

North Carolina's Nutrient Management Strategies

CHPP Steering Committee
October 16, 2020

Rich Gannon, NC DWR – NPS Planning

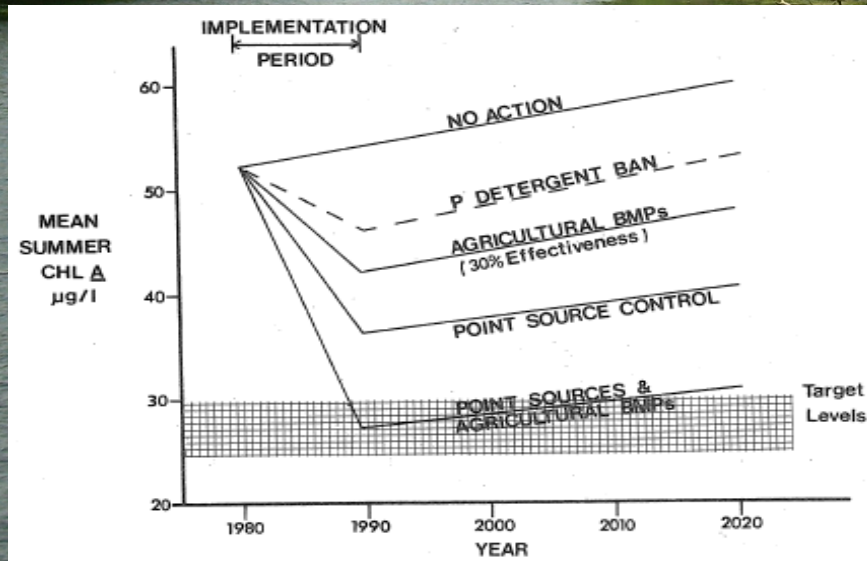


Why We Manage Nutrients



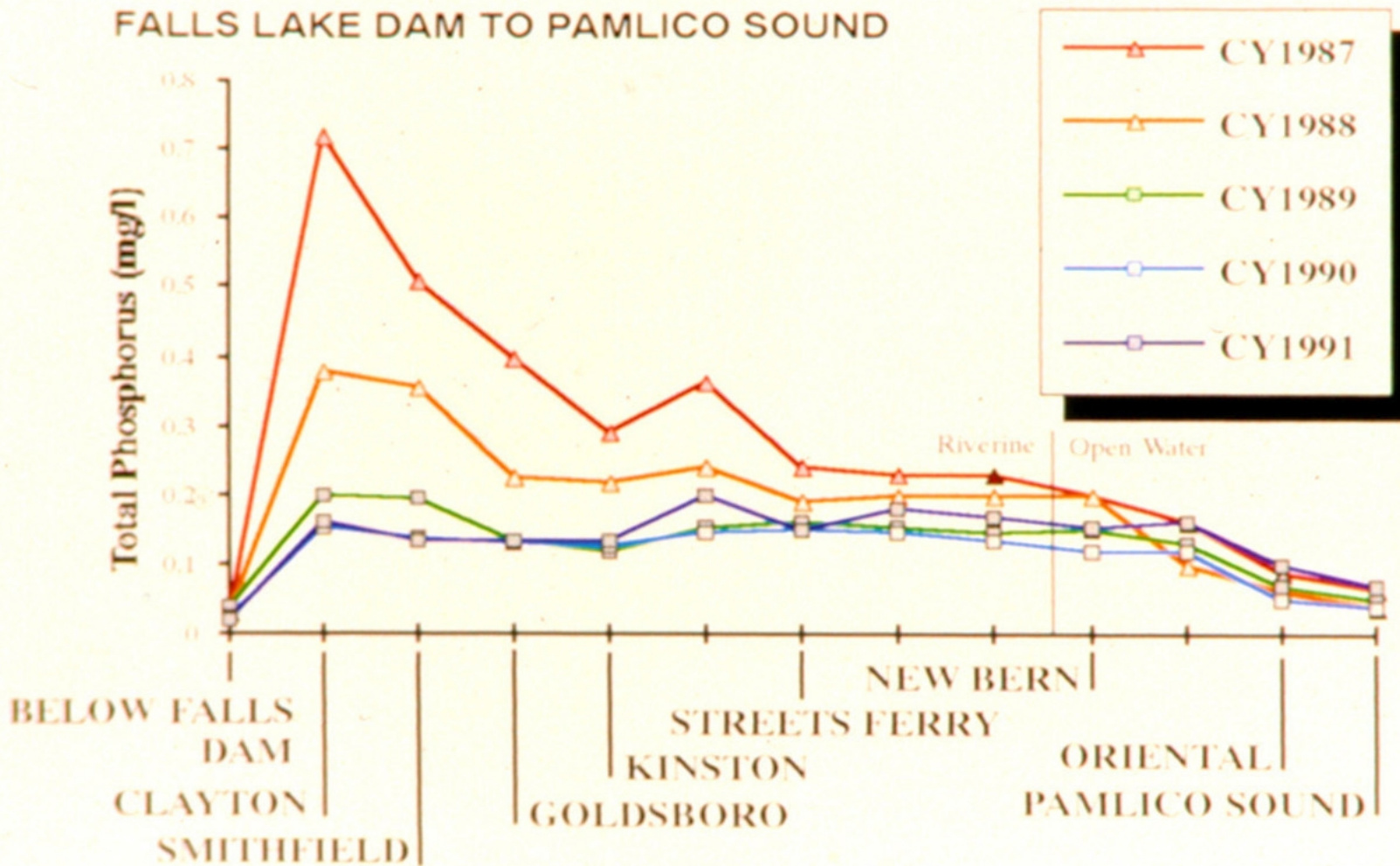
Early Nutrient Management Actions

- 1978 – chlorophyll a standard
- 1979 – NSW classification
- 1982 – Chowan NSW strategy
 - Point sources: technology limits
 - NC Ag Cost Share Program
- 1988 – phosphate detergent ban
- 1991 – (Coastal) New River NSW strategy
 - Point sources consolidation, technology improvements



Instream Effect, 1988 P Detergent Ban

MEDIAN ANNUAL TOTAL PHOSPHORUS 1987-1991
FALLS LAKE DAM TO PAMLICO SOUND

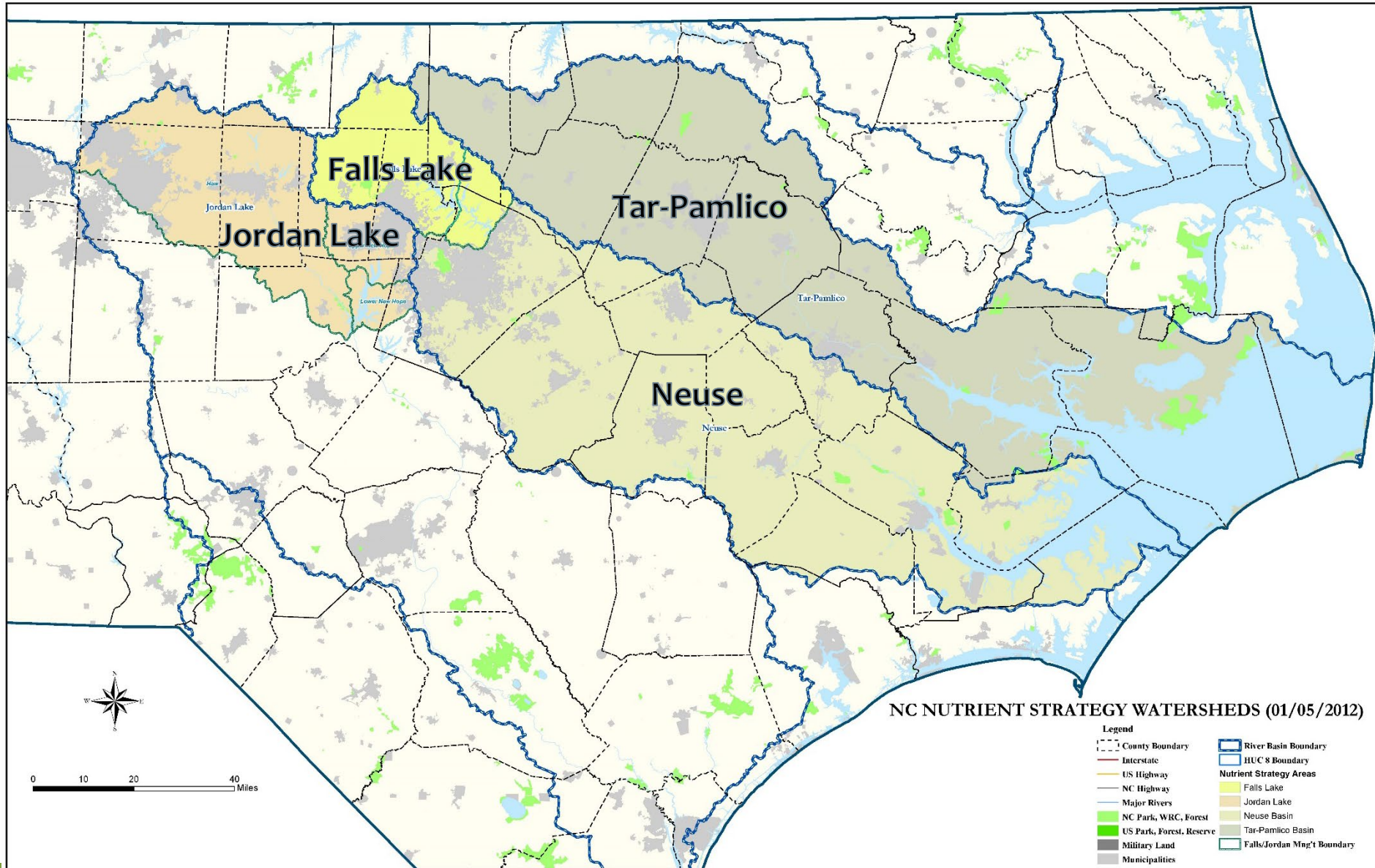


NC's Nutrient Regulatory Foundation

- Federal + state authorities
- 1978 - Chlorophyll a criterion: 40 $\mu\text{g/L}$ (10/90)
 - No numeric N or P criteria (yet)
- 1979 - NSW supplemental classification
- 1997 Clean Water Responsibility Act – EMC shall:
 - Set reduction goals for nutrient-impaired waters,
 - Establish plans with “fair, reasonable and proportionate” reductions from point and nonpoint sources
 - Adopt rules for above, and to implement TMDLs
- Modeling to set point/nonpoint source goals for N, P and guide wasteload allocations for dischargers



'Modern' Nutrient Strategy Watersheds

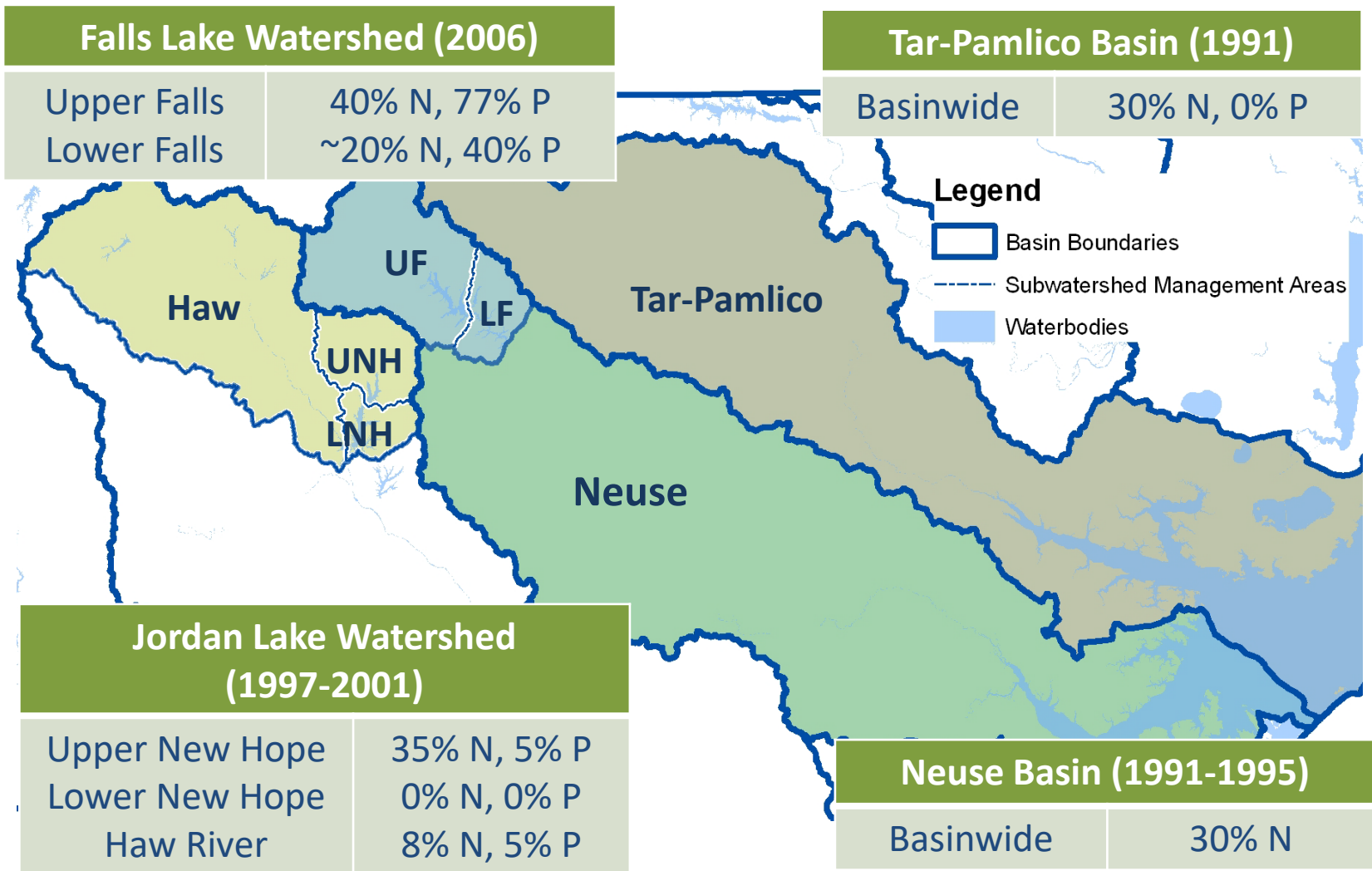


Rule Elements of Modern Nutrient Management Strategies

- Wastewater
- Agriculture
- Riparian buffer protection
- Stormwater
 - New development
 - Existing development (Jordan, Falls)
- Nutrient trading



Nutrient Strategy Reduction Goals



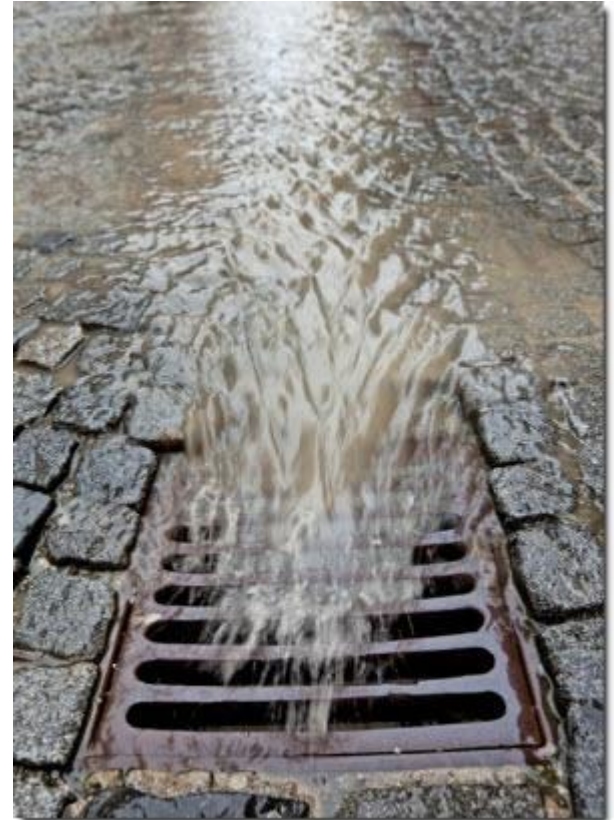
Wastewater Rules

- Individual nutrient mass limits (TN, TP)
- Watershed group permits, compliance associations
- Allocation/offset options for new/expanding facilities



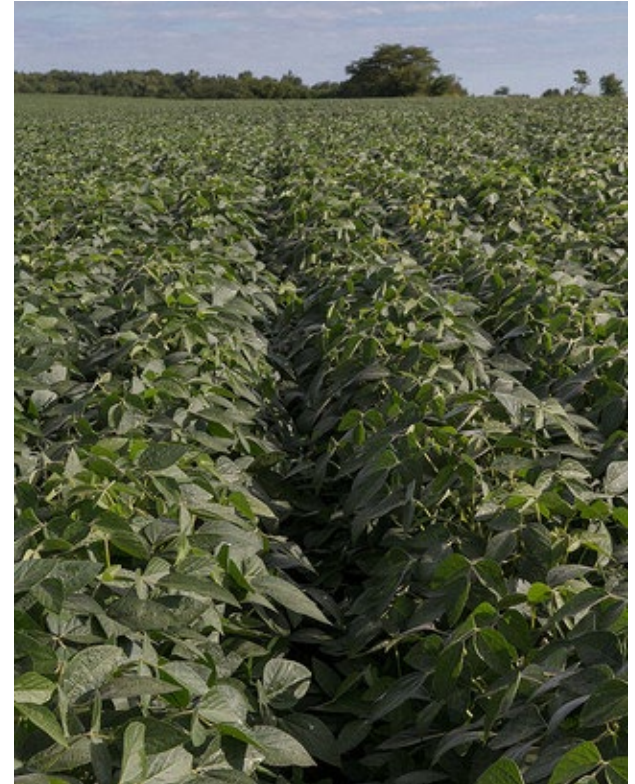
Stormwater Rules

- New development
 - Locally implemented
 - Developers meet nutrient rate targets
 - Onsite SCMs
 - Option - purchase offsite credits
- Existing development
 - Local governments regulated
 - Reduce nutrient loading based on existing developed lands
 - DWR administers



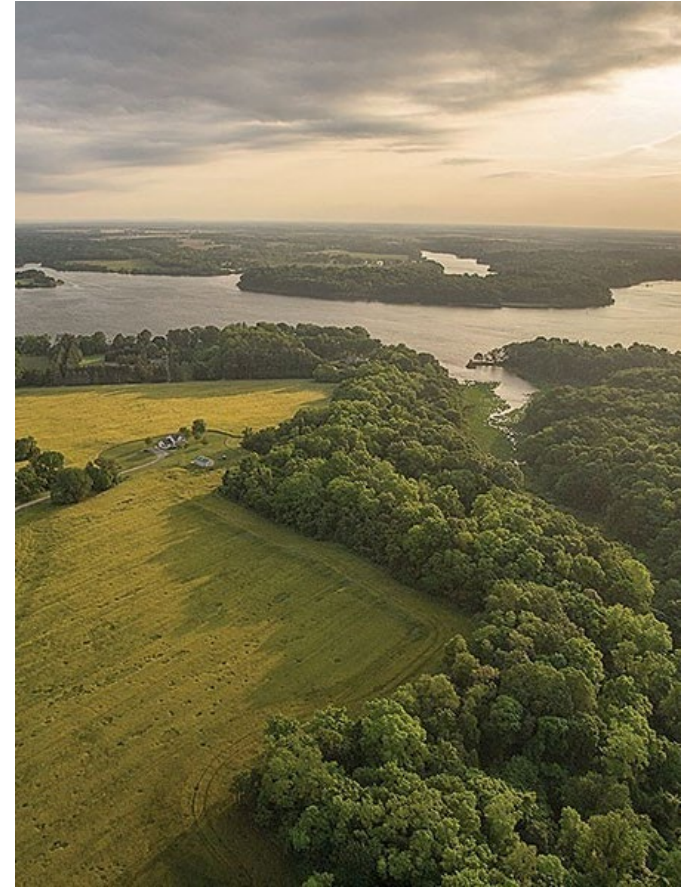
Agriculture Rules

- Collective compliance (not individual)
 - Meet strategy reduction percentages
- Cropland nutrient accounting (and pasture in Jordan, Falls)
 - Nitrogen - edge-of-field loss reduction estimates
 - Not comparable to nutrient reduction estimates of other sectors
 - Reductions via BMPs, fertilizer decreases, crop shifts, ag land lost
 - Phosphorus - qualitative risk evaluation



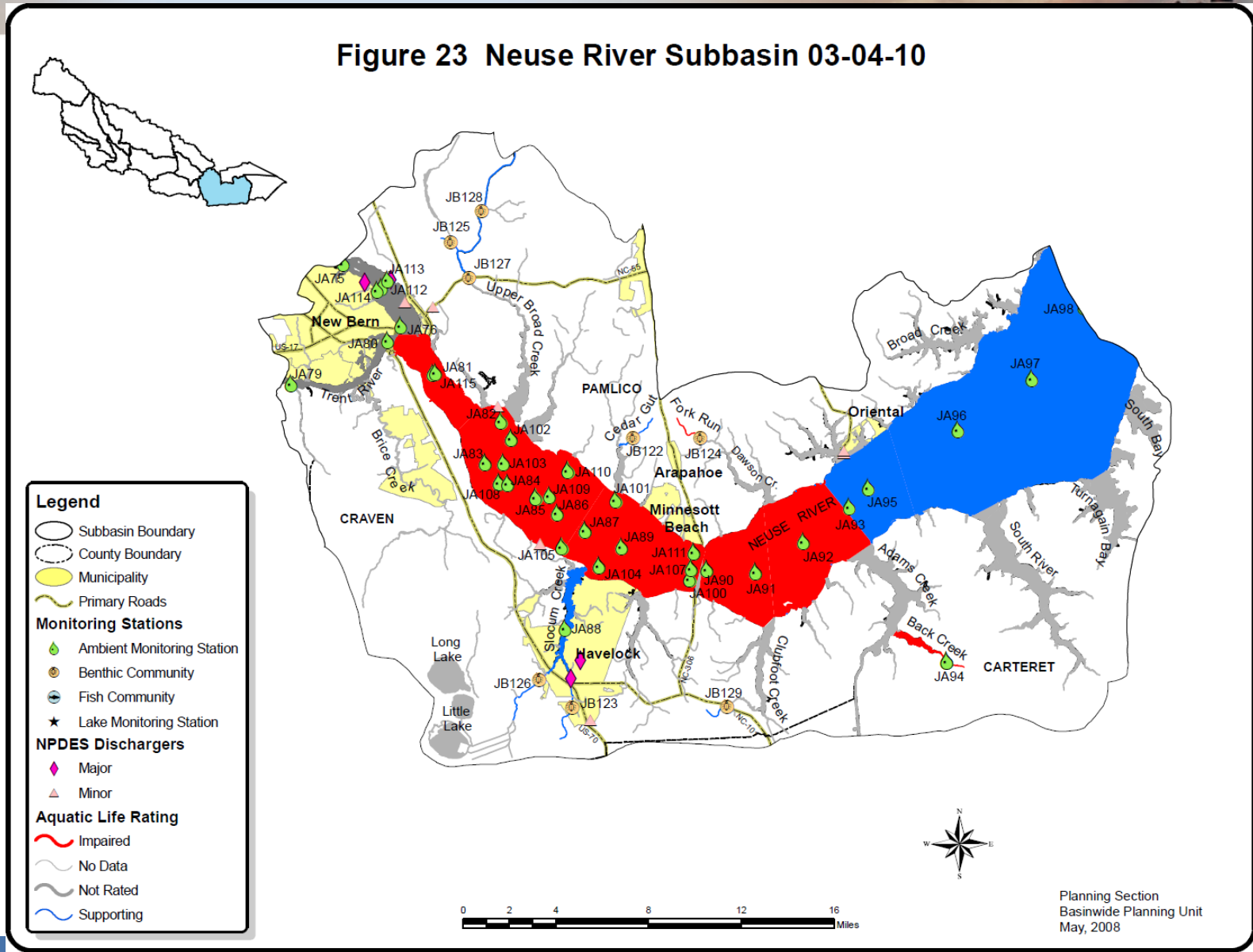
Riparian Buffer Rules

- Protects riparian buffers 50' out
- Implemented by DWR
 - Local governments in Jordan
- Table of Uses – activities within buffer:
 - exempt,
 - prohibited,
 - allowable,
 - allowable with mitigation
- Driver for DMS compensatory mitigation program

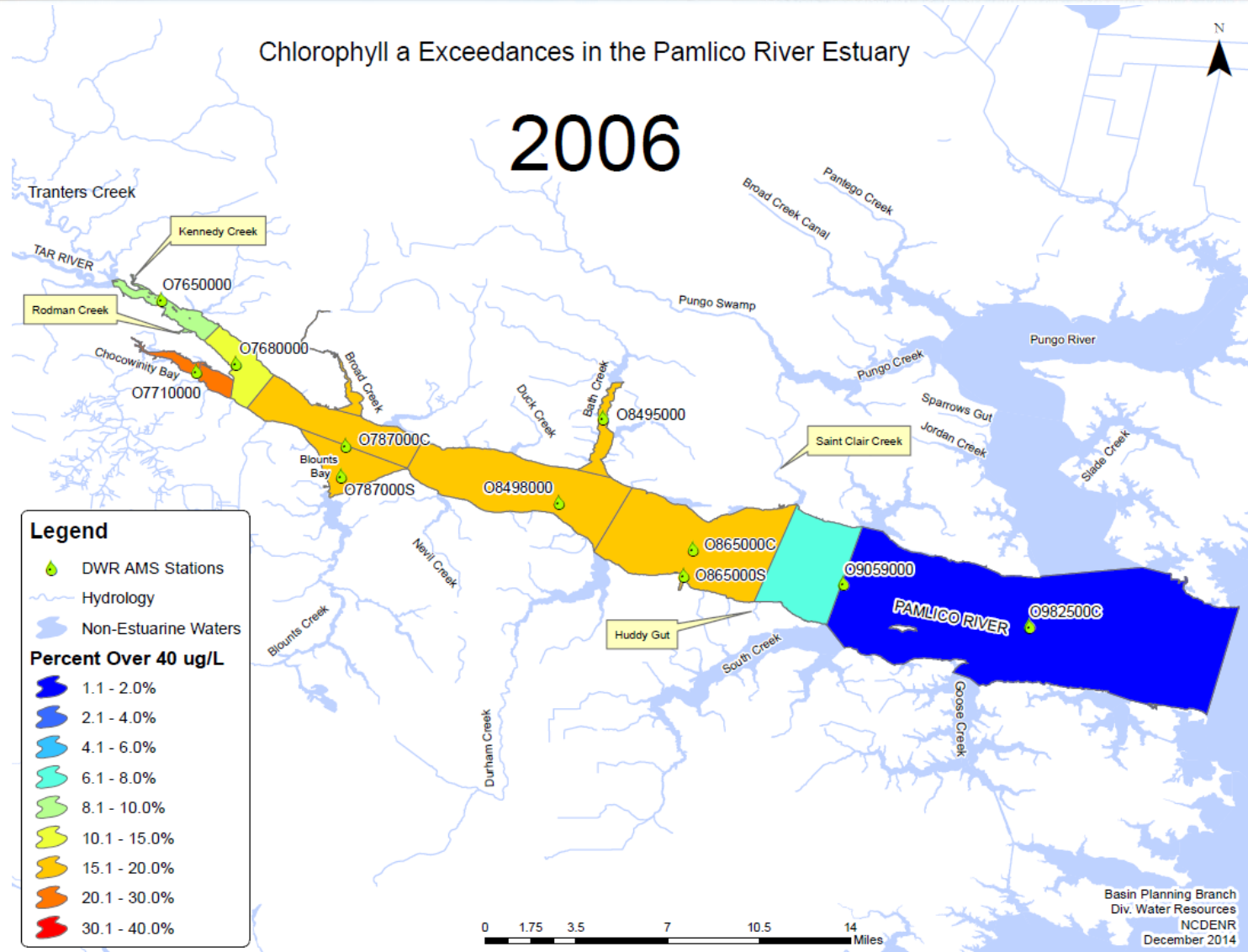


Neuse Estuary Impairment - 2008

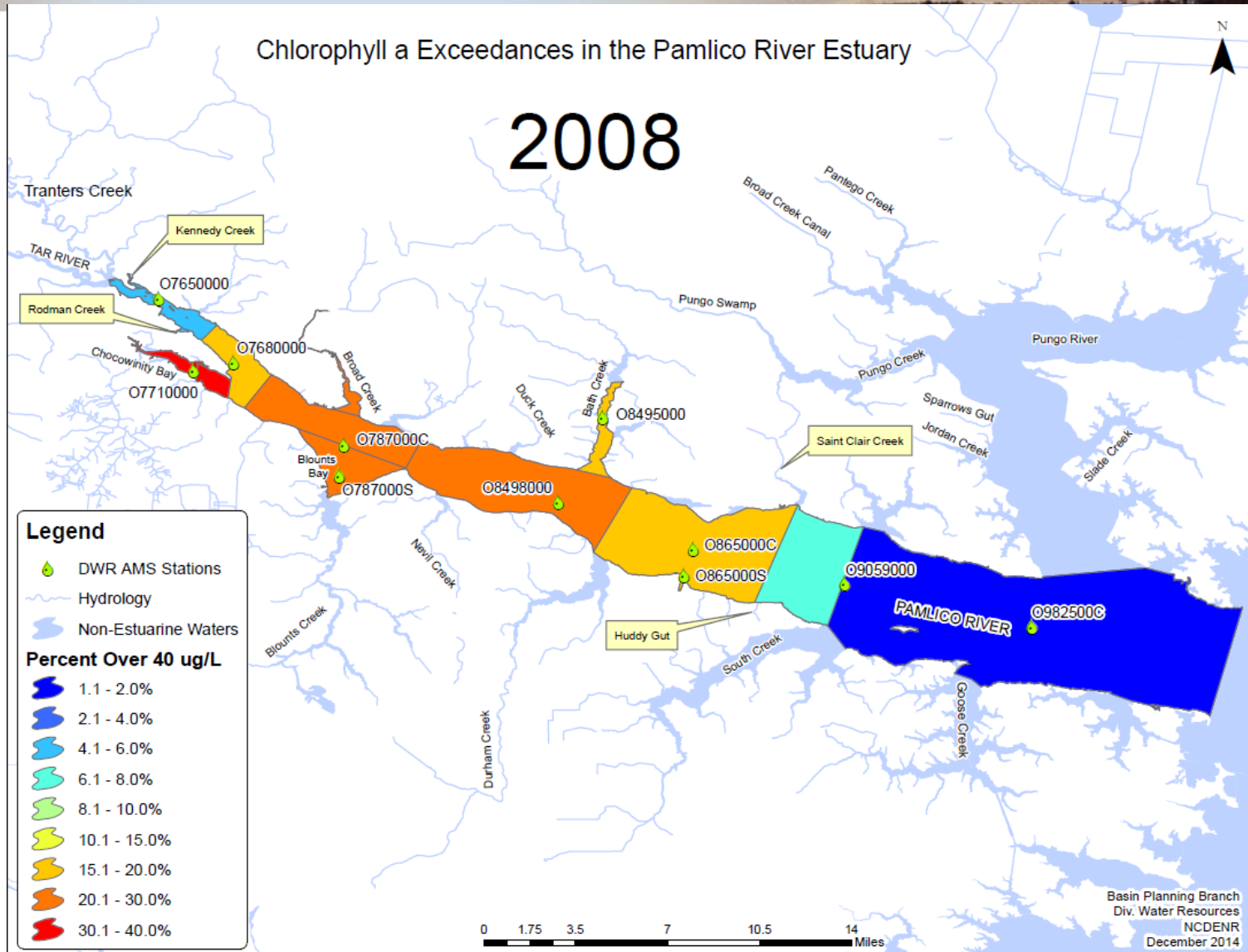
Figure 23 Neuse River Subbasin 03-04-10



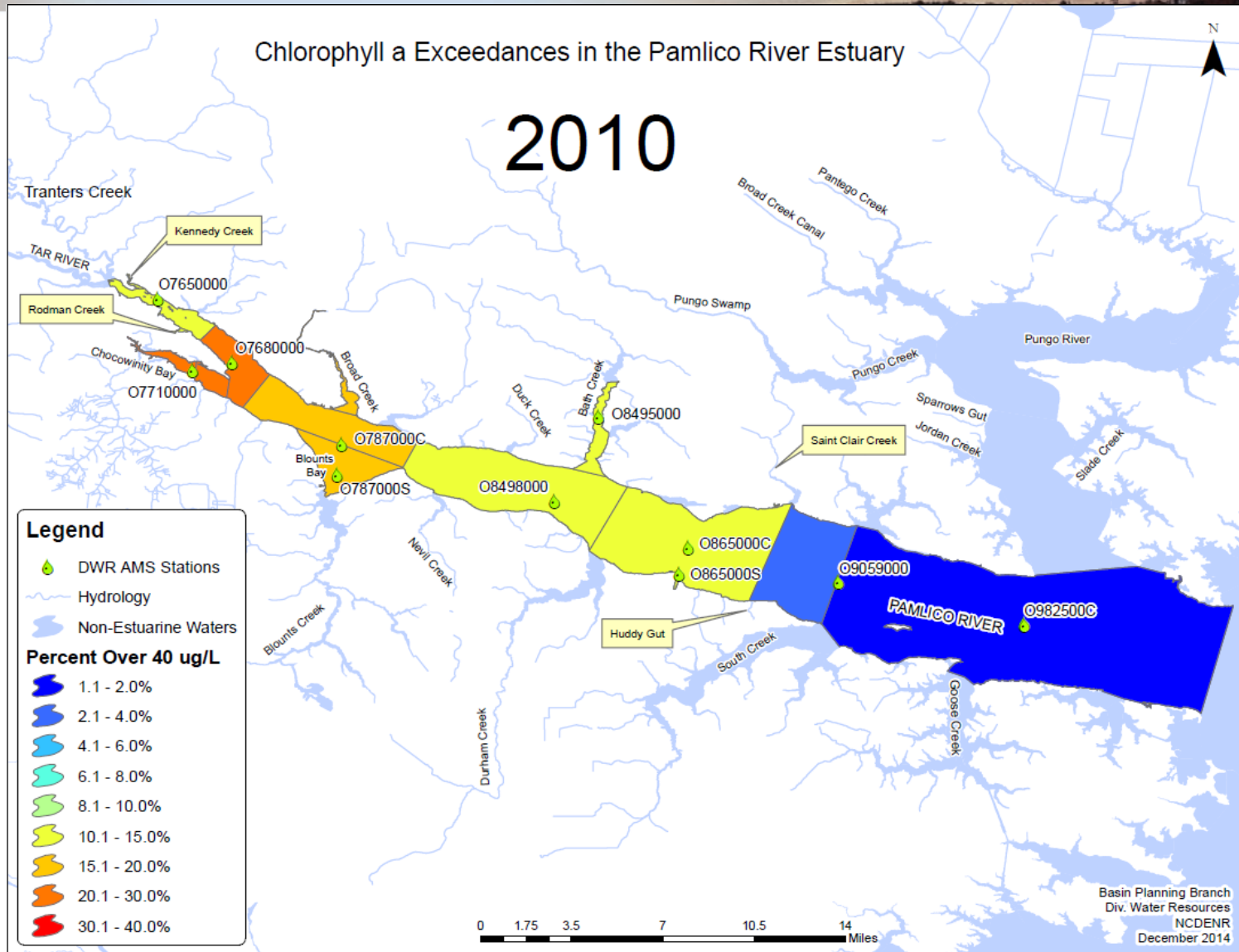
Pamlico Estuary Impairment - 2006



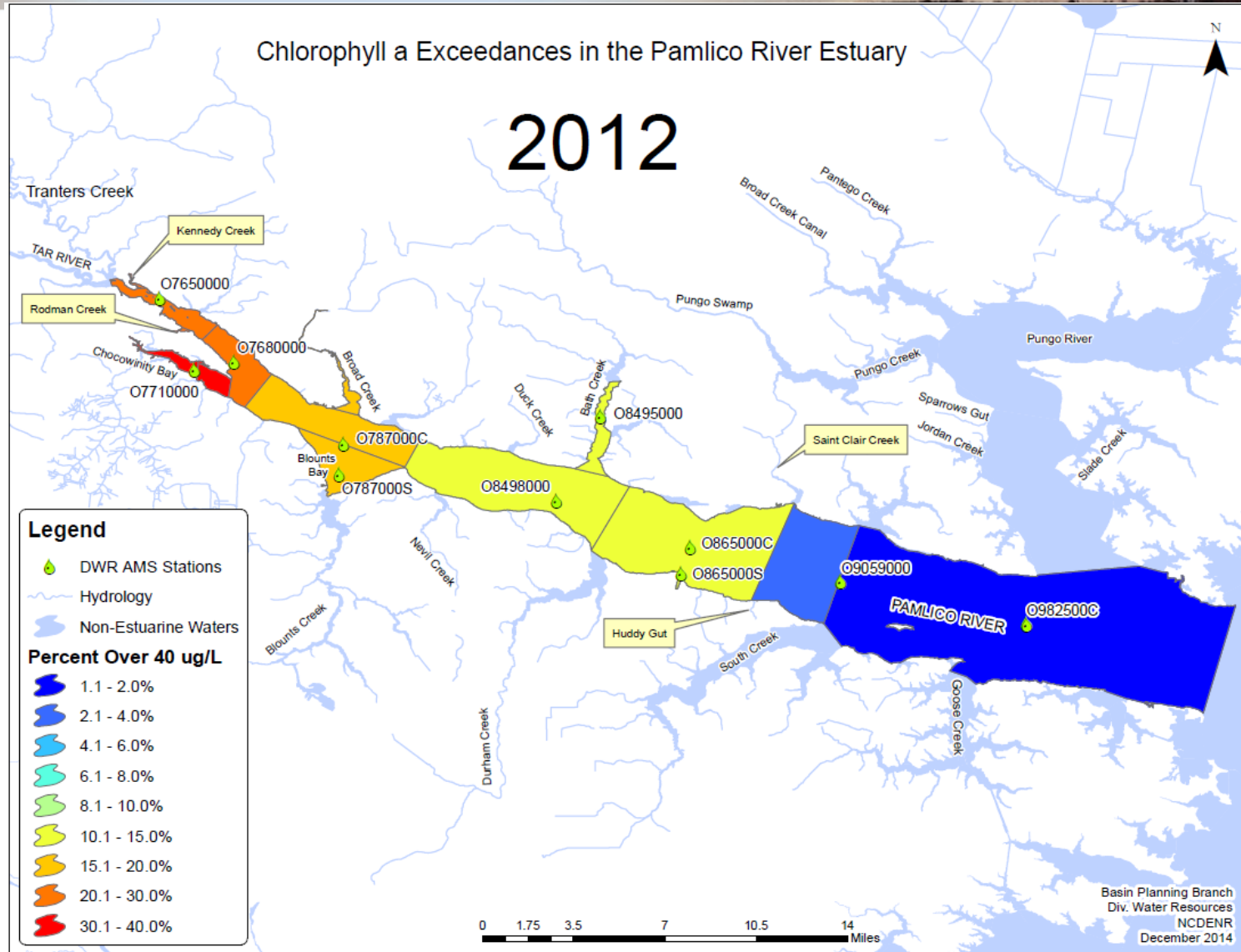
Pamlico Estuary Impairment - 2008



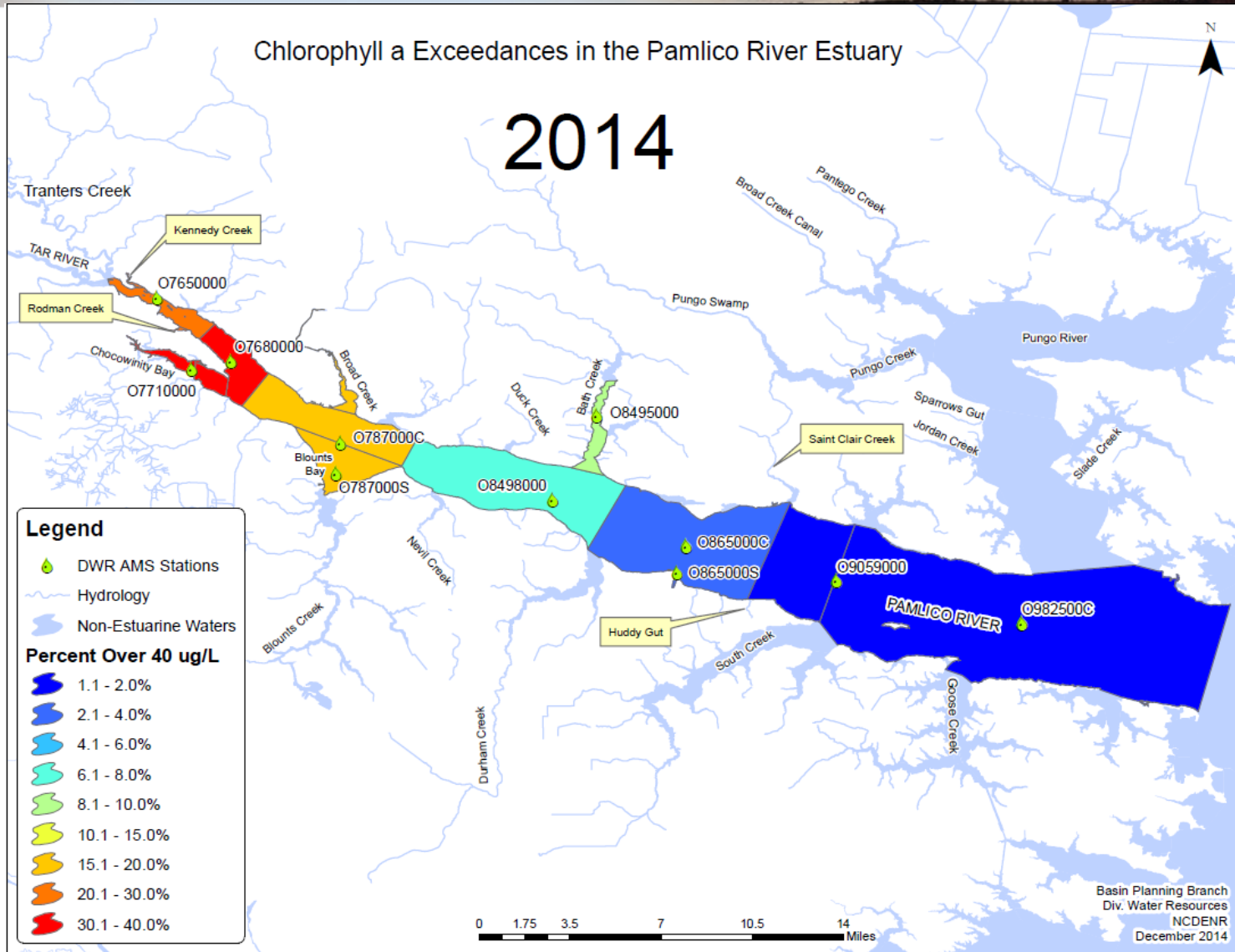
Pamlico Estuary Impairment - 2010



Pamlico Estuary Impairment - 2012

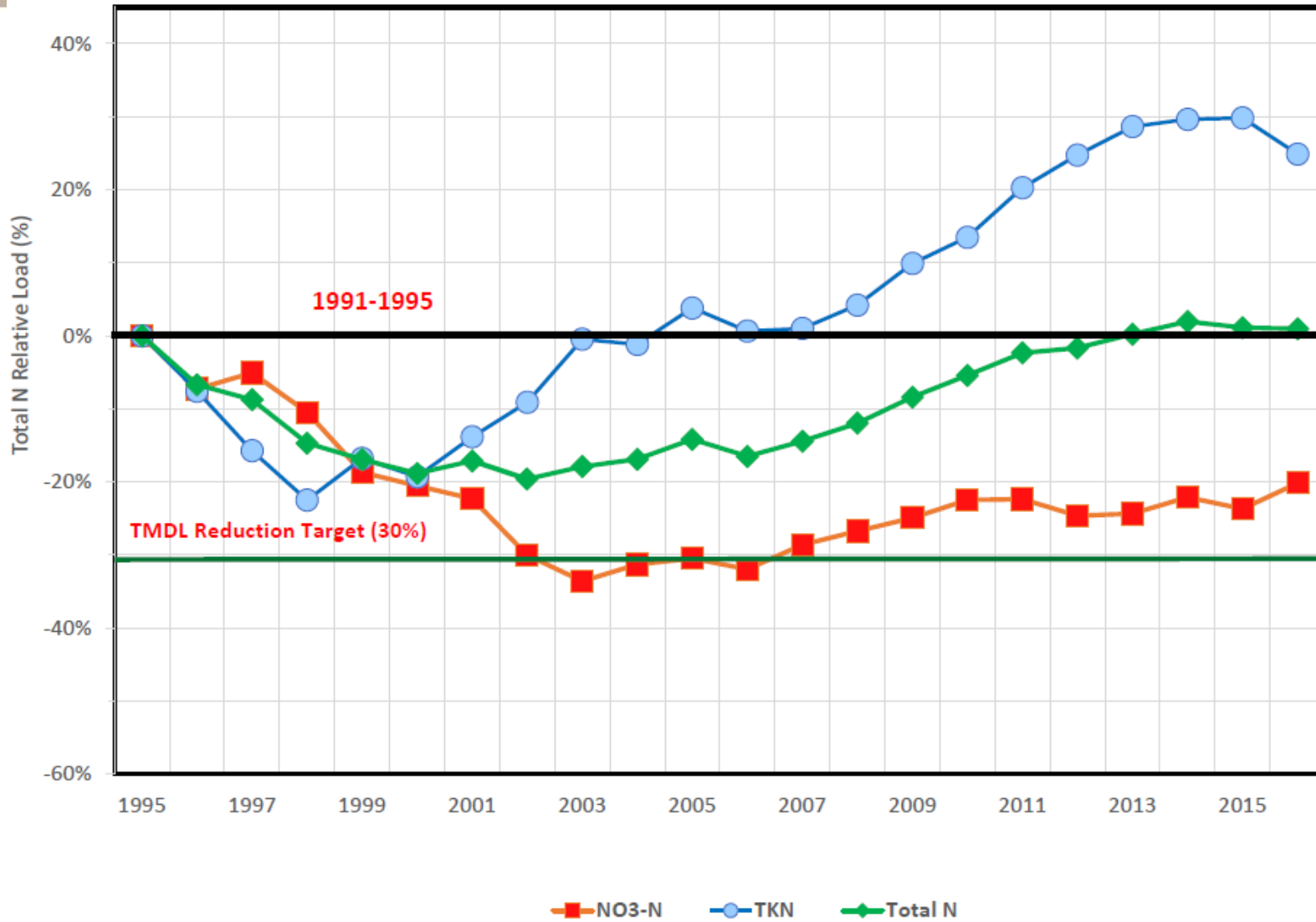


Pamlico Estuary Impairment - 2014



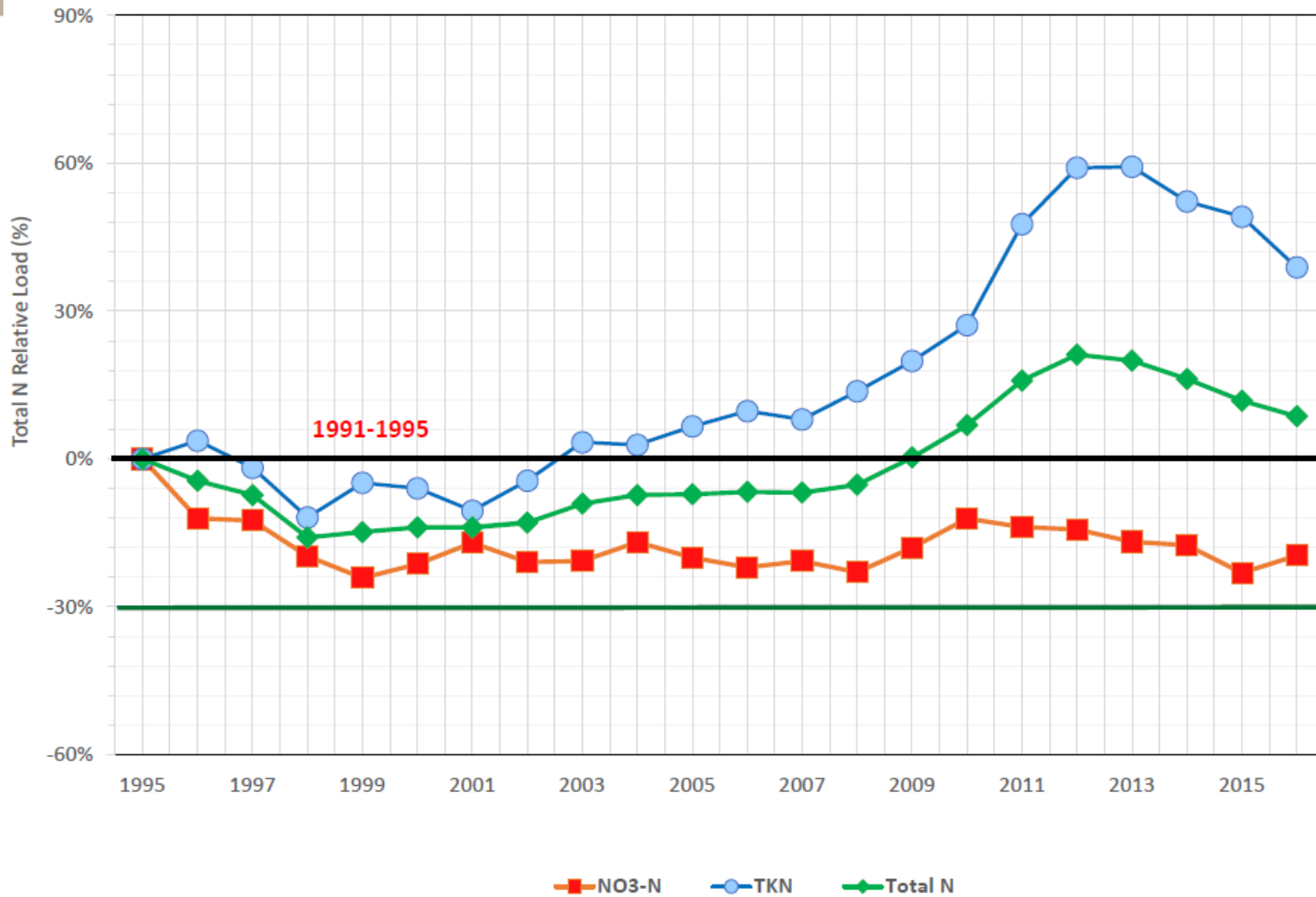
Flow-Normalized Nitrogen Loads (% vs. 1991-1995)

Neuse River at Fort Barnwell

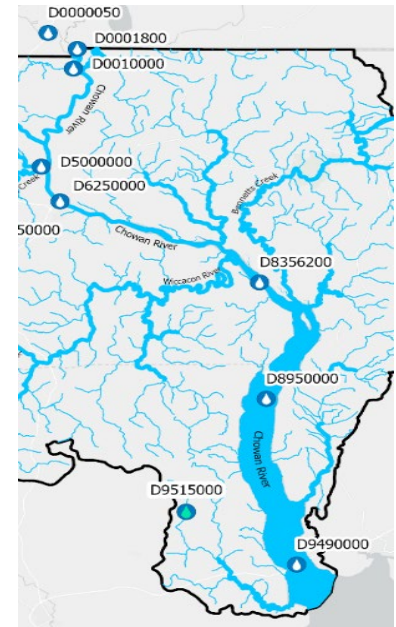
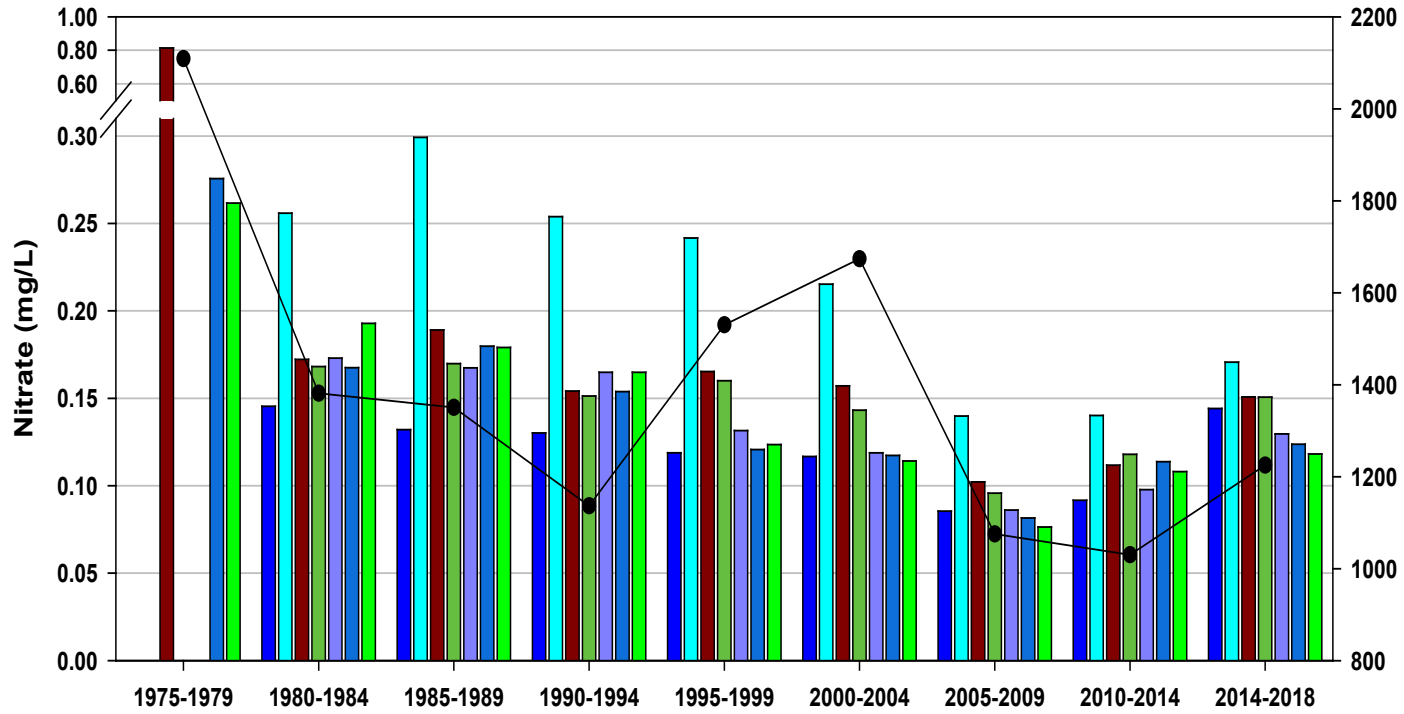
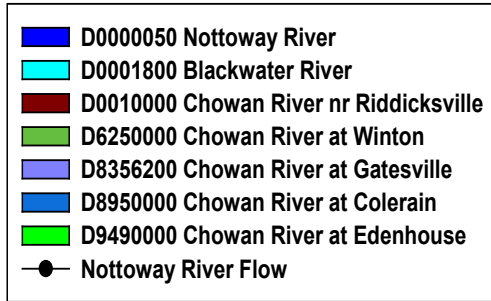


Flow-Normalized Nitrogen Loads (% vs. 1991-1995)

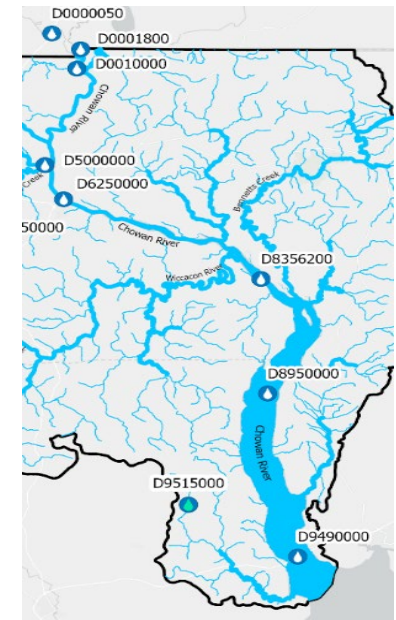
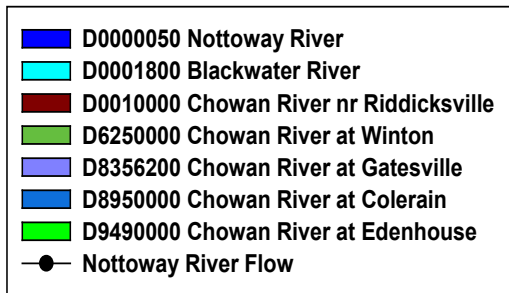
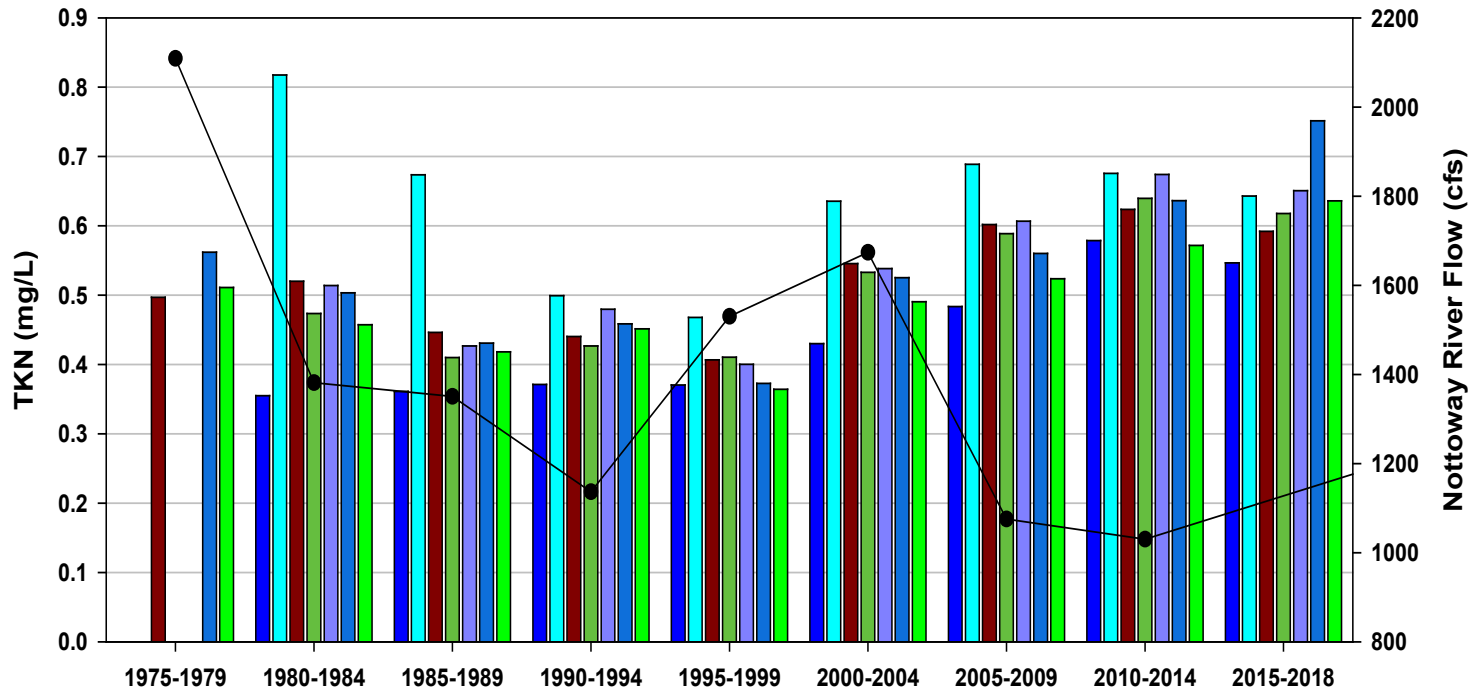
Tar River near Grimesland



Chowan River Basin Water Resources Plan Nutrient Sensitive Water Summary



Chowan River Basin Water Resources Plan Nutrient Sensitive Water Summary



Chowan Blooms Resurgence

- Recent blooms upswing not reflected in impairment
- Nutrient trends – large increase organic N
- Draft Basinwide Plan -
 - Public comment until Oct 30
 - Seek EMC approval Jan 2021
- Recommended actions include -
 - Eutrophication problem recognition
 - Revise criteria – NCDP
 - Increase monitoring – DWR
 - Local monitoring, education – water, health
 - Potential Voluntary Measures –
 - Increase Ag BMPs
 - Existing and New Development controls
 - Create swamp forest buffer conservation incentive
 - Potential Regulatory Measures –
 - Dry litter op's registration, ... ?
 - Consider NPS rules
 - Research –
 - Better characterize septic failures
 - Source tracking
 - Stream flow
 - Forest management effects
 - Increase interstate coordination



CHOWAN RIVER BASINWIDE WATER RESOURCES PLAN 2020

Quick Facts

- Located in the northeast corner of the state, waters in the Chowan River basin begin in Virginia and flow into North Carolina. 3,000 mi² (85%) lies in Virginia, 1,900 mi² (25%) lies in North Carolina.
- 2016 land use in the North Carolina portion of basin consists of 36% forest, 20% agriculture and 20% wetlands.
- All or portions of Bertie, Chowan, Gates, Hertford, and Northampton counties and 16 municipalities are in the North Carolina portion of the basin.
- Chowan River proper originates where the Backwater and Nottoway rivers meet. Major tributaries include Potocasi Creek, Wicacoan River, and Ahoosie Creek.
- 23 miles of the Wicacoan River (Roggerd Swamps) and 8 miles of Crooked Swamps are identified as impaired (exceeding water quality standards) (2018).

More information about water quality and quantity issues in the basin can be found here: <https://deq.nc.gov/chowan2020>



DEQ
NORTH CAROLINA
Department of Environmental Quality

Basinwide planning is a watershed-based approach to identify areas that need additional protection, restoration, or preservation to ensure waters of the state are meeting their designated use. Basinwide water resources plans (basin plans) are prepared by North Carolina's Department of Environmental Quality (DEQ) Division of Water Resources (DWR). Implementation of recommendations, however, entail the coordinated efforts of state and local agencies, community leaders, and stakeholders in the basin.

Nutrient Management

The Chowan River was the first coastal river in North Carolina to be recognized for water quality issues related to excess nutrients. In 1972 and 1978, major nuisance algal blooms were reported in the lower portion of the river. Nuisance algal blooms are the growth of microscopic or macroscopic vegetation due to an excess amount of nutrients in a river system. The nutrient sources in the Chowan River were identified as wastewater from municipal and industrial dischargers, overland flow, and drainage from agricultural and urban areas.

In May 1979, the Environmental Management Commission (EMC) established the Nutrient Sensitive Water (NSW) supplemental classification. This supplemental classification provided a legal basis for controlling the discharge of nutrients (nitrogen and phosphorus) into surface waters. This enabled nutrient limits to be included in National Pollutant Discharge Elimination System (NPDES) wastewater permits discharging to the surface waters of the Chowan River basin (3 mg/L total nitrogen and 1 mg/L total phosphorus as a 30-day average).

In 1982, the then North Carolina Department of Natural Resources and Community Development developed the Chowan/Albemarle Action Plan and the Chowan River Water Quality Management Plan. The plans identified specific management goals to reduce nutrients in the Chowan River. These included reducing nitrogen inputs by 15% to 25% and phosphorus inputs by 30% to 40%. Reducing both nutrients would result in a reduction in chlorophyll a. Chlorophyll a is an algal pigment used to measure biological productivity in aquatic ecosystems. The plans also dictated that peak levels of chlorophyll a were not to exceed 40 µg/L. During summer months, chlorophyll a concentrations were not to exceed 25 to 30 µg/L.

Implementation measures were put into place throughout the 1980s and 1990s and included converting (where possible) point source discharge to land application and the installation of best management practices (BMPs) to control nonpoint source pollution from agricultural lands. Information presented in the 2002 and 2007 Chowan River basin plans indicated the management strategies were working and nutrients were being reduced. This led to a steady decline in the frequency and intensity of algal blooms, and the majority of chlorophyll a measurements were below the state's water quality standard of 40 µg/L.

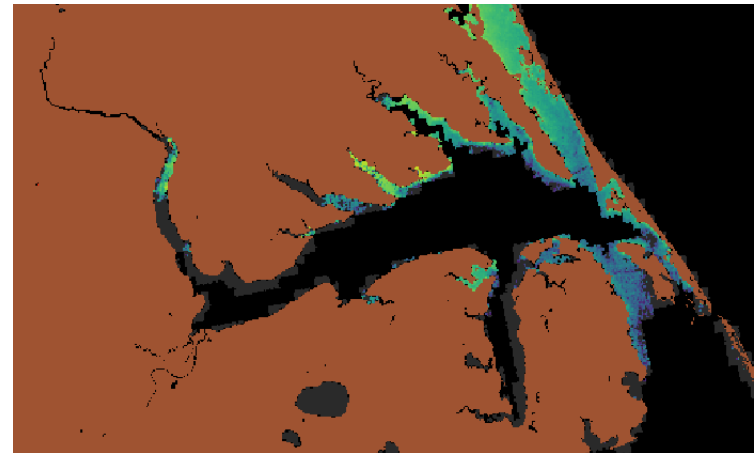
Coastal Strategies Adaptation - *Some Sources Meriting Further Consideration*

- Small dischargers (< 500k GPD)
- New Development – tighter onsite controls
- Existing Developed Lands
 - Runoff
 - Sanitary infrastructure
- Forest harvesting in SMZs (riparian zones)
- Livestock open stream access
- Dry litter poultry (legislation required)



Nutrient Criteria Development

- Criteria = water quality protection standards
 - Protect water body's designated uses via sensitive endpoints
- “NCDP” Process – pilots 1st: reservoir, estuary, flowing stream
 - Guided by Scientific Advisory Committee (researchers)
 - Draft criteria -> Criteria Implementation Committee (management implications)
 - Rulemaking
- Estuary pilot: Albemarle Sound/
Chowan River
 - Phase I i.d.'d research, now occurring
 - Reevaluating response criteria
 - Potential for N, P numeric criteria
 - Timeline
 - SAC recommendations mid-2022
 - Rulemaking complete 2024



Questions?



Nitrogen Trend vs. Baseline Period, Trent River at Trenton

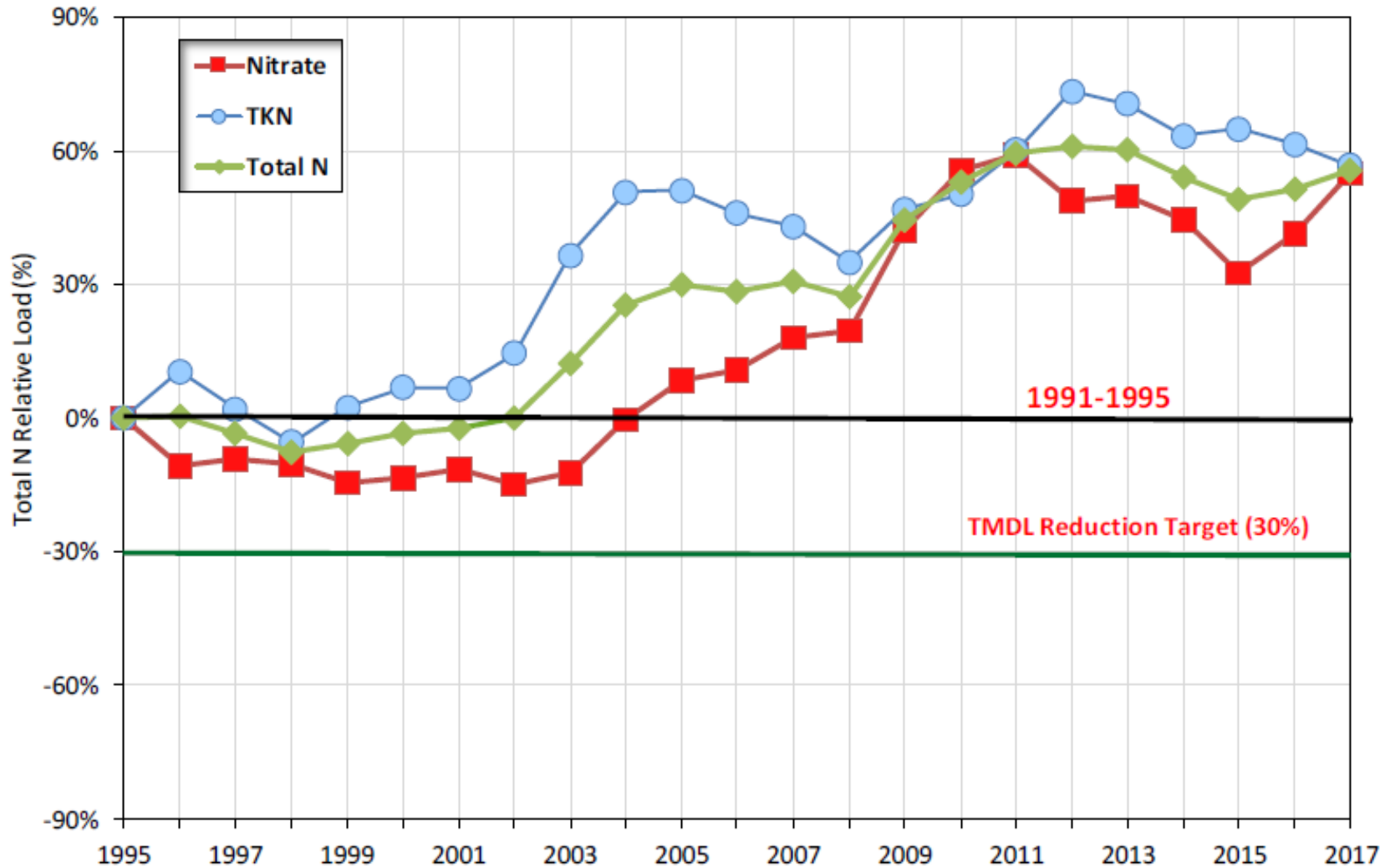


Figure 20. Nitrogen reduction for average flow conditions compared to the 1991-1995 baseline for Trent River at Trenton

Flow-Normalized Total Phosphorus Load (% vs. 1991-95)

Tar River near Grimesland

