NC's Watershed-Based Approach to Nutrients Permitting

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Water Quality Permitting Section

NC DEQ/ DWR

DWR

Division of Water Resources

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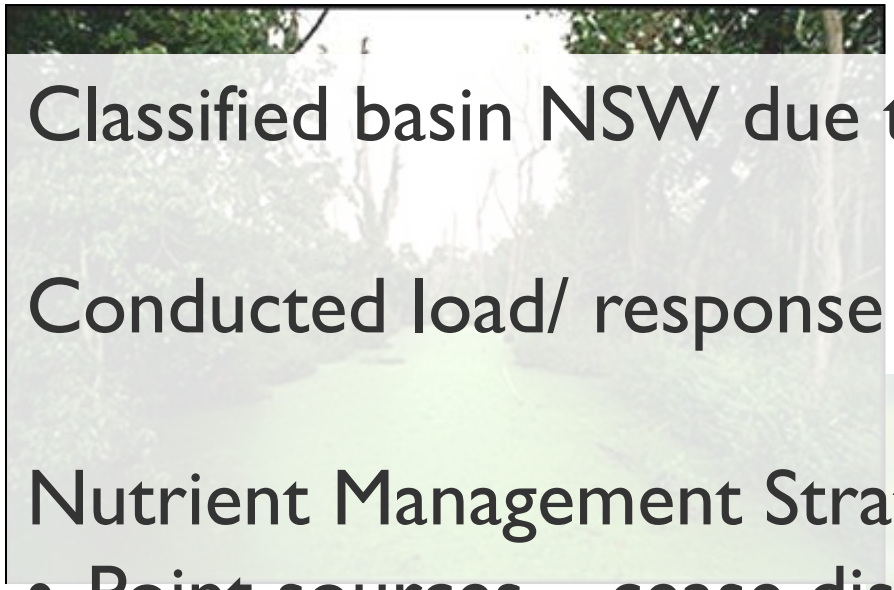
Regulatory Action - 1979

- Chlorophyll-a standard
  - Indirect measurement of algal biomass
  - 40 µg/L statewide, except 15 µg/L Trout
- NSW Supplemental Classification
  - Waters "experiencing or … subject to excessive growths of … vegetation [which] impair the use of the water for its best usage"
  - Applies to affected waters and upstream tribs
  - Requires nutrient management strategy
- NCDP

Chowan River, Late 1970s

Chowan River

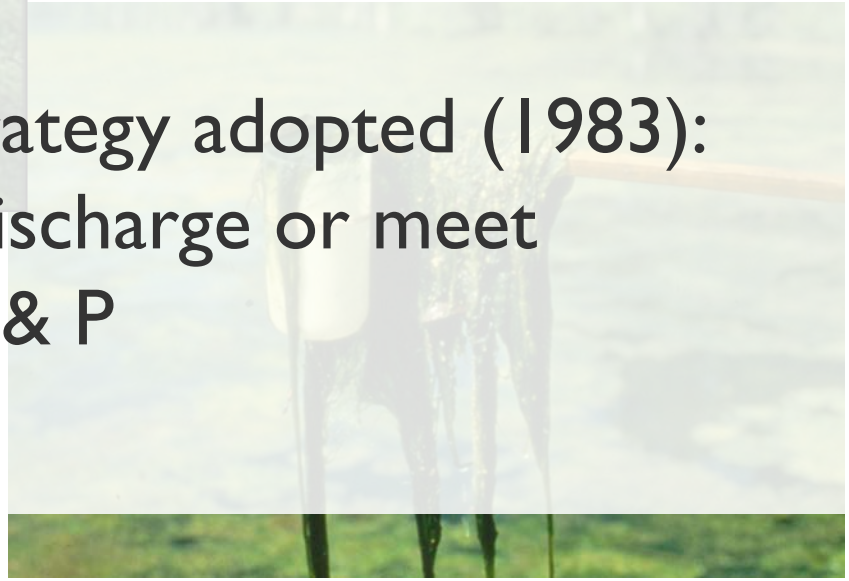


Classified basin NSW due to chlorophyll-a levels

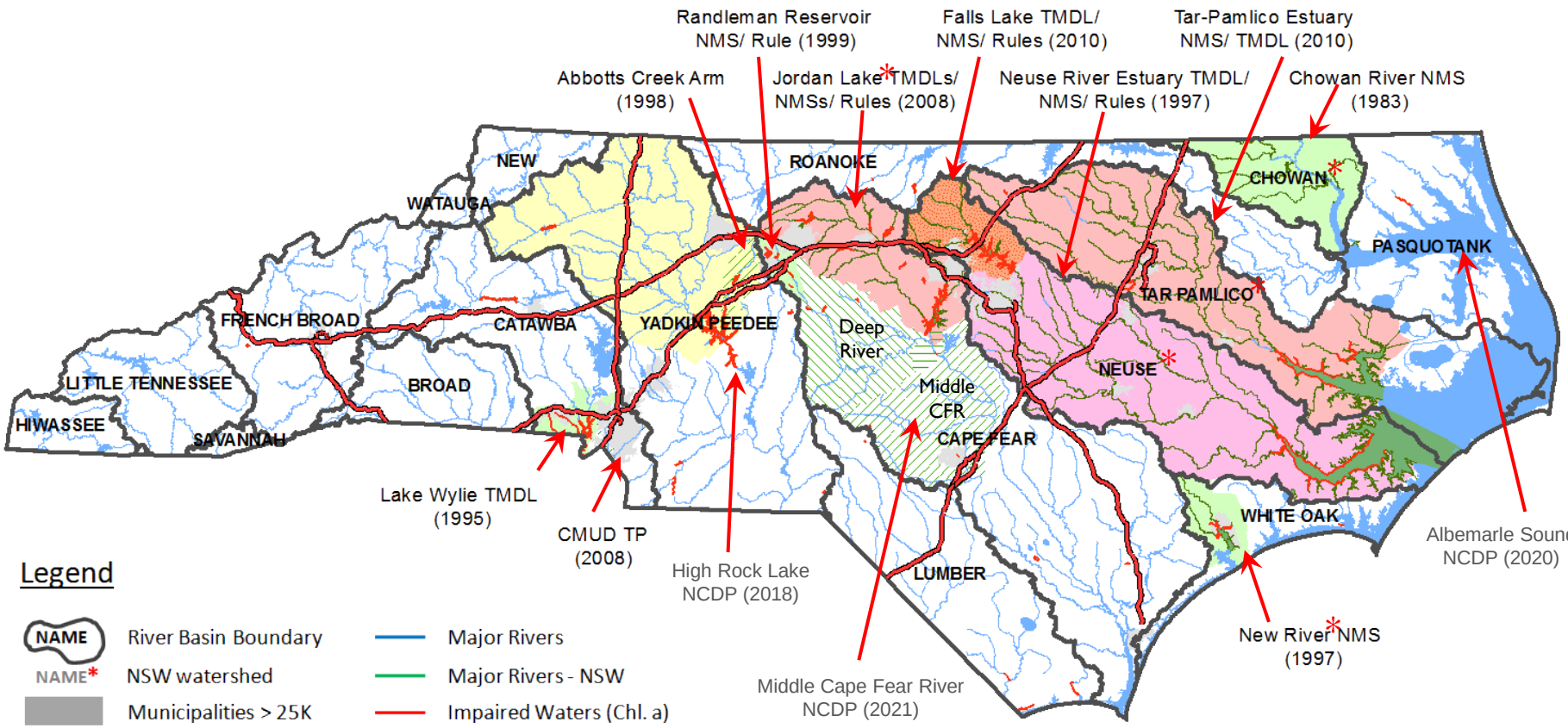
Conducted load/ response analysis

Nutrient Management Strategy adopted (1983):

- Point sources – cease discharge or meet 3 & 1 mg/L limits for N & P



Watershed-Based Nutrient Controls



Existing Nutrient Strategies

January 4, 2016

Year	Waterbody	Management Approach/ Mechanism	Nitrogen Controls	Phosphorus Controls	Facilities Affected
1983	Chowan River	NMS/ Basin Plan	Eliminate discharges, where feasible; 3.0 mg/L limits	Eliminate discharges, where feasible; 1.0 mg/L limits	1 POTW w/ 3&1 N&P limits
1992	Tar-Pamlico estuary	**NMS/ Phased TMDL**	Group cap. Individual limits set in 2016, subject to group compliance	Group cap. Individual limits set in 2016, subject to group compliance	15 POTWs w/ mass N&P limits
1995	Lake Wylie	TMDL	Mass limits typ. ≡ 6 mg/L @ Q_{pmt}	Mass limits typ. ≡ 1 mg/L @ Q_{pmt}	5 major POTWs, 3 industry
1997	New River estuary	NMS/ Phased TMDL	Case-by-case limits for WWTPs ≥ 1.0 MGD, similar to Camp Lejeune (5.0 mg/L (S), 10.0 (W))	2.0 mg/L limits (S&W)	1 major POTW, 1 federal, 11 minor 100% domestic.
1997	Neuse River estuary	**NMS/ Phased TMDL**	Mass limits for WWTPs ≥ 0.5 MGD, equiv. to 3.7/ 5.5 mg/L N for POTWs; group compliance option	2.0 mg/L limit, depending on size and location	23 POTWs, 4 industry, 5 minor domestic
1997	High Rock Lake, Abbotts Creek Arm	NMS	-	Mass seasonal limits ≡ 0.5 mg/L (S), 1.0 mg/L (W)	3 major POTWs
1997	All NSW without calibrated, nutrient-sensitive model (HB515)	**Default nutrient limits in absence of NMS/ TMDL**	Mass limits for existing WWTPs ≥ 0.5 MGD, equiv. to 5.5 mg/L N @ Q_{pmt} in waters classified NSW	Mass limits for existing WWTPs ≥ 0.5 MGD, equiv. to 2.0 mg/L N @ Q_{pmt} when classified NSW	-
1999	Randleman Reservoir	**NMS**	-	TP cap on existing major POTW; no new/ expanding WWTPs	1 major POTW
2000	Deep River, Randleman Res. to Carbonton Dam	BPJ/ Basin Plan	-	1 mg/L P limits for new and expanding ≥ 1.0 MGD; elsewhere, no increase in N and P mass loads	(2 POTWs w/ pre-existing TP limits)
2000	Cape Fear River, Jordan Dam to Buckhorn Dam	BPJ/ Basin Plan	-	No increase in N and P mass loads	-
2000	Cape Fear River, Buckhorn Dam to L&D#3	BPJ/ Basin Plan	Mass summer limits ≡ 6 mg/L @ Q_{pmt} for new and expanding	Mass summer ≡ 1 mg/L @ Q_{pmt} for new and expanding	1 major POTW
2008	Jordan Reservoir - Haw River Arm	**NMS/ Phased TMDL**	Mass limits for WWTPs ≥ 0.1 MGD, equiv. to 5.3 mg/L N (2016)	Mass limits for WWTPs ≥ 0.1 MGD, equiv. to 0.66 mg/L P	8 major POTWs, 1 major industry, 1 minor domestic, all ≥ 0.1 MGD
2008	Jordan Reservoir - Upper New Hope Arm	**NMS/ Phased TMDL**	Mass limits for WWTPs ≥ 0.1 MGD, equiv. to 3.0 mg/L N (2016)	Mass limits for WWTPs ≥ 0.1 MGD, equiv. to 0.23 mg/L P	3 major POTWs, 1 minor domestic, all ≥ 0.1 MGD
2008	Jordan Reservoir - Lower New Hope Arm	**NMS/ Phased TMDL**	Mass limits for WWTPs ≥ 0.1 MGD, equiv. to 5.3 mg/L N (2016)	Mass limits for WWTPs ≥ 0.1 MGD, equiv. to 0.37 mg/L P	1 minor domestic ≥ 0.1 MGD
2010	Falls Lake	**NMS**	Staged limits for WWTPs ≥ 0.1 MGD; final mass limits ≡ 1.1 mg/L TN in Upper (2035); conc. limits = 3.0 mg/L in Lower (2016)	Staged limits for WWTPs ≥ 0.1 MGD; final mass limits ≡ 0.06 mg/L TP in Upper (2035); conc. limits = 0.3 mg/L in Lower (2016)	3 major POTWs in Upper, 2 minor domestic in Lower

Evolution of Nutrient Strategies

Earlier		Later
Point sources	⇨	'All' sources
Load/ Response	⇨	Nutrient-sensitive models
Tech/BPJ-based req'ts	⇨	WQ-based
N or P	⇨	N, P, or both (co-limiting)
Agency decisions	⇨	Stakeholder collaboration

Basic Steps in Strategy Development

- Identify the problem
- Invite/ promote stakeholder participation – need buy-in at all stages to succeed
- Collect data to support modeling (2-year baseline)
- Model to determine watershed-specific nutrient reduction targets (same for PS & NPS)
- Formulate strategy to achieve those reductions
- Consider opportunities for increased flexibility, cost-effectiveness
- Develop implementing rules

Tar-Pamlico & Neuse River Estuaries

More comprehensive approach to nutrient controls

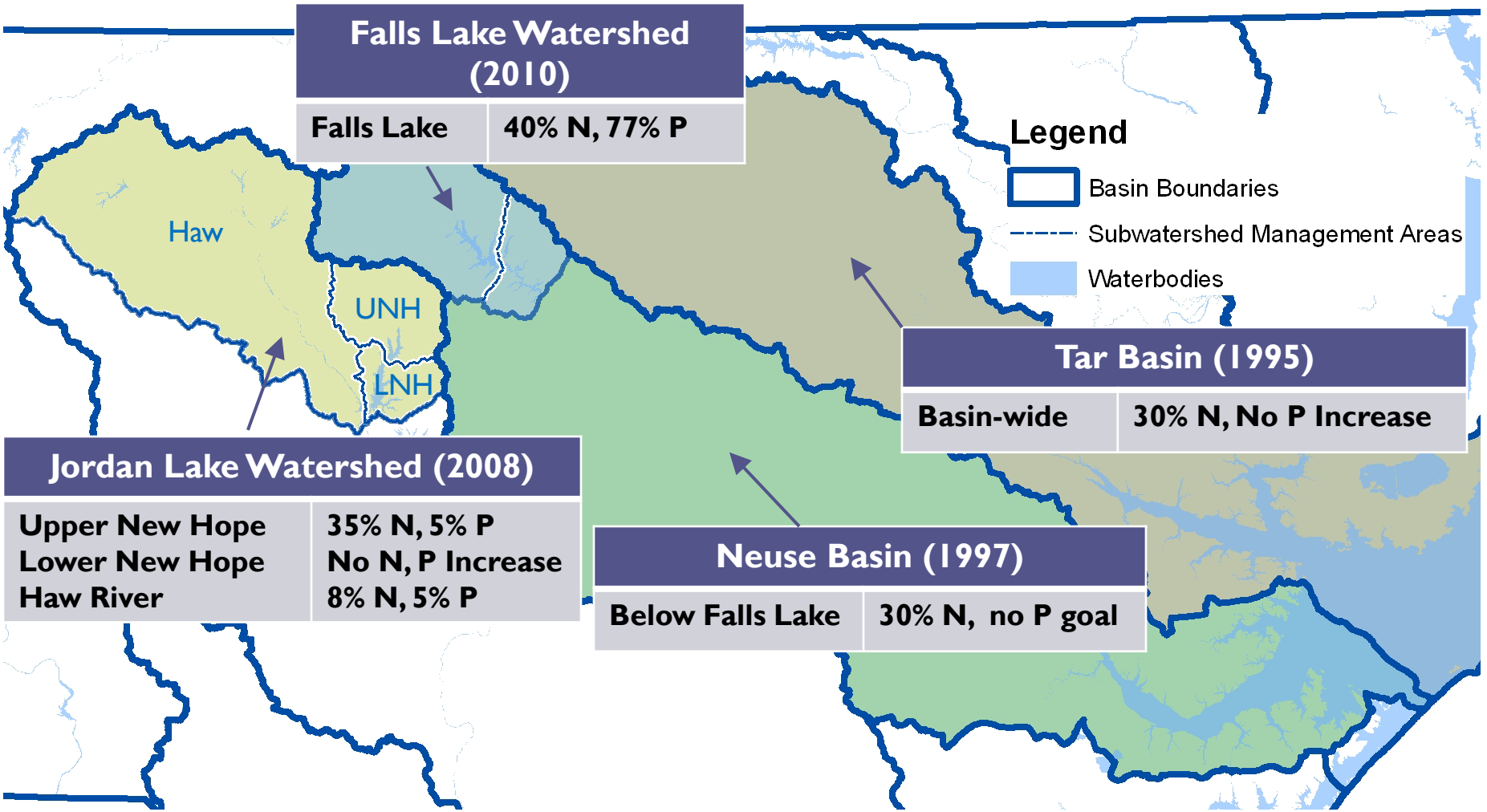
- Wastewater discharges
- Agriculture
- Riparian areas protection
- Fertilizer management (commercial)
- Urban stormwater (new development)
- Nutrient offsets
- NC Ag Cost Share funds – incentives (Tar-Pamlico)

Jordan & Falls Lakes

Further expansion of nutrient controls

- Existing development (local governments)
- Trading/ removal credits
- Adaptive management

Nutrient Reduction Targets



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Point Source Strategies

- Existing dischargers receive nutrient allocations
  - Based on PS baseline and reduction targets/ WLAs
  - Small dischargers receive tech-based allocations
  - Large dischargers receive remaining allocations in proportion to max permitted flows
  - Allocations are calendar-year mass loads
- Large dischargers ($\geq$0.5 or 0.1 MGD) receive limits; smaller dischargers receive allocations, no limits
- Limits are annual mass limits
- Limits are effective Jan. 1 and locked in for the full calendar year

TN, TP Discharge Requirements

Watershed	Mass TN Limits Equivalent To:	Mass TP Limits Equivalent To:	Facilities Affected
Tar-Pamlico Estuary	6.85 mg/L	0.92 mg/L	15
Neuse River Estuary	3.75 to 5.5 mg/L 6.7 mg/L (no limit)	2.0 mg/L (conc.)	32 ≥ 0.5MGD 37 < 0.5 MGD
Jordan Lake ▪Haw River ▪Upper New Hope ▪Lower New Hope	 5.39 mg/L 3.04 mg/L 5.35 mg/L 12.0 mg/L (no limit)	 0.66 mg/L 0.37 mg/L 0.23 mg/L 2.0 mg/L (no limit)	 9 ≥ 0.1 MGD 4 ≥ 0.1 MGD 1 ≥ 0.1 MGD 33 < 0.1 MGD
Falls Lake (Stage I) (Stage II)	3.0 - 3.6 mg/L* 1.13 mg/L 12.0 mg/L (no limit)	0.33 - 0.46 mg/L* 0.06 mg/L 12.0 mg/L (no limit)	3 ≥ 0.1 MGD 3 < 0.1 MGD

* At current flows + 10%

Point Source Strategies (cont.)

- New & expanding discharges
- Regionalization incentive
- Group compliance option
- Offset payments (compliance group only)
- Localized impacts ("hot spots")

Transport Considerations

- Allocations & limits can be expressed as discharge loads and delivered loads
  - Discharge loads for end-of-pipe limits
  - Delivered loads for TMDL compliance
- Transport factors are determined during modeling, used to convert from discharge to delivered values and back
- Critical in trading

Trading Options

- Trading can include:
  - Purchase of allocation from an existing discharger (PS-PS)
  - Purchase of offsets from mitigation banker or similar source (PS-NPS In-Lieu Fees)
- Transactions are conducted in terms of *delivered loads* to ensure no exceedance of PS WLAs.
- Transactions must not result in "hot spots"

Group Compliance Approach

- Alternate approach to meeting PS nutrient reductions
- Voluntary
- Dischargers form a not-for-profit association and are subject to combined nutrient limits
- Association and members are co-permittees to a new group permit; individual permits remain in effect
- Provides dischargers with flexibility in meeting nutrient requirements
- Promotes collaboration and technical assistance among members

Group Compliance Approach

- Individual permits
  - Remain in effect
  - Members deemed "in compliance" with mass nutrient limits
- Group permit
  - New NPDES permit for Association and members
  - Governs mass nutrient limits and group reporting only

Group Permit

- Contains member roster and individual allocations (discharge and delivered)
- Identifies Association's nutrient limits: sum of members' delivered allocation
- All limits and transactions are expressed in terms of delivered allocation
- Limits are annual mass limits
- Limits in effect on Jan. 1 are in effect for the full calendar year

Group Permit – Compliance

- Limits are revised annually, as needed, to reflect changes in membership or allocations
- Allocation transfers (trades) must first be incorporated into individual permits (major mods) in order to:
  - Address potential local impacts
  - Allow for public review and comment
- Changes in members' allocations in the group permit are then made by minor mod

Group Permit - Compliance

- If Association meets its nutrient limit(s),
  - Association is in compliance, and
  - all members are deemed in compliance
- If Association exceeds a nutrient limit,
  - Association is in violation of its permit and must make offset payment, and
  - members > individual allocations are in violation
  - Association and noncompliant members are subject to enforcement actions

So how's that working? …

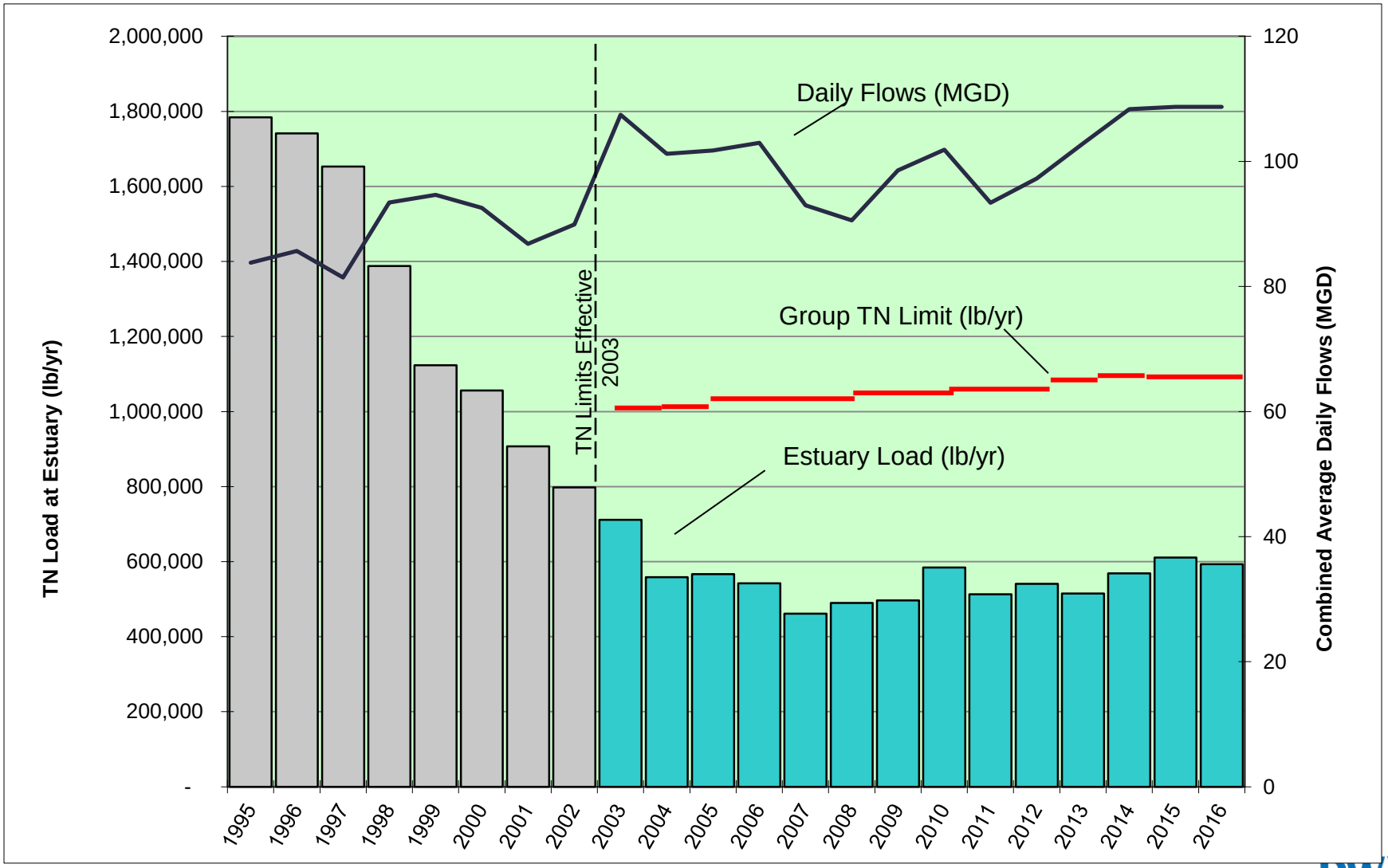
Chowan Basin Strategy

- "Nutrient Sensitive Waters" 1979
- Mostly point source improvements
- By 1990:
  - 20% ⇩ nitrogen loads
  - 29% ⇩ phosphorus loads
  - Reduced algal blooms

Tar-Pamlico & Neuse Estuary Strategies

- Developed strategies/ TMDLs/ rules
- Rules fully implemented
- Substantial progress by PSs and NPSs

NRCA Performance



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Best Performers 2016

POTWs with 2016 Effluent TN < 3.0 mg/L						
Permit	Owner Name	Facility Name	Ann. Avg. Nitrogen (mg/L)	Permitted Flow (MGD)	Ann. Avg. Flow (MGD)	% Capacity
NC0029572	Town of Farmville	Farmville WWTP	1.22	3.50	2.003	57%
NC0026433	Town of Hillsborough	Hillsborough WWTP	1.45	3.00	1.060	35%
NC0032077	Contentnea MSD	Contentnea MSD WWTP	1.59	2.85	2.137	75%
NC0079316	City of Raleigh	Little Creek WWTP	1.79	2.20	0.805	37%
NC0065102	Town of Cary	South Cary WRF	2.10	16.00	5.369	34%
NC0048879	Town of Cary	North Cary WRF	2.26	12.00	5.659	47%
NC0023906	City of Wilson	Wilson WWTP	2.26	14.00	9.497	68%
NC0026824	South Granville W&SA	SGWASA WWTP	2.29	5.50	2.019	37%
NC0023949	City of Goldsboro	Goldsboro WRF	2.34	17.60	9.096	52%
NC0024236	City of Kinston	Kinston Regional WRF	2.43	11.85	6.278	53%
NC0064891	Town of Kenly	Kenly Regional WWTP	2.49	0.63	0.401	64%
NC0023841	City of Durham	North Durham WRF	2.49	20.00	9.779	49%
Note:	All dischargers are in the Neuse River basin.					

Tar-Pamlico & Neuse Estuary Strategies

- Developed strategies/ TMDLs/ rules
- Rules fully implemented
- Substantial progress by sources
- Still no TN reductions at the estuary
  - Unidentified sources?
- Adaptive stage – reassess

Jordan and Falls Lake Strategies

- NMS implementation underway
- Additional implementation delayed by legislative action – further study and reconsideration

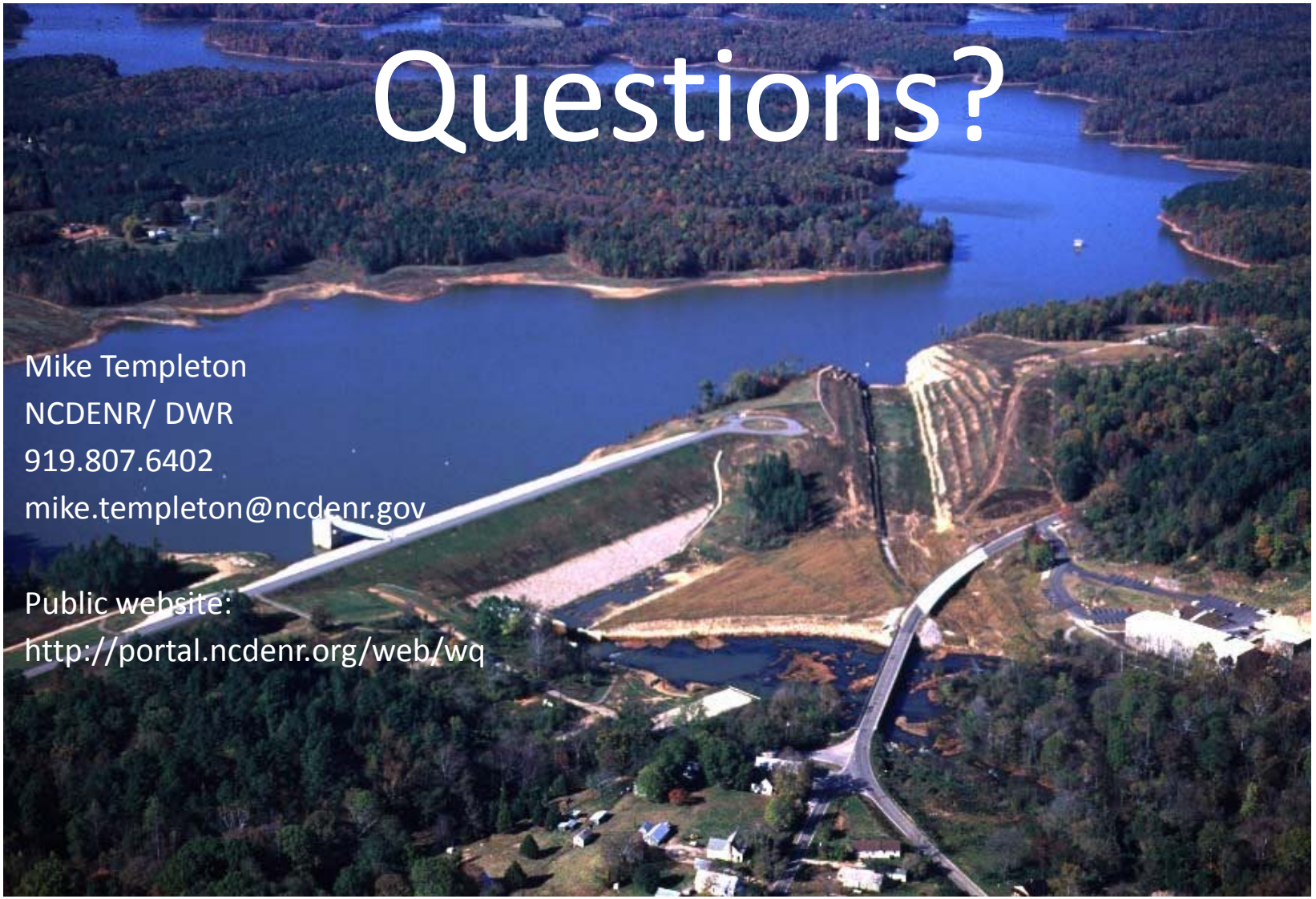
Why a Watershed Approach?

- Watershed-specific strategy
- Stakeholder participation – better results, less chance of litigation
- All sources share responsibility for contributions
- Like sources all subject to same requirements on the same schedule – fair and equitable
- Greater efficiencies in permitting
- Consistent with the basin-wide approach to water quality management and permitting

Some Downsides

- Reactive approach – strategies are developed for impaired waters
- Resource-intensive
- Multi-year process
- Uncertain ‘shelf life’
- Legislature has added to NSW requirements

Questions?



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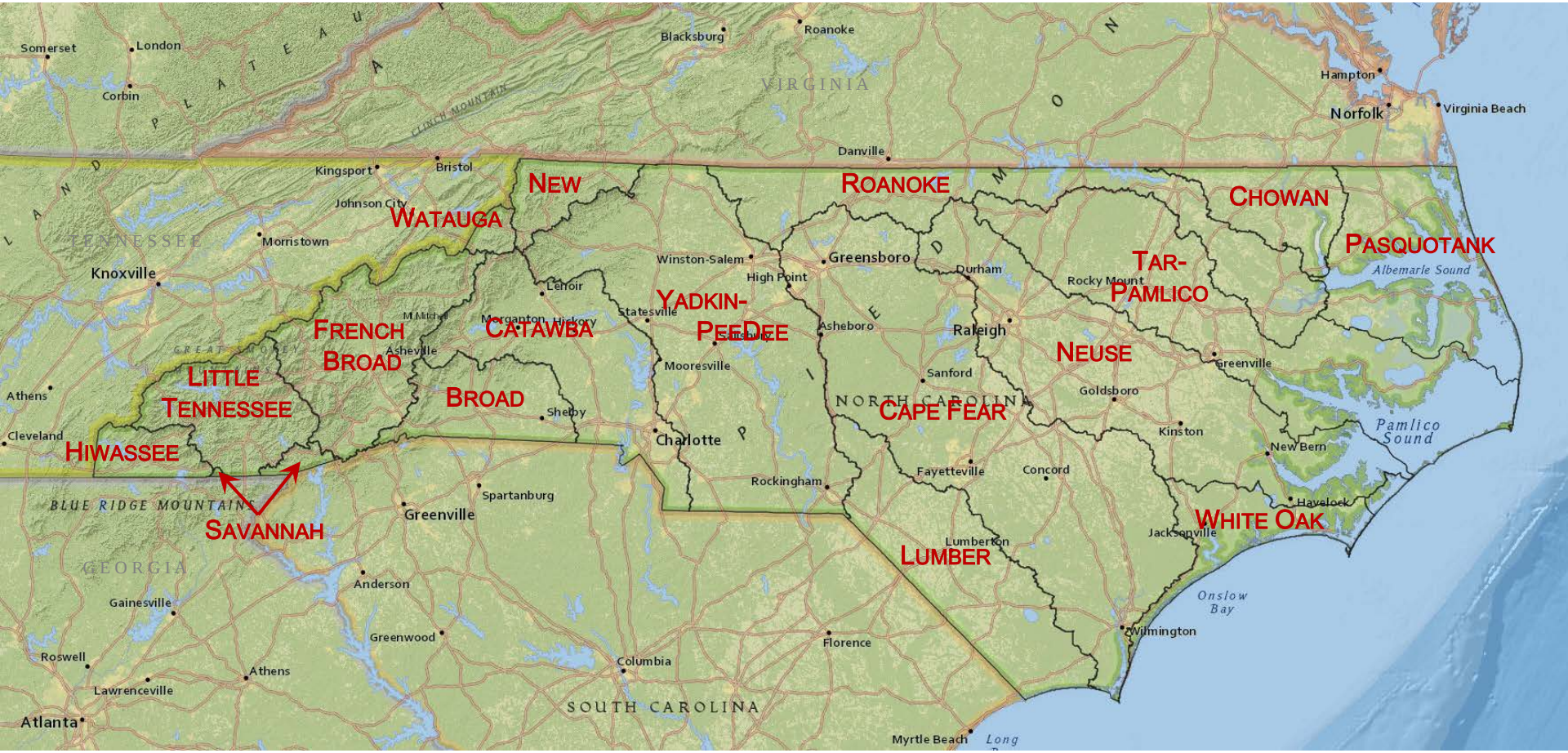
NC River Basins



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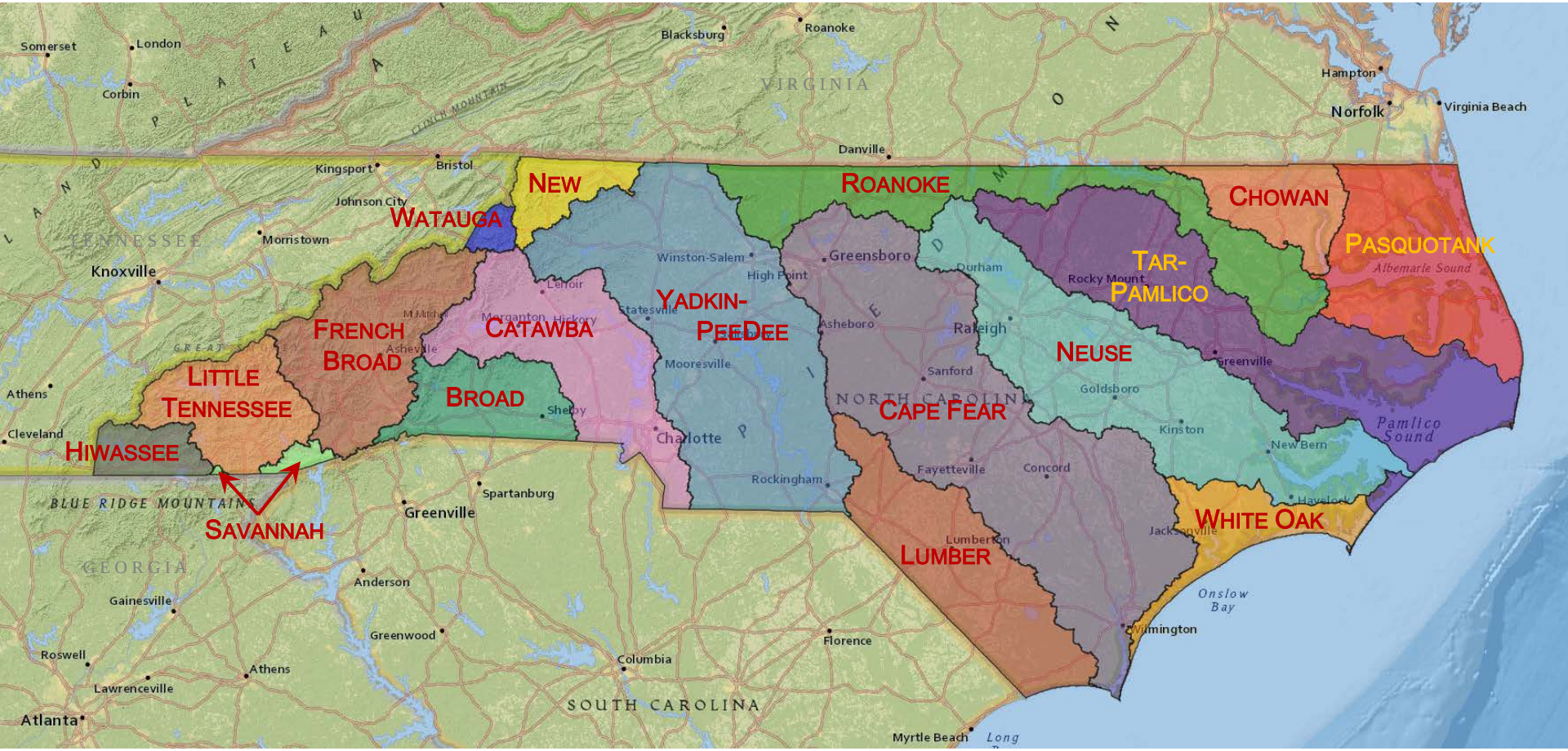
NC River Basins



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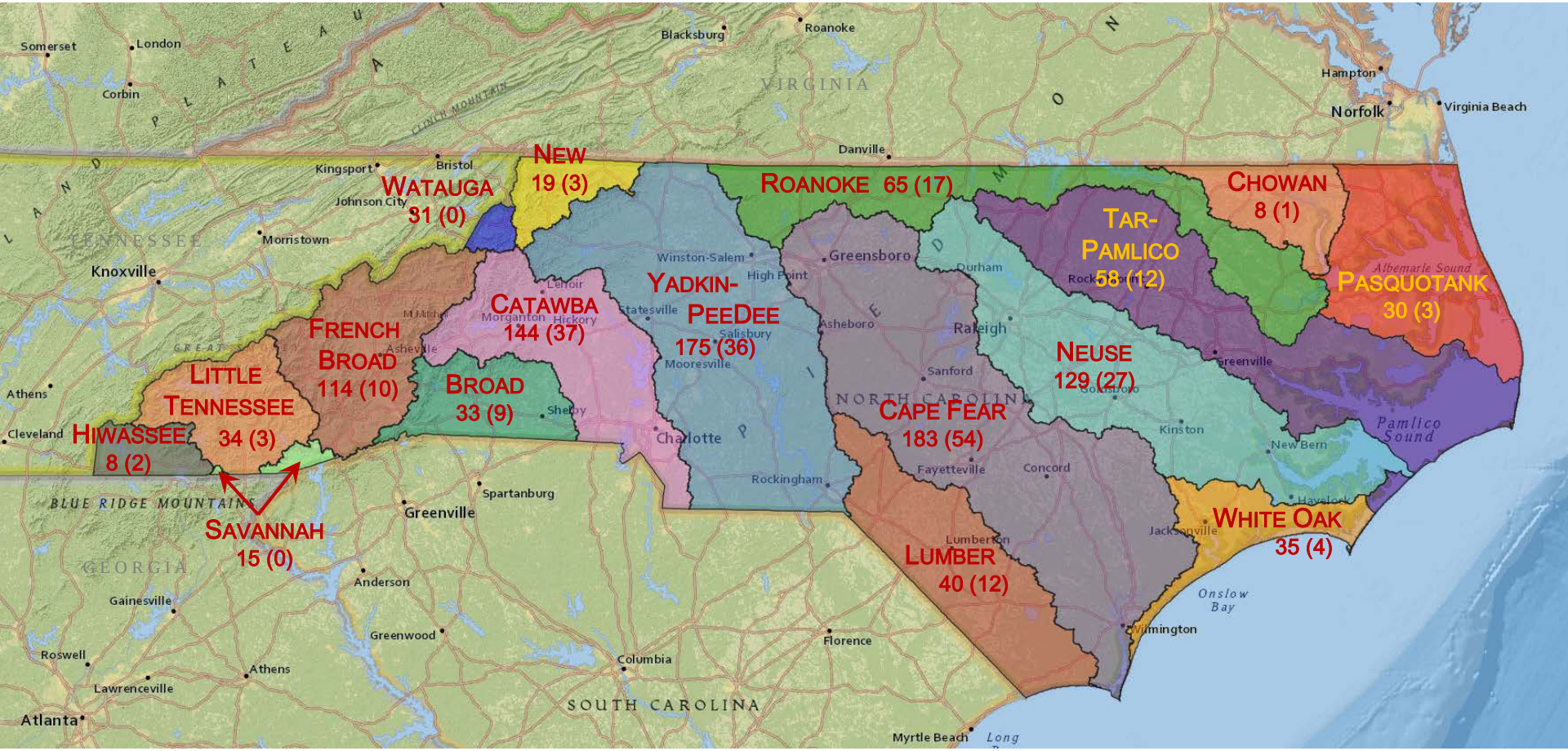
NPDES WW Permits by River Basin



Permit Counts: Totals (Majors)
State Count (9/15/17): 1,121 (230)

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Related Efforts

- Per 2005 NCIP, DWQ (now DWR) proposed threshold approach to prevent nutrient impacts; regulated community objected (too much $$$, given the uncertainties)
- Sponsored a Nutrient Forum to hear expert opinion on best approach to nutrient controls: consensus recommendation was to continue with *waterbody-specific, watershed-based approach*
- NC does not have NNC but committed to further efforts in 2014 NCDP

Pamlico River, Mid-1980s

Neuse Estuary, Summer 1995

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