



Lower Catawba Basin Nutrient TMDL Update

Stakeholder Meeting
Rock Hill Operations Center, Rock Hill, SC
November 19, 2013

South Carolina Department of Health and Environmental Control

Promoting and Protecting the Health of the Public and the Environment www.scdhec.gov

Outline

- Background
- Current Water Quality
- TMDL Scope
- Modeling Approach
- TMDL Development Plan
- Questions

Background

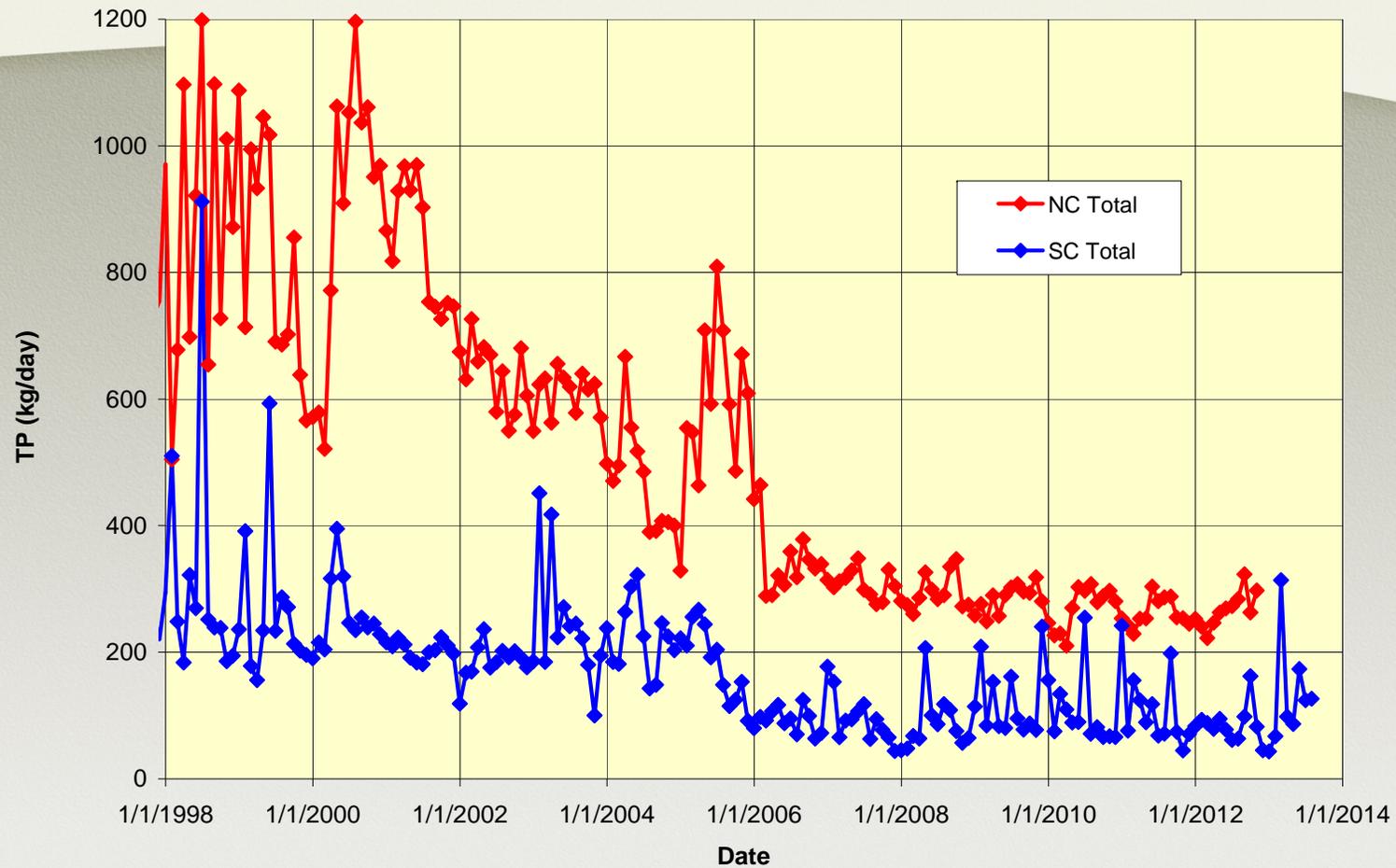
- History of nutrient enrichment
 - Lake system included on Impaired Waters List since 1992 (prior to numeric nutrient WQS)
- Effects expressed in SC lakes
 - Impaired water quality: Phosphorus, Nitrogen, Chlorophyll, pH, Dissolved Oxygen
 - Increased DO depletion in bottom waters
- Water quality management concern since at least 1990s
 - Modeling studies (Duke Energy, USC, SCDHEC, NCDENR, et al.)
 - SC numeric nutrient criteria (2001)

Background

- NPDES permitting
 - SCDHEC begins limiting phosphorus in permits (2001)
 - NC NPDES phosphorus load reductions in permits (2006) (actual reductions started earlier)
 - Two major SC NPDES industrial discharges have ceased operations
 - Phosphorus levels in the lakes improved

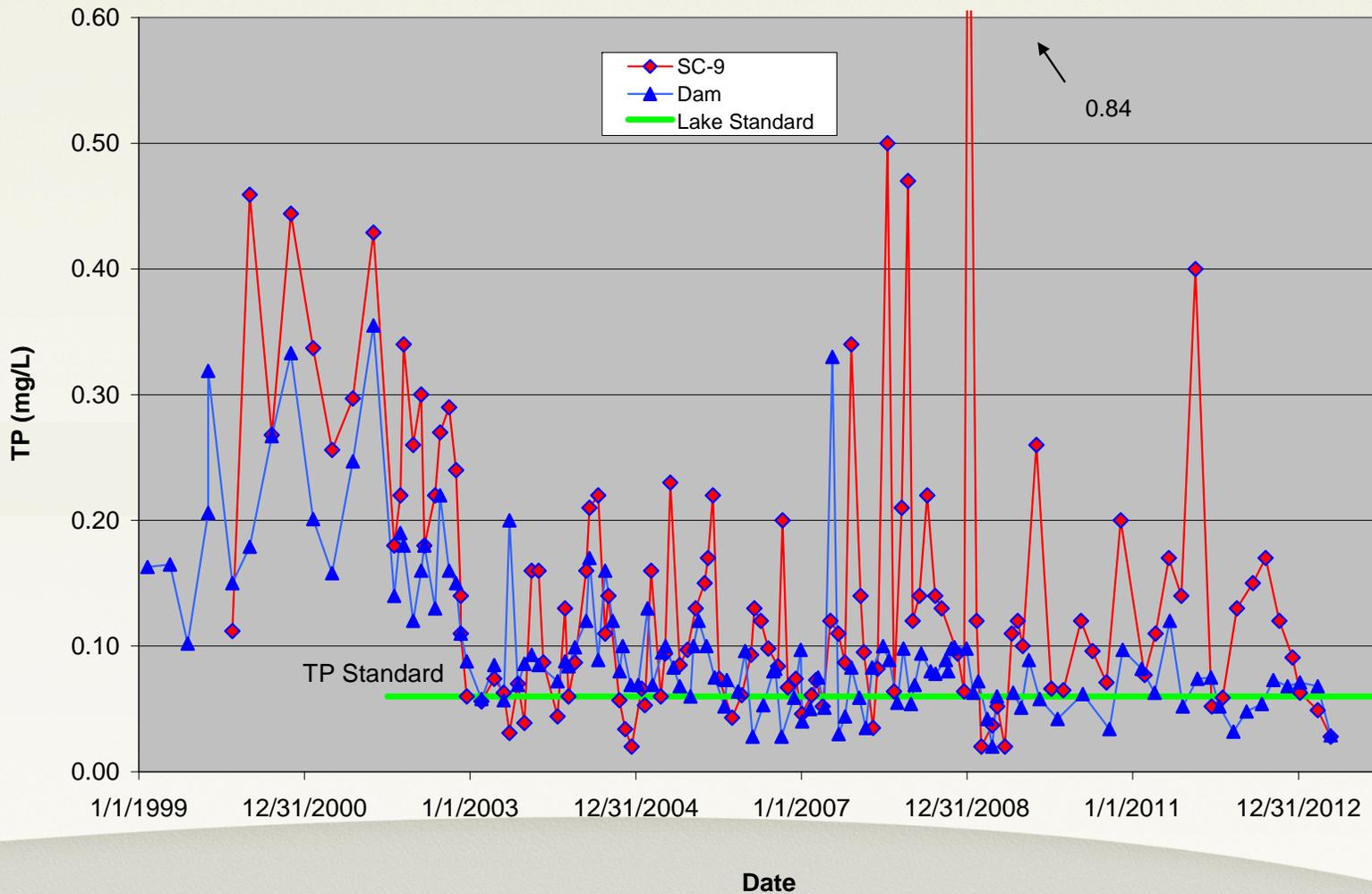
Wastewater Loading

Total Phosphorus Loads Discharged into Lower Catawba Basin - Fishing Creek Reservoir from Major NC & SC Dischargers



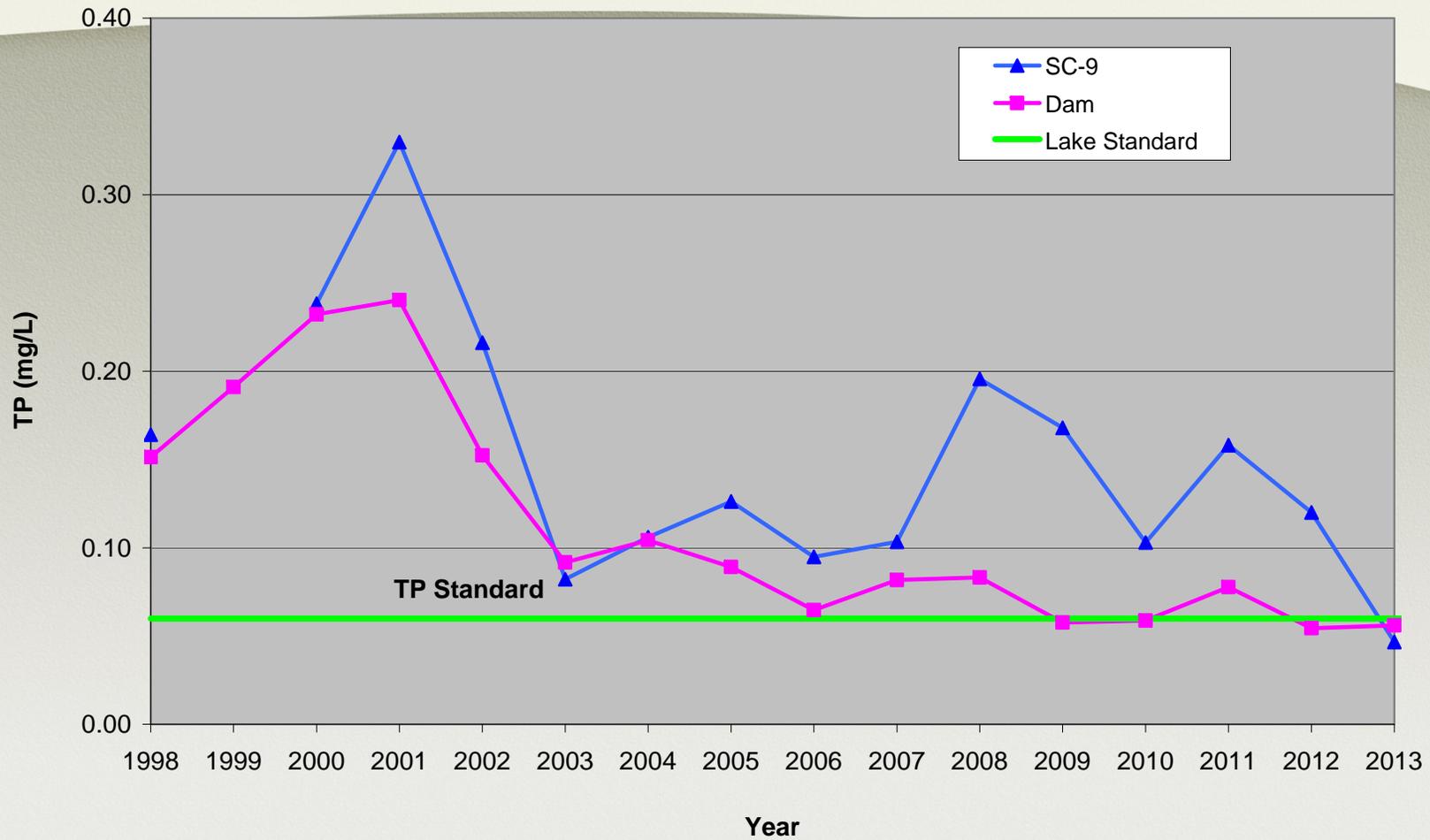
Fishing Creek Reservoir Phosphorus

Total Phosphorus Concentrations in Fishing Creek Reservoir at SC-9 and at Dam



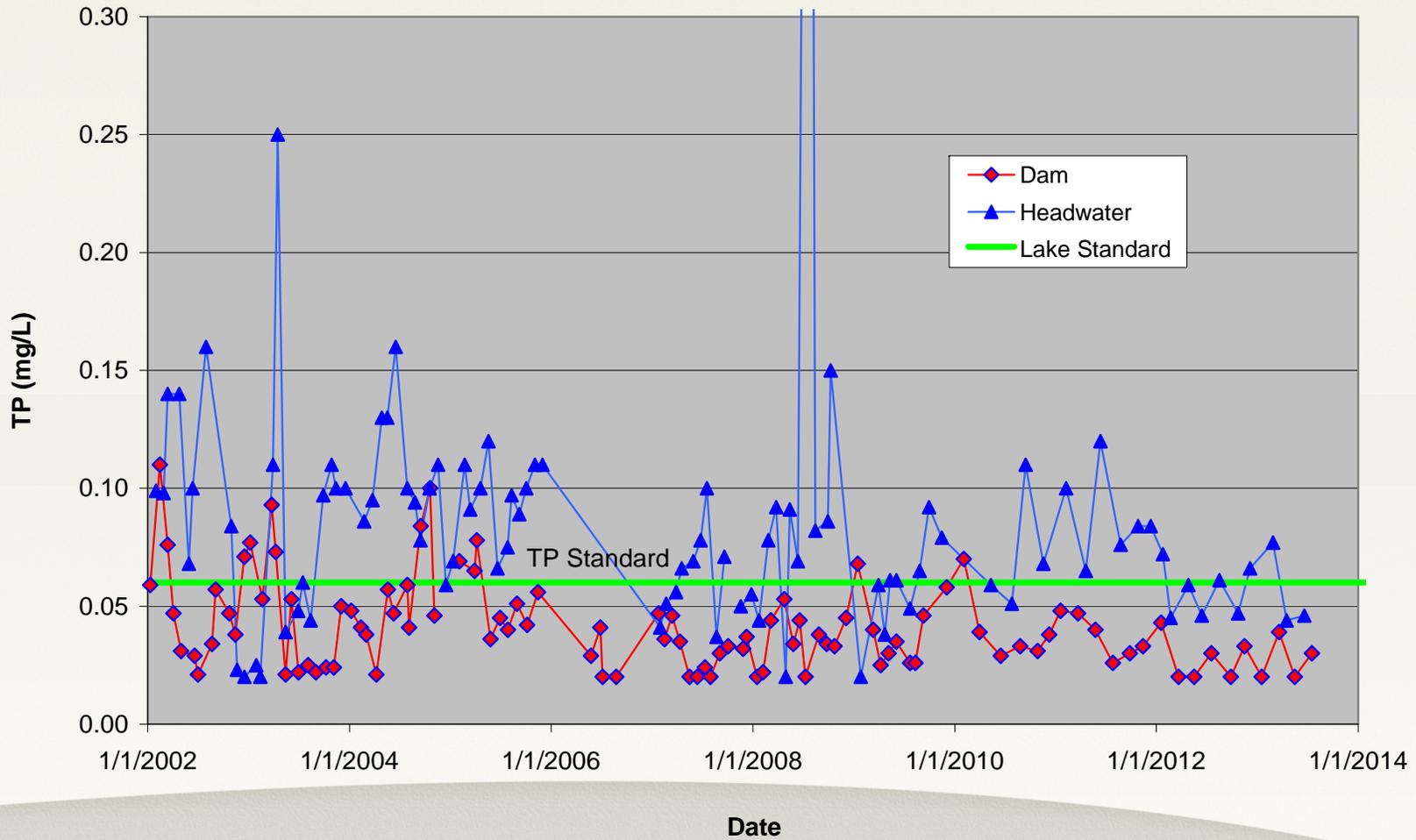
Fishing Creek Reservoir Phosphorus

Mean Annual Total Phosphorus Concentrations in Fishing Creek Reservoir at SC-9 and at Dam



Lake Wateree Phosphorus

Total Phosphorus Concentrations in Lake Wateree at Headwater (Cedar Creek Reservoir TR) and at Dam



TMDL Development Begins

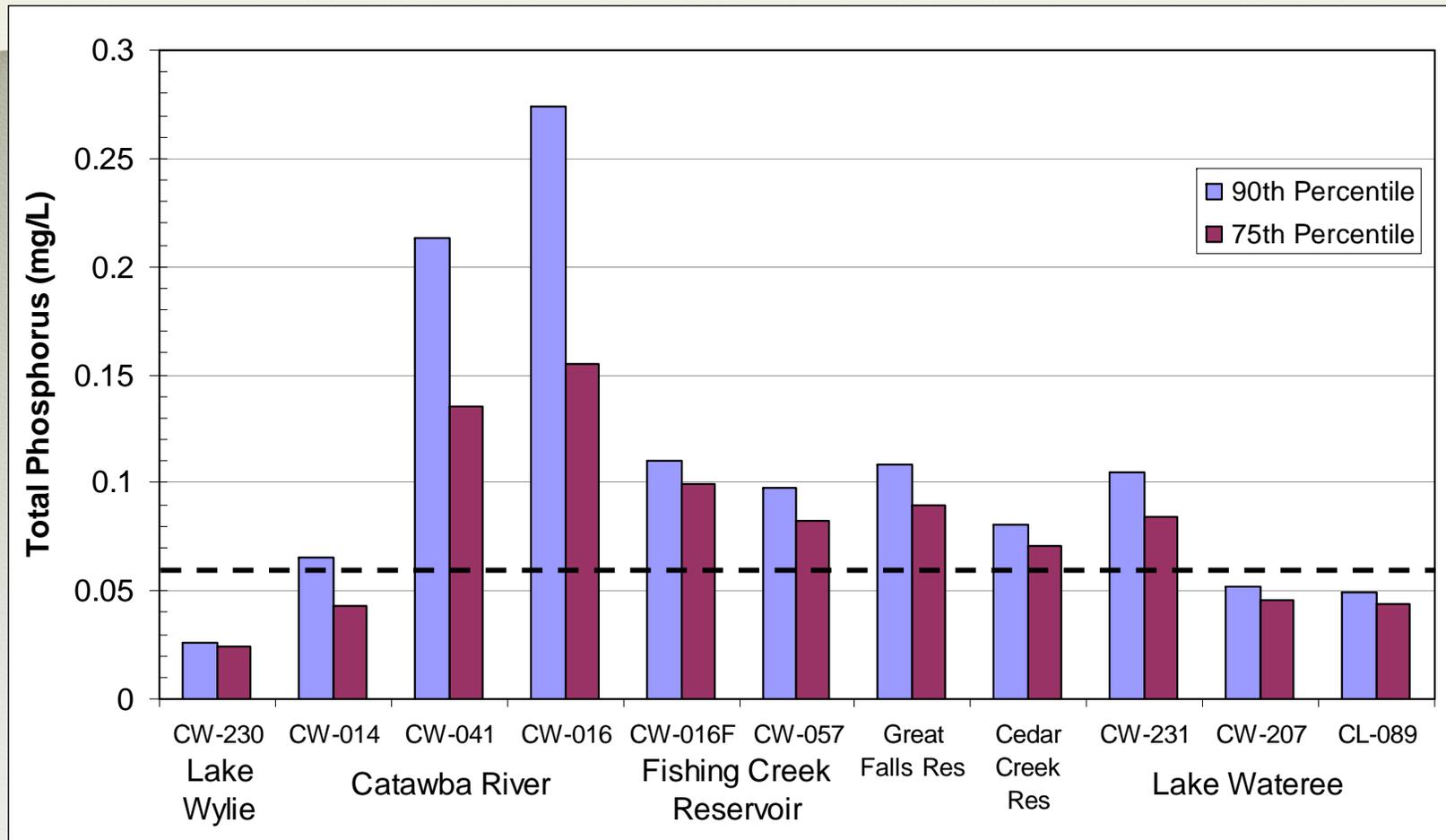
- SCDHEC TMDL
 - Commenced 2005
 - Additional modeling, stakeholder meetings, model review, technical comments (2005-2008)
- TMDL development paused
 - Other projects
 - System changing/model updates needed
 - Declining resources

Current Water Quality

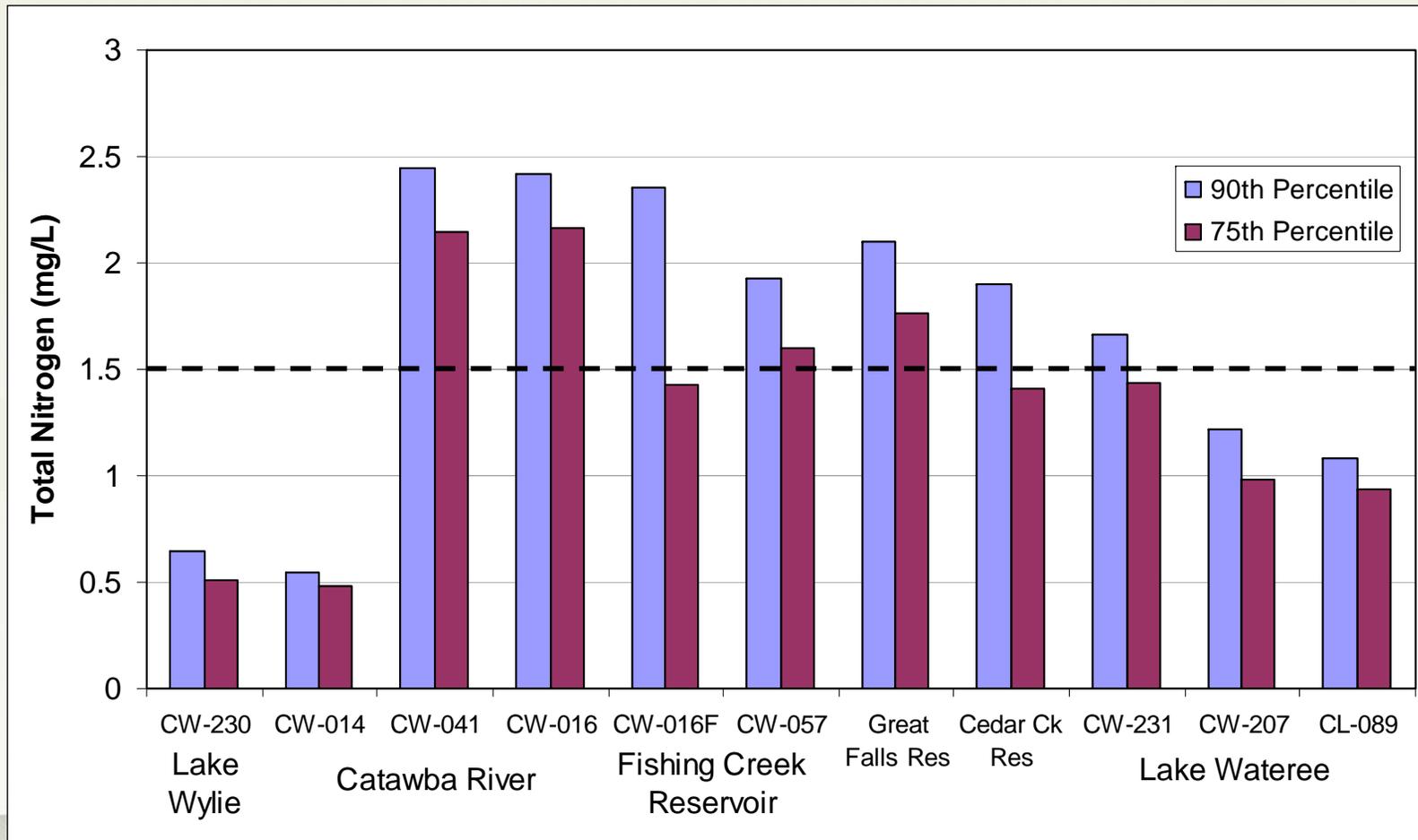
2012 303(d) List of Impaired Waters

- 2012 List, data from 2006-2010 plus legacy sites
 - Lake Wylie, SC not impaired
 - Fishing Creek Reservoir TP, TN, pH, chl-a
 - Great Falls Reservoir TP, TN
 - Cedar Creek Reservoir TP, TN, pH, DO
 - Lake Wateree TP, pH, DO

Current Water Quality 2008-2012 Phosphorus

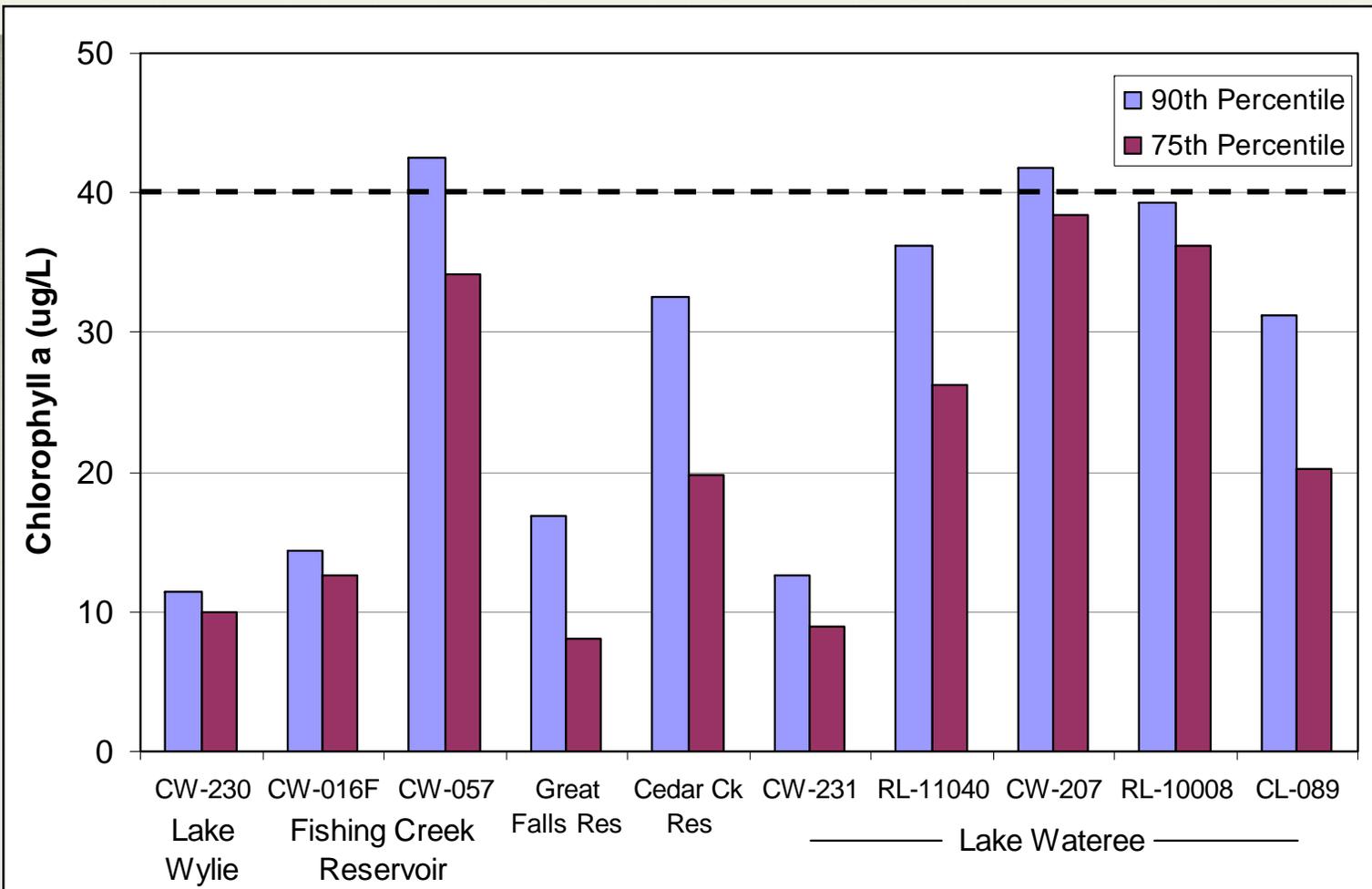


Current Water Quality 2008-2012 Nitrogen



Current Water Quality

2008-2012 Chlorophyll *a*



2014 303(d) List

- Data from 2008 through 2012
- Assessment is in progress
- Draft 2014 303(d) List for public comment in February
- To EPA in April
- Final summer 2014 (typical schedule)

TMDL Development Resumes in 2012

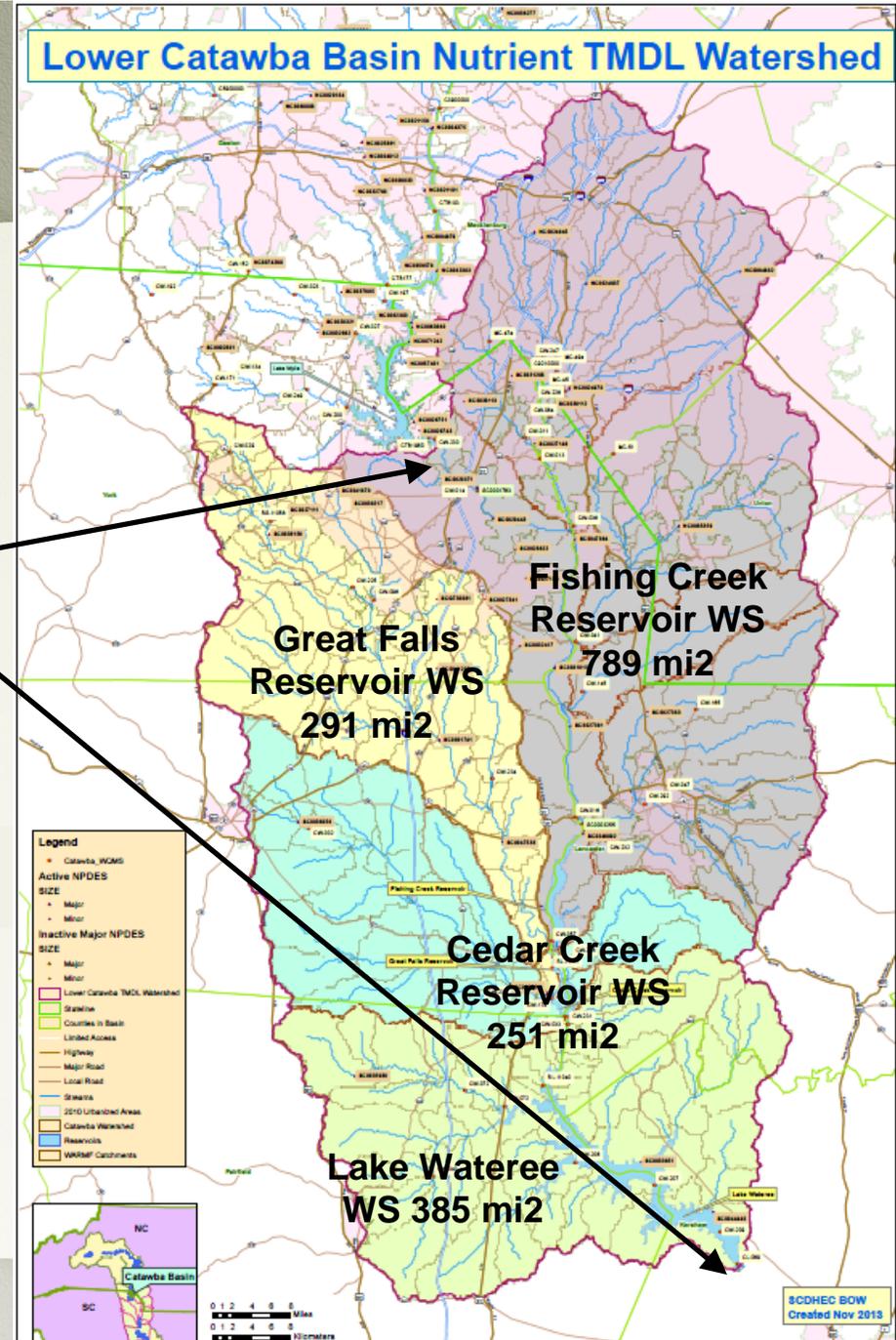
- Load reductions and water quality improvements have occurred
- Goal of the current modeling effort is to determine what more is needed, considering all sources, to achieve and maintain WQ standards in SC lakes
- EPA 319 NPS Grant funds used to contract Systech Water Resources, Inc. for modeling work
- Coordination with NCDENR and EPA Region 4 is ongoing
- Good response to data requests

TMDL Scope

- Target
 - S.C. Water Quality Standards R. 61-68
 - Numeric nutrient criteria, lakes > 40 acres
 - Piedmont and Southeastern Plains ecoregions
 - Total phosphorus: 0.06 mg/L
 - Total Nitrogen: 1.5 mg/L
 - Chlorophyll *a*: 40 ug/L
 - Addressing causal variables expected to improve pH and dissolved oxygen (diurnal swings not modeled)
 - Fishing Creek, Great Falls, Cedar Creek Reservoirs, Lake Wateree

TMDL Scope

- Area
 - Lower Catawba basin from Lake Wylie Dam to Lake Wateree Dam
 - 1717 square miles
 - Shown are sub watersheds not including upstream river input



TMDL Scope

- Phosphorus and nitrogen sources
 - Wasteload allocation
 - NPDES domestic and industrial wastewater
 - NPDES stormwater
 - Load allocation
 - Nonpoint sources, e.g. agriculture, septic, background
 - Most of the sources are upstream of Fishing Creek Reservoir

Current Wastewater Loading

Summary of Loading to Lower Catawba Reservoirs from Major Point Sources from Current Permits and Reported

Loading to Fishing Creek Reservoir:

State	Current Design/Permitted			Actual 2010-11		Future
	Flow	Phosphorus		Phosphorus		Flow
	(mgd)	(kg/day)	(lbs/day)	(kg/day)	(lbs/day)	(mgd)
NC	105	385	849	266	587	111
SC *	32.5	223.4	493	105.1	232	43.5
Total	137.5	608.4	1342	371.1	818	154.5

Loading to Great Falls Reservoir:

State	Current Design/Permitted			Actual 2010-11		Future
	Flow	Phosphorus		Phosphorus		Flow
	(mgd)	(kg/day)	(lbs/day)	(kg/day)	(lbs/day)	(mgd)
NC	105	385	849	266	587	111
SC *	37.5	233	514	108.6	239	50.5
Total	142.5	618	1363	374.6	826	161.5

Loading to Cedar Creek Reservoir:

State	Current Design/Permitted			Actual 2010-11		Future
	Flow	Phosphorus		Phosphorus		Flow
	(mgd)	(kg/day)	(lbs/day)	(kg/day)	(lbs/day)	(mgd)
NC	105	385	849	266	587	111
SC *	40.3	243.4	537	111	245	53.3
Total	145.3	628.4	1386	377	831	164.3

Modeling Approach

- Watershed Analysis Risk Management Framework (WARMF) model
 - Represents a river basin by land catchments, stream segments, and lakes
 - Uses meteorological inputs to simulate runoff, nonpoint load, hydrology, and water quality
- Developed by Systech Water Resources, Inc. for Electric Power Research Institute (EPRI)
- Originally applied to Catawba by Duke Energy
- Updated by NCDENR, SCDHEC, USC
- Documentation available at:
<http://www.scdhec.gov/environment/water/tmdl/catawba.htm>

Current Model Updates

- Phase I
 - SCDHEC contracted Systech to extend the WARMF model simulation period from 2005 to 2012
 - Completed June 2013
 - Technical memorandum and June 2013 version of the model available on SCDHEC website
 - Model required calibration

Current Model Updates

- Phase II
 - Model calibration in progress
 - Draft calibration report and model available for stakeholder review early January 2014
 - 45-day review period
 - Comments requested
 - Systech to complete calibration report and model by the end of April 2014

TMDL Development Plan

Next Steps and Target Dates

- Calibration Report and Model May 2014
- Initial TMDL Scenario(s) September 2014
- Allocation Meeting November 2014
- Allocated TMDL Scenario(s) Spring 2015
- Draft TMDL on Public Notice Summer 2015
- Respond to Comments Fall 2015
- Notice of Dept. Decision Fall 2015*
- EPA Approval End of 2015*
- Implementation 2016*

*Subject to Request for Review (Appeal)

Allocation Process

- Full range of regulated and unregulated sources
- Bi-state coordination will be needed
- Allocation tools based on the TMDL model facilitate allocation process in complex systems
 - Charleston and Savannah DO TMDLs successfully allocated using “TMDL Calculators”
 - Allowed unlimited scenario testing by stakeholders and optimization of allocations
- Stakeholder-led process works best

SCDHEC Lower Catawba Basin Nutrient TMDL Website

<http://www.scdhec.gov/environment/water/tmdl/catawba.htm>



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303 (d) & Total Maximum Daily Loads

Lower Catawba River Basin Nutrient TMDL Development in South Carolina

Background

Phosphorus and nitrogen are essential nutrients for aquatic life and are present in the natural environment. In surface waters, phosphorus and nitrogen are causal variables (nutrients) that control algal growth, which is typically measured by chlorophyll-a. Without adequate levels of phosphorus and nitrogen, a balanced, indigenous aquatic community may not exist in surface waters. However, excess nutrient levels can lead to water quality problems such as algal blooms, hypoxia (low dissolved oxygen), and elevated pH.

Within the Catawba River Basin of South Carolina, Cedar Creek Reservoir, Fishing Creek Reservoir, Great Falls Reservoir, and Lake Wateree reservoirs are considered to be impaired due to excessive nutrients and microscopic algal growth. [Basin Map](#) Over 30 ambient monitoring locations within the reservoir system are currently included on the State's [2012 303 \(d\) List of Impaired Waters](#) (the most recent biennial list submitted to and approved by The USEPA). Many of these monitoring locations have been included on the 303(d) list for total phosphorus, total nitrogen or Chlorophyll-a since South Carolina adopted numeric nutrient criteria, or water quality standards, for these pollutants in 2004. Elevated pH has also been observed at monitoring locations within the system. Long-term monitoring data have demonstrated these conditions existed prior to 2004 although more recent data are demonstrating some improvement as nutrient reductions have been implemented by utilities in the Basin upstream of the impaired reservoirs.

In accordance with the Clean Water Act and 40 CFR Part 130, Total Maximum Daily Loads (TMDLs) are required to address impaired locations included on a State's 303(d) list. South Carolina is developing TMDLs to address these impairments in the Lower Catawba River Basin. Once these TMDLs are implemented through permits and voluntary measures, the reservoir system should continue to respond and, over time, achieve the water quality standards as outlined in [Regulation 61-68, SC's Water Classifications & Standards](#).

Nutrient Model and TMDL Development

TMDLs are currently being developed to address excessive nutrients in the Catawba River Basin of South

Questions



South Carolina Department of Health and Environmental Control

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