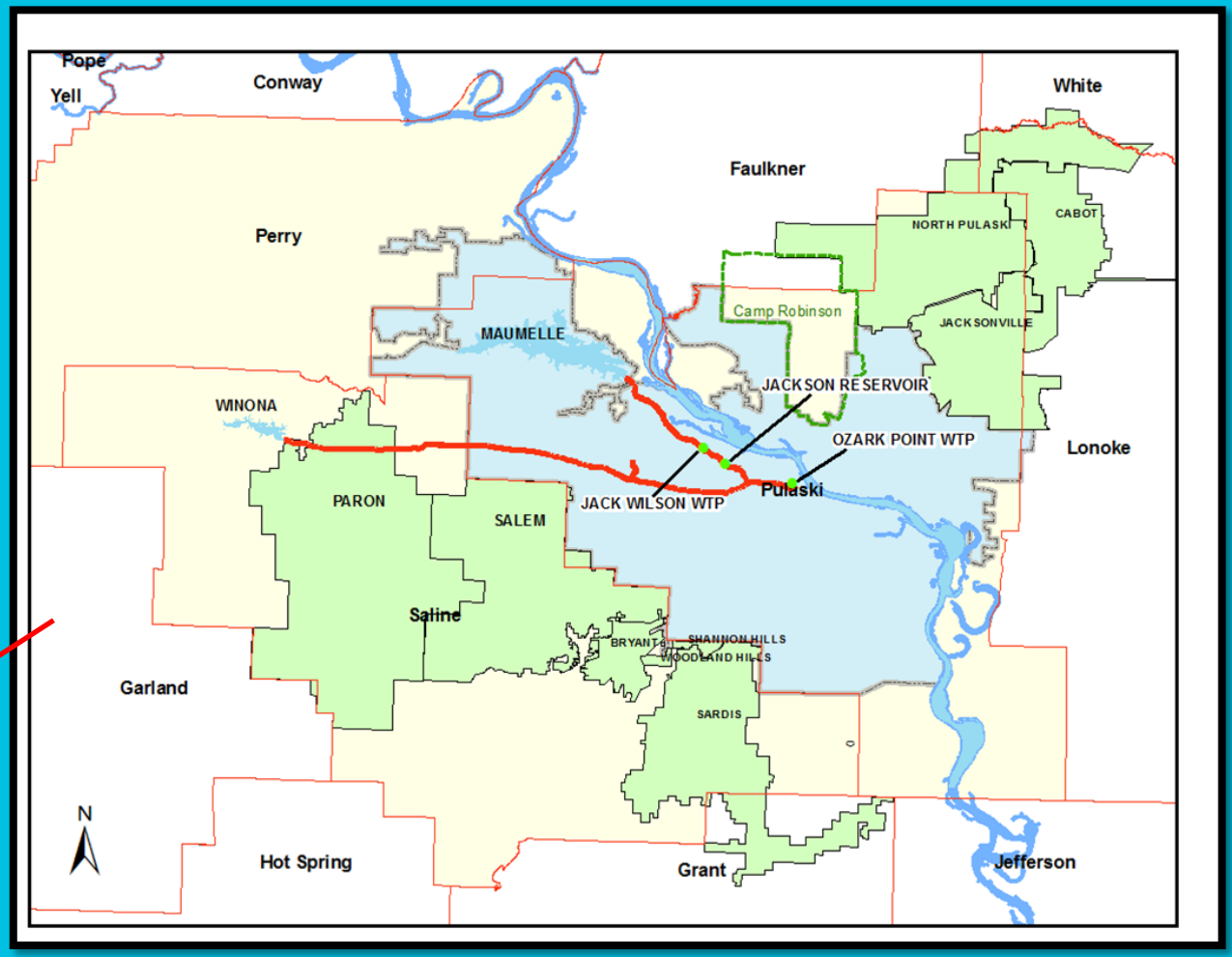
Deputy Director of Conservation

The Nature Conservancy- Arkansas

Water for All Summit Mooresville, NC April 3, 2025

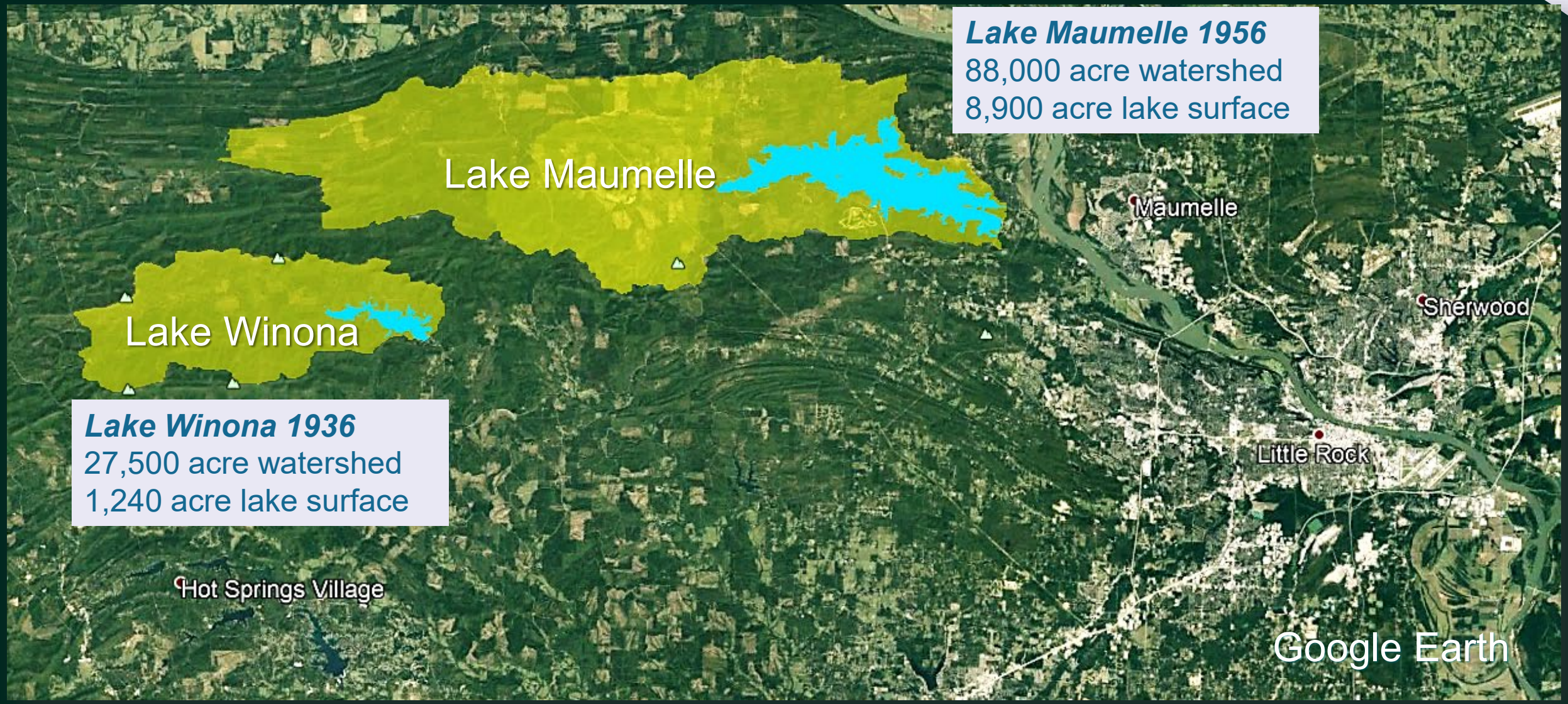
Central Arkansas Water

- Serves 500,000+ Arkansans with safe, affordable, and reliable high-quality water
- One in every 6 Arkansans benefit from CAW's service
- Supply from 2 reservoirs: Lake Maumelle & Lake Winona



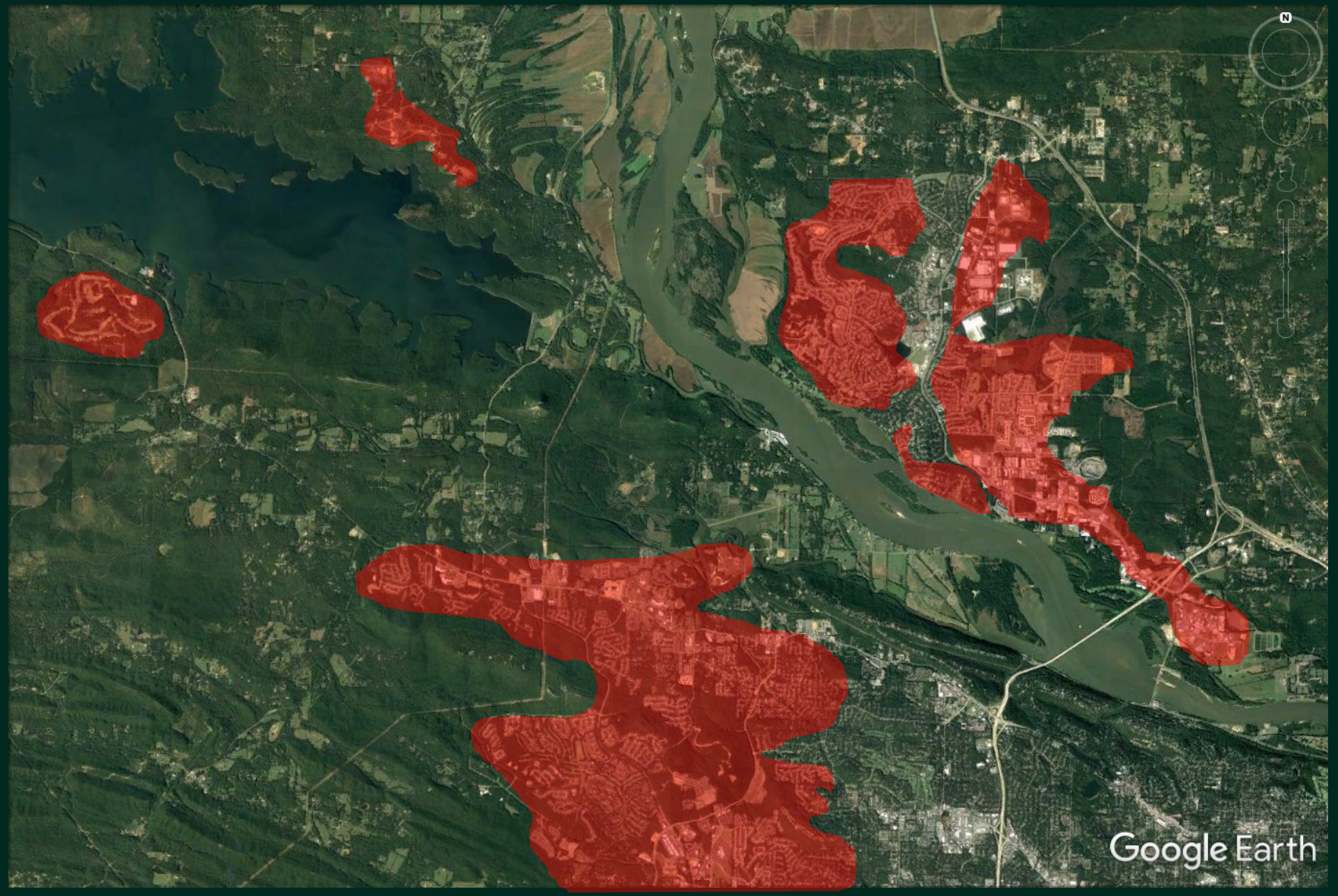
CAW Watersheds

The Nature Conservancy



Lake Maumelle 1956
88,000 acre watershed
8,900 acre lake surface

Lake Winona 1936
27,500 acre watershed
1,240 acre lake surface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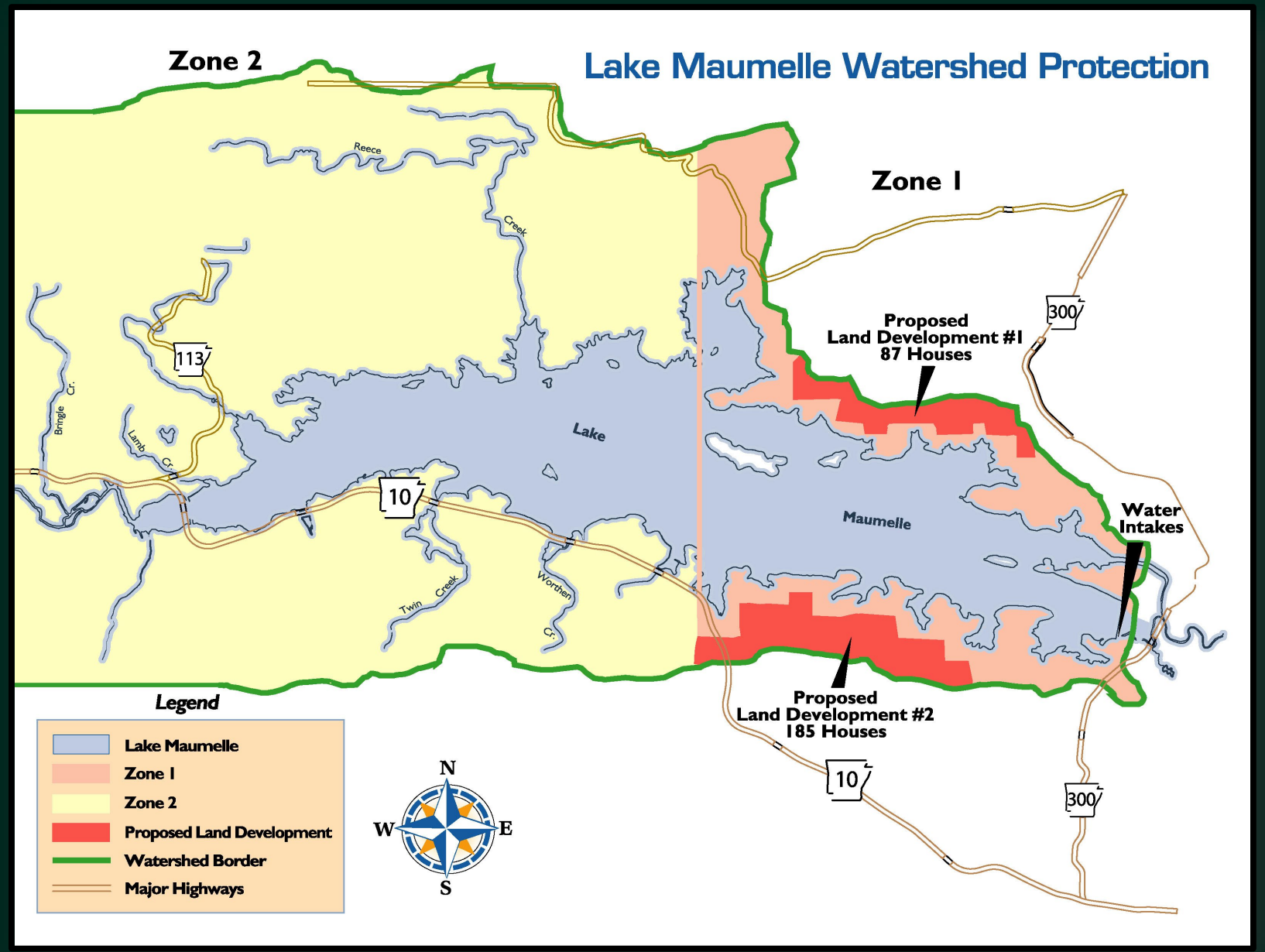
Google Earth

Proposed Development Pre-2004

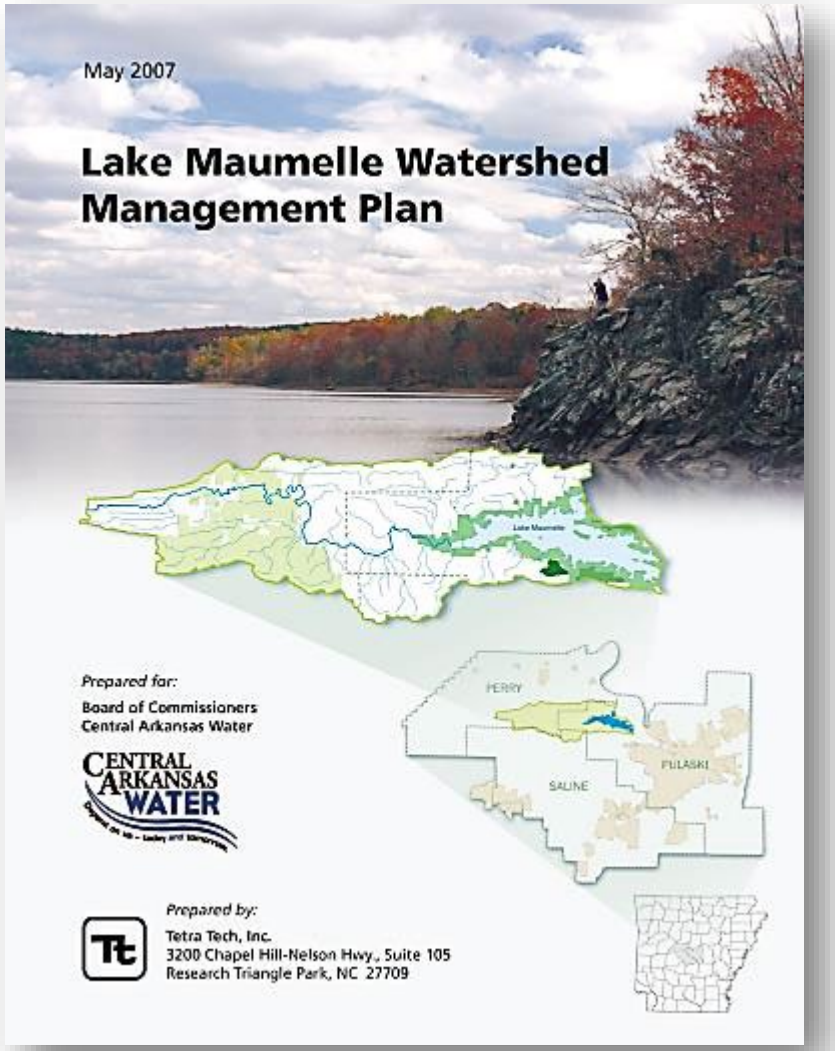
The Nature Conservancy



2007 Management Plan

Findings:

- Existing water quality is very good
- Future water quality will not meet goals under build-out scenarios

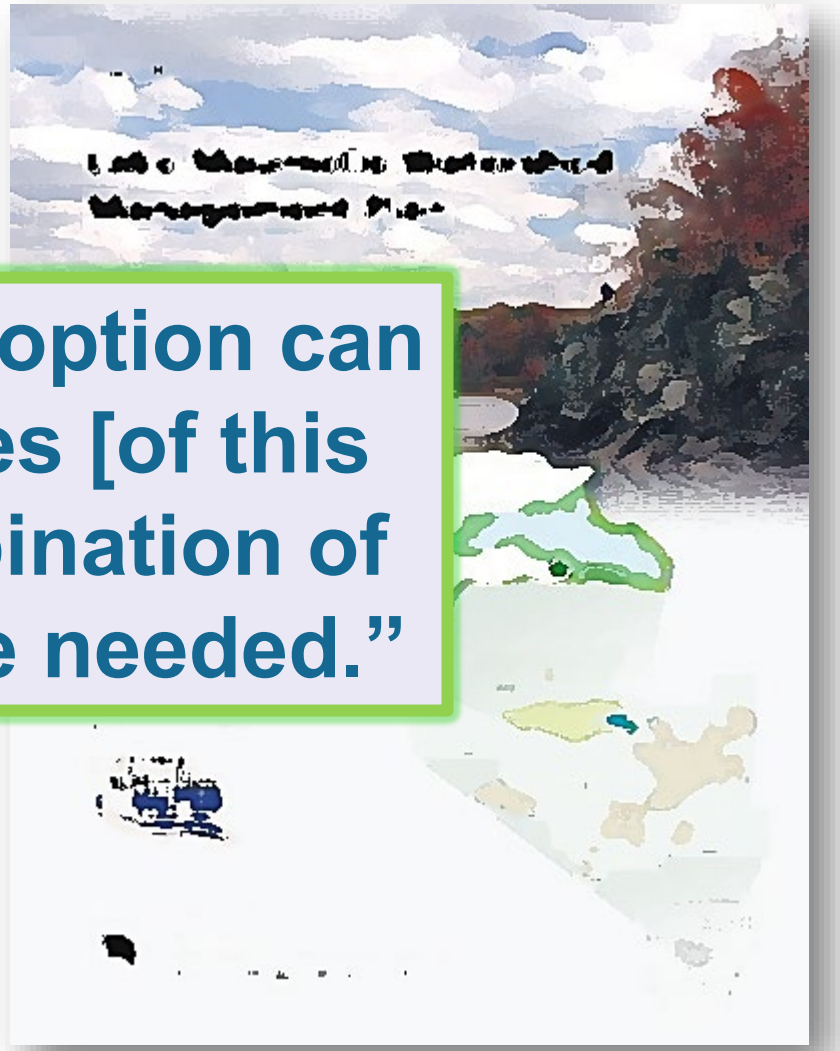


2007 Management Plan

Findings:

- Existing water quality is very good
- Future [illegible] meet g[illegible] scenar[illegible]

"No single management option can meet all of the objectives [of this plan]; therefore, a combination of methods and actions are needed."



CAW's Watershed Protection Program's Goals

To **PROTECT, RESTORE, and ENHANCE** the natural watershed environment of the Utility's two water sources through a variety of pollution prevention, watershed, and source water protection approaches; part of an overall utility strategy to maintain and enhance ecological and community sustainability, and ultimately ensure CAW can provide high-quality water with minimal treatment.

Photos by Bryan Rupar, Land Conservation Coordinator

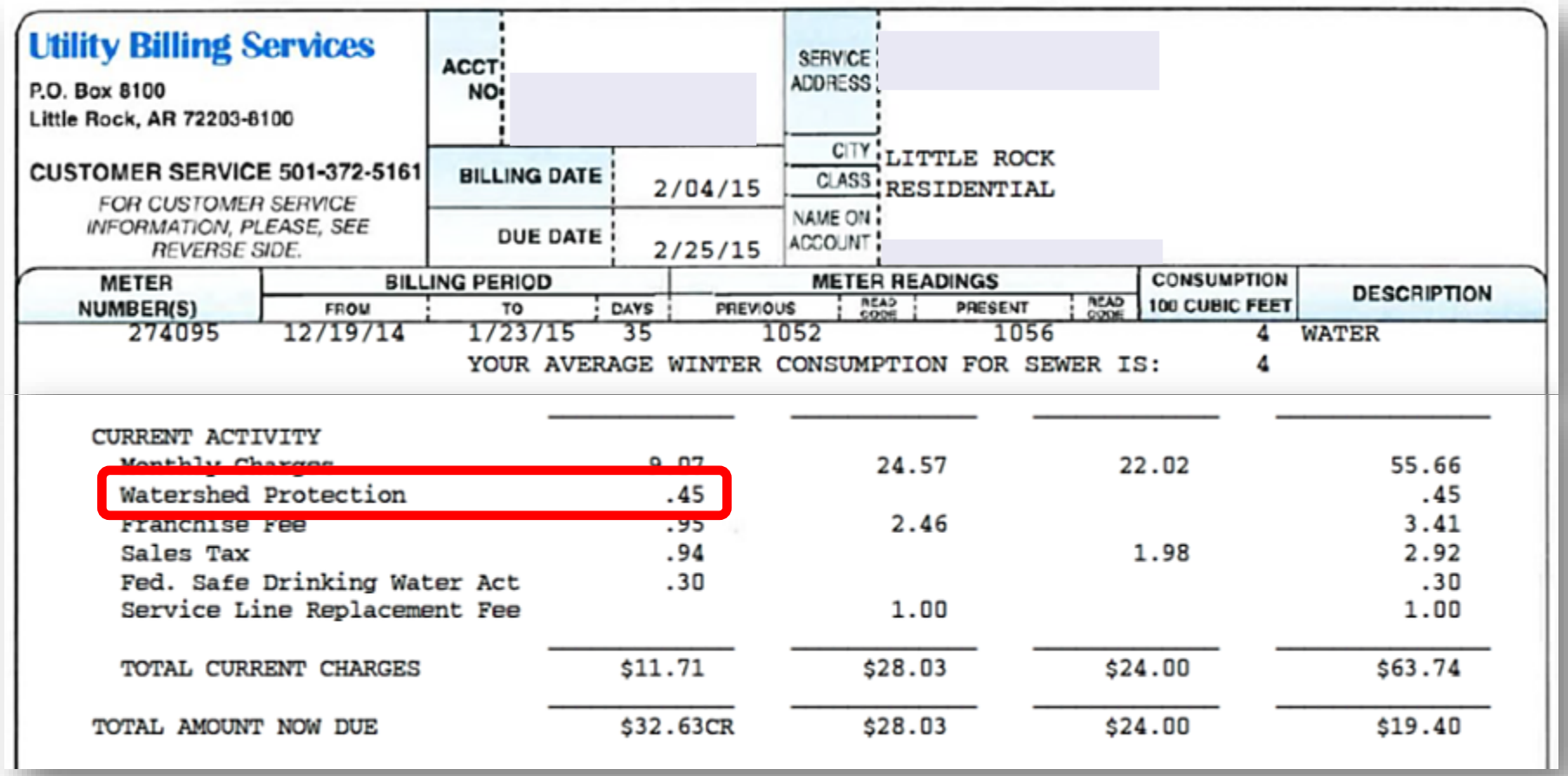
Protecting the resource...

Managing the Land

1) Land Acquisitions and Conservation Easements
2) Forest Management: *Fire, Thinning, Roads*
3) Restoration & Reforestation
4) Monitoring
5) Education and Outreach
6) Risk Mitigation and Emergency Response
7) Wildlife and Recreation Management

Plan Implementation= Watershed Protection Fee

- Implemented a $0.45 watershed protection fee per meter in May 2009.
- Displayed on bills to increase consumer knowledge of watershed protection.
- Generated approximately $1 million per year.
- Bought opportunistically and leveraged for a single 900ac purchase.



Utility Billing Services
P.O. Box 8100
Little Rock, AR 72203-8100

CUSTOMER SERVICE 501-372-5161
FOR CUSTOMER SERVICE INFORMATION, PLEASE, SEE REVERSE SIDE.

ACCT NO:
BILLING DATE 2/04/15
DUE DATE 2/25/15
SERVICE ADDRESS
CITY LITTLE ROCK
CLASS RESIDENTIAL
NAME ON ACCOUNT

METER NUMBER(S)	BILLING PERIOD FROM	TO	DAYS	METER READINGS PREVIOUS	READ CODE	PRESENT	READ CODE	CONSUMPTION 100 CUBIC FEET	DESCRIPTION
274095	12/19/14	1/23/15	35	1052		1056		4	WATER
				YOUR AVERAGE WINTER CONSUMPTION FOR SEWER IS:				4	

CURRENT ACTIVITY				
Monthly Charges	9.07	24.57	22.02	55.66
Watershed Protection	.45			.45
Franchise Fee	.95	2.46		3.41
Sales Tax	.94		1.98	2.92
Fed. Safe Drinking Water Act	.30			.30
Service Line Replacement Fee		1.00		1.00
TOTAL CURRENT CHARGES	$11.71	$28.03	$24.00	$63.74
TOTAL AMOUNT NOW DUE	$32.63CR	$28.03	$24.00	$19.40

Evaluating Lands....

Beginning in 2015….

CAW created & used a scoring matrix to identify, evaluate, and prioritize lands for purchase.

- ❑ Watershed Characteristics (*stream frontage, tributaries, critical areas…*)
- ❑ Connectivity Potential (*to existing CAW properties*)
- ❑ Development Capacity (*roads and services)*
- ❑ Landscape Characteristics (*slope, soil type, land-use, forest cover*)
- ❑ Size
- ❑ Price
- ❑ Other Considerations

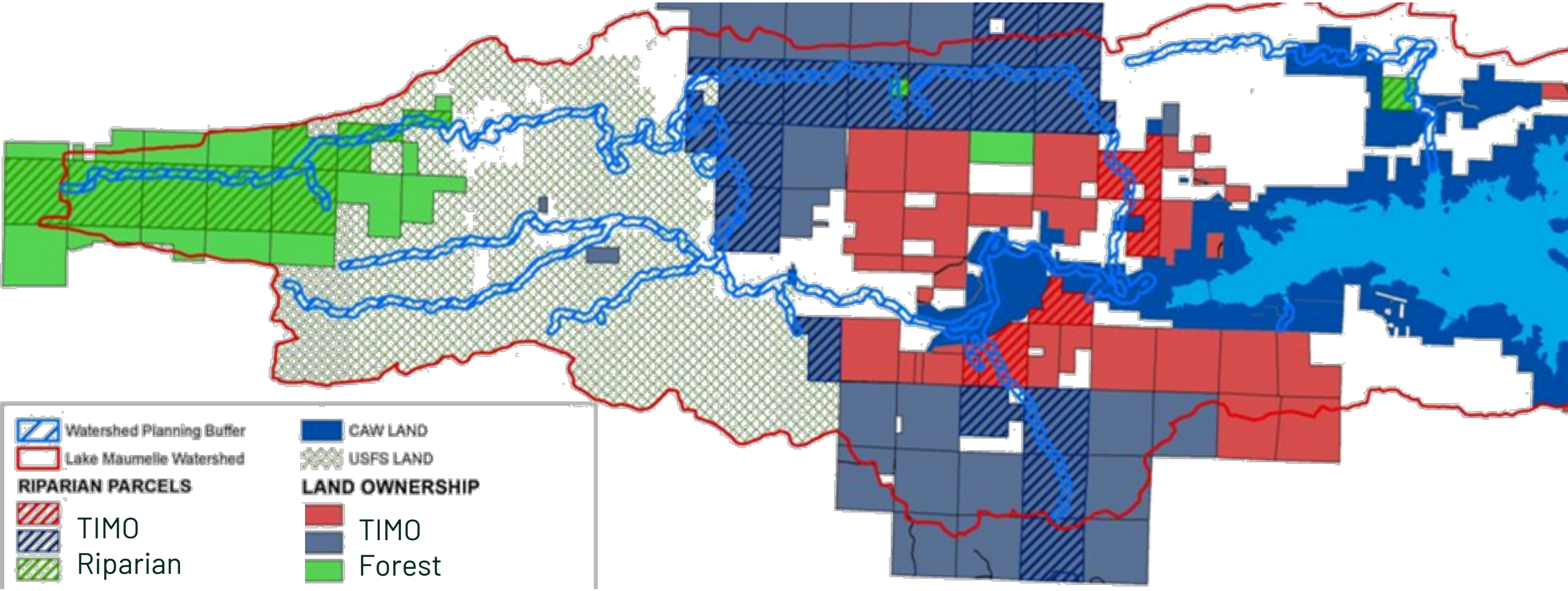
In 2018….

CAW had surpassed initial land purchasing goal.

The CAW Board directed the program to:

- ❑ Keep purchasing lands beyond the 1200ac
- ❑ Continue to refine/evaluate what is purchased
- ❑ Explore innovative ways of obtaining CEs
- ❑ Voted to increase the WPF

HWC Prioritization Process



Refined Goals

GOAL:

Leverage funding to acquire riparian parcels from TIMOs (~$55M)

57% Protected and 76% Riparian

OUTCOME:

A safe and reliable water source for current citizens and future generations of Arkansans (100 years or more!)

Watershed Ownership 2020*

	Acres	% of Watershed
CAW Total	21,056	24
USFS	13,591	16
Non-CAW Held Easement	856	1
TIMOs	31,216	36
Private/Other	20,952	24
Watershed	87,680	100

41 % of Watershed currently Conserved

Major Tributaries Buffer Ownership:

- **43% Conserved**
- **34% TIMO's**
- **24% Private**

Watershed Protection Fee

- Rate study was conducted in 2018, and a resolution amend the WPF was adopted.
- The amendment would double the fee to $0.90 through 3 equal $0.15 bumps over an 18mo period.
- Final increase went into effect 1/1/2021.
- Generates approximately $2.2M annually

Request for this change was once again citizen driven.

WATERSHED PROTECTION FEE

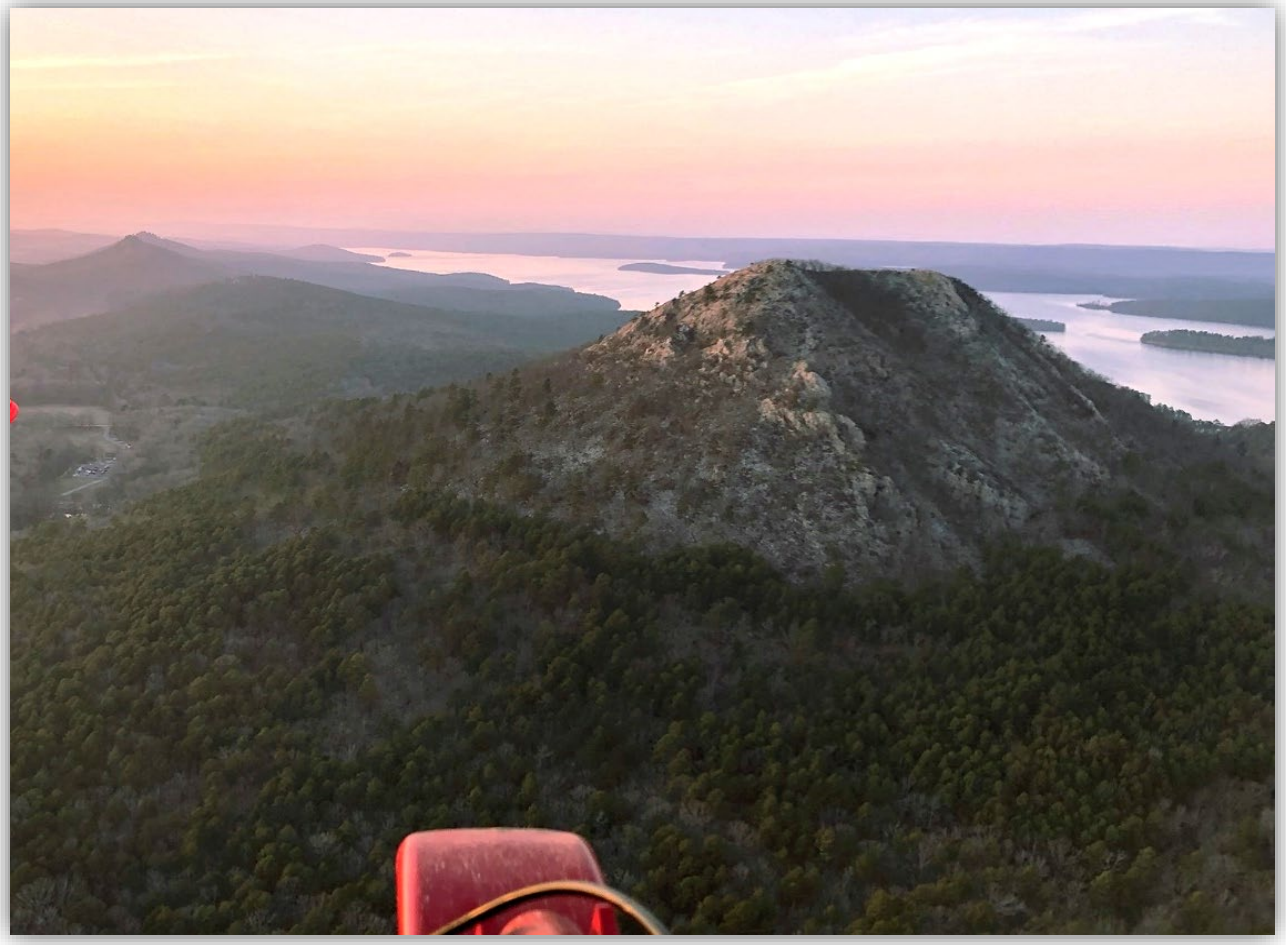
A Watershed Protection Fee will appear each month as a separate item on your billing statement. The fee will go toward funding our Watershed Management Program, which includes land purchases, water quality monitoring, and other measures to protect our drinking water supply lakes from potential sources of pollution. The monthly fee will be 90 cents for households with a 5/8 inch-diameter meter. The Watershed Protection Fee by meter size will be, as follows:

METER SIZE	WATERSHED PROTECTION FEE
5/8"	$0.90
3/4"	$0.90
1"	$1.35
1 1/2"	$2.25
2"	$4.50
3"	$7.20
4"	$13.50
6"	$22.50
8"	$45.00
10"	$72.00

The Watershed Protection Fee will appear beside the following line-item on your monthly billing statement: *Watershed Protection.*

Central Arkansas Water
Essential & Exceptional

Received First Ever
Certified Green Bond
for Protection of Forest Lands
as Water Infrastructure
(October 2020)



encourage capital

WORLD RESOURCES INSTITUTE

Green/Gray Bond- October 2020

The Nature Conservancy

- First-ever in the world certified to protect forests for water quality
- $10 million for watershed protection
- $21.8 million for gray infrastructure upgrades that support water delivery system efficiencies
- Three years to draw on funding (interest free period)

2023 Scoring Matrix Revision

Last major revision in 2016

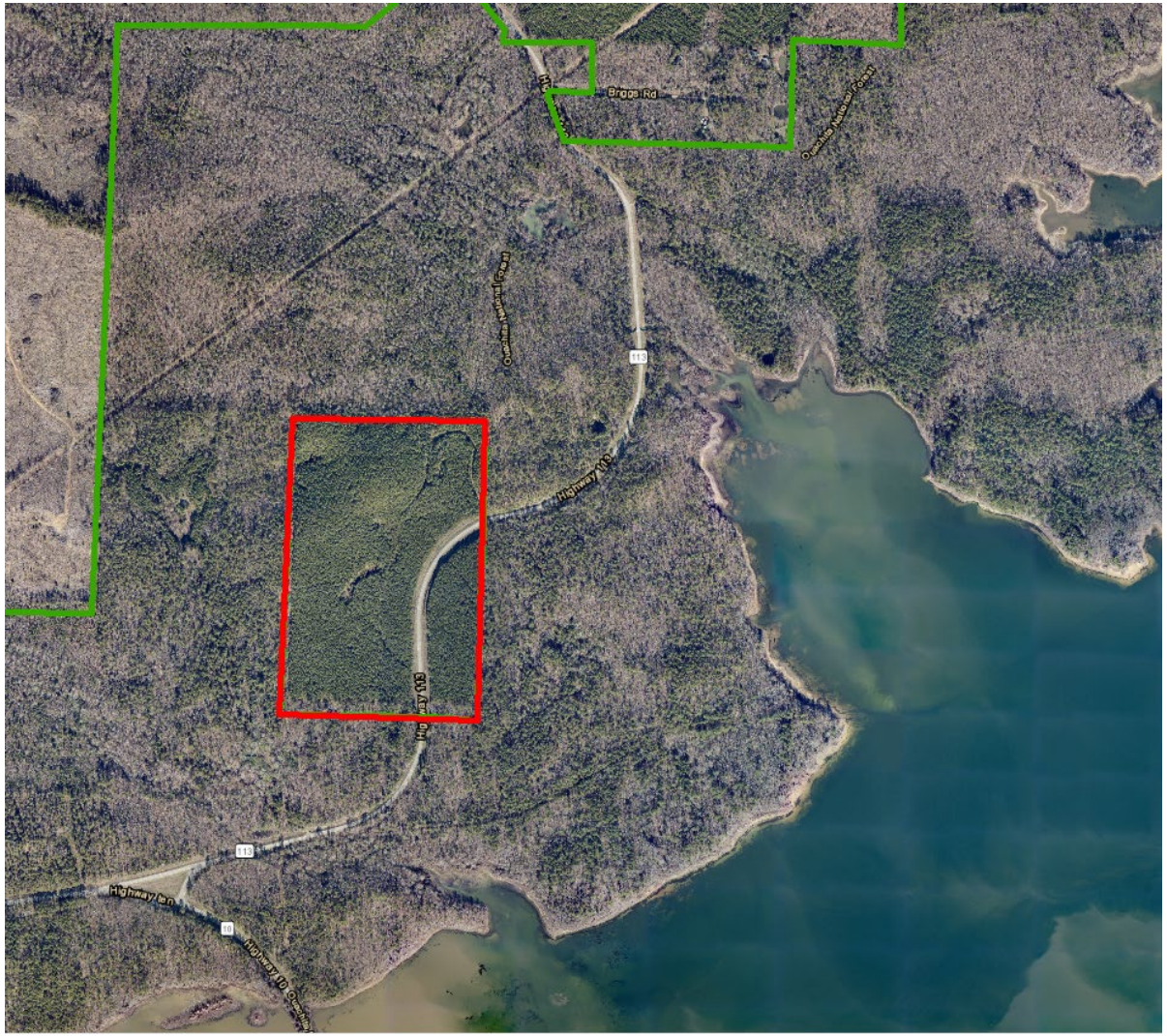
2023 updates improved functionality

- Weighted scores
- New attributes evaluated (i.e. zoning ordinances)

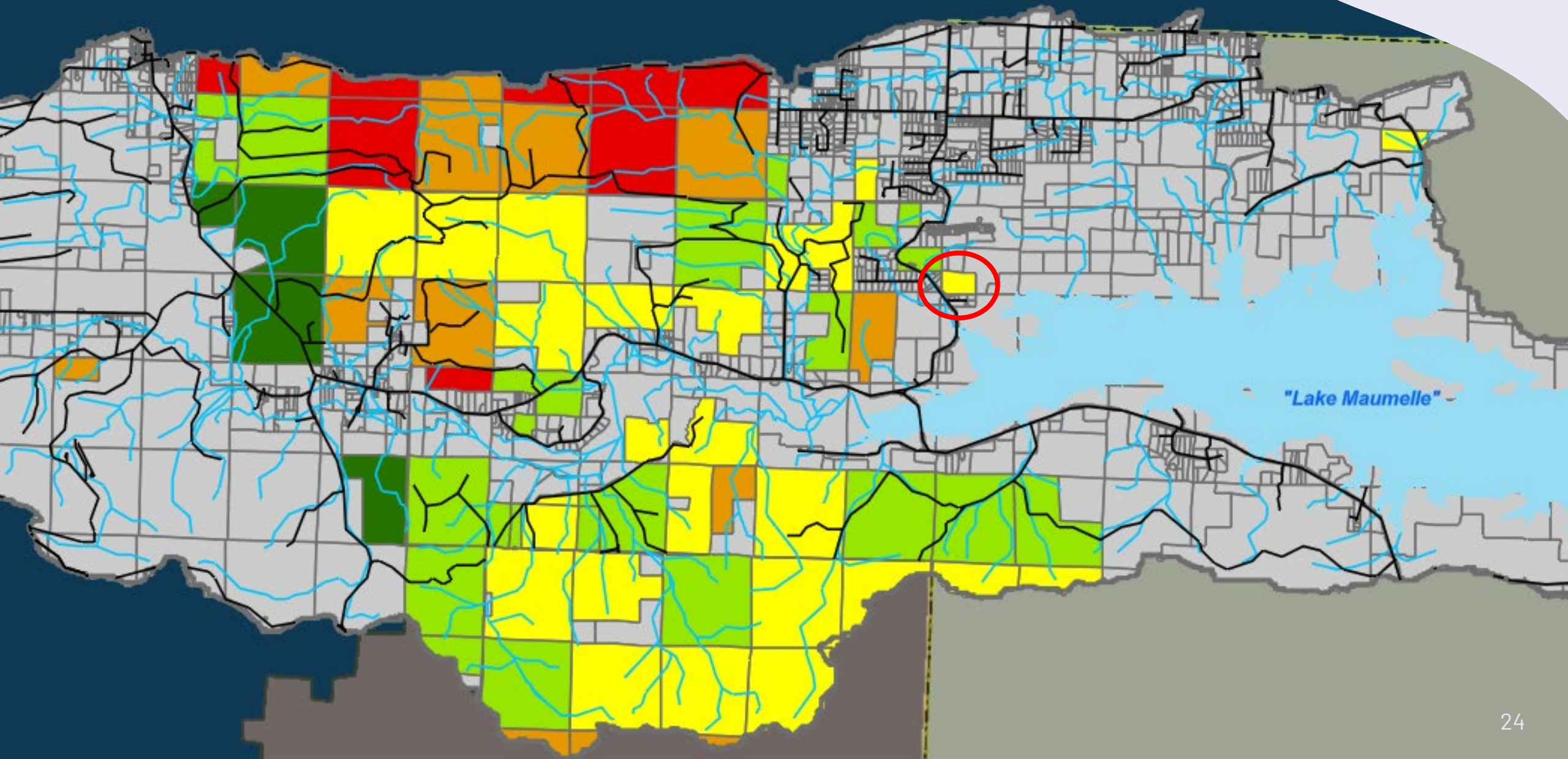
New matrix has two weighted scores

- Ecological Score
- Development Score

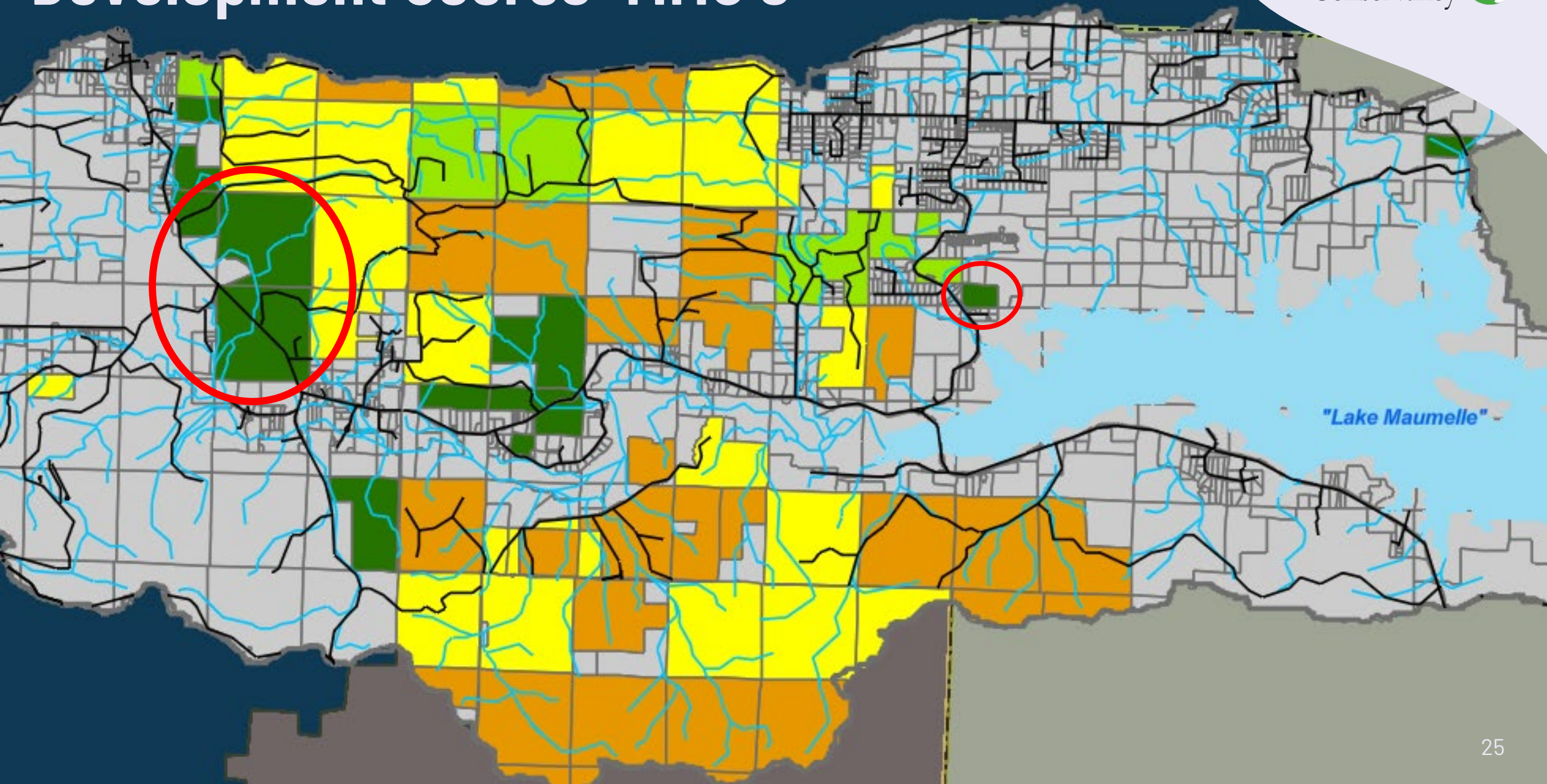
Development vs. Ecological Score



Ecological Scores-TIMO's

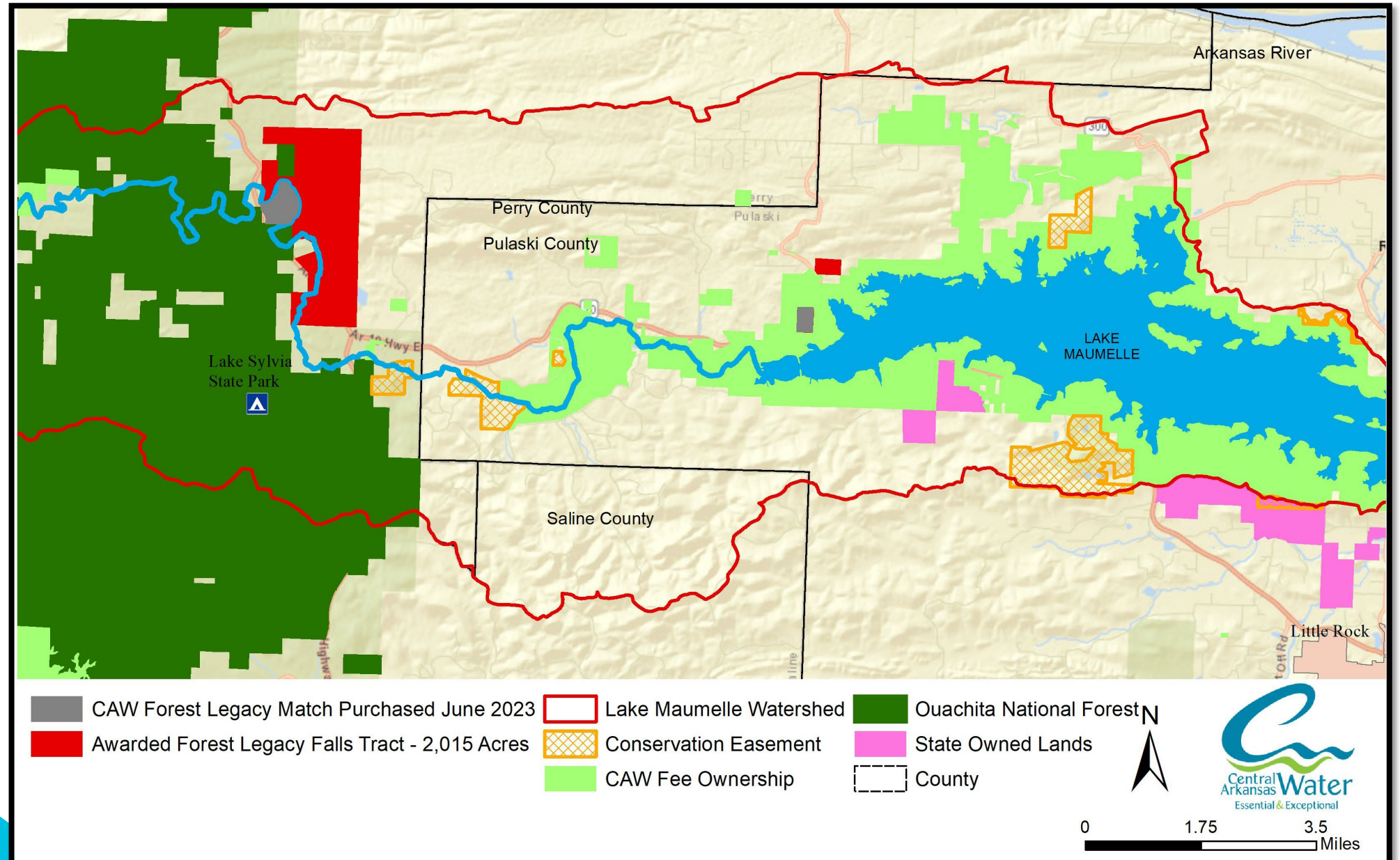


Development Scores-TIMO's

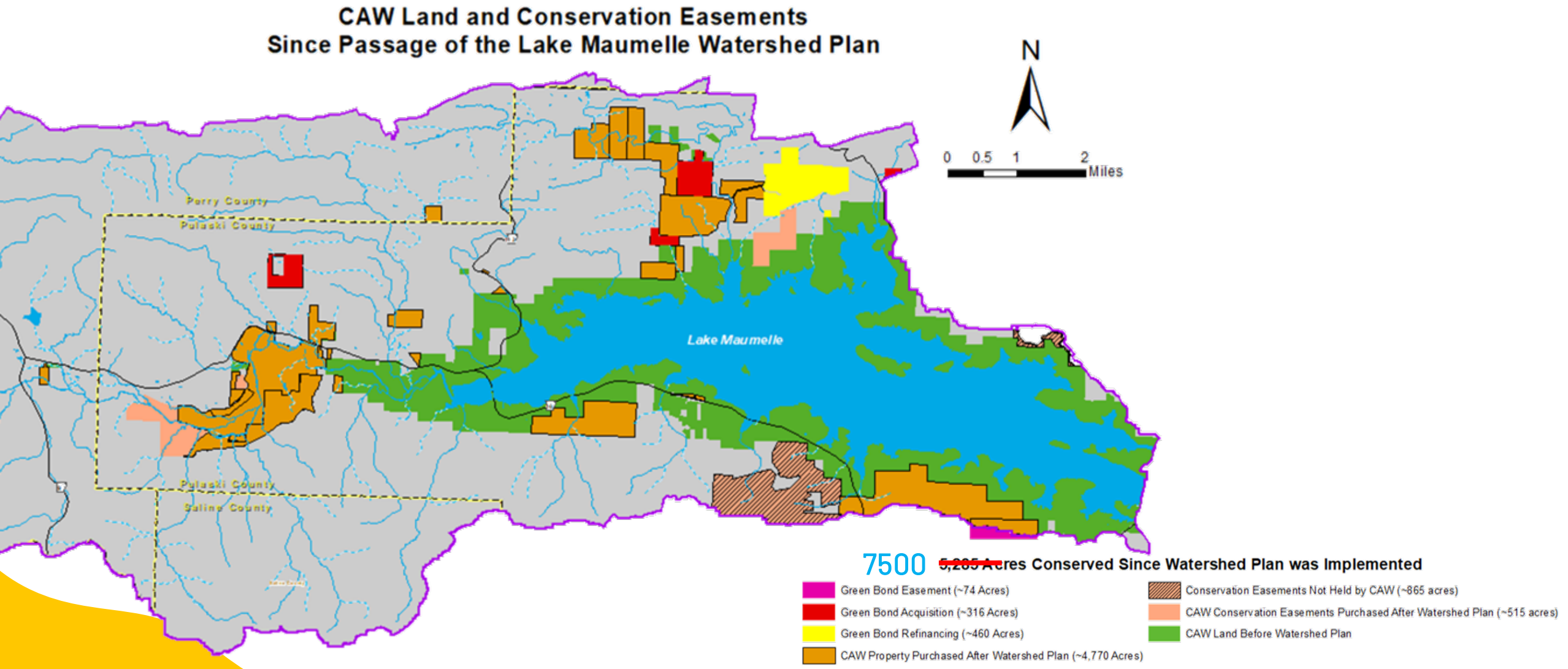


Forest Legacy Purchase

The Nature Conservancy



CAW-Owned Watershed Lands



Watershed Ownership*

	Acres	% of Watershed
CAW Total	23,971	28
USFS	13,591	16
Non-CAW Held Easement	856	1
TIMOs	28,603	33
Private/Other	20,652	23
Watershed	**87,680**	**100**

*Lake Maumelle Watershed

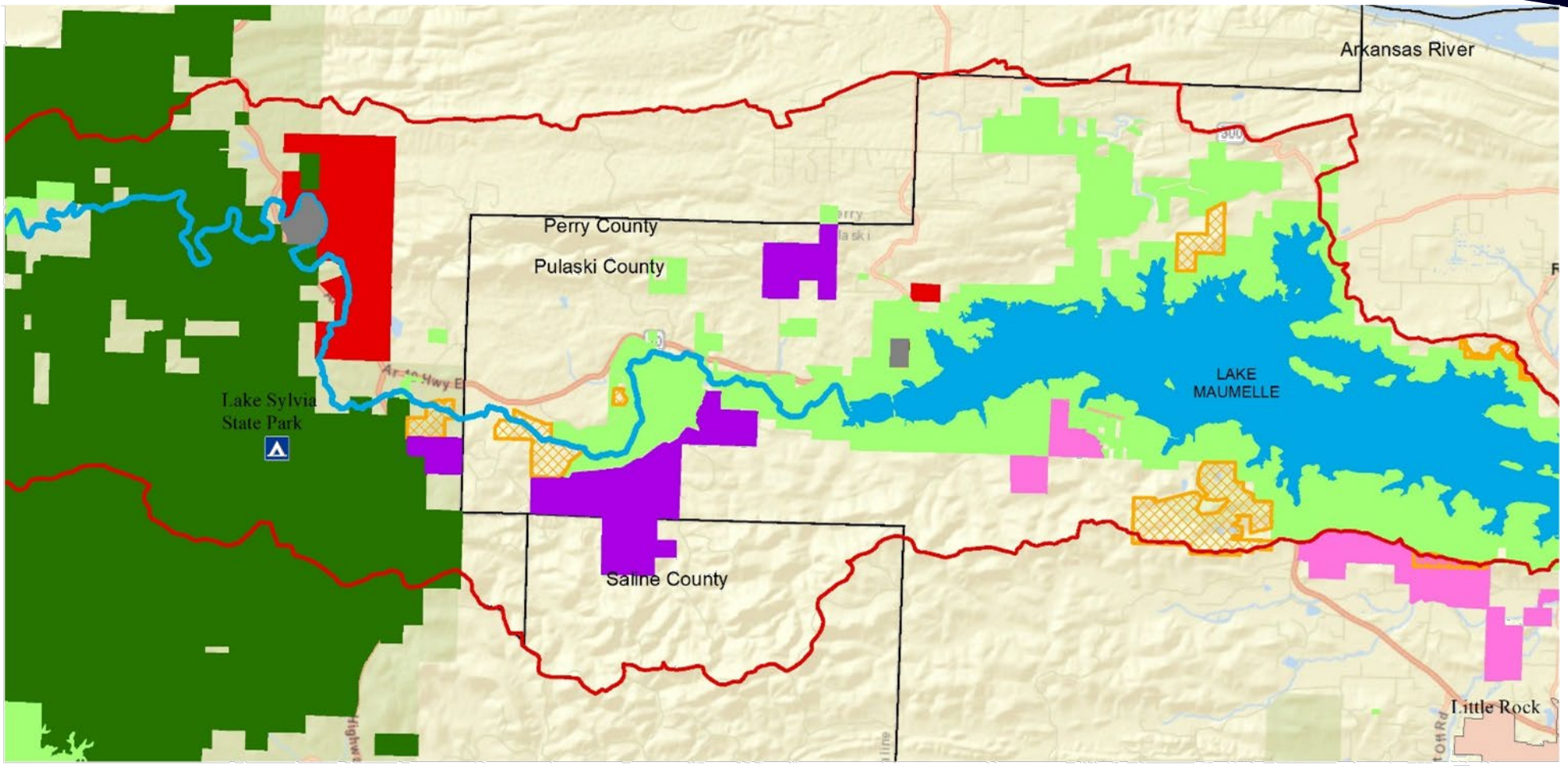
45% of Watershed currently conserved

Major Tributaries Buffer Ownership

- **48% Conserved**
- **31% TIMO's**
- **21% Private**

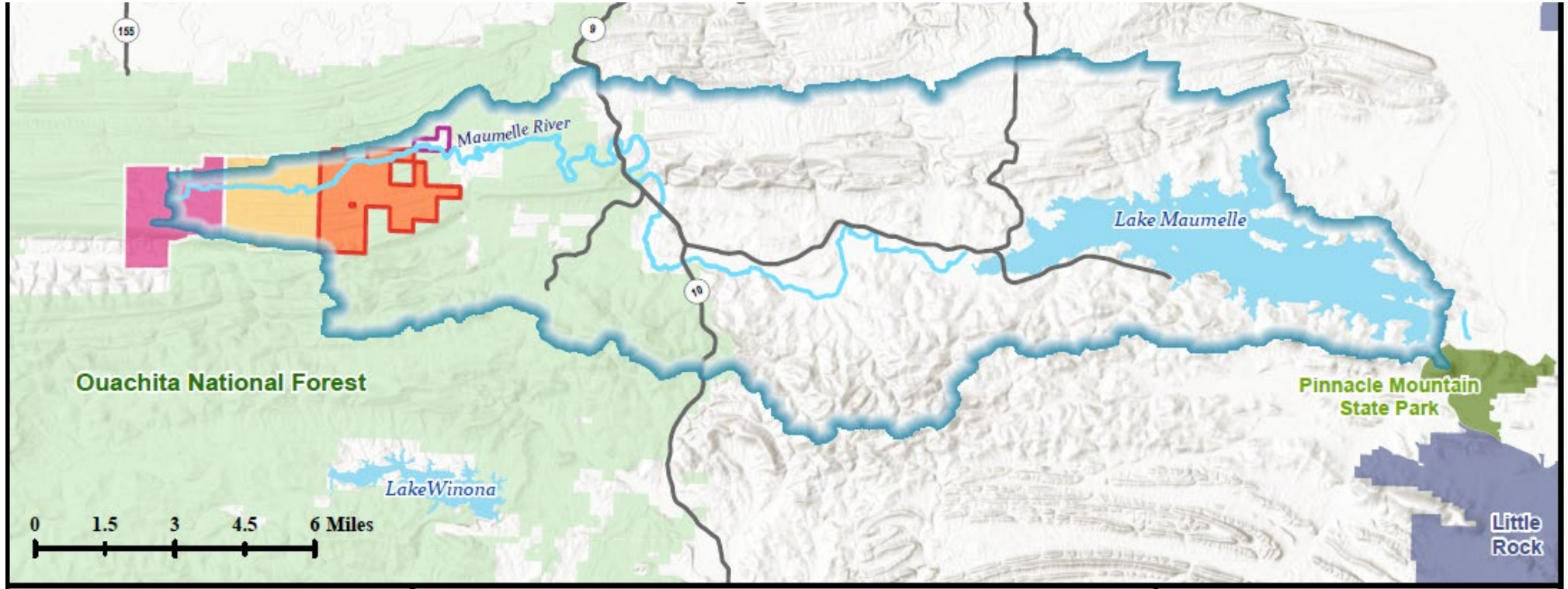
Where are we going?....

Forest Legacy Future Phase

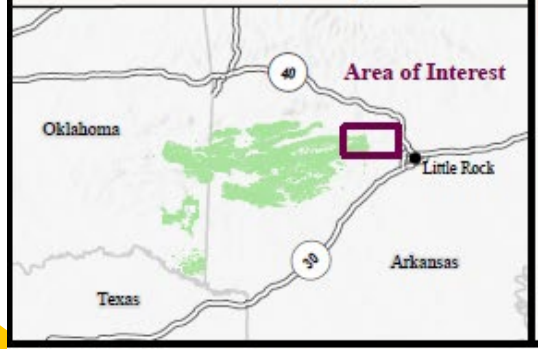


Partnership with National Forest

The Nature Conservancy



Vicinity Map



Legend

- East Tract - Phase 1 (2,556 Ac.)
- Central Tract - Phase 2 (2,360 Ac.)
- West Tract - Phase 3 (2,600 Ac.)
- National Forest System Lands
- Acquisition in Process (159 Ac.)
- State Park
- Municipal Boundary
- Maumelle Watershed

Disclaimer

The USDA Forest Service makes no warranty, expressed or implied regarding the data displayed on this map, and reserves the right to correct, update, modify, or replace this information without notification.

References

Data acquired from a variety of sources of differing accuracy, precision and reliability. Features represented by the data may not reference accurate geographic locations.

Maumelle River Tracts

Land and Water Conservation Fund Acquisition Proposal

U.S. Forest Service - Southern Region
Ouachita National Forest
U.S. Congressional District 2-AR

T3N-R19W Sec. 13, 24-26 & 35-36
T3N-R18W Sec. 12-24 & 27-30
5th Principal Meridian, Perry County, AR

Copies of this map are available for public inspection in the Forest Supervisor's Office, Ouachita National Forest, Hot Springs, AR.

Map Publication Date: 07-11-2023 \ Version #3

Data used in creation of this map are on file with Ouachita National Forest, Hot Springs, AR.

Watershed Ownership* Scenario FL and LWCF

	Acres	% of Watershed
CAW Total	26,263	30
USFS	19,715	22
Non-CAW Held Easement	865	1
TIMOs	20,562	23
Private/Other	20,952	23
Watershed	**87,680**	**100**

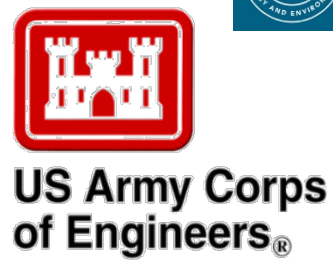
*Lake Maumelle Watershed

53% (+11%) of Watershed conserved

Major Tributaries Buffer Ownership

- **66% (+19%) Conserved**
- **13% TIMO's**
- **21% Private**

57% Protected and 76% Riparian



QUESTIONS?

Raven L. Lawson (TNC)

Deputy Director of Conservation

raven.lawson@tnc.org

Bryan Rupar (CAW)

Watershed Protection Manager

bryan.rupar@carkw.com