

# Managing Nutrients in NC: Watershed Rules, Achievements, & New Directions

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# Agenda

- Background
  - Clean Water Act requirements for states
  - Nutrient over-enrichment & why care
  - North Carolina NSW strategies
- Agriculture Rules
  - Reduction requirements per Rule
  - Report contributors & data utilized
  - CY2024 results
- Updates
  - Water quality status
  - NSW strategy development and revision





A map of the Yadkin River basin in North Carolina, showing the river and its tributaries. The map is light blue and white. The word "BACKGROUND" is overlaid in large, bold, black capital letters across the center of the map. The bottom portion of the image is a solid dark blue horizontal bar.

# BACKGROUND

# Clean Water Act Requirements for States

1. Designate water uses (e.g. recreation, water supply, aquatic life).

# Clean Water Act Requirements for States

North Carolina 15A NCAC 02B Water Quality Standards for Surface Waters															
Pollutant or Parameter	CAS #	Freshwater			Fresh & Salt	Saltwater			Supplemental Classifications			Synonyms & Other Information	Cancer Endpoint <sup>10</sup> (EC & WS)	Reference Source (See supporting info tab)	
		Class B	Class WS (I - V)	All waters (Class C)	All waters (Class C & SC)	All waters (Class SC)	Class SB	Class SA	Trout <sup>2</sup>	Swamp Waters <sup>5</sup>	High Quality Waters <sup>7</sup>				
		Primary Recreation <sup>8</sup>	Water Supply <sup>5</sup>	Aquatic Life <sup>1</sup> & Secondary Recreation <sup>4</sup>	Fish Consumption <sup>3</sup>	Aquatic Life <sup>1</sup> & Secondary Recreation <sup>4</sup>	Primary Recreation <sup>8</sup>	Shellfish <sup>9</sup>							
Aldrin	309-00-1													EPA QCW 1986; EPA HHCCM 2002	
Ammonia														NC	
Arsenic <sup>11</sup>	7440-38-2		10 (t)	Acute: 340 (d) Chronic: 150 (d)	10 (t)	Acute: 69 (d) Chronic: 36 (d)						Dissolved metal for aquatic life, Total metal for HH & WS	Yes	EPA NRWQC (AL); EPA NPDWR 2006	
Barium	7440-39-3		1000 (t)										No	IRIS & RAIS 11/08	
Benzene	71-43-2		1.19		51								Yes	IRIS 2000	
Beryllium <sup>11</sup>	7440-41-7			Acute: 65 (d) Chronic: 6.5 (d)								Dissolved metal for aquatic life	NA	NC calculation. Based on LC50 data from EPA AWQC 1980	
Biological Oxygen Demand (BOD)											5000 (E)	Effluent Limit	NA	NC	
Cadmium <sup>11</sup>	7440-43-9			Acute: Calc (d,h) Chronic:		Acute: 33 (d) Chronic:						Acute: Calc (d,h) Chronic:	<a href="#">Click to calculate freshwater aquatic</a>	NA	EPA 2016/State update 2022

2. Set water quality standards (WQS) to protect designated uses.

# Clean Water Act Requirements for States

3. Monitor and assess waters to see if standards are met (Integrated Report).



# Clean Water Act Requirements for States

NC 2022 Integrated Report  
Water Quality Assessment

AU ID Search  
Enter Number

AU Name Search  
e.g. "Mill Creek-Neuse"

## Filters

Primary Integrated Report Category

- 1 - Meeting Criteria
- 3 - Data Inconclusive
- 4 - Exceeding Criteria, has TMDL/Mgmt. Strategy
- 5 - "303(d) List" - Exceeding Criteria

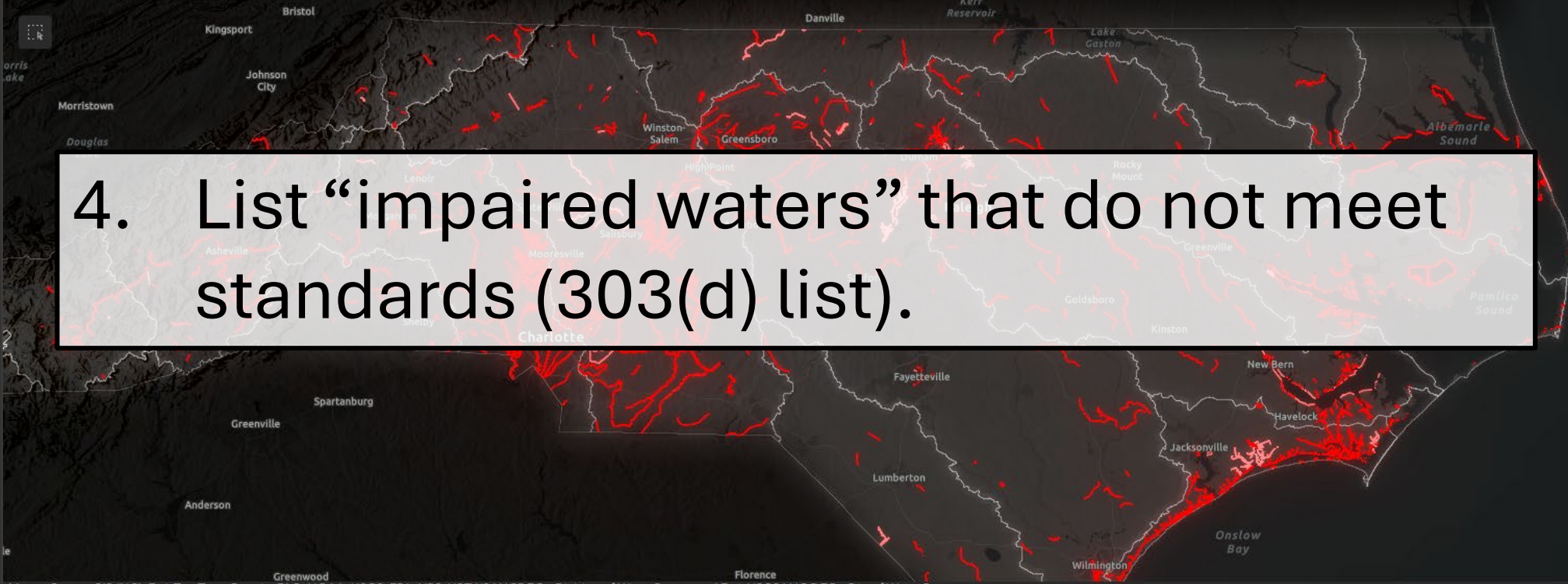
Integrated Report Subcategory  
All

Parameter  
All

Parameter Detailed  
All

River Basin  
All

Waterbody Type  
All



Moore County GIS (NC), Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, NPS, USFWS | NCDEQ - Division of Water Resources | Esri, USGS | NC DEQ - Div. of Water Resources

Powered by Esri

AU Name	AU ID	AU Number	Parameter	IR Category	Waterbody Type	Classification
Abbotts Creek	1563	12-119-(1)	Fish Community (Nar, AL, FW)	5	Creek	WS-III
Abbotts Creek	12986	12-119-(6)b	Benthos (Nar, AL, FW)	5	Stream	C
Abbotts Creek (including Lexi...	13899	12-119-(4.5)b	Chlorophyll a (40 µg/l, AL, NC)	5	Creek Impoundment	WS-III;CA
Abbotts Creek Arm of High P...	1541	12-119-E...	Chlorophyll a (40 µg/l, AL, NC)	5	Stream	WS-III

Learn more about the [Integrated Report](#)

1,843 Filtered/Selected Assessments

Reset All Filters -->

# Clean Water Act Requirements for States

NC TMDL and TMDL Alternative Watersheds

Plan Type: No Selection | River Basin: No Selection | Parameters (multiple selectio...): No Selection

### Project List

- Turkey Creek - EPA Approved 10/20/2022
- Virginia Creek - EPA Approved 6/13/2022
- Walnut Creek - EPA Approved 7/27/2021
- Haskett Creek - EPA Approved 4/21/2021
- Swearing Creek - EPA Approved 11/30/2019
- Hominy Swamp 4b Plan - EPA Approved 8/18/2019
- Pine Knoll Shores Nine Element Plan - EPA Approved 8/18/2019
- Bald Creek - EPA Approved 6/19/2017
- 2015 Addendum to the Low pH TMDL for the Great Smoky Mountains National Park, TN - EPA Approved 4/18/2016
- 2015 Addendum to the Low pH TMDL for the Great Smoky Mountains National Park, TN - EPA Approved 4/18/2016
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[Click HERE for information on the Statewide Mercury TMDL](#)

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### Project Details

Project Name	Dan and Smith River Fecal Coliform Addendum TMDL
PlanType	TMDL
RiverBasin	Roanoke
Parameter	Fecal Coliform
TMDL Document	<a href="#">View</a>
Appendix	

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**5. Develop TMDLs (Total Maximum Daily Loads) or alternative restoration strategies for pollutants causing impairments.**

Major River Basins

TMDL and Alternative Watersheds Legend:  
TMDL (Blue)  
4b (Yellow)  
5r (Green)

For more info visit:  
• NC TMDLs  
• NC TMDL Alternatives

Reset Map -->

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Fish Kills &  
Public Health  
Concerns



Algal Blooms



Use Nuisances

**Why care  
about  
nutrients?**

# Fish Kills & Public Health Concerns

A photograph showing a riverbank with a large number of dead fish piled up along the shore. The fish are mostly silver and appear to be dead, lying on the sandy and grassy bank. The water is calm and reflects the surrounding greenery.

# Algal Blooms

A photograph of a river covered in a thick green algal bloom. The water is completely obscured by a dense layer of bright green algae. The surrounding trees and sky are visible in the background, but the water itself is a solid green color.

Abundance of nutrients (nitrogen and phosphorus) in water ecosystems leads to eutrophication which can cause harmful algal blooms and fish kills.

# Fish Kills & Public Health Concerns

A photograph showing a riverbank with a large number of dead fish piled up along the shore. The fish are mostly silver and appear to be dead, lying on the sandy and grassy bank. The water is calm and reflects the surrounding greenery.

## Algal Blooms

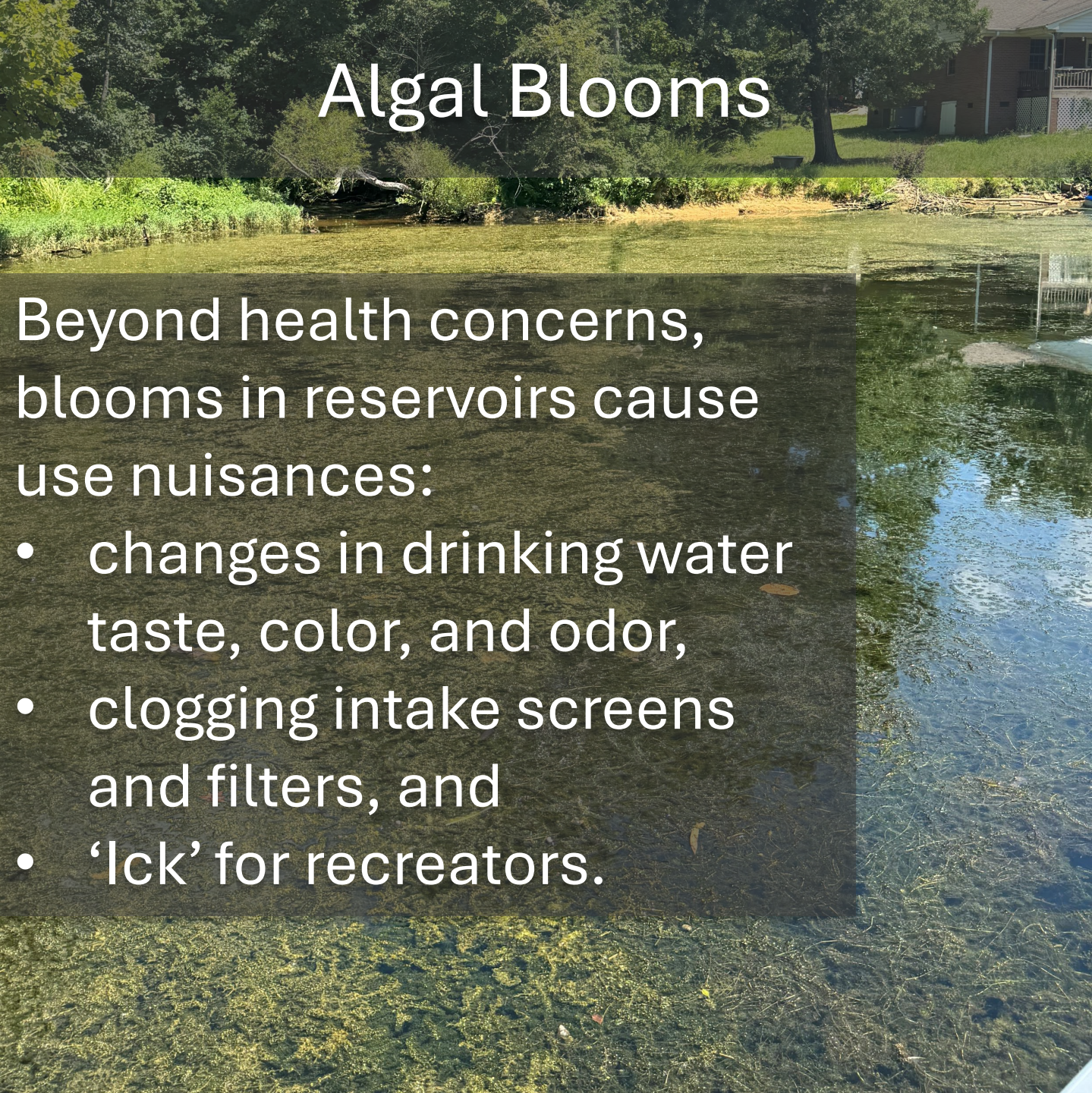
A photograph of a river with a thick green algal bloom covering the surface. The water is a vibrant green color, and the surrounding trees and sky are reflected in the water. The bloom appears to be a dense layer of cyanobacteria.

Slow-moving waters in NC (reservoirs, estuaries, freshwater wetlands) are particularly prone to cyanobacterial blooms that disperse toxins in the water prompting public health advisories (for people, pets, and wildlife).

# Use Nuisances



# Algal Blooms



Beyond health concerns, blooms in reservoirs cause use nuisances:

- changes in drinking water taste, color, and odor,
- clogging intake screens and filters, and
- 'lck' for recreators.

**A river runs through it**

Even if there were  
major impact on

A growing body  
of ever-larger vol  
substances th  
nutrients ca

In recent  
sensitive  
pollutio

This i  
play  
hav

**North Carolina pioneered basinwide nutrient strategies or “Nutrient Sensitive Waters” (NSW) strategies in the 1990s in response to harmful algal blooms and fish kills occurring in the Neuse and Tar-Pamlico estuaries (and resulting public pressure).**

JOURNAL ARTICLE  
**History of Toxic Pfiesteria in North Carolina Estuaries from 1991 to the Present: Many toxic Pfiesteria outbreaks have plagued the Albemarle-Pamlico Estuarine System, including after the 1997 outbreak**  
Joann M. Burkholder

...a billion fish  
...these events had  
...when the organism was first  
...agent (Burkholder et al. 1992, 2001a,  
...1997). In 1997, 50,000 fish died in a small area of the  
...from toxic Pfiesteria, and press coverage of the event was like

1992 (11)

2001 (11)

At the time, these strategies were groundbreaking for addressing both **point** and **nonpoint** sources of nutrient pollution.

15A NCAC 02B Rule	Rule Title
.0701	Definitions
.0703	Nutrient Offset Credit Trading
.0710	Purpose & Scope
.0711	Stormwater
.0712	Agriculture
.0713	Wastewater Discharge Requirements
.0233/.0714	Protection and Maintenance of Existing Riparian
.0241/.0715	Delegation of Authority (Riparian Buffers)

EPA has long accepted NC's NSW strategies as valid alternative TMDLs for addressing nutrient related water quality impairments.



# NSW Strategy Challenges

- Reactive
- Resource and time intensive to develop
- Subject to interventions (legislative, etc.)



UNC Institute for the Environment, & North Carolina Collaboratory. (2023). *Field technician retrieving sampling equipment from buoy* [Photograph]. In *Falls Lake Study: Final Report to the North Carolina General Assembly (December 2023)* (p. 8). <https://nutrients.web.unc.edu/wp-content/uploads/sites/19393/2024/01/Falls-Lake-Final-Report-2023.pdf>

# Components of NC Nutrient Sensitive Waters (NSW) Strategies

- **Stormwater Rule(s):**



- Regulates **new development** and in some watersheds **existing development** under local, state, or federal control (e.g. NCDOT, etc.).
- Requires local governments to establish stormwater programs (e.g. disturbance thresholds, onsite and offsite treatment requirements, etc.)

- **Buffer Rule:**



- **50 feet required** for all land use changes
- Exempts footprint of existing and ongoing uses in the buffer



- **Agriculture Rule:**



- **Collective compliance** approach of cropland & pastureland N loss accounting and assessing P loss risk

- **Wastewater Rule:**



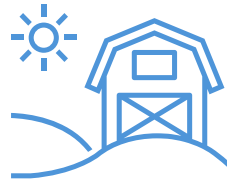
- **Discharge limits** for different sized facilities (group compliance options available)
- Nutrient credit/offset trading options (existing and new/expanding facilities)

**Basis is chlorophyll a standard, with set model-based reduction goals!**



# Why are agriculture and development regulated in NSW strategies?

## Agriculture's Role



- Is a major land use in NSW basins and watersheds
- Ag drainage (canals, tile, etc.) has changed natural runoff & infiltration patterns
- Runoff from agricultural land is a significant nonpoint source contributor of nutrients, sediment and bacteria

## Development's Role



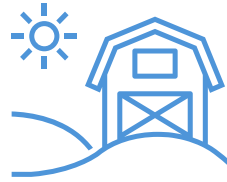
- Is a significant (and growing) land use in NSW watersheds
- Impervious surface changes runoff patterns and increases water velocity causing downstream issues
- Runoff from developed land is a significant nonpoint source contributor of nutrients and sediment

**Both sectors are major contributors of nutrients!**



# What responsibilities are mandated by regulation for the sectors?

## Agriculture's Responsibilities



- Farmers are implementing BMPs to infiltrate water, control runoff, and reduce contaminant losses
- Some BMPs are required (2T Rules, buffer for new ag land, etc.) but many are voluntary
- **Must show collective progress as a sector**

## Development's Responsibilities



- New dev. required to establish 50' buffers & follow erosion control (E&SC) during construction
- New dev. must plan for post-construction stormwater management and adhere to local programs
- Local governments are required to reduce contributions from existing development (\$\$\$)

**Both sectors have nutrient reduction regulatory requirements!**



# But wait, why isn't residential fertilizer use regulated?



- The **NCDA&CS** regulates manufacture, sale, & distribution of fertilizers in NC.
- The **NCDEQ/EMC** can regulate land application of fertilizers.
- NC G.S. 106-678:
  - **Prohibits local governments** from adopting any ordinance or resolution regulating the use or application of fertilizer unless approval is obtained from NC DEQ/EMC
  - The **NCDEQ/EMC regulatory authority is limited** to only controlling fertilizer application within water quality protection strategies or NPDES permits



# But wait, why isn't residential fertilizer use regulated?

## Bottomline:

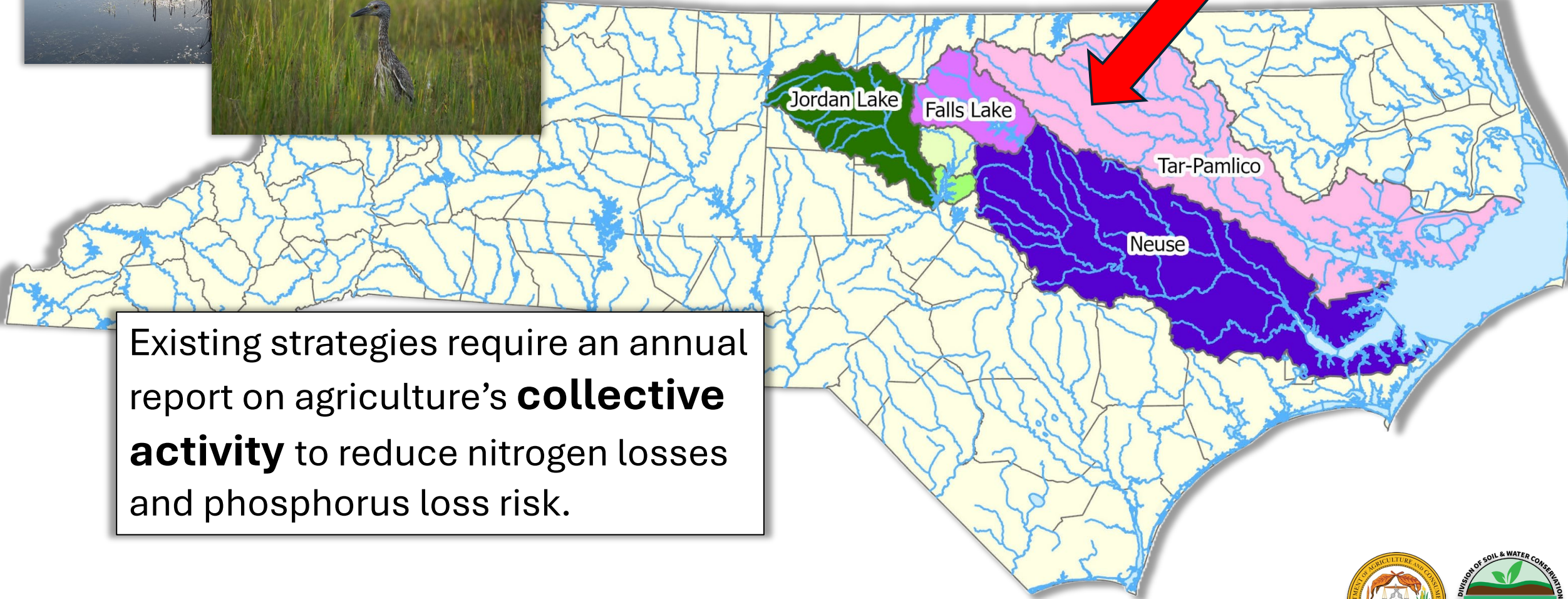
- Enforcing residential fertilizer use across residential acres in NSW watersheds **requires significant state staffing, monitoring and compliance infrastructure, which DEQ does not possess**
- Shifting authority to local governments, which may possess staff & funds to accomplish, is hindered by state statute



A map of North Carolina showing various agricultural regions and water bodies. The map is light blue and white, with labels for several locations: Hays, Elkin, Jonesville, Boonville, Silgan, Roaring River, Ronda, Millers Creek, North Wilkesboro, Yadkinville, and Lewisville. The text "AGRICULTURE RULES" is overlaid in large, bold, black letters across the center of the map.

# AGRICULTURE RULES

# Existing NSW Strategies



Existing strategies require an annual report on agriculture's **collective activity** to reduce nitrogen losses and phosphorus loss risk.



# Existing Strategies Neuse River Basin

Rule effective 1997  
Readopted April 2020

Baseline: 1991 –  
1995  
30% Nitrogen loss  
reduction  
(cropland only)



Photo by Bruce Fritz, USDA Agricultural Research Service

[CY2024 Annual Report Link](#)



# Existing Strategies Tar-Pamlico River Basin

Rule effective 2001  
Readopted April 2020

Baseline: 1991  
30% Nitrogen loss  
reduction  
No phosphorus loss  
increase  
(cropland only)



Photo by Scott Bauer, USDA Agricultural Research Service

[CY2024 Annual Report Link](#)

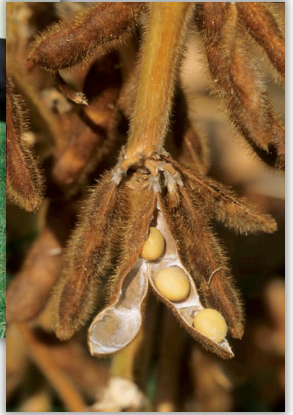
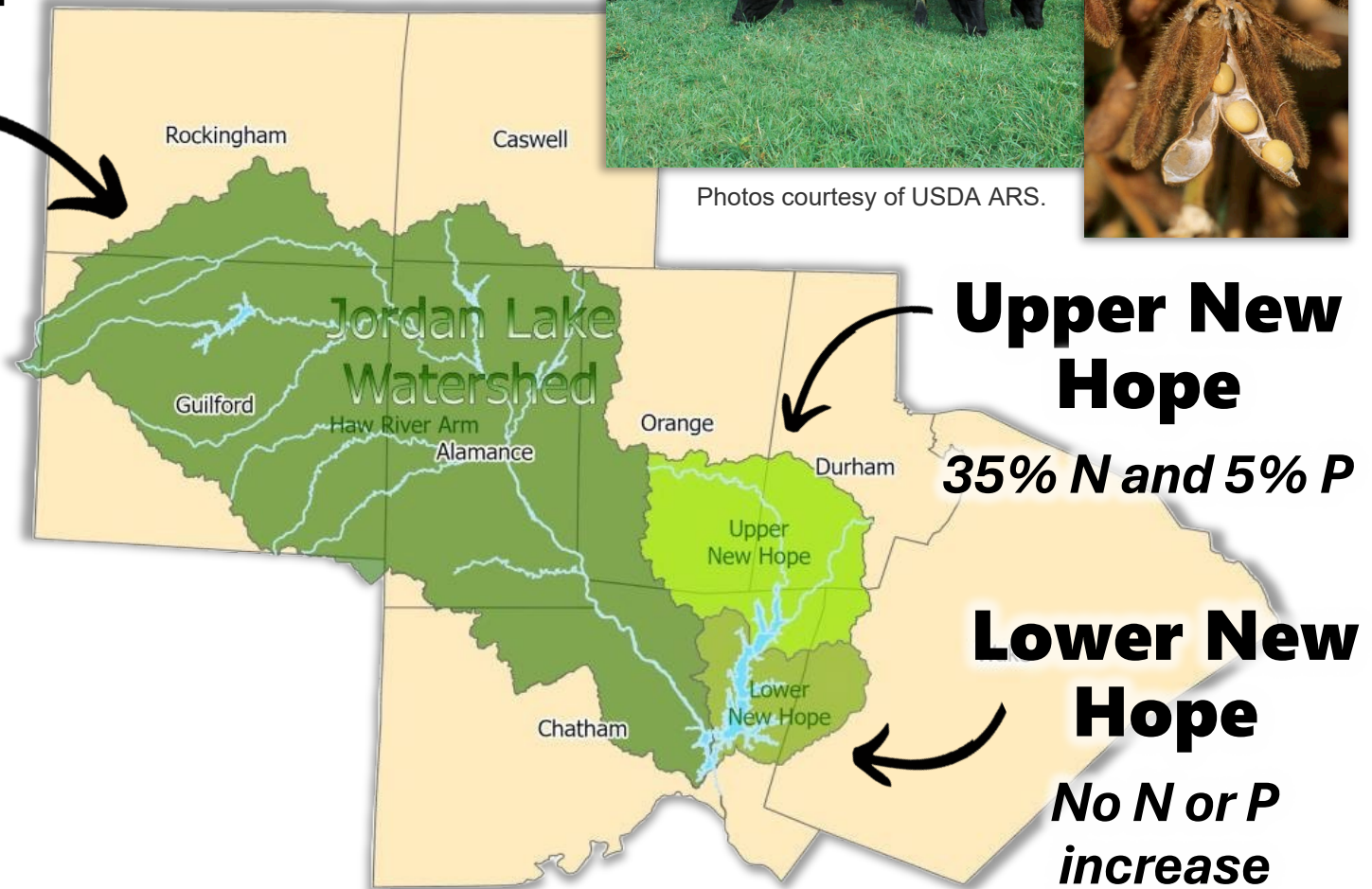


# Existing Strategies Jordan Lake Watershed

**Haw**  
8% N and 5% P

Rule effective 2009  
*Undergoing Readoption*

Baseline: 1997 - 2001  
Nitrogen and phosphorus  
reductions by  
subwatershed  
(cropland & pastureland)



[CY2024 Annual Report Link](#)



# Existing Strategies Falls Lake Watershed

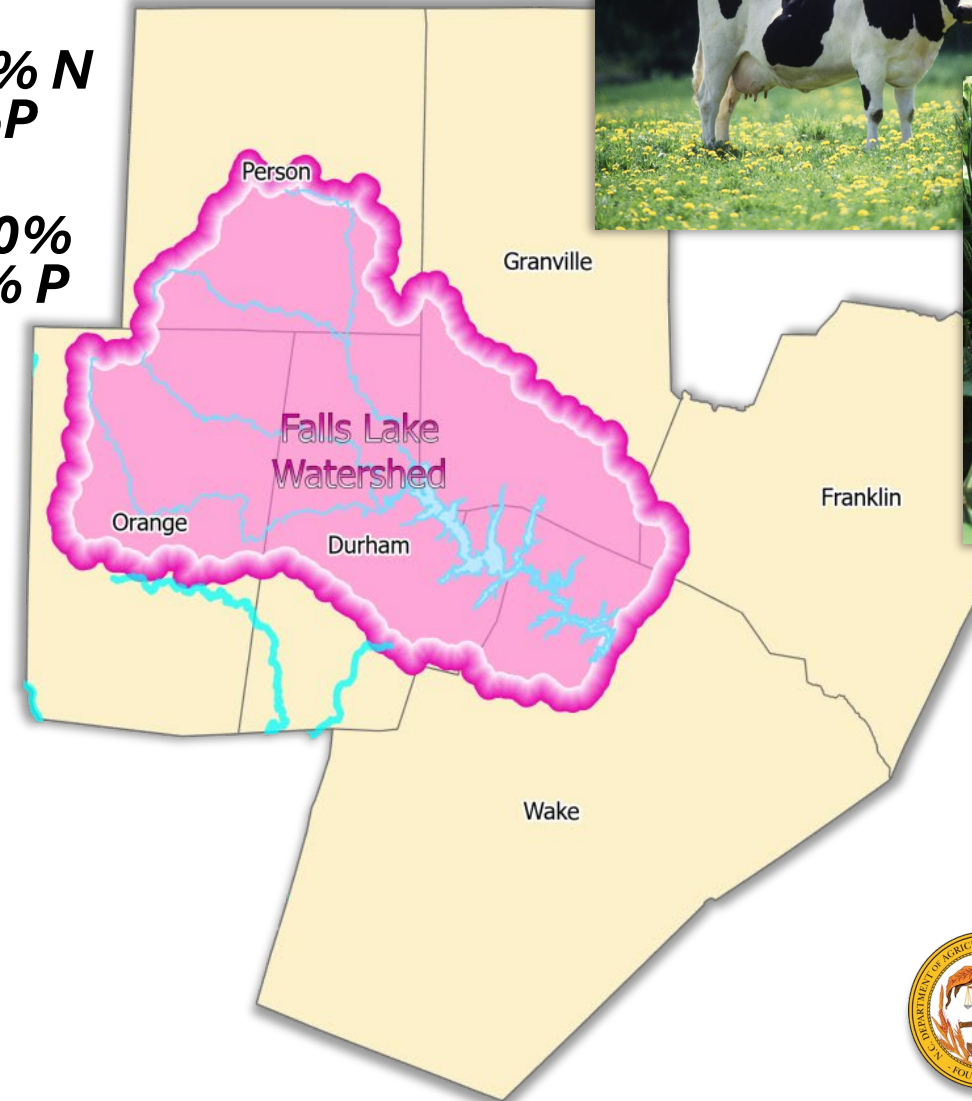
Rule effective 2011  
*Undergoing  
Readoption*

**2020** *Stage I: 20% N  
and 40% P*

**2041** *Stage II: 40%  
N and 77% P*

Baseline: 2006  
Nitrogen and  
phosphorus  
reductions by time  
periods  
(cropland &  
pastureland)

[CY2024 Annual  
Report Link](#)



Photos courtesy of  
USDA ARS.



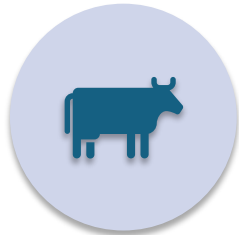
# Agriculture Data Collected & Incorporated



Farm Service Agency  
Annual Crop Reports or  
USDA NASS  
Annual/Census Crop Data



Fertilization rate application  
data from LACs and  
regional agronomists



USDA NASS livestock data  
& Agriculture Census Data



Local knowledge and data  
on farmer-implemented  
nutrient-reducing BMPs not  
supported by cost-share  
funding



Select BMPs implemented  
using state and federal cost  
share funding



*We rely on local  
knowledge and expertise  
to make sure collected  
data is complete and  
accurate.*

*Special thanks to all LAC  
members, including  
District Staff and  
Supervisors, who  
contribute to annual  
reporting efforts!*



# CY2024 Results Nitrogen Tracking

~\$2.1 million ACSP spent in total within NSW watersheds

~\$8.6 million EQIP spent in total within counties in NSW watersheds

57% N reduction (crop)  
36% N reduction (pasture)

52% N reduction

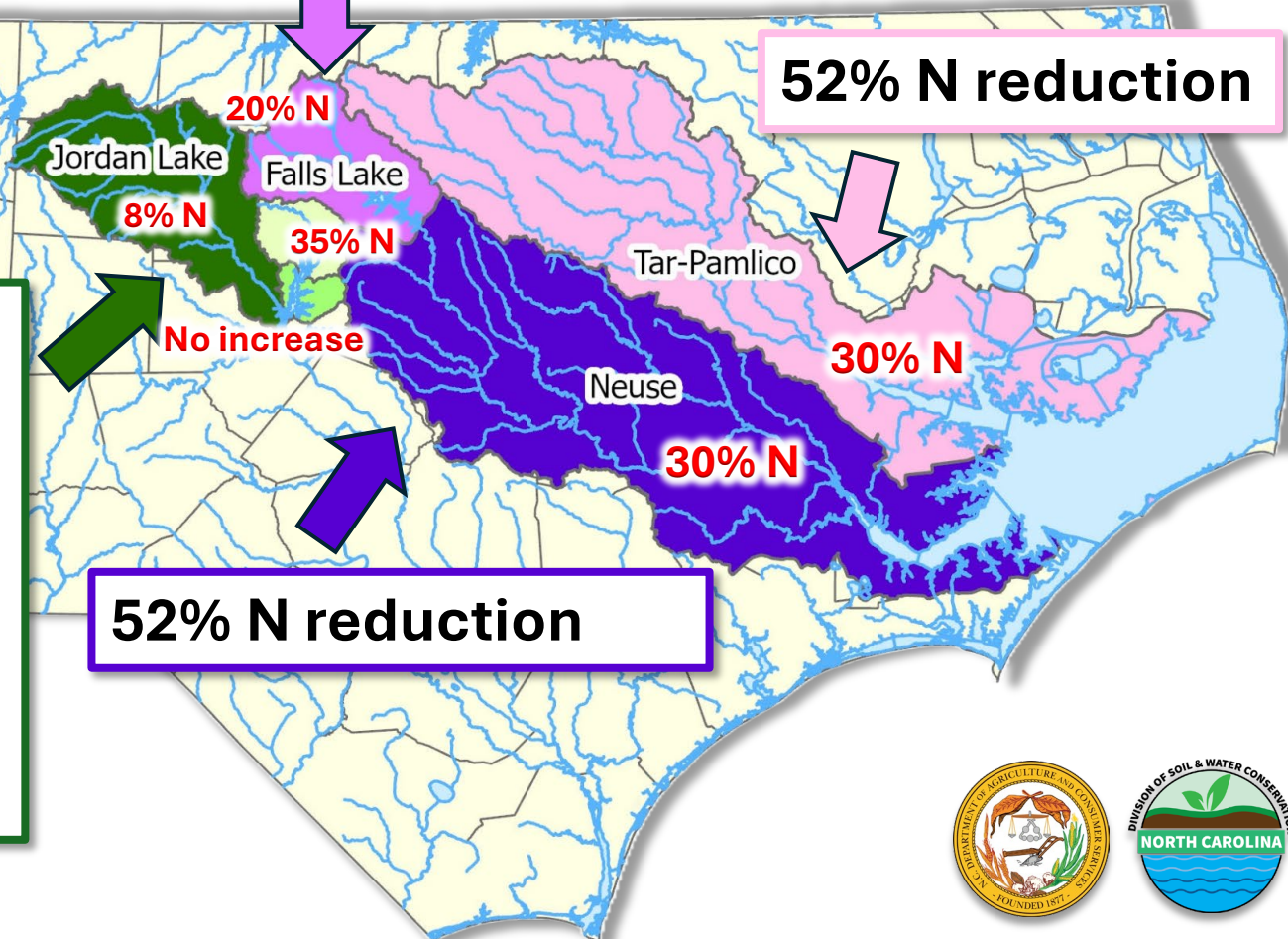
## Crop (2023):

- 45% N reduction (Haw)
- 59% N reduction (UNH)
- 58% N reduction (LNH)

## Pasture (2022 Cycle):

- 56% N reduction (Haw)
- 52% N reduction (UNH)
- 40% N reduction (LNH)

NASS data availability issues limit annual N-loss reduction comparisons to baseline in Jordan.



# CY2024 Results Phosphorus Tracking

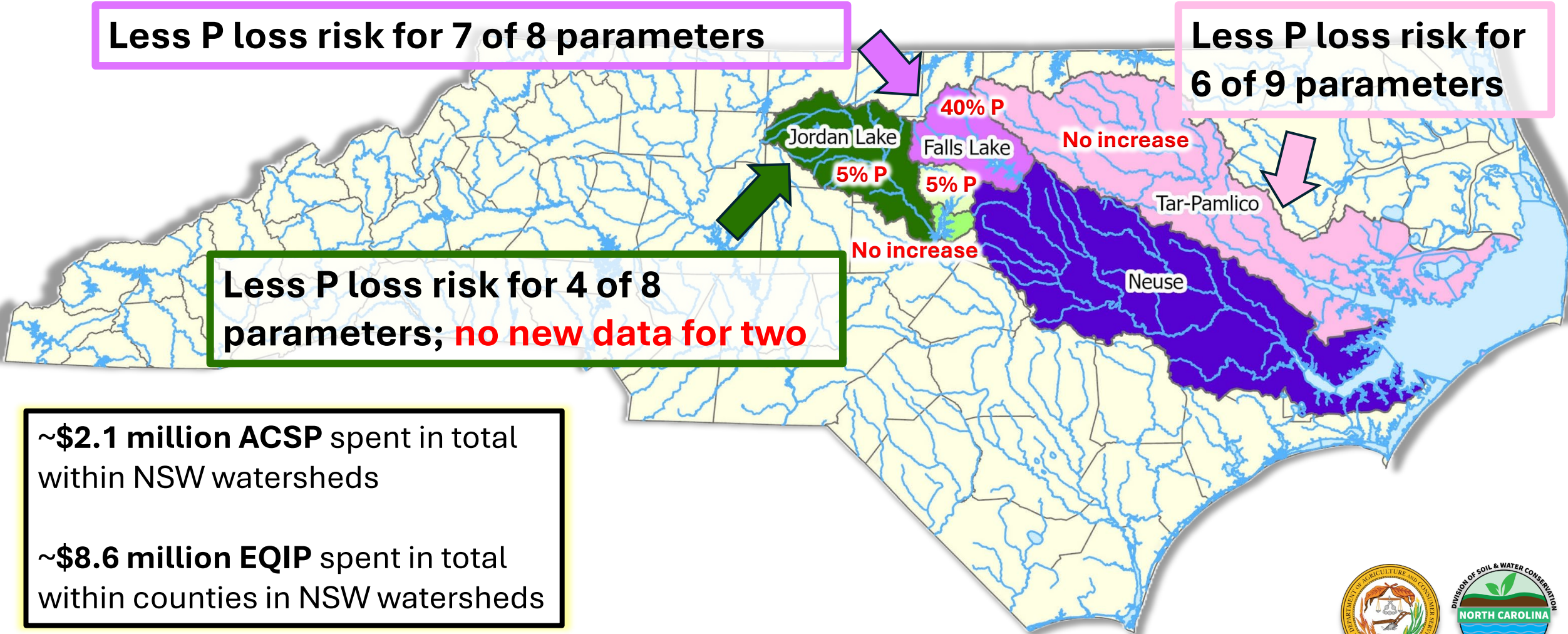
Less P loss risk for 7 of 8 parameters

Less P loss risk for 6 of 9 parameters

Less P loss risk for 4 of 8 parameters; **no new data for two**

~\$2.1 million ACSP spent in total within NSW watersheds

~\$8.6 million EQIP spent in total within counties in NSW watersheds





# UPDATES

# The BIG Question

- Previously SWCC Members have asked, “**Is water quality improving?**”

**Bottomline: It’s complicated. Estuaries and lakes are still **impaired**.**

- A supporting packet was prepared for Commission members summarizing water quality standards, monitoring, and water quality changes



# Key Takeaways from Support Packet

## → Still work to do

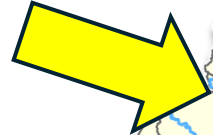
- Systems change! New issues arise!
- **Nonpoint source control** remains critical & challenging; rising organic N contributions is the latest obstacle
- Must continue monitoring algal activity & other parameters
- Continued investment is necessary in:
  - ✓ **Restoration practices** (streambank stabilization, etc.)
  - ✓ **Point source controls** (wastewater plant upgrades, etc.)
  - ✓ **Preservation** (forest & ag land with nutrient-reducing BMPs)

## → Will take a long time to see results

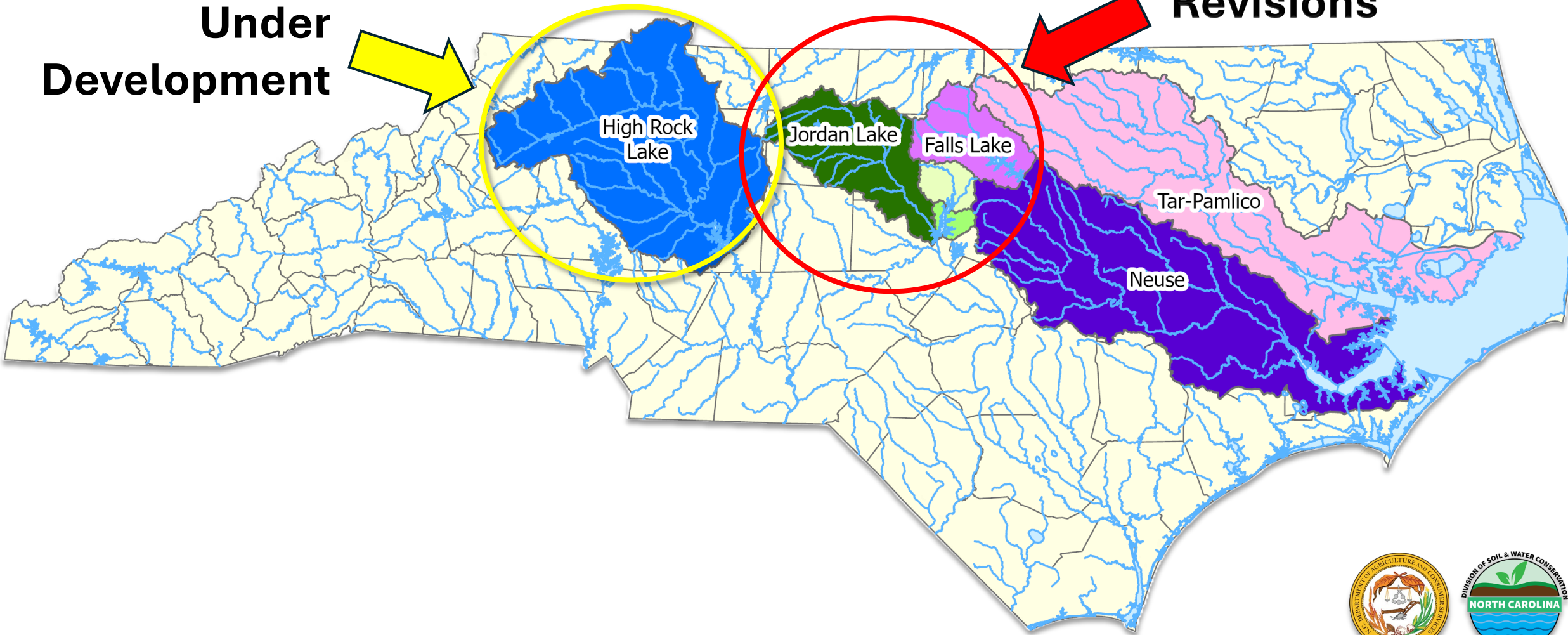


# NSW Strategy Revision & Development in NC


**Under  
Development**



**Undergoing  
Revisions**



# Jordan Lake Rulemaking Updates

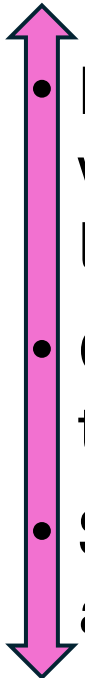
- 
- **Nov. 2023 – May 2025:** Stakeholder workgroups met & rule language was drafted
  - **May 2025 – Present:** Technical feedback provided on rule concepts
  - Awaiting EMC consideration

## Rule Concepts Expected Impacting Ag:

- Existing dev. investment pool option
- Cattle exclusion collective target
- Revised reporting



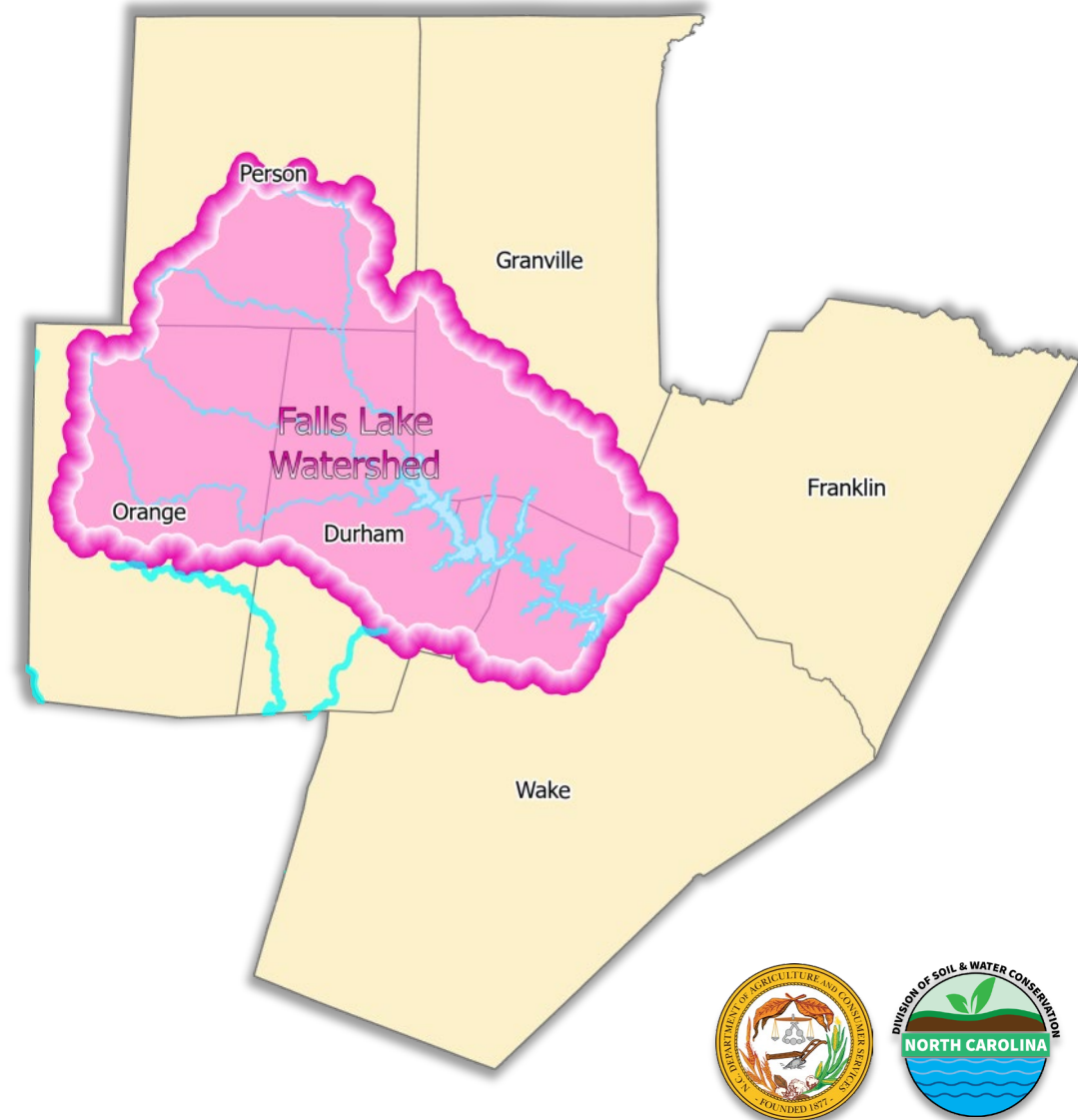
# Falls Lake Rulemaking Updates

- 
- **Nov. 2024 – Aug. 2025:** Stakeholder workgroups (led by UNRBA) met & rule language drafted
  - CES, DWR, and NCFB met several times to discuss Ag Rule revisions
  - **Sept. 2025 – Present:** DWR & UNRBA are negotiating rule language

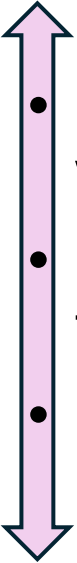
## Rule Concepts Expected

### Impacting Ag:

- Existing dev. investment pool option
- Revised reporting



# High Rock Lake Rulemaking Updates

- 
- **Nov. 2022 – Mar. 2024:** Stakeholder workgroups met & finalized reports
  - **Mar. 2024 – Nov. 2025:** Technical feedback provided on rule concepts
  - **Currently paused due to staffing change**

## Rule Concepts Expected Impacting Ag:

- Existing dev. investment pool option
- Cattle exclusion collective target & reporting
- Dry litter poultry waste management requirements





# Questions?

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