Nitrogen Offset Credits

For NPDES permits in the Neuse River Basin

Future of Nitrogen Trading in the Neuse River Basin
(Steve Tedder & Barrett Jenkins)

- Neuse Estuary TMDL
- Nitrogen Allocations/Trading
- Nitrogen Offset Credits
  - Riparian Buffer Restoration
  - Removal Rates
  - Transport Factors
  - Service Areas
  - Credit Release Schedules

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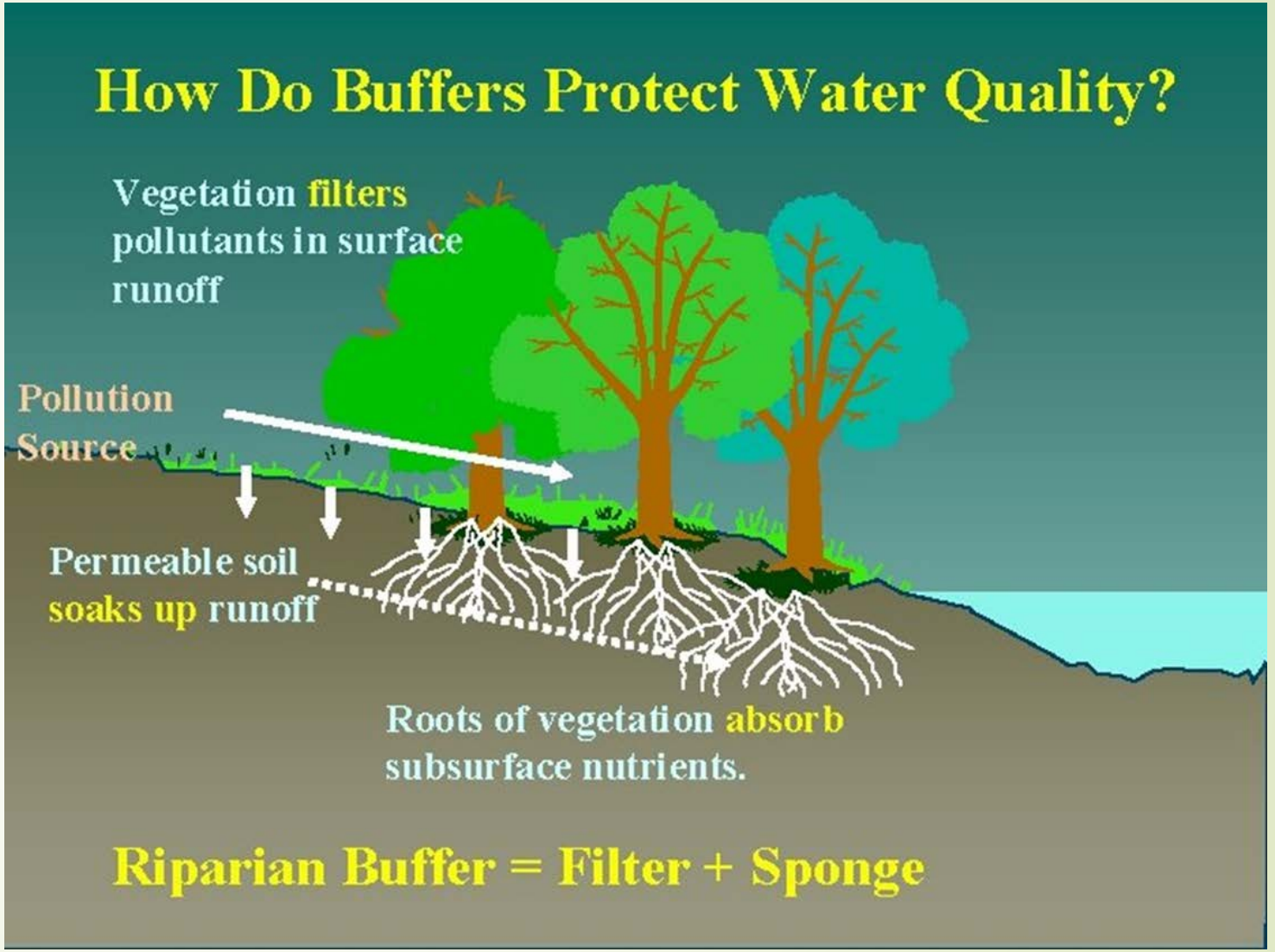
Everyone gets a slice of the pie

- TMDL sets total NPDES permitted nitrogen load draining to the neuse estuary
- Each permitted entity is allocated a “load” (aka slice of the pie) based on size of municipality

Everyone got a slice and not many want to share…….

Riparian Buffer Restoration as a Nutrient Offset

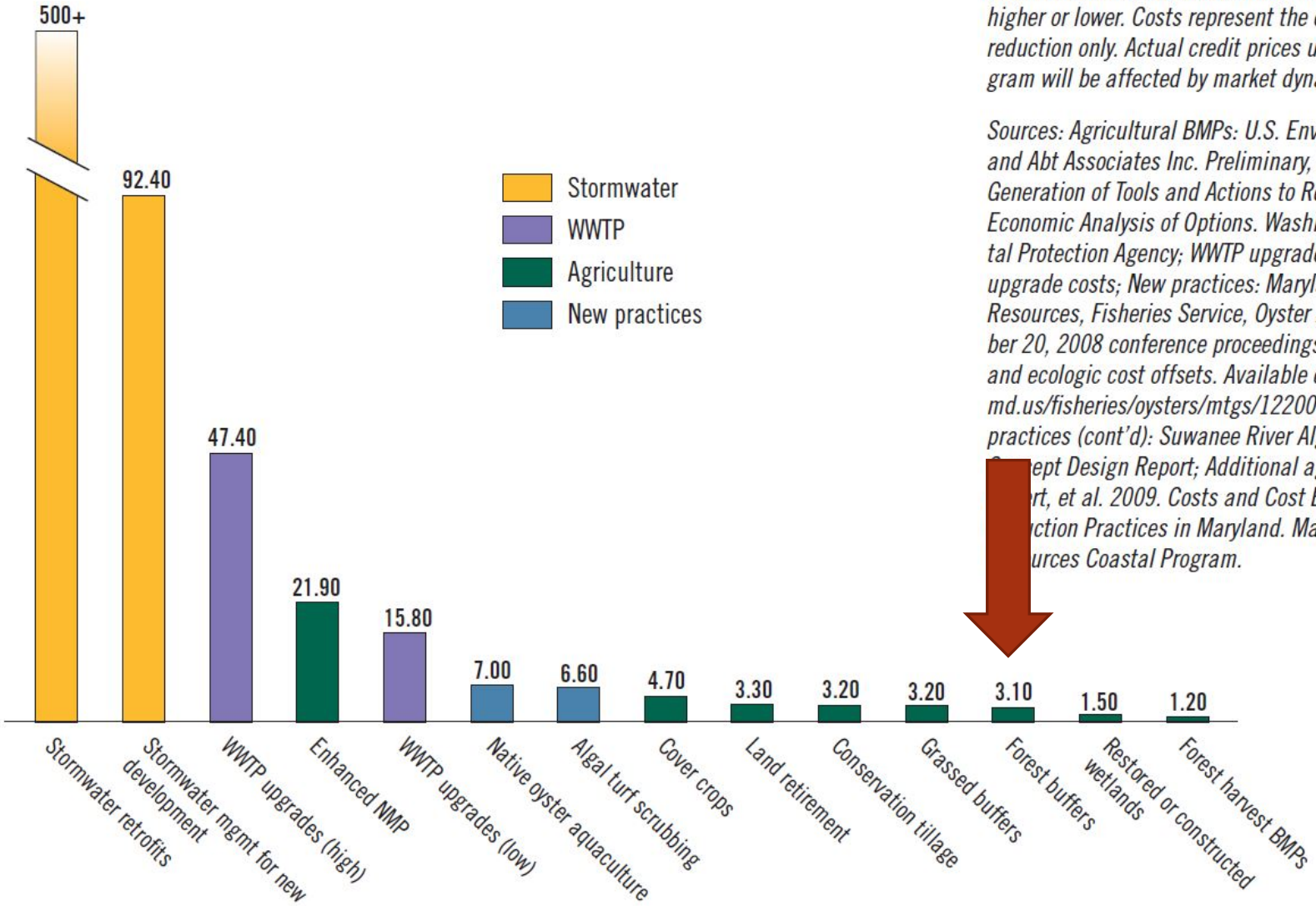
- Neuse estuary TMDL set up a program to protect riparian buffers in the neuse estuary watershed
- Private entities began "banking" riparian buffer restoration projects in the early 2000's to meet TMDL goals
- Developing riparian buffers for nutrient offset credits was a natural extension of this program



Why is Riparian Buffer Restoration the preferred Nutrient Offset approach?

FIGURE 1. Average Cost of Selected Nitrogen Reduction Measures

Dollars per pound of annual nitrogen reduction



Note: Cost estimates do not take into account the baseline or minimum practices that agriculture will have to implement prior to selling credits. Depending on which practices farmers implement first, the costs of agricultural nutrient reduction measures may be higher or lower. Costs represent the costs of achieving the nitrogen reduction only. Actual credit prices under a nutrient trading program will be affected by market dynamics of supply and demand.

Sources: Agricultural BMPs: U.S. Environmental Protection Agency and Abt Associates Inc. Preliminary, 2009. Chesapeake Bay: Next Generation of Tools and Actions to Restore the Bay: Preliminary Economic Analysis of Options. Washington, D.C.: U.S. Environmental Protection Agency; WWTP upgrades: WRI analysis using plant upgrade costs; New practices: Maryland Department of Natural Resources, Fisheries Service, Oyster Advisory Commission. December 20, 2008 conference proceedings: Oyster restoration economic and ecologic cost offsets. Available online at: http://www.dnr.state.md.us/fisheries/oysters/mtgs/122007/meeting122007.html; New practices (cont'd): Suwanee River Algal Turf Scrubbing System [illegible]ept Design Report; Additional agricultural BMPs from Wieland, [illegible]rt, et al. 2009. Costs and Cost Efficiencies for Some Nutrient [illegible]ction Practices in Maryland. Maryland Department of Natural [illegible]urces Coastal Program.

Considerations

- Less Staff Resources to dedicate
- Known End Product and Cost
- Ability to spread cost over many years
- Avoiding seeking permission to purchase properties outside jurisdiction
- Allows mitigation experts to oversee the effort long term
- Ability to negotiate agreements

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Background

- Restoration Systems provides turnkey water quality mitigation (stream, wetland, buffer, nutrient offsets)

- Developed first Nutrient Offset "Bank" in NC in 2008.

- Today nutrient offset credits in NC are used for both point and non-point source permittees

Key factors to consider in acquiring nutrient offset credits

- removal rates, uncertainty factor, transport factor, service area, credit release schedule

NC Division of Water Quality - Methodology and Calculations for determining Nutrient Reductions associated with Riparian Buffer Establishment

Nitrogen Water Quality Benefits for Riparian Buffer Restoration

1). Benefit of Land Use Change
2). Benefit of Nutrient Removal from Nonpoint Source Runoff
3). Benefit of Nutrient Removal from Periodic Overbank Flood

Nitrogen General Assumptions:

1. Life expectancy of Riparian Buffer is assumed to be 30 years. (Life expectancy for stormwater detention pond is 20 - 30 yrs)
2. Restored Riparian Buffer is assumed to be natural.

Effectiveness of Riparian Buffer	Annual Effectiveness (kg/ha/yr)	Annual Effectiveness (lb/ac/yr)	Effectiveness in 30 yrs (lb/ac)
Benefit (1)	11.08	9.89	296.6
Benefit (2)	70.09	62.[illegible]4	1876.1
Benefit (3)	3.75	[illegible]	100.4
Total	84.92	75.77	2273.0

Nitrogen Benefit Descriptions and Assumptions:

1) Benefit is due to change land use.
Assume existing land use export coefficient is a composite export coefficient with a value of 12.98 kg/ha (agriculture and urban).
Wetland export coefficient is 1.9 kg/ha.
The annual nutrient output is decreased by 11.08 kg/ha annually by land use changing.
2) Benefit is due to nitrogen removal from nonpoint source runoff.
Nutrient contribution/buffer treatment area ratio is approximately 10.8 (based on studies examined by Gannon 1997).
In flow loading is calculated by nutrient contribution area x composite export coefficient.
In flow loading is 10.8 ha x 12.98 kg/ha = 140 kg/ha/yr.
Nutrient removal due to this benefit is calculated by in flow loading x removal efficiency
*Gannon, Richard. 1997. Effectiveness of Wetland Riparian Areas for Treatment of Agricultural Pollution Sources: A Literature Review. (Draft)
The nitrogen removal efficiency is 50% based on various literature.
* Kadlec, Robert H. and Robert L. Knight. 1996. Treatment Wetland
* Moshiri, Gerald A.1993. Constructed Wetlands for Water Quality Improvement. Lewis Publi.
* Mitsch, William J. 1994. Global Wetlands: Old world and New. Elsevier
3) Benefit is due to nitrogen removal from overbank flooding
Nitrogen concentration is assumed to be 2.5 mg/L. Assume overboard is 1 ft. Flood frequency is assumed to be once every year.
Nutrient removal due to this benefit is estimated by in flow concentration x area (1 ha) x overboard height x removal efficiency.

Formula for Calculating Nitrogen Offset Reductions on Riparian Buffer Restoration Sites:

*Size (Acres) * 75.77(lbs/Acre/Year) * 30 Years = Total Pounds of Nitorgen Removed from Riparian Buffer Project*

Example Calculation & Costs

2 MGD Permit

2 MGD x 3 mg/l x 8.34 conversion x 365 days/year = 18,264 lbs/year N discharge

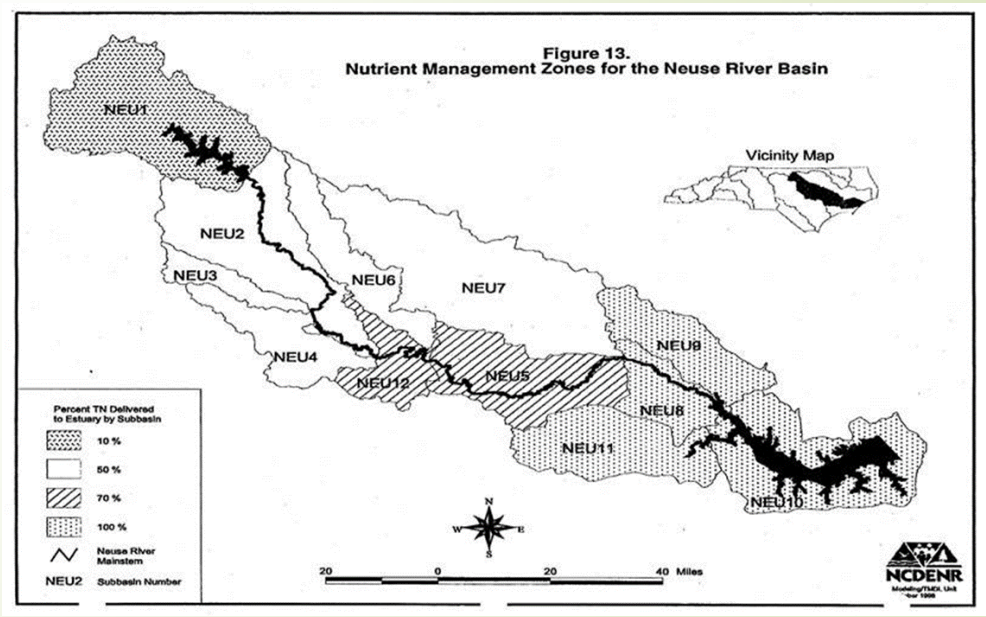
18,264 lbs/year x 1.5 (uncertainty factor) x Transport Factor (maybe*) = 27,397 lbs/year of Nutrient Offset Credit

COSTS:

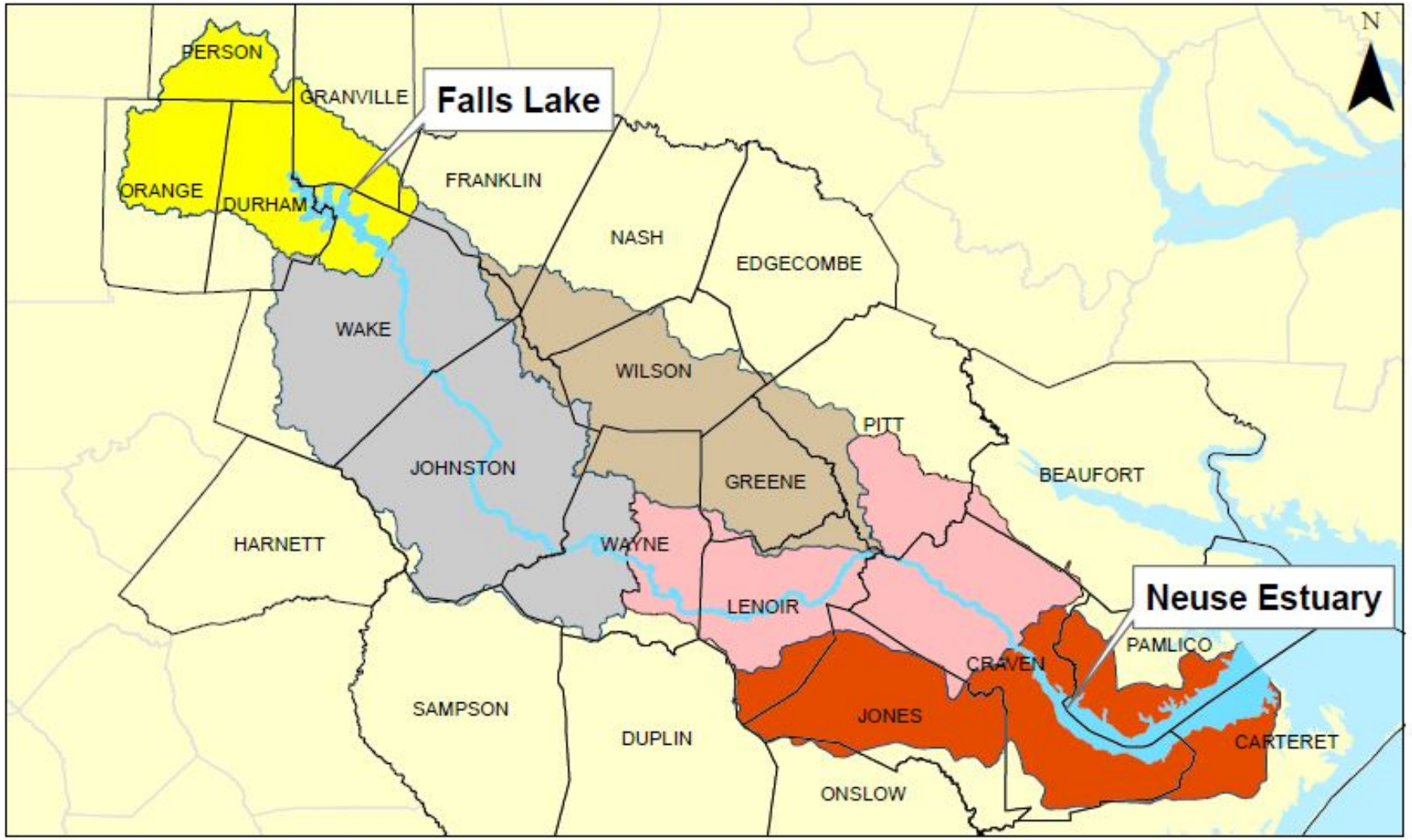
NCDMS ILF Rates in lbs/year (If you pay the State):
Neuse 01 below Falls Lake: $743 per lbs/year
Neuse 02, 03, 04: $448 lbs/year

Private Sector Rates (Restoration Systems):
Less expensive because you don't have to pay the state's overhead AND we are able to utilize cheaper land

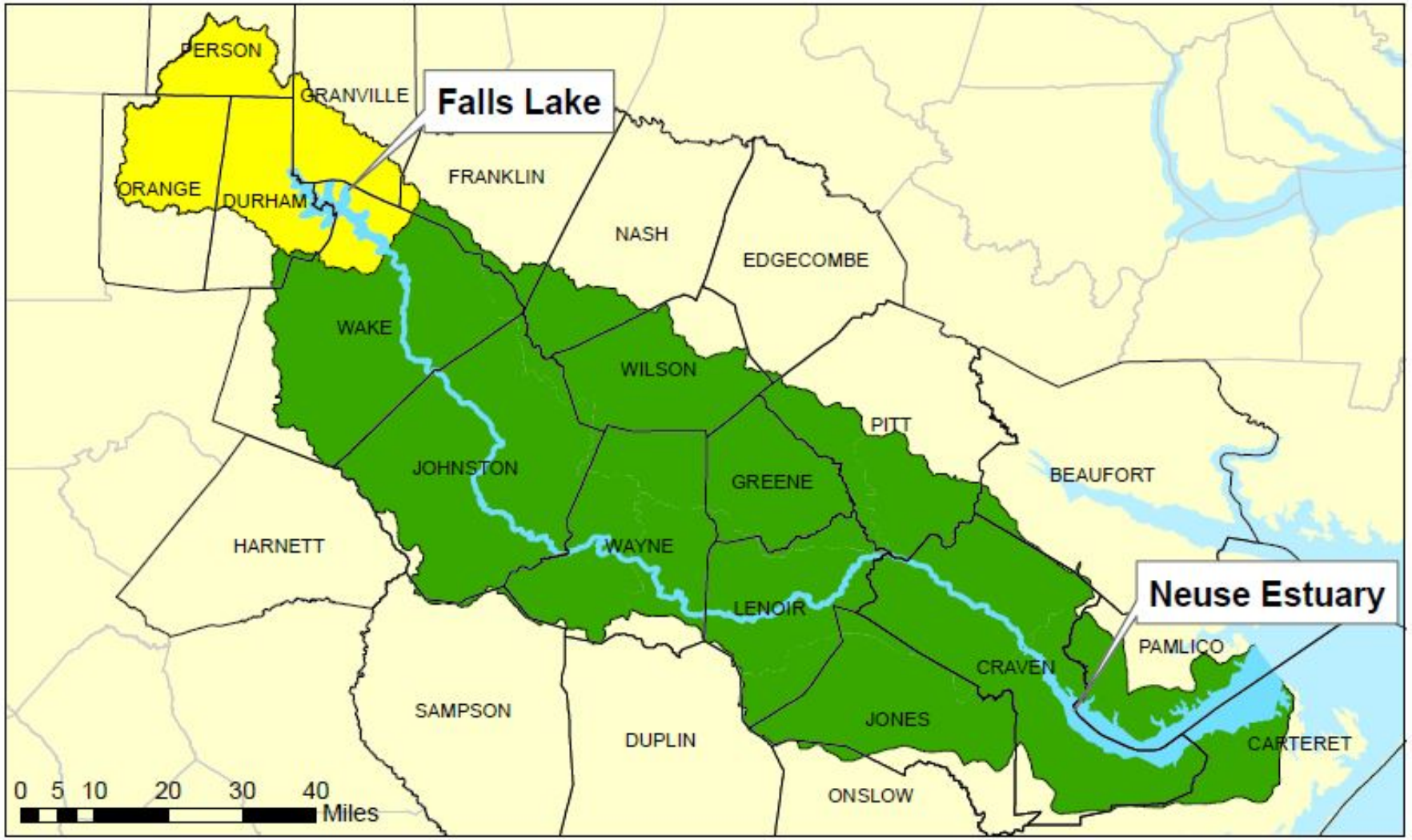
* NC SL 2020-18



Map 1: Neuse River Basin - Current Service Areas



Map 2: Neuse River Basin - Expanded Service Areas



Credit Release Schedule

- 7 year process, including 5 annual monitoring reports
- Only “released” credits can be used in NPDES permit
- Nutrient offset credit provider can work with NPDES permitting staff to coordinate schedule and incorporate in permit

Table I - Credit Release Schedule for Riparian Buffer and Nutrient Offset Credits

Task	Project Milestone	% Credit Available for Sale
1	Permitting Documents (MBI and BPDP) Approved by DWR, Conservation Easement Recorded* and Financial Assurance Posted	20
2	Mitigation Site Earthwork, Planting and Installation of Monitoring Devices Completed	20
3	Monitoring Financial Assurance Posted and Approval of As-Built Report	10
4	Monitoring Report #1: Approved by the DWR** & financial assurance renewed	10
5	Monitoring Report #2: Approved by the DWR** & financial assurance renewed	10
6	Monitoring Report #3: Approved by the DWR** & financial assurance renewed	10
7	Item B (1) of Section X in this Instrument has been completed and approved by DWR.	5
	No remaining credits will be released until Task 7 has been satisfied	
8	Monitoring Report #4: Approved by the DWR** & financial assurance renewed	5
9	Monitoring Report #5: Approved by the DWR** and final site visit by DWR has been conducted	10
	Total	**100%**

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Questions???