Draft 2021 Status Report
Falls Lake Nutrient Management Strategy

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UNRBA PFC
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Requirements & Schedule for Falls Status Report

Overview

- Requirements set in Falls Purpose & Scope Rule (.0275)
- Division reports to EMC every 5 years; First report 2016
- Purpose
  - Update on strategy implementation
  - Evaluate changes in lake loading & water quality progress
  - Make recommendations on rule revisions
- Input & review provided by stakeholders

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Organization of 2021 Report

Three Main Sections

- Implementation Status of Falls Management Strategy

- Water Quality Progress
  - Changes in loading to lake
  - Lake chlorophyll *a* concentrations
  - Integrated Report summary
  - UNRBA Monitoring Project

- State of Knowledge
  - Advances in Science & Control Technology
  - Summaries of UNRBA Special Studies
  - Collaboratory Falls Lake Study – Interim Update

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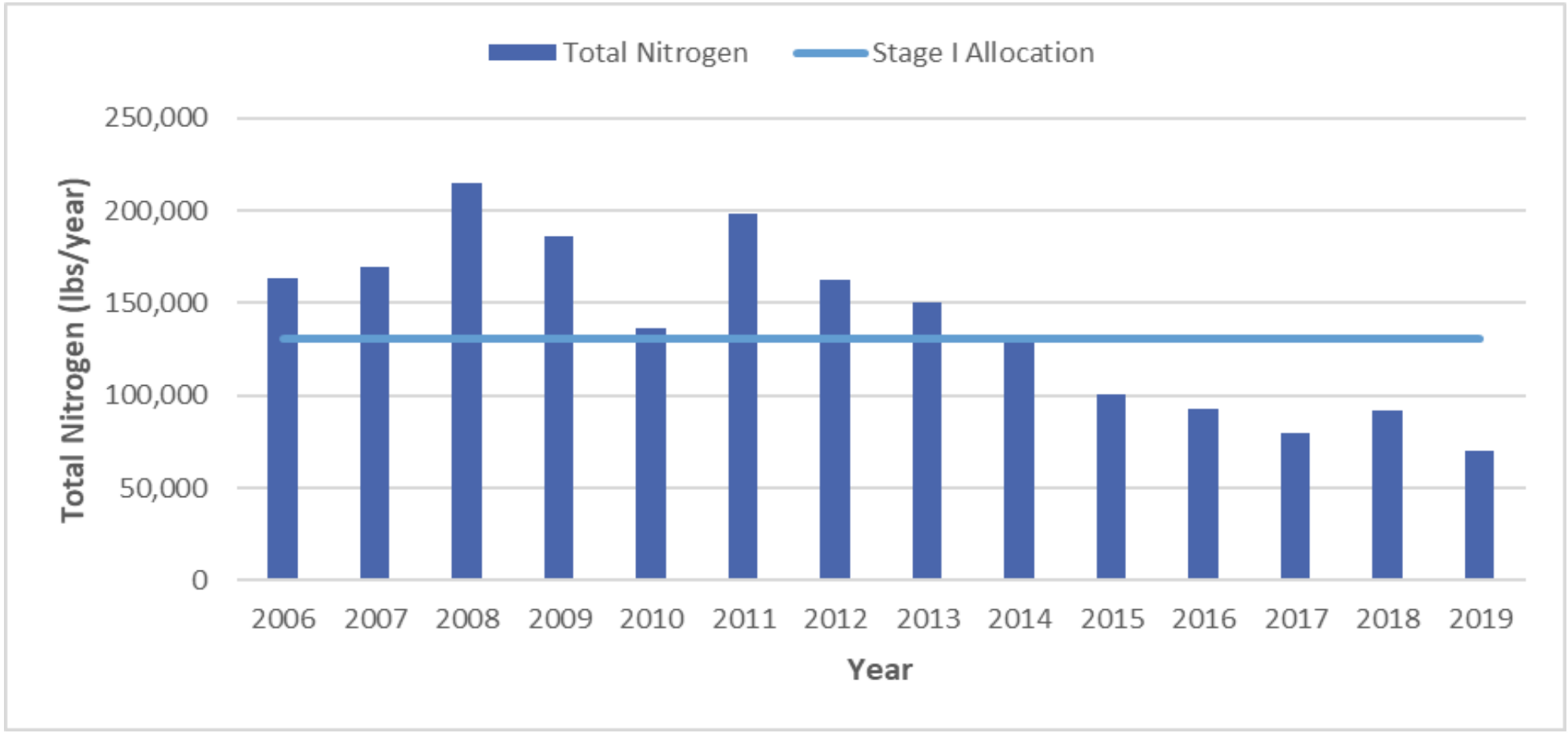
Falls Lake Stage I Rule Requirements

Regulated Source	Stage I Reduction Requirements
Wastewater	• 20% TN & 40% TP Reductions by 2016
Agriculture	• 20% TN & 40% TP Reductions by 2021
New Development Stormwater	• Local Governments Adopt Local Programs • Development meets rate targets: • 2.2 lbs/ac/yr TN and 0.33 lbs/ac/yr TP
Existing Development Stormwater	• Local governments develop local or joint program • Reduce loads back to 2006 baseline
State & Federal Stormwater	• Similar to LG requirements • NCDOT implements 6 retrofits per year

Wastewater Combined Nitrogen Reductions

Implementation Status – Falls Wastewater Rule



<u>Falls WWTP</u>

- North Durham
- Hillsborough
- SGWASA

- Falls WWTP achieved 57% TN reduction as of 2019

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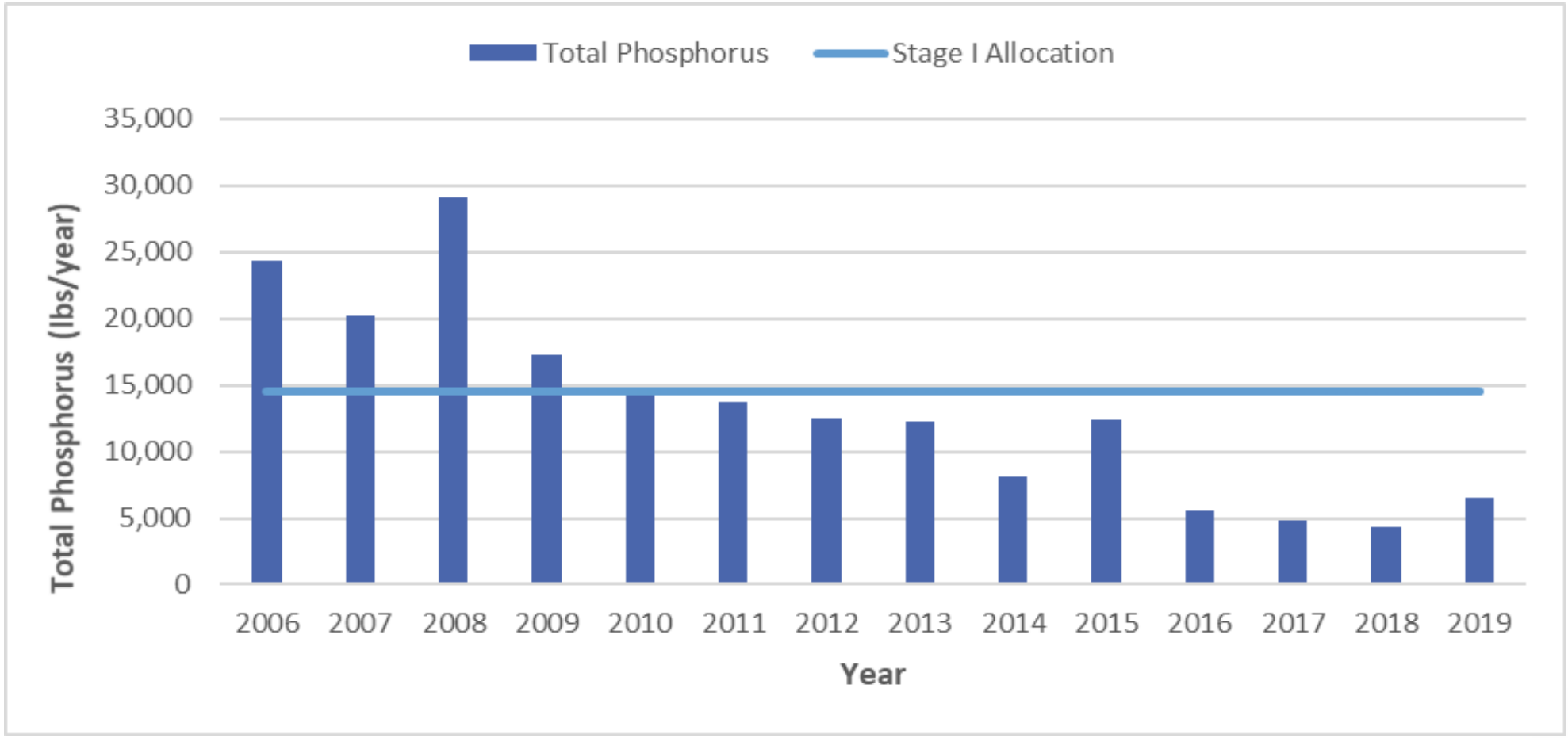
Wastewater Combined Phosphorus Reductions



Falls WWTP
- North Durham
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- Falls WWTP achieved 73% TP reduction as of 2019

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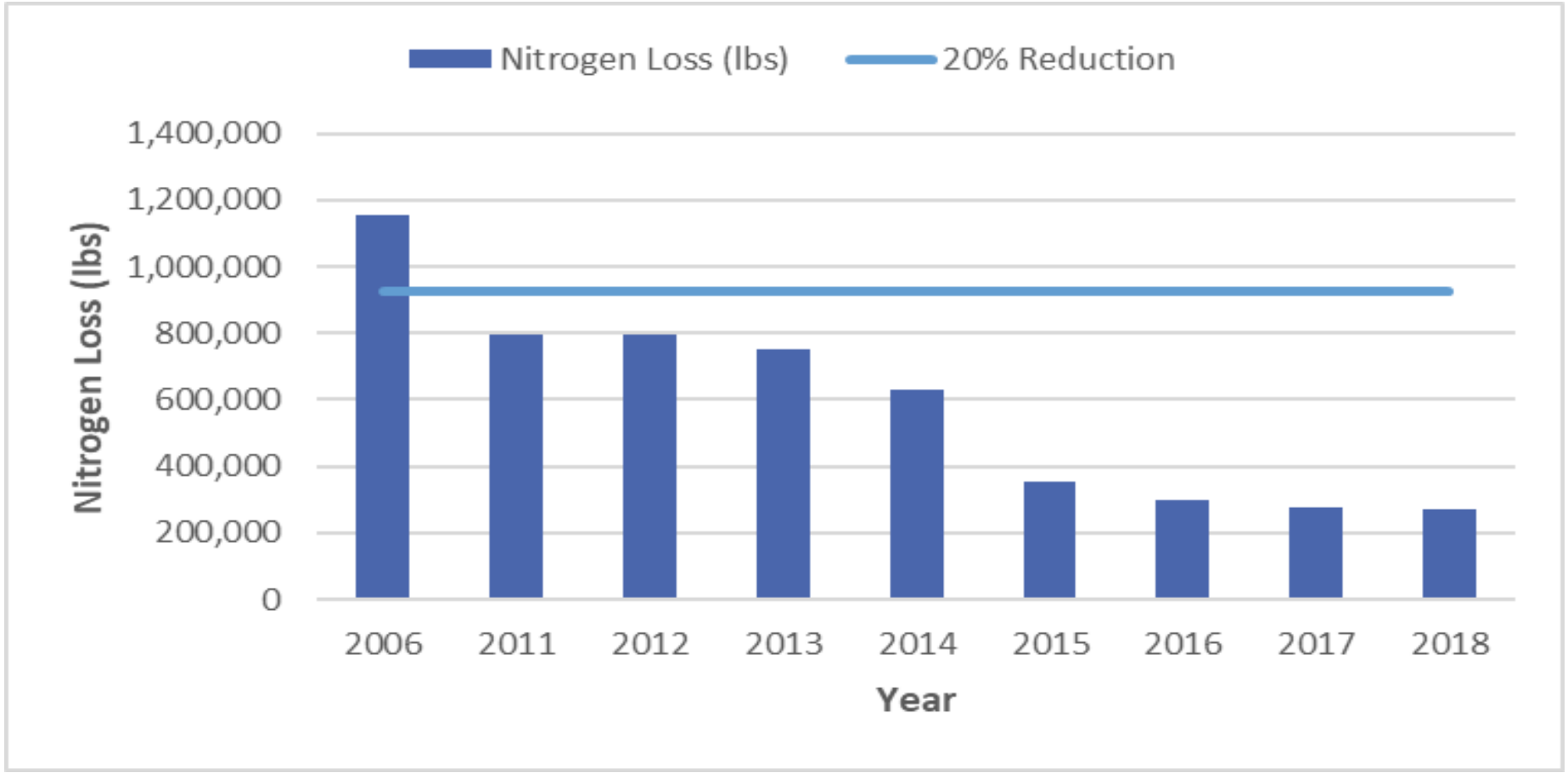
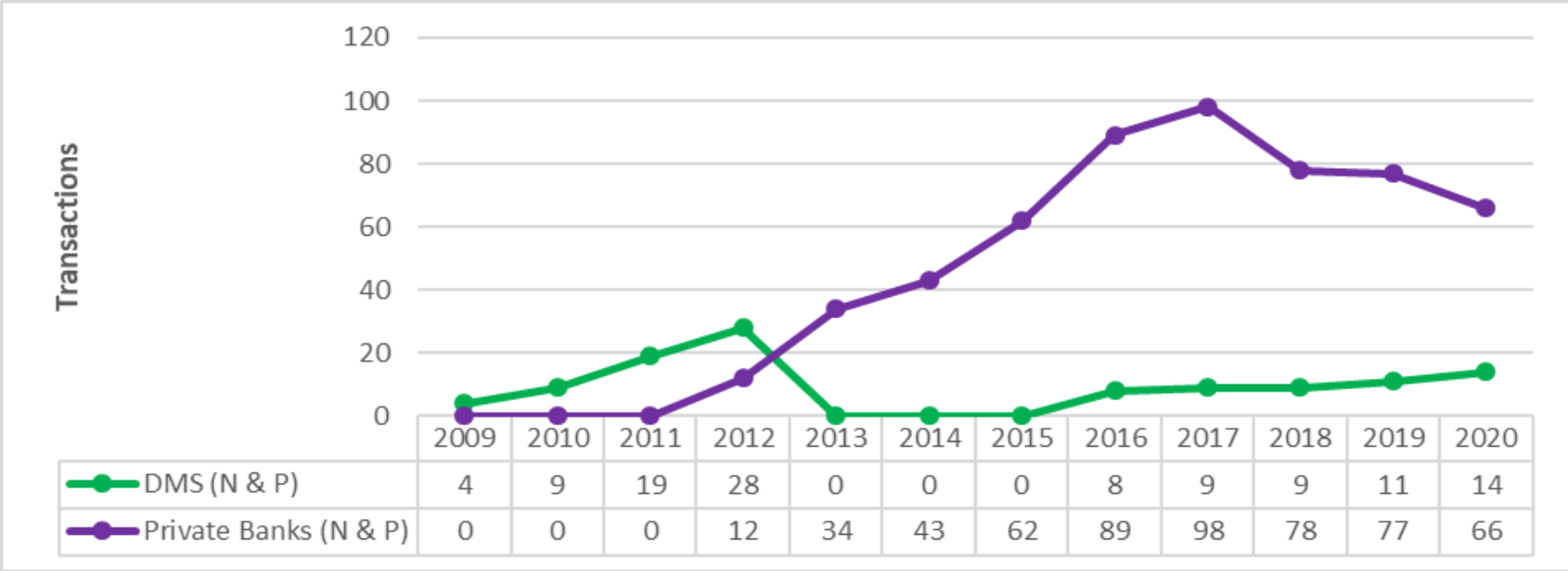
Agriculture Estimated N Loss Reductions



- Agriculture reporting 77% TN reduction as of 2018

New Development Stormwater

- All LG's began implementing programs by July 2012
- State & Federal entities also implementing New D
- Nutrient Offset Payment as of December 2020
  - 114,930 lbs. nitrogen
  - 16,408 lbs. phosphorus



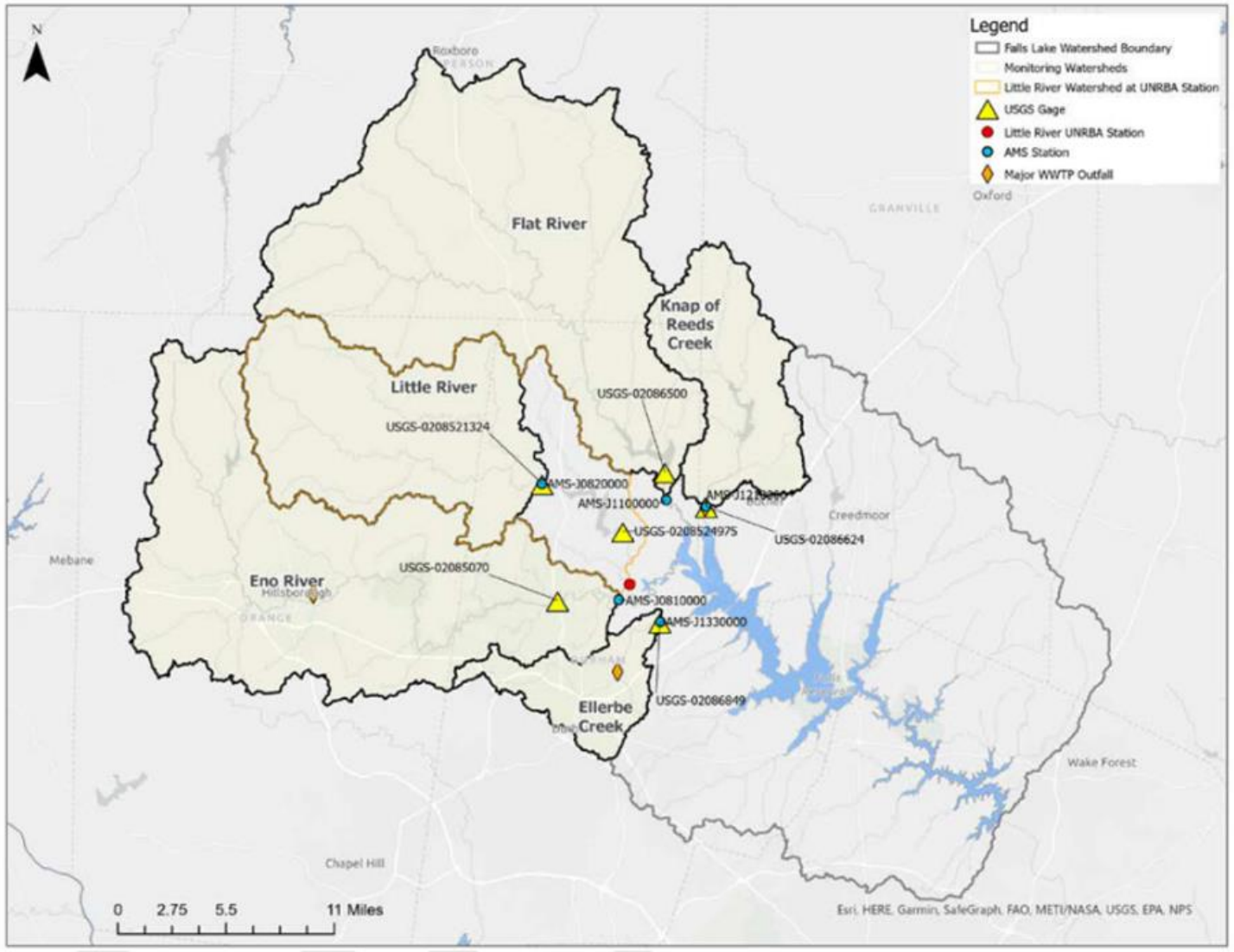
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
DMS (N & P)	4	9	19	28	0	0	0	8	9	9	11	14
Private Banks (N & P)	0	0	0	12	34	43	62	89	98	78	77	66

Existing Development Stormwater

- Local Governments Conducted Inventories in 2013
- Post-2013 DWR continued collaboration with LG's
  - Expands "toolbox" of available nutrient reducing practices
  - Develops Model Program & preliminary jurisdictional loads
- UNRBA Developed Interim Alternative Implementation Approach (IAIA)
  - Innovative investment based approach; deemphasizes pounds-accounting
- Model Program Approved – January EMC
  - Local & Joint Implementation Programs Due July 2021

Water Quality Progress

DWR Lake Loading Analysis



- Loading from Upper 5 major tributaries
  - Eno River
  - Little River
  - Flat River
  - Knap of Reeds
  - Ellerbe Creek
- Used Ambient Monitoring Stations and USGS Flow Stations
- Methods:
  - LOADEST
  - Flow Normalized Loads

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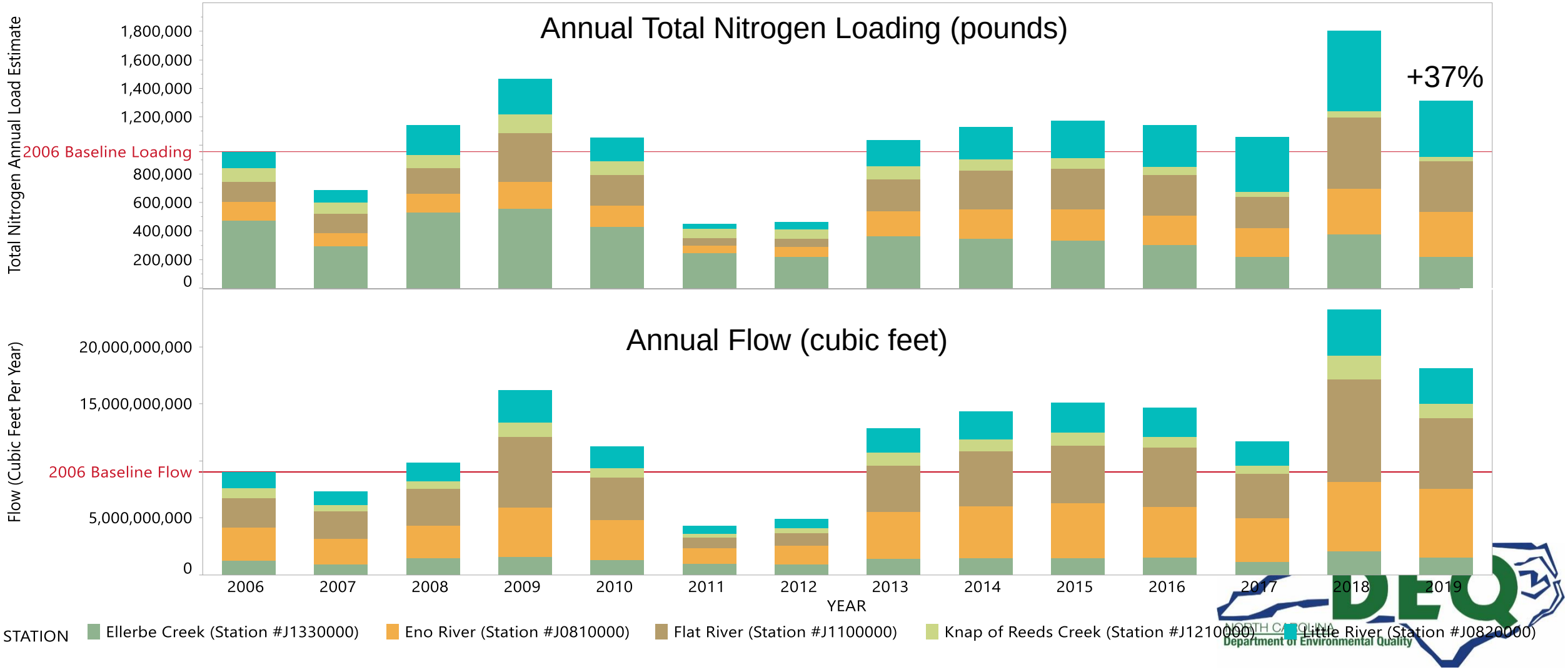
DWR LOADEST Nitrogen Loading Estimates

Combined Loading & Annual Flow w/ Stacked Tributary Contributions



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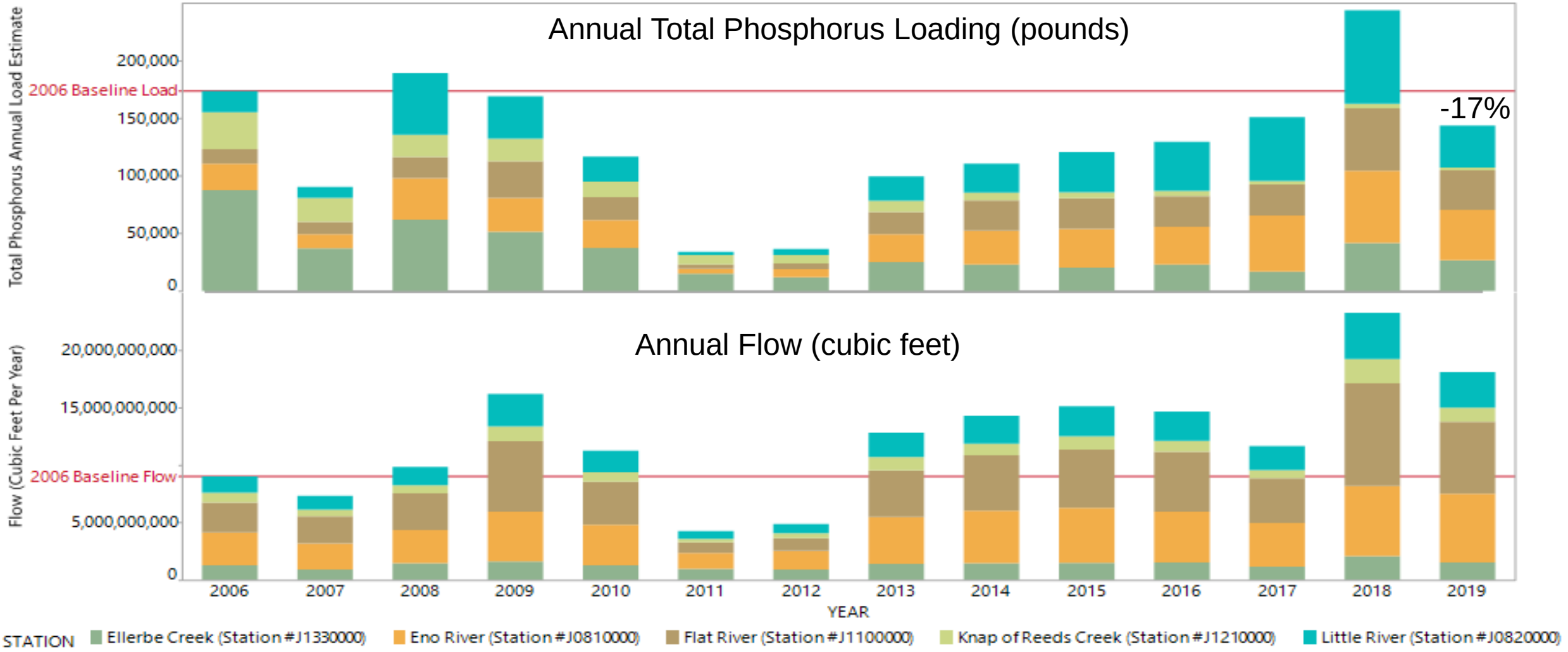


DWR Flow Normalize Loading Estimates

- Flow Normalized = Removes Effects of Year-to-Year Variability of Flow

- Results (2006 – 2019)
  - Downward trends in TP in all five upper watersheds (-52%)
  - Downward trends in TN in three of five upper watersheds (-20%)

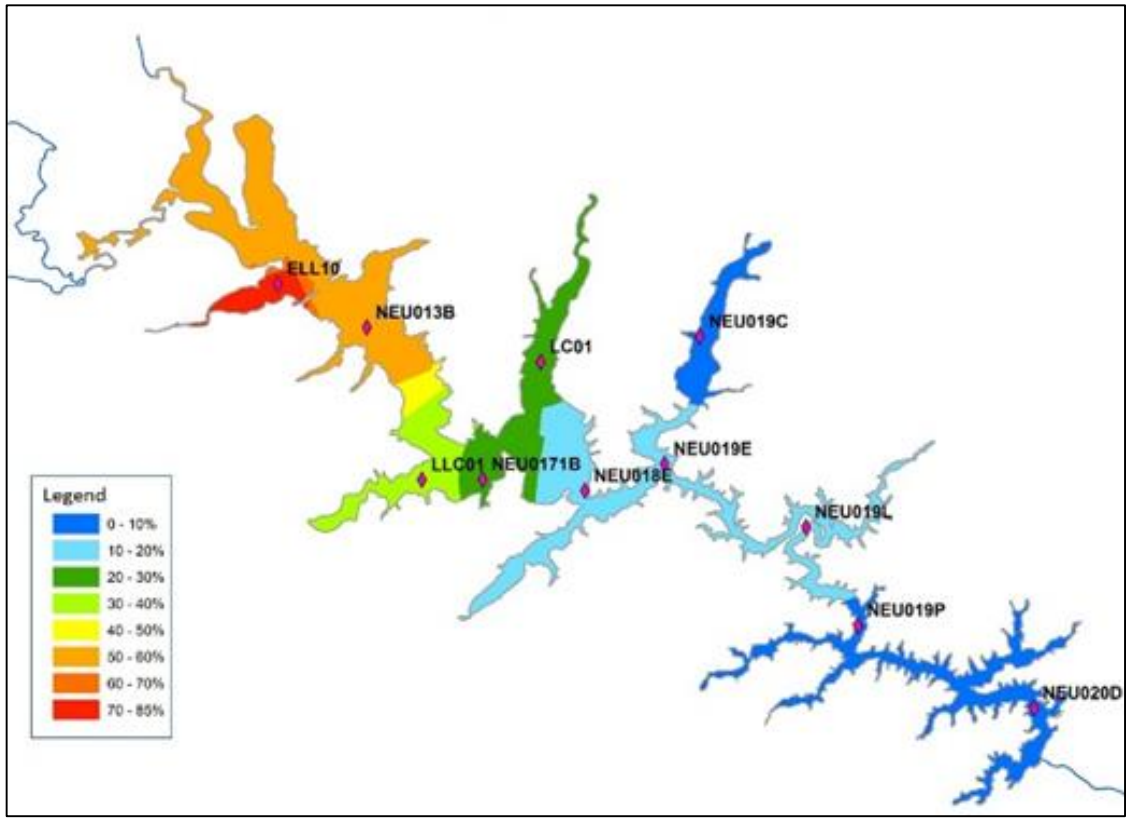
- Tributaries w/ point sources experienced decreases in loading

- Tributaries w/ nonpoint source only experienced slight increases

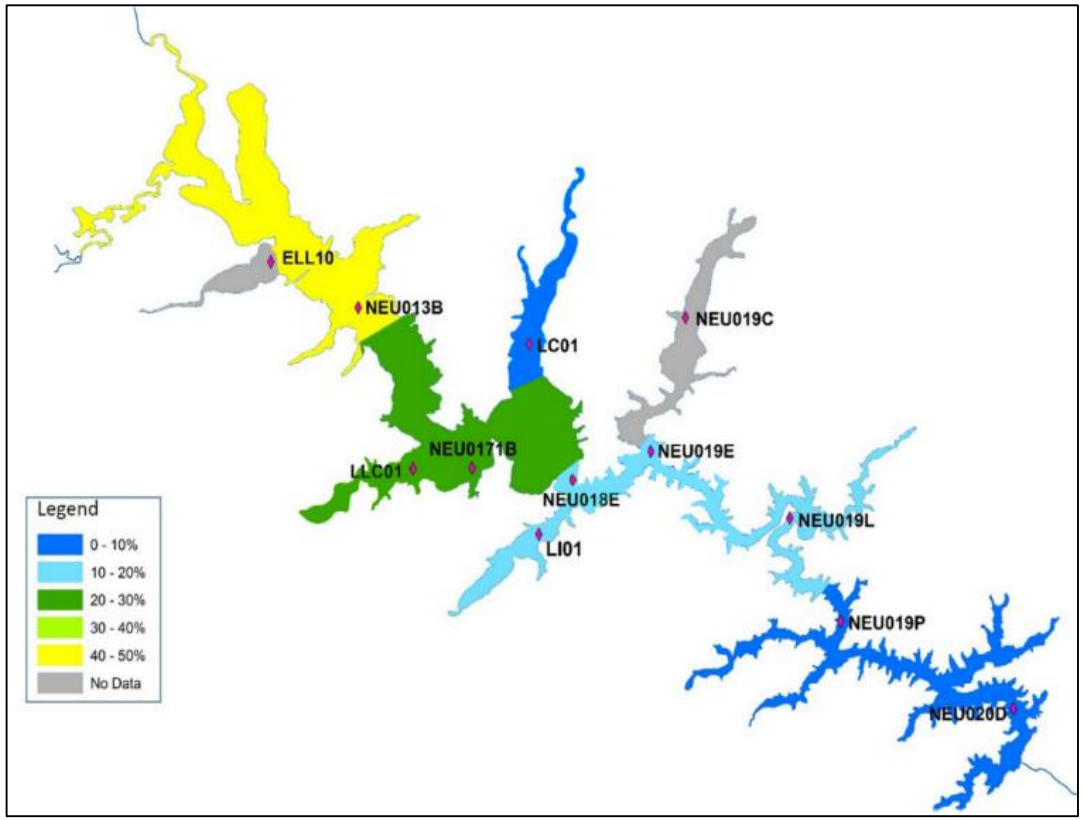
Lake Chlorophyll a Concentrations
Comparison (Pre/Post Strategy)

Percent of Data Exceeding Chlorophyll *a* Standard

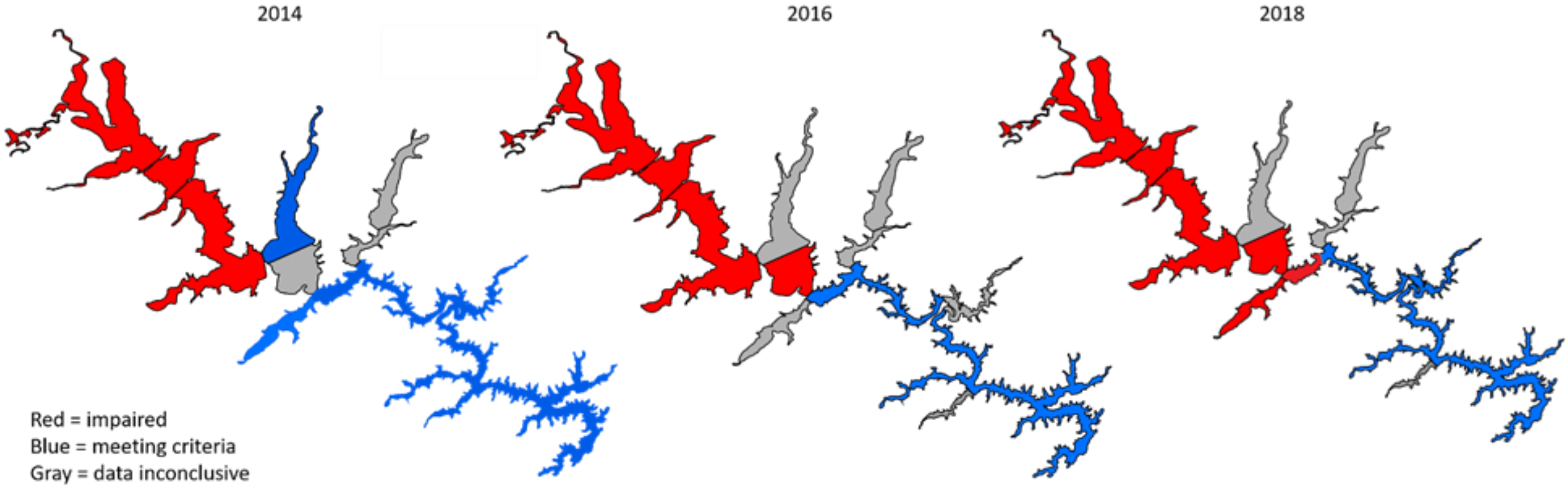
2005 - 2007



2015 - 2019



Impairments from 2014, 2016, 2018 Integrated Reports



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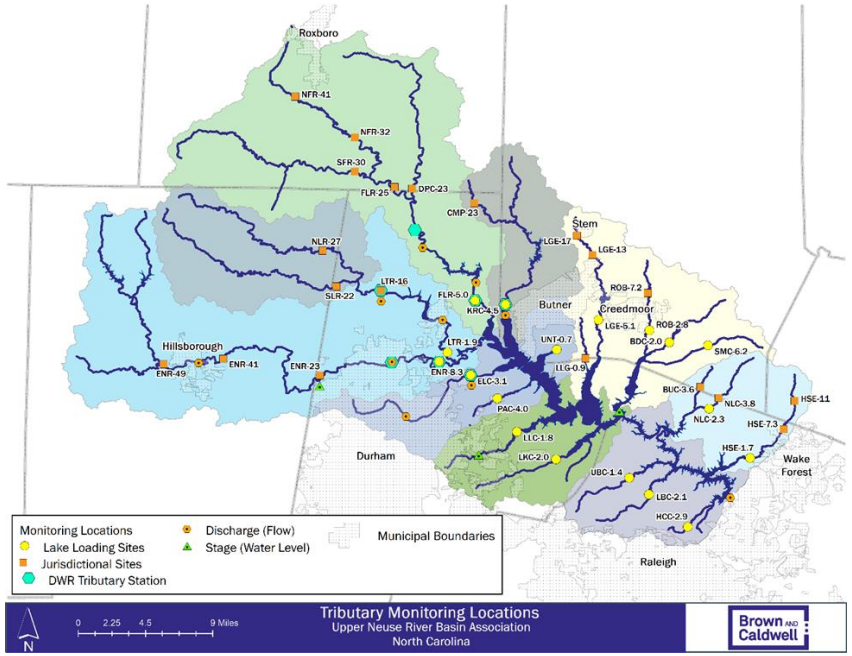
UNRBA Monitoring Project
Loading Analysis Highlights

- Summary of UNRBA's Routine Monitoring
- UNRBA Tributary Loading Evaluations
  - LOADEST
  - Trends since Falls Lake Impoundment
- UNRBA LOADEST Results (2006 vs 2017)
  - Loads decreased by 13% TN and 15% TP
- Loading Trends Since Lake Impoundment (1983 vs 2018)
  - Loads decreased by 60% TN and 90% TP



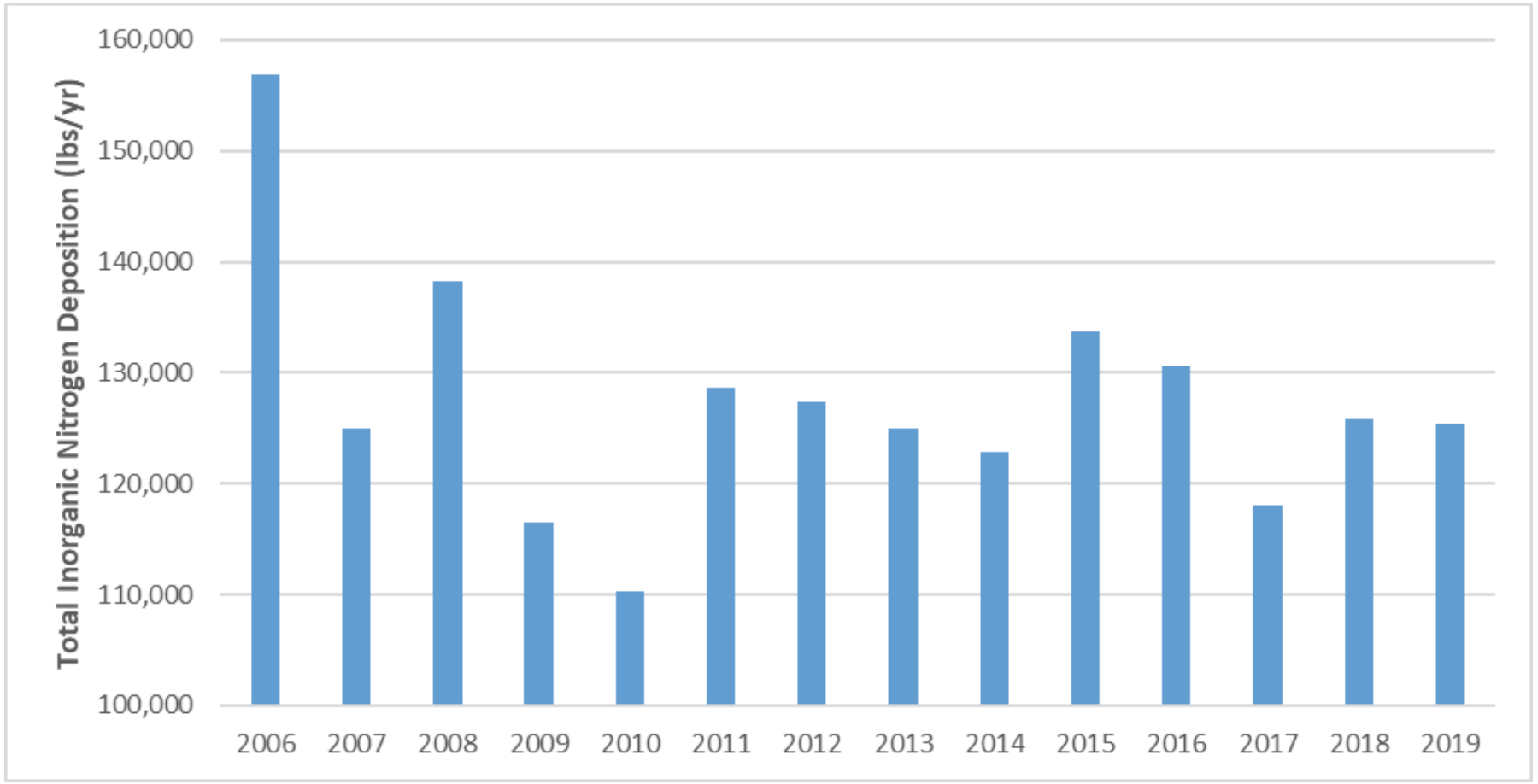
State of Knowledge
Topics Covered

- Required by Rule
  - Wastewater Treatment Technology
  - Stormwater Treatment Technology (New & Existing D Stormwater)
  - Utilization of Nutrient Offsets & Upcoming Program Changes
  - Programmatic Measures Implemented by LGs
  - Current and projected extent of reuse & land application
  - Atmospheric Deposition Trends
  - Summary of Studies Evaluating Nutrients from Groundwater & Onsite Systems

- New Additions for this Report
  - UNRBA Special Studies
  - UNC Collaboratory Falls Lake Study

Atmospheric Deposition

Annual Total Inorganic Nitrogen Atmospheric Deposition to Surface of Falls Lake



Source: Simulated Rates by EPA Clean Air Status Trends Network (CASTNET)

- 20% Decline in Nitrogen Deposition to Lake
- Reductions likely due to state & federal air quality initiative

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UNRBA Special Studies

Special Studies Summarized From UNRBA 2019 Monitoring Report

High Flow Sampling	*Light Extinction Data Collection*
Storm Event Sampling	*Model Performance Evaluation*
Lake Sediment Quality & Internal Nutrient Loading	*Recreation Use Evaluation*
Constriction Point Assessment	*Reservoir Bathymetry & Sediment Mapping*

- These studies will fill data gaps for model development process
- Provide insight to lake water quality beyond changes in loads

UNC Collaboratory Falls Lake Study

Research Projects

Studies Summarized From Collaboratory 2020 Interim Report

Quantifying Sediment Nutrient Processes	Estimating Influence of Onsite Wastewater Treatment Systems
High & Low Flow Observational Study	Green Street Retrofits & Wet Pond Retrofits
Cyanotoxin Presence & Year-Round Dynamics	UNRBA Model Review
Paying for Nutrient Management	Importance of Lake & Impoundment Ecosystems to Global Organic Carbon Cycling
Balance Between Cyanobacterial N Fixation & Denitrification	

Summary
Falls 2021 5-year Report

- Implementation of rules continues in a timely fashion
  - Regulated community working constructively and collaboratively with DWR
- Sources meeting or exceeding Stage I reductions goals
- Stage I lake loading reductions not yet met, but majority of lower lake meeting Chl-*a* standard
- UNRBA and Collaboratory will inform understanding of lake response and upcoming rules readotpion process *(begins ~2024)*

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Next Steps

- Request comments on draft by April 13th
- Will make revisions to address public comments
- Present Final Report to May 2021 WQC & EMC as information item
- Next Report in 2025 – Evaluates Impact of Stage I & Feasibility of Stage II

QUESTIONS / COMMENTS

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Division of Water Resources

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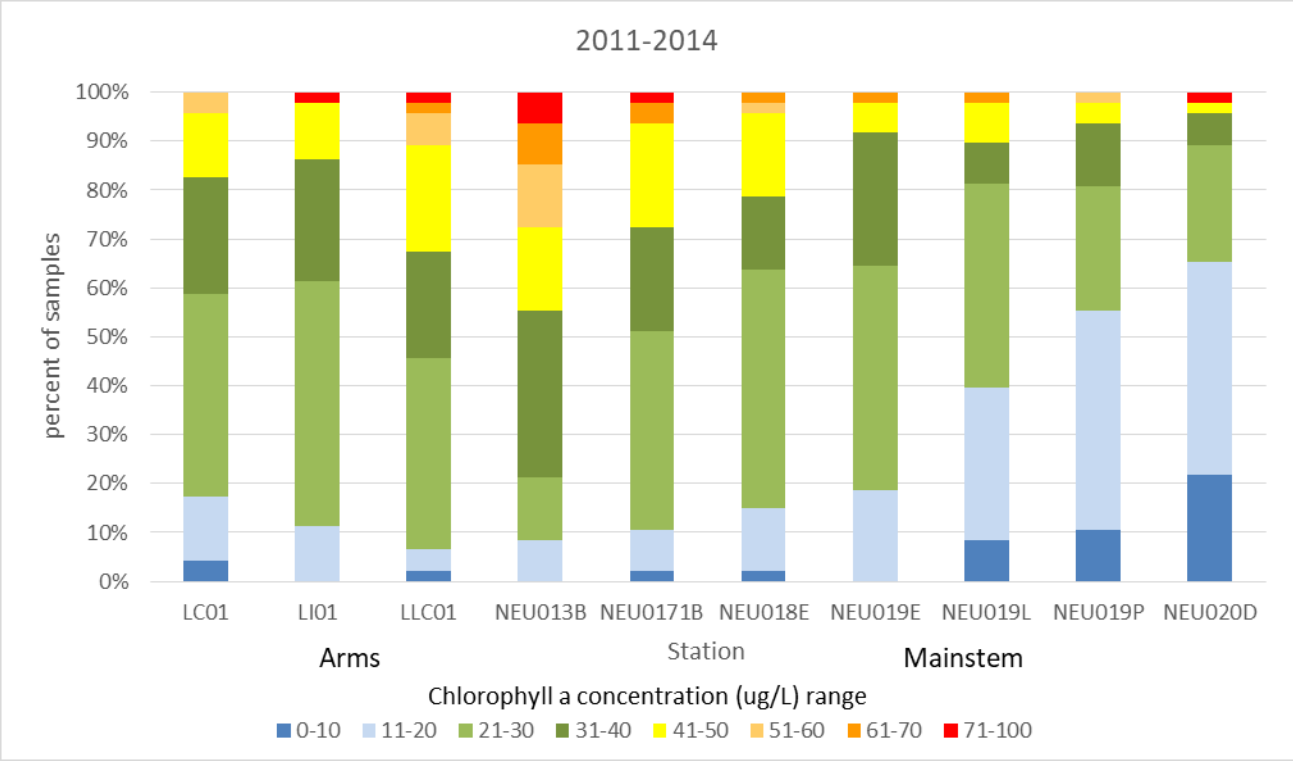
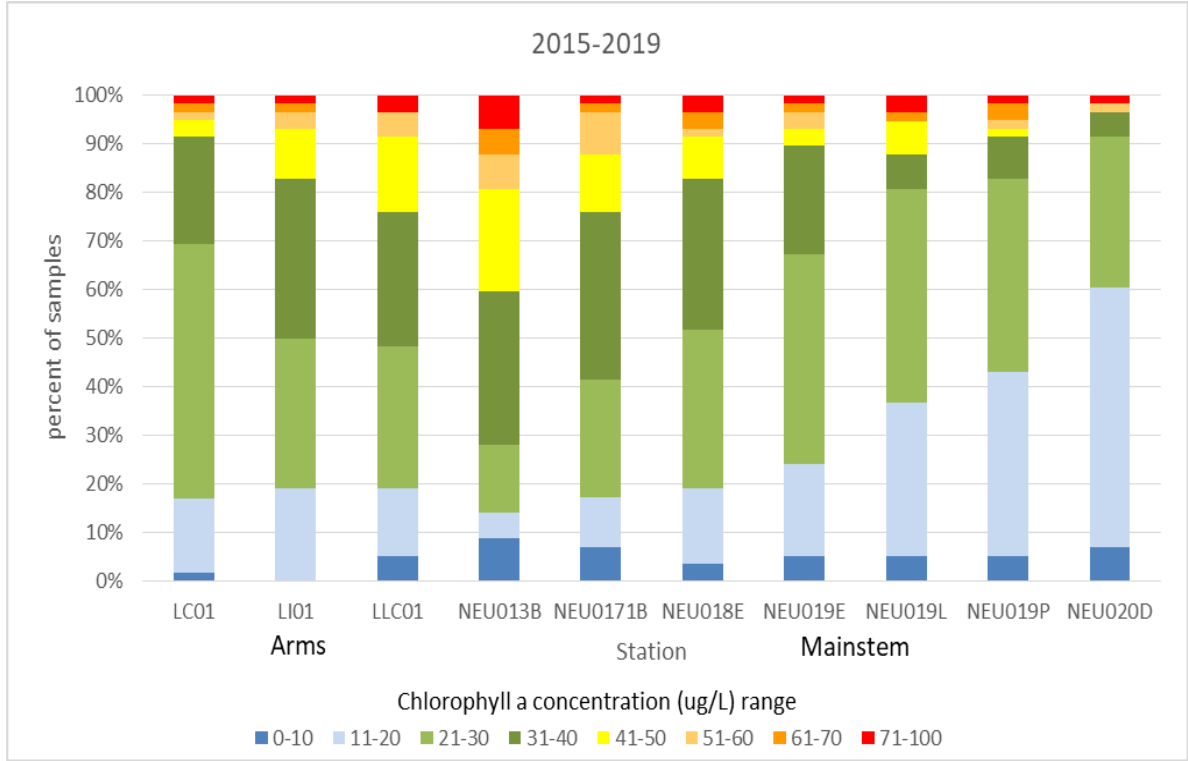
Distribution of Chlorophyll *a* Concentrations by Station

2011 - 2014



2015 - 2019



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