NC's Nutrient Criteria Implementation Plan (NCIP): Overview and Timeline of Process February 2, 2010

January 9, 2001: US EPA, through Federal Register, (Attachment) publishes 17 Ecoregional Nutrient Criteria documents for lakes/reservoirs, rivers/streams and wetlands. Criteria are published pursuant to Section 304(a) of the Clean Water Act (CWA) to provide guidance for states to use in adopting water quality standards. These criteria included Total Nitrogen, Total Phosphorus, Chlorophyll a and Secchi depth criteria aimed at reducing and preventing eutrophication on a National scale. The Federal Register notice specifically outlines that states are "expected to adopt or revise EPA ecoregional nutrient criteria … into State … water quality standards by 2004." The notice includes options for states to adopt 304(a) published criteria, develop alternative standards or plans to control *nutrients* by the end of 2001. Ultimately, these options would result in states establishing nutrient standards by the end of 2004. Those standards must meet the requirements of the CWA, including approval by the US EPA. If states had not met this obligation by the end of 2001, EPA proposed to promulgate protective nutrient criteria (Total Nitrogen, Total Phosphorus, Chlorophyll a, Secchi depth) in those states/tribes.

January 2001: DWQ staff began meetings to determine the applicability and utility of the federal ecoregional documents. Staff immediately questioned the science of the derived recommended concentrations for chlorophyll a, phosphorus and nitrogen. (Example: Chlorophyll a criteria was proposed at 4.93 ug/l for the Southeastern Temperate Forested Plains region –i.e. Falls/Jordan Lakes) http://www.epa.gov/waterscience/criteria/nutrient/ecoregions/lakes/lakes_9.pdf

November 14, 2001: Recognizing problems associated with short compliance timelines, US EPA issues guidance to accomplish the federal requirements. Known as the "Grubbs" memo ("Development and Adoption of Nutrient Criteria into Water Quality"; Geoffrey Grubbs, Director, Office of Science and Technology; Attached), the guidance clarified the requirements for states to derive an EPA "mutually agreed upon" "plan of action" by 2004 with the intended purpose to reduce nutrients. The guidance noted that if a state had developed a plan of action or initiated its administrative process to adopt nutrient criteria by the end of 2004, EPA would conclude that a federal promulgation was *not* appropriate.

2002 to June 2004: Under CWA requirements to review and maintain protective standards, staff held numerous internal meetings, attended meetings with US EPA staff and sister states (Region IV and National) to propose an alternative plan for nutrient control in NC. After multiple revisions were drafted with reviews by EPA Headquarters Office of Science and Technology Nutrient Criteria Team and Region IV staff, NC DWQ submitted its final draft plan.

June 1, 2004: North Carolina Nutrient Criteria Implementation Plan (NCIP)(signed by Coleen Sullins on behalf of Alan Klimek) was submitted to Andrew Bartlett, US EPA, East Standards, Monitoring and TMDL Section for approval in accordance with Federal Register requirements of Jan 2001 (NCIP 6/1/04: Attached). This submittal included anticipated timelines for development of nutrient related actions, an overview of the State's nutrient management strategies (Standards, NSW classifications, etc.) and a data inventory summary for NC lakes and reservoirs (Attached).

September 20, 2004: State received letter from US EPA providing "mutual agreement" of NCIP (signed by James Giattina, Director, Water Management Division, EPA Region IV; attached). In addition to providing a mutual agreement status, the letter contained a number of other recommendations for consideration. As required under CWA delegated authority, the correspondence noted that any changes to water quality standards resulting from the proposed plan *must be evaluated under the State's Triennial Review* process for standards development.

October 12, 2005: *WQC-EMC Information Item* – Staff presented a very brief overview of Triennial Review actions pursuant to CWA requirements. Investigations, evaluations and conclusions toward any proposed changes to state nutrient related regulations were not scheduled, per the timelines in the approved NCIP, for completion until December 2007, thus the WQC was not presented any proposed actions or changes to water quality standards with respect to nutrients. The Commission was presented that these potential changes were being evaluated as a part of the "plan". (Presentation was originally scheduled for September 8, 2005, delayed due to Hurricane Katrina).

October 25, 2005: Recognizing the staffing needs to complete NC General Assembly Session Law 2005-190 mandates relating to protection of drinking water supply reservoirs (ex: Falls Lake) and for Jordan Lake nutrient management proposals, DWQ (Alan Klimek, Director -Attached) submitted a request to US EPA Region IV staff for re-mutual agreement of the plan in order to extend the proposed milestone timelines. This request was made in accordance with the "Grubbs" memo and timelines were adjusted to meet both the needs of SL 2005-190 and the Federal Register 2001 actions.

January 2006: *WQC-EMC Triennial Review presentation (Action item).* Staff presented a report on standards proposed for revision and included additional discussion on standards under review, but not proposed for action. Standards discussed, *but not presented for revision* included freshwater bacterial indicators and chlorophyll a. This PowerPoint presentation included discussions of the NCIP, its timeline status and the push by EPA for standards to be established to achieve control of nutrient inputs to the State's waters. *No action* was requested of the Commission with respect to any changes to nutrient related standards (chlorophyll a).

March 9, 2006: *EMC Triennial Review presentation (Action item – request to proceed to public hearing).* The EMC approved staff to take out for Public Notice revisions as recommended by the WQC in January 2006. It does not appear, from the public records, that EMC members requested any additional information with respect to nutrients. The presentation, and request to proceed, centered only on those actions approved for modification by the WQC.

July 3, 2006: State receives "re-mutual agreement" correspondence (Signed by Gail Mitchell for James Giattina, Director, Water Management Division, dated June 27, 2006). Receipt of "re-mutual agreement" did not constitute a US EPA approved change to water quality standards. Changes resulting from the state's Triennial Review process were expected to be submitted to EPA under CWA obligations.

May 25, 2007: Benjamin Grumbles, Assistant Administrator , US EPA issues a "Memorandum on Nutrients", the "Grumbles" memo (Attached), which further encouraged states to "accelerate" adoption of Nitrogen, Phosphorus (as causal variables), chlorophyll a and transparency (as response variables)

into states' water quality standards. This memo also contained a gross mischaracterization of NC's nutrient control regulations. DWQ responded to the Grumbles memo by submitting a letter (Coleen Sullins, Director, June 18, 2007- Attached) to the EPA correcting the misstatements and presenting a precise representation of programs and proactive regulations approved by the Environmental Management Commission.

November 12, 2008: *WQC-EMC information item*. In accordance with the NCIP timelines to begin the more formalized stakeholder process, staff presented to the WQC an information item on the state-wide approach to address nutrients, the NCIP, planned rule revisions and proposed rules for technology based nitrogen and phosphorus controls.

January 2009 to present: Staff has presented to stakeholder groups the proposed revisions to the water quality standards, including topics under review but not planned for revisions during this timeframe. (Examples: ammonia, bacteria, mercury fish tissue criteria, nutrients) Note that prior to these efforts, staff has presented NCIP information to Falls Lake and High Rock Lake stakeholders and other interested parties.

September 10, 2009: *EMC Information item;* DWQ Planning, Point Source Branch and Environmental Sciences staff provided information on: (1)proposals to change water quality standards for metals and chlorophyll a under CWA authority, (2)overview of the proactive nutrient management approach which included chlorophyll a thresholds action levels derived from the NCIP, (3) water bodies, identified through the NCIP investigations, that would likely be affected by any proposed changes to water quality standards or to regulations pertaining to point and non-point source control. It is important to recognize that the proposed thresholds and proactive strategies are not water quality standards and are not subject to EPA approval. They are, however, a result of our mutual agreement with the US EPA for actions to be undertaken to achieve stronger controls on nutrients as directed by the January 2001 Federal Register notice. The review of the chlorophyll a standards were required under CWA Triennial Review and these standards were also reviewed under NCIP mutual agreement.

November 5, 2009: DWQ submitted a request to US EPA Region IV staff to further extend NCIP timelines for adopting revised chlorophyll a standards and the establishment of chlorophyll a threshold rules and associated management strategies. (Chuck Wakild; Deputy Director, for Coleen Sullins - Attached). These revisions to the timelines provide additional time for the administrative rule making process. Approval of this timeline modification is pending.

November 18, 2009: *WQC-EMC Action Item.* Planning staff presented proposed changes to the chlorophyll a water quality standards (15A NCAC 2B .0200) in conjunction with proposed chlorophyll a threshold rules (15A NCAC 2B.0600). WQC members requested that additional stakeholder meetings occur on the proposed chlorophyll a threshold regulations.

January 13, 2010: *WQC-EMC Action Item.* Planning staff requested permission to proceed with changes to water quality standards (15A NCAC 2B .0200, which included the chlorophyll a standards). Approval was granted to proceed to the full Environment Management Commission in March 2010. (Note: This item did not include requests for action on 15A NCAC 2B .0600 – the chlorophyll a threshold rules)

Attachment 1

Existing North Carolina Nutrient Criteria Management Strategy

Overview

The State of North Carolina has aggressively pursued and endorsed the use of flexible, site-specific measures for the control of nutrients in its surface waters for a number of years. In fact, North Carolina had already implemented a number of the key provisions presented in the November 14, 2001 EPA Office of Science and Technology (OST) memorandum and established an existing, functioning nutrient criteria program that substantially complies with its requirements long before this memorandum was distributed. Specifically, under this existing nutrient control program North Carolina has:

- **Adopted and implemented a suite a nutrient response standards** that includes chlorophyll-a, dissolved oxygen (DO), and pH.
- **Implemented a statewide sampling and ambient monitoring program** for these nutrient response criteria.
- **Developed and implemented use support methodology** to interpret this nutrient criteria ambient water quality data.
- **Listed surface waters as "impaired"** on the North Carolina 303(d) List for exceedances of the nutrient response criteria, based upon this use support methodology.
- **Created nutrient response models for the development of Total Maximum Daily Loads (TMDLs)** for chlorophyll-a. These TMDLs have included nitrogen and phosphorous limits for discharges to those waters listed as nutrient impaired.
- **Developed and implemented nitrogen and phosphorous NPDES permit limits** from these TMDLs.
- **Established an innovative, specialized classification of "Nutrient Sensitive Waters (NSW)"** that has already been applied to three entire river basins and a portion of another two within North Carolina.

In addition to the preceding DWQ actions, the North Carolina General Assembly adopted "House Bill 515" in 1997. Among other things, this legislation mandated strict limits on the discharge of nitrogen and phosphorous into NSW-classified waters.

North Carolina believes that a proactive management strategy based upon adaptive management techniques is the most viable method to control excessive nutrients from point and non-point sources and has developed its comprehensive program accordingly. The underlying principle guiding this strategy and the number one priority for North Carolina's program has always been to develop flexible nutrient control approaches to prevent future impairments. Utilizing this flexible and proactive approach the North Carolina nutrient control program has already achieved a number of noteworthy accomplishments. Among these are:

- The development and successful implementation of adaptive, site-specific management control strategies for a broad range of nutrient-impaired waters throughout the State.

- The use of approximately $100,000,000.00 in agricultural cost share money to control nutrient pollution from non-point sources and the establishment of an innovative nutrient trading program.
- The implementation of mandatory riparian buffers in two of the major riverbasins in the State in an effort to further control nutrient non-point source pollution.

The remainder of this attachment will provide further details regarding the individual elements of North Carolina's existing nutrient control program.

I. Existing Nutrient Response Criteria

For a number of years, North Carolina has included a suite of nutrient response criteria in its surface water quality standards. These nutrient response criteria include both numeric and narrative standards for chlorophyll-a, dissolved oxygen, and pH. These standards are delineated in 15A NCAC 2B .0211, Fresh Surface Water Quality Standards for Class C Waters and 15A NCAC 2B .0220, Tidal Salt Water Quality Standards for Class SC Waters. The standards specified in 2B .0211 apply to all fresh surface waters of the State, and those standards specified in 2B .0220 are applicable to all tidal salt surface waters of the State.

The specific nutrient response criteria contained in 2B .0211 that apply to all surface fresh waters of the State are provided below:

Chlorophyll-a: [As specified in 15A NCAC 2B .0211(3)(a)] *Chlorophyll a (corrected): not greater than 40 ug/l for lakes, reservoirs, and other waters subject to growth of macroscopic or microscopic vegetation not designated as trout waters, and not greater than 15 ug/l for lakes, reservoirs, and other waters subject to growth of macroscopic or microscopic vegetation designated as trout waters (not applicable to lakes and reservoirs less than 10 acres in surface area); the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;*

Dissolved Oxygen (DO): [As specified in 15A NCAC 2B .0211(3)(b)] *Dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions;*

pH: [As specified in 15A NCAC 2B .0211(3)(g)] *pH: shall be normal for the waters in the area, which generally shall range between 6.0 and 9.0 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;*

Attachment 1

The specific nutrient response criteria contained in 2B .0220 that apply to all tidal salt surface waters of the State are presented below:

Chlorophyll-a: [As specified in 15A NCAC 2B .0220(3)(a)] *Chlorophyll a (corrected): not greater than 40 ug/l in sounds, estuaries, and other waters subject to growth of macroscopic or microscopic vegetation; the Commission or its designee may prohibit or limit any discharge of waste into surface waters if, in the opinion of the Director, the surface waters experience or the discharge would result in growths of microscopic or macroscopic vegetation such that the standards established pursuant to this Rule would be violated or the intended best usage of the waters would be impaired;*

Dissolved Oxygen: [As specified in 15A NCAC 2B .0220(3)(b)] *Dissolved oxygen: not less than 5.0 mg/l, except that swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions;*

pH: [As specified in 15A NCAC 2B .0220(3)(g) *pH: shall be normal for the waters in the area, which generally shall range between 6.8 and 8.5 except that swamp waters may have a pH as low as 4.3 if it is the result of natural conditions;*

DWQ documents clearly state that these standards were adopted in order to form a basis for nutrient control throughout the State. It was the intention of the Division at the time these standards were adopted, as it remains today, to utilize these nutrient response variables in a manner that will allow for the development of nitrogen and phosphorous limits on a case-by-case basis for those waters where the intended best usage of the water is being impaired by nutrient pollutants. This impairment is determined by the implementation of a viable use support methodology.

II. Nutrient Criteria Ambient Monitoring and Use Support Methodology

The North Carolina DWQ Ambient Monitoring System actively monitors for chlorophyll-a, dissolved oxygen, and pH in all "slow moving" waters of the State, which are those waterbodies at the greatest risk from the effects of nutrient over-enrichment and eutrophication. North Carolina's slow moving waters include lakes, estuaries, and coves. In addition, the Division monitors for DO and pH in the remaining "fast moving (rivers and streams)" waters of the State. A viable use support methodology has been implemented within NC in order to interpret this nutrient response criteria ambient data. To date, this methodology has been primarily utilized to rate slow moving waters in which chlorophyll-a exceedances have threatened a designated use. For those waters that meet these requirements, the use support rating is based upon a review of the available nutrient response criteria ambient data for a five- year window. If 10% of the samples taken over the previous five years exceed the standard, the waterbody is rated as

"partially supporting (PS)." If 25% of the samples taken over the previous five years exceed the standard, then the waterbody is rated as "not supporting (NS)."

This use support methodology has already been successfully employed by DWQ to list nutrient impaired waters on North Carolina's previous 305(b) Reports and 303(d) Lists.

III. 303(d) Listing of Nutrient Impaired Waters, TMDL Development, and Nitrogen and Phosphorous Permit Limits

Those waters within North Carolina that have been designated as "impaired for nutrients," based upon the preceding use support methodology, have been included on the appropriate 303(d) List(s). Once listed, the Division initiates the development of a Total Maximum Daily Load in order to meet the exceeded standard in the impaired waters. An integral part of the TMDL process is the creation of a comprehensive nutrient response model. This model includes nitrogen and phosphorous limits for both point and non-point sources in the affected watershed. These limits developed in this process are then utilized to establish total nitrogen and phosphorous permit limitations in the NPDES permits of those dischargers to the affected waterbody. An example of where this course of action has already occurred is in the Catawba Riverbasin. As a result of a site-specific nutrient management plan developed by DWQ for the Lake Wylie area, the City of Gastonia's Long Creek Wastewater Treatment Plant received permit limits for both total nitrogen and phosphorous. These limits are 1 mg/l for total phosphorous – year round and 6 mg/l for total nitrogen during the summer season. Following the imposition of these nutrient limits, the Long Creek plant expended approximately $30,000,000 in order to be able to comply with these requirements.

IV. Nutrient Sensitive Waters (NSW) Classification

North Carolina established itself as a leader in innovative approaches to the control of nutrients in surface waters when it adopted its Nutrient Sensitive Waters (NSW) classification for nutrient-polluted waterbodies. In responses to nuisance algal blooms and fish kills in North Carolina's surface waters, the NC Environmental Management Commission (EMC) established the NSW supplemental classification in May 1979 as a legal basis for controlling the discharge of nutrients, primarily nitrogen and phosphorous, into surface waters. This designation, which is codified in 15A NCAC 2B .0223, is applied by the EMC "upon a finding that such waters are experiencing or are subject to excessive growths of microscopic or macroscopic vegetation. Excessive growths are growths which the Commission determines impair the use of the water for its best usage as determined by the classification applied to such waters." The NSW classification mandates the development of a nutrient management strategy for those waters so designated. These management strategies may be voluntary (incentive based) or mandatory and apply to both point and non-point sources of nutrient pollution. In

North Carolina, the implementation of these nutrient management strategies led to the unprecedented use of state-funded agriculture cost-share dollars for the control of agriculturally-related non-point sources. To date, the expenditure of agriculture cost-share money for these purposes has reached approximately $100,000,000.00. This level of expenditure clearly demonstrates North Carolina's commitment to the control of nutrient pollution. The determination to classify a specific waterbody as NSW is based upon a comprehensive and detailed scientific evaluation of a myriad of parameters including, but not limited to: exceedances of the nutrient response standards, fish kill frequencies, frequency and duration of algal blooms, sediment loading, and a through examination of the relative contribution of point and non-point sources to the overall nutrient problem.

Within North Carolina, the entire Chowan, Neuse, and Tar-Pamlico riverbasins and a portion of the Upper Cape Fear and White Oak riverbasins have received the NSW designation to date. Additional site specific nutrient management strategies have been developed by DWQ for Lakes Wylie, Jordan, and Santeetlah. In the case of the Neuse and Tar-Pamlico, this designation has resulted in the implementation of a mandatory nutrient management strategy throughout their complete riverbasins. These required management strategies have established a wide range of controls for both point and non-point sources of nutrient pollution in order to accomplish, in the case of the Neuse, the stated goal of reducing nitrogen loading by 30%. The specific requirements of the Neuse management strategy are delineated in rules 2B .0232 through 2B .0242 of Chapter 15A of the North Carolina Administrative Code. These rules contain specific nutrient management strategies for wastewater dischargers, stormwater management, agricultural operations, and overall nutrient management. In addition, the Neuse NSW rules establish mandatory 50-foot wide riparian buffers to help control nutrient run-off. The specific requirements of the Tar-Pamlico mandatory nutrient management strategy are detailed in 15A NCAC 2B .0255 through 15A NCAC 2B .0261. Similar to the Neuse, the Tar-Pamlico strategy also implements mandatory 50-foot wide riparian buffers along the banks of the river and its tributaries. Furthermore, an innovative nutrient trading program for point sources has been incorporated as an integral part of the Tar-Pamlico NSW management strategy (15A NCAC 2B .0229). This flexible approach to the control of additional nutrient loading has been the subject of recent national attention. The resources that have been allocated to the implementation of these nutrient reduction strategies within North Carolina have been substantial. At present, over 20 person-years of effort have already been applied to meeting non-point source nutrient reduction goals in the Neuse and Tar-Pamlico riverbasins.

V. House Bill 515

In 1997, the North Carolina General Assembly adopted proactive legislation intended to provide additional protection to North Carolina's waters from the effects of nutrient pollution and eutrophication. These protective measures were contained in Part VI, Nitrogen and Phosphorous Limits for Surface Waters, of House Bill 515. This legislation mandated total nitrogen and phosphorous permit limits for specific discharges

to those waters that had been designated as Nutrient Sensitive Waters, as described above. Specifically, House Bill 515 established a total nitrogen permit limit of 5.5 mg/l and phosphorous limit of 2.0 mg/l for all new dischargers commencing after July 1, 1997, and those dischargers existing before this date and with a discharge greater than 500,000 gallons per day. The effect of this legislation was to mandate stringent limitations on the discharge of nitrogen and phosphorous on a wide range of point sources.

VI. Demonstrated Successful Results from the NC Approach

A demonstration of the viability and validity of North Carolina's approach to nutrient control can be found in the successes produced by this program, such as the dramatic improvements that have been gained in the Chowan Riverbasin. In 1979, all waters of the Chowan Riverbasin were designated as NSW. The Chowan River was the first waterbody in the State to receive this supplemental classification because of water quality problems associated with nutrient enrichment. For the Chowan River, this NSW classification became effective in September 1979, thereby enabling the Division of Water Quality to establish nutrient limits in the NPDES permits of the wastewater treatment plants that discharged into this riverbasin. Furthermore, in 1990, the Division implemented a site-specific management strategy that included the following major points:

- Reduction in phosphorous inputs from point and non-point sources by 35 to 40 percent
  - Point Sources
    - Land application systems for municipal wastewater treatment plants
    - Phosphorous limits of 1 mg/l in the North Carolina portion of the basin
  - Non-point Sources
    - Target funds from the Agriculture Cost Share Program to the Chowan Riverbasin
- Reduction of nitrogen inputs from all sources by 20 percent
  - Point Sources
    - Land application systems for municipal wastewater treatment plants
    - Nitrogen limits of 3 mg/l in the North Carolina portion of the basin
  - Non-point Sources
    - Target funds from the Agriculture Cost Share Program to the Chowan Riverbasin

Results: Since the implementation of this management strategy the following results have been achieved:

- A significant reduction in the frequency and duration of algal blooms
- The nitrogen reduction goal of 20% has been met.
- Total phosphorous has been reduced by 29%.

- Over $1,942,634 of Agriculture Cost Share funding has been directed towards the Chowan basin over the last five years.
- All municipal POTW's in the basin have switched to non-discharge systems for the treatment of domestic wastewater.

North Carolina emphatically believes that the proactive, flexible, adaptive, and site-specific approach to nutrient control that was successfully employed in the Chowan River, has already been and can, again in the future, be adapted and applied to other nutrient impaired or threatened waters in the State in order to achieve similar positive results.

Conclusion

North Carolina is justifiably proud of its proactive approach to the regulation and control of excessive nutrients in its surface waters. This approach has been based on the realization that this State's rivers, lakes, estuaries, and coves are some of its most valuable natural and economic resources and a thorough understanding of the risk posed to these waters by nutrient pollution and over-enrichment. The Division's nutrient control activities and programs have been guided by the underlying principle that a proactive strategy based on adaptive management techniques will be the most successful method to comprehensively control nutrient pollution. This approach has led to North Carolina already establishing a suite of nutrient response criteria and implementing a number of site-specific nutrient management plans across the State. These adaptive, site-specific plans have resulted in strict nitrogen and phosphorous permit limits for many affected dischargers and the expenditure of millions of dollars of agriculture cost share funds in an effort to control nutrient run-off from non-point sources. North Carolina's proactive approach to the control of nutrients in its surface waters has led to the adoption of a special Nutrient Sensitive Waters designation for nutrient polluted waters and the adoption of House Bill 515 by the NC General Assembly. This legislation mandated strict nitrogen and phosphorous limits for many of the dischargers to the NSW-designated waters. Furthermore, mandatory riparian buffers have been required in two of North Carolina's largest riverbasins as a result of this NSW designation. By employing a multi-tiered, innovative strategy to combat this water quality problem, North Carolina has made great strides in controlling and reducing the level of nutrient pollution in its surface waters and, in so doing, has aggressively protected the designated best usage of these resources. The substantial successes achieved in the control and reduction of excessive nutrients in the Chowan River provide concrete validation of North Carolina's overall strategy and demonstrate the effectiveness of flexible, site-specific approaches to nutrient control.

Attachment 2
NC Existing Data Inventory

Mountain Lakes

Lake	Ecoregion	River Basin	Number of Stations[+]	Date Range	Number of Observations Chla *	TN	TP
ALLEN CREEK RESERVOIR	Mountain	French Broad	2	August 1, 1990 to August 12, 2002	26	26	26
APALACHIA LAKE	Mountain	Hiwassee	3	August 10, 1981 to July 28, 1999	9	12	12
ASU LAKE	Mountain	New	1	July 21, 1992 to August 11, 1998	1	4	4
BEAR CREEK RESERVOIR	Mountain	Little Tennessee	2	July 26, 1988 to August 11, 1999	4	10	10
BEETREE RESERVOIR	Mountain	French Broad	1	July 31, 1990 to August 12, 1997	2	5	5
BURNETT RESERVOIR	Mountain	French Broad	2	July 31, 1990 to August 13, 2002	10	16	16
BUSBEE RESERVOIR	Mountain	Little Tennessee	1	July 31, 1990	1	1	1
CALDERWOOD LAKE	Mountain	Little Tennessee	2	July 27, 1988 to August 10, 1994	4	4	4
CASHIERS LAKE	Mountain	Savannah	2	August 1, 1995	2	2	2
CEDAR CLIFF LAKE	Mountain	Little Tennessee	2	July 28, 1988 to August 11, 1999	14	22	22
CHATUGE LAKE	Mountain	Hiwassee	3	August 11, 1981 to July 6, 1999	9	15	15
FONTANA LAKE	Mountain	Little Tennessee	5	August 12, 1981 to August 29, 1994	18	18	18
HIWASSEE RESERVOIR	Mountain	Hiwassee	5	August 10, 1981 to July 29, 1999	65	70	70
KERR SCOTT RESERVOIR	Mountain	Yadkin	3	September 21, 1981 to August 13, 2002	33	48	48
LAKE ADGER	Mountain	Broad	3	August 1, 1989 to June 13, 2000	6	9	9
LAKE CHEOAH	Mountain	Little Tennessee	3	July 27, 1988 to August 9, 1999	6	9	9
LAKE EMORY	Mountain	Little Tennessee	3	July 27, 1988 to August 9, 1994	6	6	6
LAKE JAMES	Mountain	Catawba	6	August 3, 1981 to August 21, 2002	80	99	99
LAKE JULIAN	Mountain	French Broad	3	July 31, 1990 to August 12, 2002	15	15	15
LAKE JUNALUSKA	Mountain	French Broad	3	September 22, 1981 to August 12, 2002	25	34	34
LAKE LURE	Mountain	Broad	3	August 13, 1981 to August 22, 2000	17	27	27
LAKE SEQUOYAH	Mountain	Little Tennessee	3	July 27, 1988 to August 10, 1999	6	15	15
LAKE SUMMIT	Mountain	Broad	3	January 19, 1989 to August 23, 2000	9	18	18
LAKE TAHOMA	Mountain	Catawba	2	August 2, 1990 to August 21, 2002	10	10	10
LAKE TOXAWAY	Mountain	Savannah	4	August 1, 1995	4	4	4
NANTAHALA LAKE	Mountain	Little Tennessee	3	August 11, 1981 to August 9, 1999	39	47	47
SANTEETLAH LAKE	Mountain	Little Tennessee	13 (3)	August 12, 1981 to May 25, 1999	152	239	239
THORPE RESERVOIR	Mountain	Little Tennessee	4	July 28, 1988 to August 10, 1999	25	36	36
WATERVILLE LAKE	Mountain	French Broad	3	August 1, 1990 to August 12, 2002	17	16	16
WOLF CREEK RESERVOIR	Mountain	Little Tennessee	2	July 26, 1988 to August 11, 1999	2	10	9
LAKE KENILWORTH	Mountain	French Broad	2	June 20, 2002 to August 13, 2002	6	6	6
31 Mountain Lakes	**Total Number of Stations:**		**97 (87)**	**Total Number of Observations:**	**623**	**853**	**852**

* Chlorophyll *a* data does not include data from 1996 through 2000

[+] Station number in parenthesis indicates the usual number of ambient sites sampled.
The larger number is the greatest number of sites sampled at one time

Attachment 2
NC Existing Data Inventory

Piedmont

Lake	Ecoregion	River Basin	Number of Stations [+]	Date Range	Number of Observations Chla [*]	TN	TP
APEX RESERVOIR	Piedmont	Neuse	1	August 12, 1991 to July 12, 2000	2	3	3
BACK CREEK LAKE	Piedmont	Yadkin	3	July 27, 1989 to August 22, 2002	21	27	27
BADIN LAKE	Piedmont	Yadkin	14 (3)	July 27, 1981 to October 10, 2002	84	99	98
BASS LAKE	Piedmont	Neuse	2	August 9, 1988 to July 27, 1995	4	4	4
BEAVERDAM LAKE	Piedmont	Neuse	1	April 28, 1983 to November 29, 1983	8	8	8
BELEWS LAKE	Piedmont	Roanoke	4	July 14, 1981 to August 27, 2002	54	78	77
BESSEMER CITY LAKE	Piedmont	Catawba	1	July 30, 1990 to August 19, 2002	5	5	5
BLEWETT FALLS	Piedmont	Yadkin	1	July 28, 1981 to August 3, 1999	7	10	10
BIG LAKE	Piedmont	Neuse-	3 (2)	August 13, 1981 to August 7, 2000	9	17	17
BUCKHORN RESERVOIR	Piedmont	Neuse	2	August 11, 1981 to July 27, 1995	6	6	6
BUNCH LAKE	Piedmont	Yadkin	1	July 27, 1989 to August 29, 2001	14	18	18
BURLINGTON RESERVOIR	Piedmont	Cape Fear	1	August 13, 1981 to August 21, 1998	8	14	14
CANE CREEK RESERVOIR	Piedmont	Cape Fear	3	August 30, 1990 to August 13, 1998	11	24	24
CITY POND (WADESBORO)	Piedmont	Yadkin	2	August 9, 1989 to August 8, 2000	4	10	10
CLEARWATER LAKE	Piedmont	Cape Fear	1	July 29, 1981 to July 30, 1987	2	2	2
CLIFFS OF THE NEUSE LAKE	Piedmont	Neuse	1	July 22, 1981 to August 16, 2000	4	7	7
CORPORATION LAKE	Piedmont	Neuse	2	August 10, 1988 to August 9, 2000	6	12	12
FALLS LAKE	Piedmont	Yadkin	2	July 28, 1981 to July 28, 1994	15	15	15
FALLS OF THE NEUSE RESERVOIR	Piedmont	Neuse	9	April 26, 1983 to August 27, 2001	574	656	653
FARMER LAKE	Piedmont	Roanoke	3	August 29, 1991 to August 14, 2002	24	39	39
GRAHAM-MEBANE RESERVOIR	Piedmont	Cape Fear	5	August 17, 1993 to August 13, 1998	7	20	20
HANGING ROCK LAKE	Piedmont	Roanoke	1	July 1, 1981 to August 29, 2002	17	25	25
HARRIS LAKE	Piedmont	Cape Fear	3	August 5, 1987 to September 11, 2001	27	30	30
HIGH POINT LAKE	Piedmont	Cape Fear	2	July 15, 1981 to August 8, 2002	25	52	51
HIGH POINT RESERVOIR	Piedmont	Cape Fear	3	July 15, 1981 to August 8, 2002	33	66	66
HIGH ROCK LAKE	Piedmont	Yadkin	8	July 21, 1981 to September 5, 2002	118	190	190
HOLTS LAKE	Piedmont	Neuse	2	July 26, 1990 to July 25, 1995	4	4	4
HYCO LAKE	Piedmont	Roanoke	4	July 26, 1983 to August 17, 1999	36	48	48
JORDAN LAKE[#]	Piedmont	Cape Fear	17 (7)	July 14, 1982 to November 7, 2001	929	1332	1314
KANNAPOLIS LAKE	Piedmont	Yadkin	2	August 8, 1989 to August 22, 2000	4	10	10
KERNERSVILLE RESERVOIR	Piedmont	Roanoke	1	August 17, 1988 to August 20, 2001	4	10	10
KERR RESERVOIR (NUTBUSH CREEK)	Piedmont	Roanoke	10 (4)	July 8, 1981 to September 10, 2001	39	56	56
KINGS MOUNTAIN RESERVOIR	Piedmont	Broad	4	August 2, 1989 to August 23, 2000	43	56	56
LAKE BEN JOHNSON	Piedmont	Neuse	1	August 10, 1988 to August 9, 2000	3	5	5
LAKE BENSON	Piedmont	Neuse	2	July 23, 1981 to August 9, 2000	12	20	19
LAKE BRANDT	Piedmont	Cape Fear	3	July 15, 1981 to August 6, 1998	13	21	21
LAKE BURLINGTON	Piedmont	Cape Fear	2	July 19, 1990 to August 21, 1998	4	10	10

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Piedmont

Lake	Ecoregion	River Basin	Number of Stations [+]	Date Range	Number of Observations		
					Chla *	TN	TP
LAKE BUTNER	Piedmont	Neuse	3	August 10, 1988 to August 14, 2000	25	29	29
LAKE CONCORD	Piedmont	Yadkin	3	August 8, 1989 to July 10, 2000	6	12	12
LAKE CORRIHER	Piedmont	Yadkin	2	August 8, 1989 to August 2, 1999	4	10	10
LAKE CRABTREE	Piedmont	Neuse	3	August 28, 1990 to August 24, 2000	9	21	21
LAKE DEVIN	Piedmont	Tar-Pamlico	2	August 1, 1989 to August 7, 2002	10	16	16
LAKE FISHER	Piedmont	Yadkin	3	August 8, 1989 to August 22, 2000	6	15	15
LAKE GASTON	Piedmont	Roanoke	6 (4)	August 6, 1981 to July 13 2000	32	60	59
LAKE HICKORY	Piedmont	Catawba	6 (4)	August 4, 1981 to August 28, 2002	43	58	56
LAKE HIGGINS	Piedmont	Cape Fear	2	August 6, 1990 to August 6, 1998	4	10	10
LAKE HUNT	Piedmont	Cape Fear	3	July 14, 1981 to August 3, 1989	33	42	42
LAKE ISAAC WALTON	Piedmont	Roanoke	3	July 28, 1988 to August 17, 1999	6	18	18
LAKE JOHNSON	Piedmont	Neuse	2	July 23, 1981 to August 8, 1995	10	10	10
LAKE LEE	Piedmont	Yadkin	3	August 9, 1989 to August 8, 2000	6	15	15
LAKE MACKINTOSH	Piedmont	Cape Fear	6	August 17, 1993 to August 13, 1998	10	64	64
LAKE MICHIE	Piedmont	Neuse	3	August 10, 1988 to August 14, 2000	7	13	13
LAKE MONROE	Piedmont	Yadkin	2	August 9, 1989 to August 8, 2000	4	10	10
LAKE MONTONIA	Piedmont	Broad	3	April 3, 1996 to September 3, 1997	0	26	25
LAKE NORMAN	Piedmont	Catawba	8	August 5, 1981 to August 22, 2002	63	87	83
LAKE ORANGE	Piedmont	Neuse	3	August 10, 1988 to July 18, 2000	9	15	15
LAKE RALEIGH	Piedmont	Neuse	2	August 6, 1987 to September 6, 1995	8	8	8
LAKE REESE	Piedmont	Yadkin	3	July 27, 1989 to August 22, 2002	24	39	39
LAKE RHODHISS	Piedmont	Catawba	10 (3)	August 3, 1981 to August 29, 2002	97	99	106
LAKE ROGERS	Piedmont	Neuse	1	August 8, 1991 to August 14, 2000	3	5	5
LAKE ROXBORO	Piedmont	Roanoke	3	August 23, 1988 to August 14, 2002	24	39	39
LAKE TILLERY	Piedmont	Yadkin	4	July 28, 1981 to August 3, 1999	28	40	40
LAKE THOM-A-LEX	Piedmont	Yadkin	2	July 16, 1981 to August 6, 2002	22	34	34
LAKE TOWNSEND	Piedmont	Cape Fear	3	August 6, 1990 to August 6, 1998	6	15	15
LAKE TWITTY	Piedmont	Yadkin	3	August 9, 1989 to August 8, 2000	6	15	15
LAKE WACKENA	Piedmont	Neuse	1	July 14, 1988 to July 25, 1995	4	4	4
LAKE WHEELER	Piedmont	Neuse	2	July 14, 1981 to August 9, 2000	12	18	18
LAKE WILSON	Piedmont	Neuse	1	August 19, 1991 to August 16, 2000	2	5	5
LAKE WRIGHT	Piedmont	Yadkin	1	August 8, 1989 to August 2, 1999	2	5	5
LAKE WYLIE	Piedmont	Catawba	8	August 6, 1981 to August 6, 2002	110	147	146
LASATER LAKE	Piedmont	Yadkin	2	August 15, 1989	2	2	2
LITTLE RIVER DAM	Piedmont	Catawba	1	July 31, 1990 to August 12, 1992	2	2	2
LITTLE RIVER RESERVOIR	Piedmont	Neuse	3	July 19, 1988 to August 14, 2000	27	51	49
LONG LAKE	Piedmont	Yadkin	1	July 28, 1981	1	1	1
LOOKOUT SHOALS LAKE	Piedmont	Catawba	3	August 10, 1988 to August 7, 2002	29	38	38

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Piedmont

Lake	Ecoregion	River Basin	Number of Stations +	Date Range	Number of Observations Chla *	TN	TP
LOWER MOCCASIN LAKE	Piedmont	Cape Fear	1	August 10, 1988 to July 27, 1993	2	2	2
MAIDEN LAKE	Piedmont	Catawba	2	July 31, 1990 to August 21, 1997	4	10	10
MAYO RESERVOIR	Piedmont	Roanoke	3	July 26, 1983 to August 17, 1999	21	30	30
MCCRARY LAKE	Piedmont	Yadkin	1	July 27, 1989 to August 29, 2001	4	10	10
MOUNTAIN ISLAND LAKE	Piedmont	Catawba	6	August 4, 1981 to August 7, 2002	36	54	54
NEWTON CITY LAKE	Piedmont	Catawba	1	August 12, 1992 to August 19, 2002	4	4	4
PAGES LAKE	Piedmont	Lumber	2	July 28, 1981 to September 6, 2001	11	11	11
PITTSBORO LAKE	Piedmont	Cape Fear	2	August 19, 1981 to August 6, 1998	5	10	10
REEDY CREEK LAKE	Piedmont	Neuse	1	August 12, 1991 to August 7, 2000	2	5	5
REIDSVILLE LAKE	Piedmont	Cape Fear	2	July 15, 1981 to August 3, 1998	8	14	14
RICHLAND LAKE	Piedmont	Cape Fear	3	August 6, 1990 to August 12 1993	6	6	6
ROANOKE RAPIDS LAKE	Piedmont	Roanoke	3	August 6, 1981 to August 5, 1999	19	29	29
ROCKY RIVER RESERVOIR	Piedmont	Cape Fear	2	August 1, 1991 to August 6, 1998	4	10	10
ROSS LAKE	Piedmont	Yadkin	1	July 27, 1989	1	1	1
SALEM LAKE	Piedmont	Yadkin	3	July 15, 1981 to August 6, 2002	33	51	50
SANDY CREEK RESERVOIR	Piedmont	Cape Fear	3	August 27, 1992 to August 4, 1998	6	15	15
SILVER LAKE	Piedmont	Neuse	1	August 19, 1991 to July 25, 1995	2	2	2
SYCAMORE LAKE	Piedmont	Neuse	1	August 12, 1991 to August 7, 2000	2	5	5
TAR RIVER RESERVOIR	Piedmont	Tar-Pamlico	4	July 31, 1989 to August 7, 2002	20	32	32
TOISNOT RESERVOIR	Piedmont	Neuse	2	August 11, 1988 to August 16, 2000	5	9	9
TUCKERTOWN RESERVOIR	Piedmont	Yadkin	2	July 27, 1981 to August 3, 1999	12	18	18
UNIVERSITY LAKE	Piedmont	Cape Fear	2	August 30, 1990 to August 13, 1998	4	10	10
UPPER MOCCASIN LAKE	Piedmont	Cape Fear	1	July 29, 1981 to July 27, 1993	4	4	4
WENDELL LAKE	Piedmont	Neuse	2	August 11, 1988 to July 25, 1995	6	6	6
WIGGINS MILL RESERVOIR	Piedmont	Neuse	2	August 11, 1988 to August 16, 2000	6	12	12
WINSTON LAKE	Piedmont	Yadkin	1	July 15, 1981 to August 20, 2001	3	9	9
101 Piedmont Lakes	**Total Number of Stations:**		**301 (262)**	**Total Number of Observations:**	**3106**	**4476**	**4446**

* Chlorophyll *a* data does not include data from 1996 through 2000

+ Station number in parenthesis indicates the usual number of ambient sites sampled.
The larger number is the greatest number of sites sampled at one time

Doesn't include special study stations for TMDL and nutrient management strategy development.

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NC Existing Data Inventory

Sandhills

Lake	Ecoregion	River Basin	Number of Stations	Date Range	Number of Observations Chla *	TN	TP
BONNIE DOONE LAKE	Sandhills	Cape Fear	1	August 17, 1993 to August 10, 1998	1	4	4
CARTHAGE CITY LAKE	Sandhills	Cape Fear	1	August 21, 1991 to August 4, 1998	2	5	5
GLENVILLE LAKE	Sandhills	Cape Fear	1	August 22, 1991 to August 10, 1998	2	5	5
HAMLET CITY LAKE	Sandhills	Yadkin	2	July 28, 1981 to August 17, 2000	6	14	14
HOPE MILLS LAKE	Sandhills	Cape Fear	1	August 22, 1984 to August 10, 1998	5	8	8
JOHNS POND	Sandhills	Lumber	1	August 30, 1981 to July 13, 1988	3	3	3
KORNBOW LAKE	Sandhills	Cape Fear	1	August 17, 1993 to August 10, 1998	1	4	4
MAXTON POND	Sandhills	Lumber	1	August 30, 1981 to August 22, 1991	4	4	4
MINTZ POND	Sandhills	Cape Fear	1	August 17, 1993 to August 10, 1998	1	4	4
OLD TOWN RESERVOIR	Sandhills	Cape Fear	2	September 15, 1988 to August 4, 1998	20	26	25
ROCKINGHAM CITY LAKE	Sandhills	Yadkin	1	August 19, 1992 to August 17, 2000	2	4	4
WATER LAKE	Sandhills	Yadkin	2	August 9, 1989 to August 17, 2000	16	20	19
12 Sandhills Lakes	**Total Number of Stations:**		**15**	**Total Number of Observations:**	**63**	**101**	**99**

* Chlorophyll *a* data does not include data from 1996 through 2000

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NC Existing Data Inventory

Coastal Plains

Lake	Ecoregion	River Basin	Number of Stations	Date Range	Number of Observations Chla *	TN	TP
GREENFIELD LAKE	Coastal Plains	Cape Fear	2	July 15, 1981 to August 3, 1998	6	12	12
LAKE MATTAMUSKEET	Coastal Plains	Pasquotank	3	July 21, 1981 to August 5, 2002	18	22	22
LAKE TABOR	Coastal Plains	Lumber	2	August 4, 1981 to July 12, 2001	8	12	12
LAKE WACCAMAW	Coastal Plains	Lumber	3	August 4, 1981 to September 6, 2001	32	41	41
LIMESTONE LAKE	Coastal Plains	Cape Fear	7	May 24, 1994 to October 21, 1994	35	35	35
MERCHANTS MILLPOND	Coastal Plains	Chowan	2	September 10, 1981 to August 22, 1995	15	15	15
PHELPS LAKE	Coastal Plains	Pasquotank	3	September 2, 1981 to August 21, 2000	51	66	66
TAYLORS POND	Coastal Plains	Cape Fear	2	June 4, 1997 to July 11, 1997	0	2	2
WHITE LAKE	Coastal Plains	Cape Fear	3	July 29, 1981 to August 5, 1998	45	54	54
9 Coastal Plains Lakes	**Total Number of Stations:**		**27**	**Total Number of Observations:**	**210**	**259**	**259**

* Chlorophyll *a* data does not include data from 1996 through 2000

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NC Existing Data Inventory

Dystrophic

Lake	Type	River Basin	Number of Stations	Date Range	Number of Observations Chla *	TN	TP
SWAN CREEK LAKE	Dystrophic	Pasquotank	3	August 23, 1989	3	3	3
ALLIGATOR LAKE	Dystrophic	Pasquotank	2	September 23, 1989	2	2	2
BAY TREE LAKE	Dystrophic	Cape Fear	2	July 29, 1981 to August 5, 1998	8	14	14
BOILING SPRINGS LAKE	Dystrophic	Cape Fear	3	July 23, 1990 to August 3 1998	6	14	14
CATFISH LAKE	Dystrophic	White Oak	2	July 28, 1981 to August 2, 1994	6	6	6
GREAT LAKE	Dystrophic	White Oak	2	July 28, 1981 to August 2, 1994	6	6	6
JONES LAKE	Dystrophic	Cape Fear	2	July 29, 1981 to August 4, 1998	22	28	28
LAKE ELLIS SIMON	Dystrophic	Neuse	1	August 17, 1988 to August 8, 1995	2	2	2
LONG LAKE	Dystrophic	Neuse	2	August 17, 1988 to August 8, 1995	4	4	4
MOTT LAKE	Dystrophic	Cape Fear	2	July 26, 1990 to August 19, 1993	20	20	20
PUNGO LAKE	Dystrophic	Tar-Pamlico	2	July 22, 1981 to July 21 1992	8	8	8
ROBERDEL LAKE	Dystrophic	Yadkin	2	August 9, 1989 to August 17, 2000	4	8	8
SALTERS LAKE	Dystrophic	Cape Fear	2	August 4, 1981 to August 4, 1998	6	12	12
SINGLETARY LAKE	Dystrophic	Cape Fear	3	July 29, 1981 to August 5, 1998	8	17	17
WHITE MILLPOND	Dystrophic	Roanoke	2	July 26, 1988 to August 18, 1994	4	4	4
15 Dystrophic Lakes	**Total Number of Stations:**		**32**	**Total Number of Observations:**	**109**	**148**	**148**

* Chlorophyll *a* data does not include data from 1996 through 2000