NEUSE RIVER BASINWIDE ASSESSMENT
APRIL, 2006

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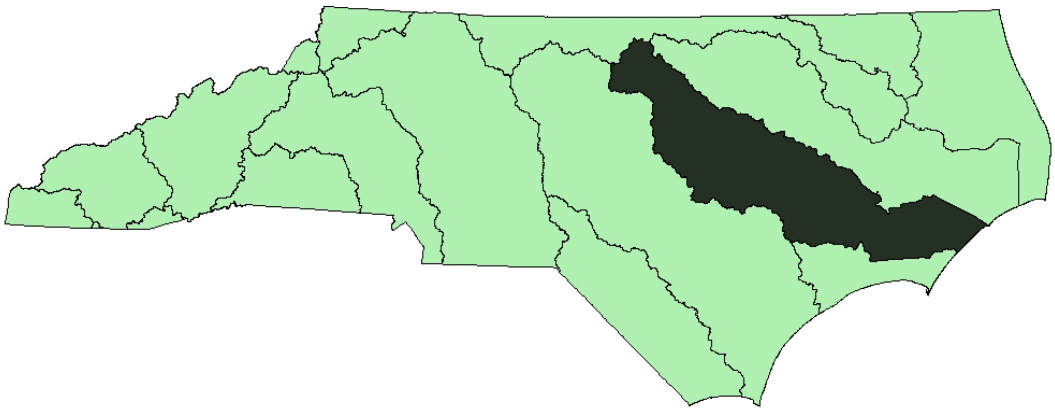

This document provides overviews from four program areas within the Environmental Sciences Section . They may be considered chapters or individual reports. The contributions from each unit are provided in the following order.

BASINWIDE ASSESSMENT –Provides basin and subbasin overviews of water quality and detailed information on collections of benthic macroinvertebrates, fish community structure, and fish tissue analyses.
Biological Assessment Unit 176 pages

LAKE & RESERVOIR ASSESSMENT-Provides lake & reservoir-specific information in the Neuse River Basin, and an overview of assessment methodology.
Intensive Survey Unit 15 pages

AMBIENT MONITORING SYSTEM ASSESSMENT-Provides results of analyses from DWQ fixed station Ambient Monitoring System and Coalition Data, including temporal and spatial trends of chemical, hydrological, and physical data where appropriate. Comparative results with data from (MODMON) are also reviewed and presented.
Ecosystems Analysis Unit 197 pages

WHOLE EFFLUENT TOXICITY PROGRAM-Provides an overview of permits requiring (WET), compliance information, and brief summaries of actions by individual facilities and/or DWQ in response to WET limit failures.
Aquatic Toxicology Unit 7 pages

BASINWIDE ASSESSMENT REPORT
NEUSE RIVER BASIN

NORTH CAROLINA
DEPARTMENT OF ENVIRONMENT
AND NATURAL RESOURCES
Division of Water Quality
Environmental Sciences Section

April 2006

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BASIN DESCRIPTION

The Neuse River basin is the third largest basin in North Carolina and is one of only three basins that are located entirely within the state. The Neuse River Basin covers 6,192 square miles and spans 19 counties. The Neuse River originates northwest of the city of Durham in Person and Orange counties and the headwaters start in the Southern Outer Piedmont and the Carolina Slate Belt ecoregions (Griffith *et al*. 2002). The uppermost 22 miles of the river's main stem is impounded behind Falls of the Neuse Reservoir dam just northeast of the city of Raleigh. Downstream of the dam, the river continues its course for approximately 185 miles southeasterly past the cities of Raleigh, Smithfield, Goldsboro, and Kinston after which it reaches the tidal waters near Street's Ferry just upstream of New Bern. Downstream of Street's Ferry, the Neuse River significantly broadens and changes into a tidal estuary that empties into the Pamlico Sound. Overall, most of the land use in the Neuse River Basin is agriculture or forest with the only major area of protected forest associated with the Croatan National Forest located in the lower reaches of the basin in Jones and Craven counties. However, there are several areas of rapidly expanding urban land use particularly associated with the cities of Durham, Raleigh, Clayton, Goldsboro, Kinston, and New Bern.

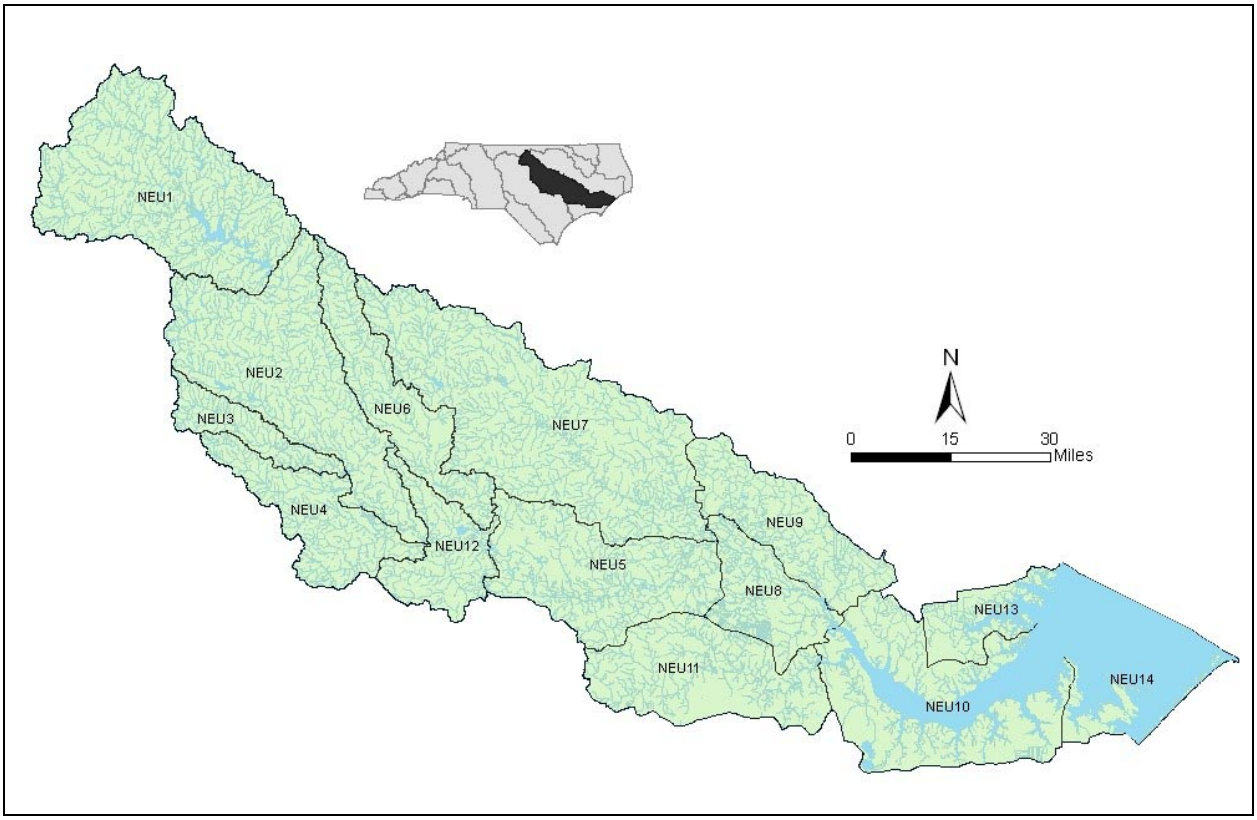


Figure 1. Geographical relationships of the Neuse River basin.

Five of the six streams listed as High Quality Waters (HQW) in the entire Neuse River Basin are restricted to headwater areas in Orange and northern Durham counties (subbasin 01) and include Sevenmile Creek, Eno River, Little River, South Fork Little River, and the North Fork Little River. The sixth and final HQW waterbody is the Little River in northeastern Wake County (subbasin 06).

INTRODUCTION TO PROGRAM METHODS

The Division of Water Quality uses a basinwide approach to water quality management. Activities within the Division, including permitting, monitoring, modeling, nonpoint source assessments, and planning are coordinated and integrated for each of the 17 major river basins within the state. All basins are reassessed every five years. The Neuse River basin has been sampled by the Environmental Sciences Section (ESS) four times for basinwide monitoring: 1991, 1995, 2000, and 2005.

The ESS collects a variety of biological, chemical, and physical data that can be used in a myriad of ways within the basinwide-planning program. In some program areas there may be adequate data from several program areas to allow a fairly comprehensive analysis of ecological integrity or water quality. In other areas, data may be limited to one program area, such as only benthic macroinvertebrate data or only fisheries data, with no other information available. Such data may or may not be adequate to provide a definitive assessment of water quality, but can provide general indications of water quality. The primary program areas from which data were drawn for this assessment of the Neuse River basin include benthic macroinvertebrates, fish community, ambient monitoring, and aquatic toxicity monitoring for the period 1999-2005. Details of biological sampling methods (including habitat evaluation) and rating criteria can be found in Appendices B-1 and F-1. Technical terms are defined in the Glossary. Studies conducted prior to 2000 were previously summarized in NCDENR (2001).

NEUSE RIVER SUBBASIN 01

Description

This subbasin consists of the Flat, Little, and Eno River watersheds, from their origins to the Neuse River (impounded as Falls of the Neuse Reservoir (Falls Lake; Figure 1). The western half of the subbasin contains a thin portion of the Southern Outer Piedmont, but is primarily located in the Carolina Slate Belt ecoregion that includes the Flat, Little, and Eno Rivers drainages (Giffith et al., 2002).

Land use in the northern half of the subbasin is mostly agricultural and forest. However, urban development is occurring northwest of Falls Lake around the Little River Reservoir (Treyburn). The other impoundment in this upper area of the subbasin is on the Flat River (Lake Michie). The lower half of this subbasin includes the town of Hillsborough, the city of Durham, Falls Lake Reservoir and its tributary streams. Land use around Falls Lake is primarily forest, but includes some of North Raleigh's newest residential developments.

Most streams have some type of water supply classification: WS-II, WS-III, or WS-IV. WS-II waters have the most protective regulations, and have the same management strategy as a High Quality Water classification. WS-II waters in the subbasin include the Eno River and tributaries above Hillsborough and the Little River and its tributaries above Little River Reservoir.

A narrow band of the Triassic Basin stretches across the middle of this subbasin and includes Ledge, Robertsons, Beaverdam, Ellerbe, and Lick Creeks. Smaller streams in the Carolina Slate Belt and Triassic ecoregions are especially susceptible to lack of flow during dry periods. This natural hydrologic stress may obscure some of the effects of point and nonpoint source runoff. Larger streams in the Carolina Slate Belt usually have high-quality habitat and are characterized by boulder-rubble substrate. The area south of Falls Lake is within a more typical portion of the Piedmont; streams in this area have sandy substrates.

The Eno River corridor contains some of the most scenic and biologically important natural areas within the entire eastern piedmont because of its geology and wide riparian corridors. The diverse array of wildlife found here includes a nationally significant fauna of freshwater mussels, snails, salamanders, fish, and other aquatic species. Upstream in Orange County, the Eno River forms links with Duke Forest, Occoneechee Mountain, and the extensive wildlands of the Eno River Uplands, now partially protected as part of the Eno River State park. The Little River joins the Eno River about six miles downstream of the Little River Reservoir, just outside of Durham. The Flat River joins the Eno River to form the Neuse River just west of the intersection of Durham, Granville, and Wake Counties. A portion of land that encompasses over 14 square miles along the Eno River has been set-aside as protected natural areas extending from the Eno River State Park to the Falls of the Neuse Gamelands.

There are three major and 15 minor active NPDES permitted dischargers in the subbasin. The major NPDES facilities are listed in Table 1.

Table 1. Major active NPDES dischargers in Subbasin 01 in the Neuse River basin as of December 2005.

Permit	Facility	County	Receiving Waterbody	Permitted Flow (MGD)
NC0023841	North Durham WRF	Durham	Ellerbe Creek	20.00
NC0026433	Hillsborough WWTP	Orange	Eno River	3.00
NC0026824	Butner WWTP	Granville	Knap of Reeds Creek	5.50

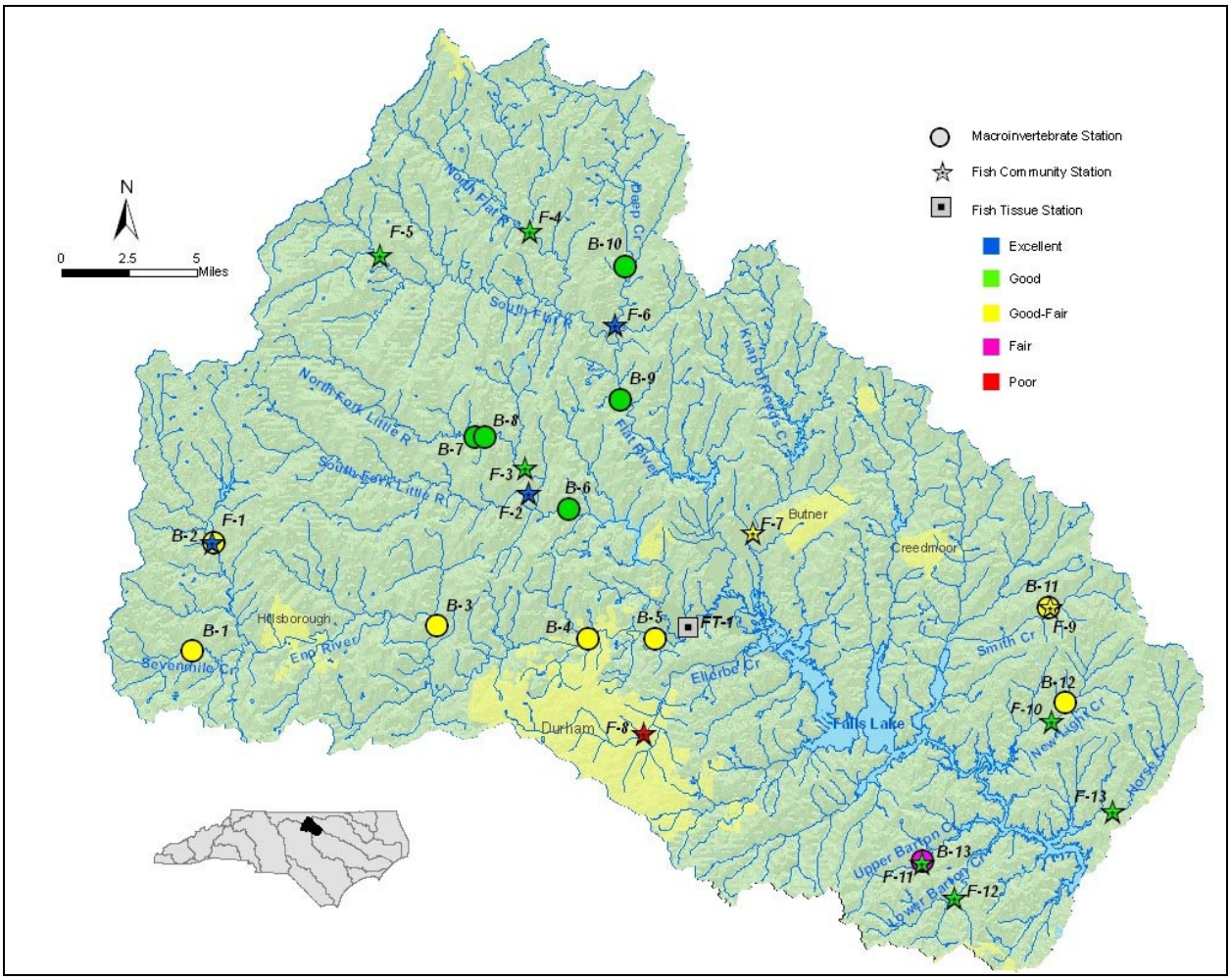


Figure 2. Sampling sites in subbasin 01 in the Neuse River basin.

Overview of Water Quality

All streams sampled for benthic macroinvertebrates in subbasin 01 were classified using Piedmont criteria. In the past, unusually high water quality was found in the Eno, Flat, and Little River systems (Table 2). This was due to a combination of Slate Belt geology forming favorable instream habitat and a general lack of disturbance. In 2000, macroinvertebrate collections produced Good or Excellent ratings for most sites on these rivers.

Based on benthic macroinvertebrate data, a majority of the sites in subbasin 01 have decreased in bioclassification since they were last sampled in 2000. The decreases in bioclassification may be due to drought conditions experienced the summer of 2005 or to other nonpoint sources in the watershed. Repeat sampling this spring or summer may be needed to verify the decreases in bioclassification. One site, North Fork Little River, improved from Good-Fair to Good. Seven Mile Creek retained the Good-Fair bioclassification it received in 2000. South Fork Little River, Flat River, and Deep Creek retained their Good bioclassification ratings. The remaining eight sites, which included portions of the Eno River, all received lower bioclassification ratings.

Except for the North Flat River fish community site, which declined from an NCIBI rating of Excellent to Good, all of the 2005 fish community basinwide monitoring sites in this subbasin maintained their water quality ratings from the 2000 monitoring cycle.

There are eight ambient monitoring sites located in this subbasin. Four stations (Eno River at US 501, Eno River at SR 1004, Little River at SR 1461, and Little River at SR 1628) have had stable water chemistry since 2000. The remaining four stations have had parameters that have exceeded water quality standards or action level standards greater than 10% of the time at a 95% statistical confidence level (see Ambient Monitoring Report).

Table 2. Waterbodies monitored in Subbasin 01 in the Neuse River basin for basinwide assessment, 2000 and 2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Sevenmile Cr	Orange	SR 1120	Good-Fair	Good-Fair
B-2	Eno R	Orange	SR 1336	Good	Good-Fair
B-3	Eno R	Orange	SR 1569	Excellent	Good-Fair
B-4	Eno R	Durham	US 15/501	Excellent	Good-Fair
B-5	Eno R	Durham	SR 1004	Good	Good-Fair
B-6	Little R	Durham	SR 1461	Excellent	Good
B-7	S Fk Little R	Orange	SR 1538	Good	Good
B-8	N Fk Little R	Orange	SR 1538	Good-Fair	Good
B-9	Flat R	Durham	SR 1614	Good	Good
B-10	Deep Cr	Person	SR 1715	Good	Good
B-11	Smith Cr	Granville	SR 1710	Good	Good-Fair
B-12	New Light Cr	Wake	SR 1912	Good	Good-Fair
B-13	Upper Barton Cr	Wake	NC 50	Good-Fair	Fair
F-1	Eno R	Orange	SR 1336	Excellent	Excellent
F-2	S Fk Little R	Durham	SR 1461	Excellent	Excellent
F-3	N Fk Little R	Durham	SR 1461	Good	Good
F-4	N Flat R	Person	SR 1715	Excellent	Good
F-5	S Flat R	Person	NC 157	Good	Good
F-6	Deep Cr	Person	SR 1734	Excellent	Excellent
F-7	Knap of Reeds Cr	Granville	off SR 1117	--	Good-Fair (2004)
F-8	Ellerbe Cr	Durham	SR 1709	--	Poor
F-9	Smith Cr	Granville	SR 1710	Good-Fair	Good-Fair
F-10	Newlight Cr	Wake	SR 1911	--	Good
F-11	Upper Barton Cr	Wake	NC 50	Good	Good
F-12	Lower Barton Cr	Wake	SR 1844	--	Good (2004)
F-13	Horse Cr	Wake	SR 1923	--	Good (2004)

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

A benthic community sample was not collected in 2005 from North Fork Little River at SR 1519 (Orange County) due to low flow conditions. A collection at this site in 2000 indicated an increase in the number of EPT taxa collected (11 in 1995 to 17 in 2000).

Three of the fish community sites in subbasin 01 were sampled for the first time in 2004 as part of an urban index study conducted by North Carolina State University (NCSU), and are being supplementally included in this monitoring cycle. There are five NPDES facilities located above the fish community sites in this subbasin. The Wildwood Green WWTP (NC0063614, 0.1MGD) located about 2.5 miles above the Lower Barton Creek fish community site had an effluent toxicity limit violation on 8/26/03.

Sevenmile Creek, SR 1120, Orange County

Seven Mile Creek is a tributary to the Eno River just west of Hillsborough. This rocky, slate belt stream was approximately six meters wide with a drainage area of 7.7 square miles. The conductivity was 104 µmhos/cm. Land cover surrounding the site was mainly forest (80%) and the habitat score was 86. The substrate was a mix of boulder (10%), rubble (30%), gravel (20%), sand (20%), silt (10%), and bedrock (10%). Stream banks were stable with diverse trees, shrubs, and grasses that provided good shading (80%) with breaks for light penetration. The riparian zone was wide and intact. In-stream habitat available for macroinvertebrate colonization included an abundance of rocks, undercut banks, and root mats.

This location has been sampled four times since 1991. It rated Good-Fair in 1991, 2000, and 2005 and borderline Good (21 EPT taxa) in 1995. In 2005, the EPT taxa richness increased to 20 from 18 in 2000 but the EPT abundance decreased to 86 in 2005 from 116 in 2000. The EPT biotic index has gradually decreased from 5.3 in 1991 to 4.9 in 2005 suggesting a slight improvement to water quality. Stenonema femoratum, and Baetis flavistriga, two fairly tolerant mayflies, which had been abundant in previous samples, were not collected in 2005. Their absence may have contributed to the lower Biotic Index score.

Eno River, SR 1336, Orange County

This site on the Eno River is located upstream of Hillsborough. The stream was 10 meters wide with a drainage area of 25.4 square miles. The visible land cover was approximately 80% forest and 20% residential. The conductivity was 79 µmhos/cm. Hydrologically, the site was diverse with a mix of runs and pools. Riffles were frequent but short in length. The substrate was a mix of boulder (10%), rubble (20%), gravel (10%), sand (40%), silt (10%), and detritus (10%). Stream bank erosion was moderate and the canopy provided approximately 70% shade. The riparian zone was wide and intact. In-stream habitat for macroinvertebrate colonization was diverse with an abundance of sticks, snags and logs, rocks, undercut banks, and root mats. The site received an overall habitat score of 87.

No major changes in water quality have been observed from benthic data since this site was first sampled in 1991. This site rated Good-Fair in 2005, a decrease from the borderline Good rating it received in 2000. In 1991 and 1995 the stream was also rated Good-Fair. EPT taxa richness has been similar for the four samples collected at this site (range from 16 to 21) as well as the EPT Biotic Index (range from 4.6 to 5.3). Dominant taxa included *Isonychia, Stenonema modestum, Cheumatopsyche, Hydropsyche betteni,* and *Triaenodes*. *Acroneuria abnormis*, a stonefly that was abundant or common in previous samples was not collected in 2005.

The fish community has been assessed two times at this location as part of the basinwide monitoring program. In 2000, 18 species were collected, and the stream was rated Excellent. The swallowtail shiner was the most common fish in this sample. In 2005, this site earned another Excellent rating, and the

NCIBI score increased six points from the score in 2000 to a maximum of 60. Out of the 18 species collected, three intolerant species were present (one more than in 2000) including pinewood shiner, chainback darter, and Roanoke darter. The most common species present in 2005 was bluehead chub.

Eno River, SR 1569, Cabes Ford, Orange County

This site is located within Eno River State Park, downstream from the city of Hillsborough. The Eno River at this site is 25 meters wide with a drainage area of 65.2 square miles. The conductivity was 157 µmhos/cm. Land cover surrounding the site was all forest (100%) and the habitat score here was 90. The substrate was a mix of boulder (10%), rubble (60%), gravel (20%), and sand (10%), with little to no embeddedness. Stream banks were stable with diverse trees, shrubs, and grass that provided partial shading with breaks for light penetration. The riparian zone was wide and intact. In-stream habitat for macroinvertebrate colonization was diverse with an abundance of rocks, snags, logs, undercut banks, and root mats.

This site has been rated either Good or Excellent since 1988. In 2005 the site received a bioclassification of Good-Fair, a decrease from the Excellent rating it received in 2000. This site also received a Good bioclassification in 1996, five weeks after Hurricane Fran in which the highest flows on record were recorded (500 year flood).

The Hillsborough WWTP (NC0026433) is located approximately four miles above this site, discharging into the Eno River. Three limit violations for total residual chlorine occurred in 2005. The Orange-Alamance Water System WTP (NC0082759), a minor discharger, is located seven miles upstream of this site. This facility had 8 limit violations for total chlorine from May to December 2005 and one violation for total suspended solids in 2004.

Total taxa richness and EPT taxa richness have steadily declined over the years (Figure 3). The Biotic Index was the lowest ever in 2000 (BI = 4.8), indicating a slightly less tolerant macroinvertebrate community. The biotic index increased to 5.3 in 2005 suggesting a more tolerant macroinvertebrate community and a decline in water quality. This is reflected in the presence of more tolerant midge taxa that were common or abundant in the 2005 sample and absent in the 2000 collection (e.g., *Conchapelopia*, *Polypedilum illinoense*, *P. halterale*, *P. scalaenum*, and *Tribelos*).

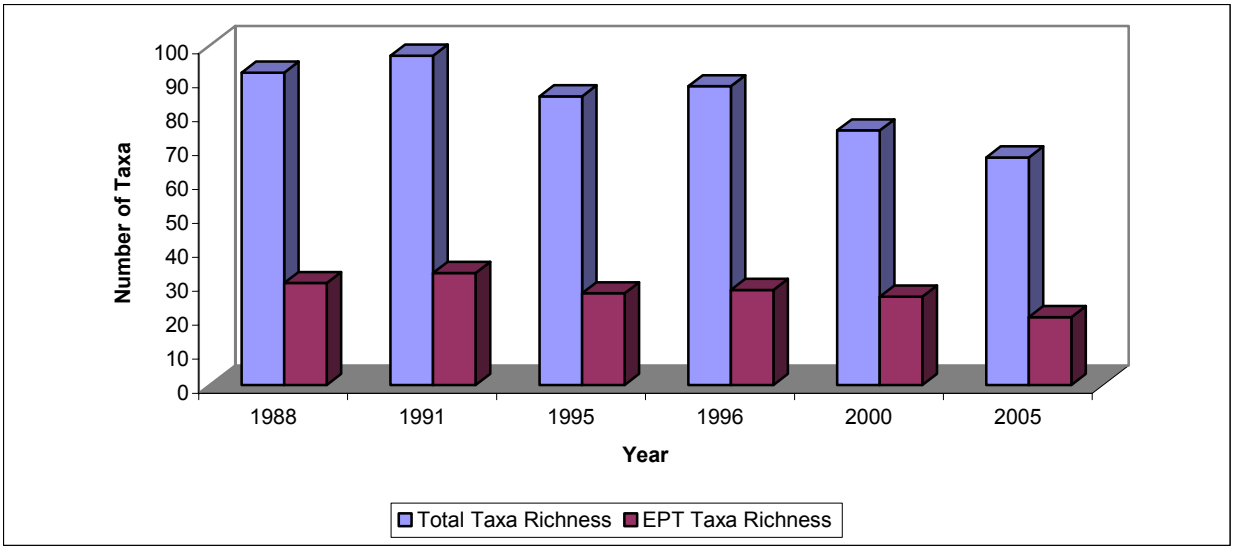


Figure 3. Total Taxa Richness and EPT Taxa Richness at Eno River, SR 1569, Orange County from 1988-2005.

Eno River, US 15/501, Durham County

This Eno River site is located inside West Point on the Eno Park in Durham. Visible land cover is mainly commercial (60%) with smaller percentages of forest (10%), residential (20%) and industrial land use (10%). Drainage area was 138.0 square miles and average stream width was 15 meters. The conductivity was 126 μmhos/cm. The substrate was a moderately embedded mix of boulder (10%), rubble (20%), gravel (20%), sand (30%), and silt (20%). Hydrologically, the site was diverse, with a mix of runs and pools; riffles were frequent but short in length. Riparian zones were intact but narrow, 12-18 meters on the left bank and 6-12 meters on the right bank. Stream banks had a few areas of erosion with diverse trees, shrubs, and grass that provided partial shading with breaks for light penetration. In-stream habitat for macroinvertebrate colonization was diverse with an abundance of rocks, macrophytes, sticks, and leafpacks. The overall habitat score was 74.

There are one major and five minor NPDES dischargers above this site. In addition to the Hillsborough WWTP and the Orange-Alamance Water System WTP, four other minor dischargers are located within six miles upstream.

Since 1984, this site has consistently received Good bioclassifications. The 2000 benthos collection resulted in an increase in both overall taxa richness and EPT taxa richness, changing the bioclassifiction to Excellent. However, the 2005 sample yielded only 17 EPT taxa and 75 total taxa, down from the 36 EPT taxa and 83 total taxa collected in 2000 thus receiving a Good-Fair bioclassification. EPT taxa that were common or abundant in 2000 but absent in 2005 included *Pseudocloeon propinquum*, *Baetis flavastriga*, *Callibaetis*, *Heterocloeon*, *Stenacron pallidum*, *S. interpunctatum*, *Ceraclea ancylus*, and *Polycentropus*.

Eno River, SR 1004, Durham County

This site, located just upstream of Falls Lake at Penny's Bend Nature Preserve, is 20 meters wide. Areas immediately upstream and downstream of this riffle were sandy, deep and slow moving. The stream was slightly turbid with clay particles coating the rocky substrate. A large amount of sand was present (40%) making the substrate a moderately embedded mix of boulder (10%), rubble (40%), and gravel (10%). Stream banks were stable with diverse trees, shrubs, and grass that provided partial shading with breaks for light penetration. Visible land cover was mainly forest (90%) with a small percentage of industrial land use (10%). Drainage area was 145.5 square miles and conductivity was 125 μmhos/cm. Instream habitat was good and the riparian zone was undisturbed. The site received an overall habitat score of 75.

This site has consistently been assigned a benthos bioclassification of Good since first sampled in 1985, but received a borderline Good-Fair rating in 2005. Taxa richness and abundance values and the Biotic Index have varied little between 1985 and 2000. However, the Biotic Index increased from 5.6 in 2000 to 6.0 in 2005 suggesting a more tolerant benthic community. Dominant mayfly taxa included *Isonychia*, *Stenonema modestum*, and *Baetis intercalaris*. Dominant caddisfly taxa included *Hydropsyche betteni*, *Cheumatopsyche*, and *Chimarra*. *Ablabesmyia mallochi*, *Rheotanytarsus*, and *Polypedilum* were the dominant midges.

Little River, SR 1461, Durham County

The Little River near Orange Factory is about 25 meters wide with a drainage area of 72.4 square miles. The conductivity was 88 μmhos/cm. Land cover surrounding the site was all forest (100%) and the habitat here scored an 81. The substrate was a moderately embedded mix of boulder (30%), rubble (30%), gravel (30%), and sand (10%). Stream banks were stable with diverse trees, shrubs, and grass that provided minimal shading with breaks for light penetration. The riparian zone was wide and intact. In-stream habitat was limited mostly to rocks and macrophytes. Sticks, leafpacks, snags, logs, undercut banks, and root mats were all present but rare.

This site has rated either Good or Excellent since it was first sampled in 1989. In 2000, this site received an Excellent bioclassification and in 2005, it received a Good bioclassification. Taxa richness, EPT taxa richness, and biotic index did not vary much between the two samples. The only major differences in taxa were that *Caenis* were abundant in the 2005 sample but absent in the 2000 sample. Also, *Heterocloeon,* a tolerant baetid mayfly and *Agnetina,* an extremely intolerant stonefly were common in the 2000 sample but absent in 2005 sample.

South Fork Little River, SR 1461, Durham County

This site is located north of Durham, about a quarter of a mile upstream of the South Fork, North Fork Little Rivers confluence where the Little River is formed. The site was 13 meters wide and drained 39 square miles of forested and rural residential land. Substrates were primarily cobble, gravel, and boulder in this section, and habitats consisted of riffles, runs, snags, and a deep pool located at the upper end of the site. The riparian border between the stream and the adjacent land was fairly thin throughout most of the site, but widened upstream. The total habitat score was 80.

The overall high quality watershed characteristics here qualify this section of the South Fork Little River as a regional fish community reference site. In support of this designation, the fish community has now earned two consecutive Excellent ratings including the 2000 evaluation. Both of these assessments produced maximum NCIBI scores of 60. The three numerically dominant species in 2005 were the bluehead chub (n=98), Roanoke darter (n=87), and redbreast sunfish (n=78). Although four more fish species were present in 2000, 30% more of the species in the current assessment showed reproductive success, and 10% fewer tolerant species were collected.

South Fork Little River, SR 1538, Orange County

This tributary to the Little River in northern Durham County averaged about eight meters wide, was very shallow, and had a rocky substrate with few pool areas. The substrate was somewhat embedded and was comprised of boulder (15%), rubble (25%), gravel (25%), sand (25%), and silt (10%). Land cover surrounding the stream was mainly forest (80%) and residential (20%). Instream habitat was abundant with rocks, macrophytes, sticks, leafpacks, and root mats. The riparian zone was wide with a few breaks present. Stream banks were fairly stable with areas of moderate erosion. Conductivity was 84 µmhos/cm. The site received an overall habitat score of 80.

This site was first sampled for benthos in 1995, resulting in a Good-Fair rating. In 2000, an increase in EPT taxa richness from 19 to 23 resulted in a Good bioclassification. In 2005, the EPT taxa richness increased to 24 and the site retained a Good bioclassification. Two major differences between the 2000 and 2005 collections were noted: the mayfly *Pseudocloeon ephippiatum* was abundant in the 2000 sample but absent in the 2005 sample; three species of *Triaenodes* were collected in the 2005 sample that had not previously been collected.

North Fork Little River, SR 1538, Orange County

This North Fork Little River site is approximately four meters wide with a drainage area of 19.2 square miles. Land cover here was predominantly agriculture (70%). The habitat score (80) reflected a stream with limited instream habitat, few riffles and pool areas and eroding, unstable banks. The substrate is moderately embedded with an even mix of rubble, gravel, and sand.

This site was first sampled in 1995; at that time it received a Good rating. A subsequent reduction in EPT taxa richness, from 29 to 20, resulted in a rating of Good-Fair in 2000. EPT abundance also decreased between years. In 2005, EPT taxa richness increased from 20 to 24, thus reverting the bioclassification back to Good. EPT abundance also increased from 81 to 119. Changes in the structure of the benthic community suggested a decrease in water quality from 1995 to 2000. These changes included the disappearance of intolerant taxa such as *Centroptilum, Diplectrona modestum, Hydroptila* and *Psilotreta.* These taxa, with the exception of *Psilotreta*, were also absent in the 2005 sample.

North Fork Little River, SR 1461, Durham County.

This typical Carolina Slate Belt site is located less than two river miles north of the North Fork, South Fork Little Rivers confluence. Land use in this 29.7 square mile watershed is largely forest and rural residential. Substrates were predominantly cobble, bedrock and boulder, and the high quality instream habitats consisted of pools, short runs, and riffles. Considerable effort was necessary to sample the fish community at this location because of the abundance of slippery rocks. The total habitat score at this site was 93.

The high quality habitat and riparian characteristics at this location establish it as one of the regional fish community reference sites. This station has been sampled for fish in 2000 and 2005, with consecutive ratings of Good. The bluehead chub was the most common species during both of these assessments, representing more than 40% of the catch. However, two more fish species were collected in 2005. In comparison to the 2005 South Fork Little River sample, this site represented four less species, a lower percentage of species with multiple age groups, and a slightly skewed trophic structure.

Flat River, SR 1614, Durham County

The Flat River at Quail Roost is an ambient monitoring station. The site is approximately 22 meters wide and has a drainage area of 144.3 square miles. The conductivity was 95 μmhos/cm. Land cover surrounding the site was mainly forest (90%). The substrate was a moderately embedded mix of boulder (10%), rubble (20%), gravel (10%), sand (30%), and bedrock (30%). Some erosional areas were present. However, stream banks were fairly stable with diverse trees, shrubs, and grass that provided minimal shading. The riparian zone was wide with a few breaks present. In-stream habitat consisted of an abundance of rocks and macrophytes. Sticks, leafpacks, snags, logs, undercut banks, and root mats were present but rare. The overall habitat score was 79.

One minor discharger, Eaton Corp-Roxboro, is approximately 12 miles upstream of this site. This facility has had a violation for tetrachloroethylene in 2001, 2002, 2004, and 2005.

This Flat River at this location has been sampled for benthic macroinvertebrates 17 times since 1984 and has consistently maintained a rating of either Good or Excellent. In 2005, the stream was slightly turbid with low flow conditions. However, this site received a Good bioclassification rating with 96 total taxa, 27 EPT taxa, and a biotic index of 5.8. The bioclassification rating in 2000 was also Good with 90 total taxa, 30 EPT taxa, and a biotic index of 5.5. The decrease in the number of EPT taxa in 2005 is reflected by the absence of several baeitid mayflies which were abundant in previous samples.

North Flat River, SR 1715, Person County

The North Flat River above SR 1715 is located about four miles southeast of Roxboro. This is another Carolina Slate Belt type stream with rocky substrates of cobble, boulder, and bedrock. The average stream width at this crossing was 12 meters. The high quality habitats at this site included riffles, runs, side snags, chutes, good pools, and an extensive riparian corridor. The total habitat score was 92.

The North Flat River has been sampled three times since 1999 for its fish community and has fluctuated between ratings of Good and Excellent. A total of 26 fish species have been collected during these samples. A total of 19 fish species were captured in 2005. This was the only fish site in subbasin 01 that decreased in rating from Excellent (2000) to Good (2005) because of a reduction in species richness and a slight change in trophic structure. Specifically, the metrics that caused the ten point decrease in NCIBI score (56 in 2000, 46 in 2005) included the numbers of sunfish, suckers, and intolerant species collected. Most notably, the intolerant pinewood shiner was absent, which represented 22 individuals in 2000. However, excluding the pinewood shiner, all other “missing” species in 2005 (white sucker, creek chubsucker, pumpkinseed, and redear sunfish) only represented one to three individuals in 2000. Likewise, the two species that were captured in 2005 but not in 2000 (brown bullhead, and flat bullhead), were only represented by one individual.

South Flat River, NC157, Person County

This site is located in southwest Person County, just below the remnants of an old milldam. The stream averages 9 meters wide at this crossing and has a drainage area of 17.3 square miles. Land use in this watershed is primarily forest and agriculture. The upper 1/3 of the sample reach has Carolina Slate belt characteristics and was dominated by riffle habitats and substrates of cobble, gravel and boulder. The lower 2/3 of the segment was dominated by sandy runs and included some areas of severe bank sloughing, and over-bank sand deposits in the floodplain. The total habitat score for the site was 59.

This is another site that has been sampled twice over the last five years for fish. In both assessments, the site was rated Good with matching individual metric scores, and a total NCIBI scores of 48. Eighteen species of fish were collected during the 2005 monitoring effort. However, this sample had a slightly skewed trophic structure with a majority of insectivorous fish (60%) including bluehead chubs and swallowtail shiners, which represented 37 and 18% of the total catch, respectively.

Deep Creek, SR 1734, Person County

This 12 meter wide site on Deep Creek is located in southeast Person County, and is a tributary to the Flat River. At this crossing, the creek drains a 32.5 square mile rural area, and has Carolina Slate Belt characteristics including substrates of boulder, cobble, bedrocks, and sand. Habitat types in this section included runs, pools, side snags, and one large bedrock shelf riffle near the downstream end of the site. The stream's riparian corridor was extensive and the total habitat score was 90.

The high quality watershed characteristics associated with this site qualifies it as a regional fish community reference site. This is the fourth time in which this stream site has been rated Excellent based on its' fish community. The NCIBI score during these four assessments has only fluctuated over four points (56 to 60). Out of the 21 species collected in this sample, the most abundant was bluehead chub. Three intolerant species including pinewoods shiner, chainback darter, and Roanoke darter have also been collected during all four assessments. Deep Creek is presently being evaluated for reclassification to High Quality Water, based on these four Excellent fish community ratings.

Deep Creek, SR 1715, Person County

This tributary to the Flat River, in southern Person County, is a Carolina Slate Belt stream surrounded by forest (80%) with some residential (20%). The creek at this site is 7 meters wide and has a drainage area of 26.7 square miles. Macroinvertebrate habitat was diverse. The substrate consisted of boulder (10%), rubble (40%), gravel (30%), sand (10%), and sand (10%); the larger substrate was moderately embedded. Stream banks were stable with some erosional areas present. The habitat scored 84.

This stream has rated either Excellent or Good since first sampled for benthos in the spring of 1990. However, since July 1995 this site has received a Good bioclassification. No major changes in water quality have been indicated since 1995. EPT taxa richness has been similar for the 1995, 2000, and 2005 samples collected at this site (range of 21 to 23) as well as the EPT Biotic Index (range of 4.4 to 4.9).

Knap of Reeds Creek, off SR 1117, Granville County

This site is located west of Butner, directly above the Butner WWTP (NC0026824) and has Coastal Plain like characteristics. At this location, the creek is six meters wide and drains 42.7 square miles of forested, agricultural, and residential land. Although there is a drinking water treatment facility located approximately three miles upstream (NC0058416, 0.25 MGD), the elevated conductivity measured here (184 µS/cm) was probably an indication of nonpoint runoff in this watershed. Substrates at this site consisted of gravel, sand, clay, and silt. Instream habitats included an abundance of coarse woody debris, good pools, and a few stick riffles. Because of the Coastal Plain characteristics at this Piedmont site, the instream and riparian habitats were assessed with both habitat forms (Appendices F-7 and F-8). Using the Mountain/Piedmont habitat scoring criteria, the total habitat score for this site was 54. Using the Coastal Plain habitat criteria, the total score was 72.

The fish community was sampled for the first time at this location as part of the 2004 NCSU urban index study. Nineteen species of fish were captured during this sample with the bluegill as the dominant species (42% of the total catch). The Good-Fair rating at this site just above the WWTP reflected less than optimal species richness and composition (absence of darters, suckers and intolerant species), probably because of the combined effect of urban runoff (conductivity of 184 µmhos/cm), and low flow status. The notably low dissolved oxygen (2.7 mg/l) has persisted at this location since mid-May (a D.O. reading of 2.7 mg/l was recorded on May, 19, 2004 by DWQ Intensive Survey Unit staff), as little to no water was flowing from the Lake Butner Dam four miles upstream (Biological Assessment Unit memorandum B-041109).

Ellerbe Creek, SR 1709, Durham County

Ellerbe Creek runs along the Interstate 85 corridor, and drains 8.9 square miles of north Durham at this location. The entire stream from its source to Falls Lake is on the state's 303(d) list of impaired streams. The urban nature of this site was reflected in the elevated conductivity (167 µS/cm), measured prior to sampling. The average width in this highly entrenched section of Ellerbe Creek was nine meters. Substrates were limited to sand and clay and there was an abundance of urban debris present, both in the stream and emerging from the stream banks. Although the riparian corridor was extensive above the steep terraced banks, instream habitats were sparse and consisted mostly of runs and a few side snags. The total habitat score for this site was 34.

Ellerbe Creek has been rated Poor for its fish community on two occasions (1995 and 2005) because of upstream urban impacts, the lack of suitable habitat, an open canopy, and possibly the stream's close proximity to the landfill. Although the NCIBI score (28) remained essentially unchanged since the 1995 sample (26), the total number of fish collected in 2005 declined by 87% (n=81). This stream appears to be supporting fewer of the two cyprinid species historically collected here, including swallowtail shiner (declined 83%) and satinfin shiner (none collected in 2005).

Smith Creek, SR 1710, Granville County

Smith Creek, located southeast of Creedmore, is a small, sand-bottom stream that is four to eight meters in width. This creek eventually flows into one of the eastern arms of Falls Lake on the Granville-Wake County border. The land cover surrounding the site is mostly forest with some agriculture. Drainage area is 6.1 square miles. The conductivity was 84 µmhos/cm. The substrate was highly embedded and consisted of mostly gravel (35%) and sand (55%). Hydrologically, the site was mostly a mix of runs and pools. Although areas of bank erosion were present, the riparian zone was broad on both sides of the stream with no obvious breaks. Stream banks had a few areas of erosion with diverse trees, shrubs, and grass that provided partial shading with breaks for light penetration. In-stream habitat for macroinvertebrate colonization was diverse with an abundance of rocks, snags, logs, sticks, and leafpacks. The overall benthic habitat score was 76 and the fish habitat community score was 68.

Eight benthos samples have been collected since 1984, with the majority of collections occurring in winter or spring, resulting in Good ratings. The stream received a bioclassification of borderline Good in 2000. The summer collections in 1991, 1995, and 2005 resulted in bioclassifications of Good-Fair. The benthic community has remained similar in composition suggesting no major changes in water quality.

For fish, Smith Creek has been sampled over the last three basinwide cycles, with an initial fish community rating of Good in 1995, and two successive ratings of Good-Fair in 2000 and 2005. In 2005, 13 species were captured here (two less than in the 2000 assessment) and the two most common species were the bluehead chub, and the white shiner, representing 35 and 30% of the catch,

respectively. Overall, the fish community trophic structure in this section of Smith Creek appears to be stable.

New Light Creek, SR 1911, Wake County

New Light Creek is another sandy bottom site located in Falls Lake Gamelands near the intersection of Granville, Franklin, and Wake Counties. The creek was six meters wide at this crossing and drains 12.2 square miles of bottomland forest. Instream habitats were primarily sandy runs with some shallow side pools. Despite an extensive riparian corridor, the canopy was open in this part of the stream. The total habitat score was 47.

The fish community in Newlight Creek was not sampled during the 2000 basinwide cycle. However, the rating of Good-Fair in 1995 improved to Good in 2005 (NCIBI = 50). Out of the 16 fish species collected in 2005, the dominant species were swallowtail shiner (n=61) and bluehead chub (n=59). Although there were far fewer total fish collected (242 in 2005 vs. 715 in 1995), the same number of species was present in both assessments (n=16), and the 2005 sample showed a more balanced trophic structure and a greater percentage of multiple age classes. However, two intolerant species found in 1995 (pinewoods shiner and Roanoke darter) were not collected in 2005.

New Light Creek, SR 1912, Wake County

This four to six meter wide sandy bottom stream is located in northeastern Wake County and has a drainage area of 9.7 square miles. The stream here is heavily sedimented, with rocks that are 50 percent embedded in the sand. There is an agricultural field within 12 meters of the left bank. Instream habitat is sparse with only a few riffle areas and eroded stream banks.

New Light Creek has been sampled four times since 1995. The site received a Good bioclassification rating in 1995, 2000, and 2001 and a Good-Fair rating in 2005. In 2000, the EPT taxa richness was 30 and the EPT BI was 5.2. In 2005, the EPT taxa richness decreased to 18, which caused the rating to decline to Good-Fair. The EPT abundance also decreased.

Upper Barton Creek, NC 50, Wake County

This stream is located in northern Wake County and is a tributary to Falls Lake. At this site, Upper Barton Creek is a small four meter wide stream with a drainage area of 6.2 square miles. The substrate is predominantly sand (60%) because the amount of development occurring in the watershed continues to increase. Instream habitats included sandy runs, side snags and one large bedrock pool at the upstream end of the site. However, the channel in this section of the stream was more noticeably filled in and had fewer riffles and chutes in comparison to the 2000 basinwide sample. The total benthic habitat score was 64 and the fish community habitat score was 57.

Hawthorne Subdivision WWTP, a minor discharger, is located approximately two miles upstream of this site. This facility had two limit violations in 2004 and two in 2005 for fecal coliform.

Upper Barton Creek has been sampled for benthic macroinvertebrates eight times since 1991. The site was rated Good up until February of 1995. In July of 1995, the site received a Good-Fair rating. The rating decreased to Fair in 1996 and increased to Good-Fair in 2000 and 2002. But in 2005, the rating decreased back to Fair. The number of EPT taxa in summer samples has continued to decrease since 1991 and the NCBI has increased, reflecting a more tolerant EPT community. The benthic community structure is changing, suggesting a long-term water quality decline since 1991; the reduction or loss of intolerant species such as *Isonychia, Nyctiophylax moestus* and *Pycnopsyche*, and increases in more tolerant taxa such as *Hydropsyche betteni, Baetis*, and *Caenis*.

With regards to fish, this site has consistently produced Good ratings over the last three basinwide monitoring cycles. During all of these assessments, the two dominant fish have been the white shiner and the bluehead chub, representing 31% and 28% of the catch respectively in 2005. It is important to note that the 2005 sample had at least three fewer species (n=14) than the two previous samples, and included no piscivores.

Lower Barton Creek, SR 1844, Wake County

Lower Barton Creek is a tributary to Falls Lake in northeastern Wake County and drains a 7.8 square mile suburban area of north Raleigh at this location. The average width of this stream site was seven meters. Substrates were mostly sand and silt. Although the surrounding land is predominantly forested, the stream was turbid at the time of sampling, and the conductivity of 104 µS/cm indicates the urban nature of this watershed. Instream habitats consisted of sandy runs, undercuts, snags, and pools. The total habitat score at this site was 47.

This creek was sampled for the first time in 2004 as part of the NCSU urban index fish study. A total of 13 species and 290 fish were collected during this effort. The bluegill was the numerically dominant species, representing 41% of the total catch. This stream supports a trophically balanced community of fish, and received a rating of Good (NCIBI score = 48). However, no intolerant species were collected during this sample.

Horse Creek, SR1923, Wake County

Horse Creek is also a tributary to Falls Lake that runs south along the west side of US 1. The Heater Utilities Waterfall WTP (NC0085863, 6,110GPD) is located about 0.5 miles upstream of this site. However, a conductivity of 64 µS/cm reflected no water quality issues with this facility. Horse Creek was six meters wide at this location and has a drainage area of 12 square miles. This watershed is largely forested and has an intact riparian zone that is a minimum of 12 meters wide. Substrates included sand and bedrock shelves, and instream habitats are composed of runs, shelf pools, snags, and deadfalls. The total habitat score for this site was 54.

This site was also sampled for fish for the first time in 2004 as part of the NCSU urban fish study. A diverse assemblage of fish was collected, including a total of 421 fish, representing 25 species. The most abundant fish was the bluegill, comprising 36% of the total catch. Although not weighed, redhorse suckers represented a large proportion of the fish biomass in this sample. Horse Creek was rated Good, with the highest NCIBI score (52) for this rating.

Special Studies

Eno River at SR 1561, Orange County

The Raleigh Regional Office (RRO) requested a benthic sample from this site, located downstream of the town of Hillsborough, to determine potential impacts from growth in and around the town of Hillsborough (Orange County; Biological Assessment Unit Memorandum B-060207). This site was compared to Eno River at SR 1336, a basinwide site located upstream of Hillsborough. The upstream site was rated as Good-Fair and the downstream site received a bioclassification of Good. The downstream site (22 EPT from a Full Scale sample) contained more EPT taxa than the upstream site (16 EPT taxa from an EPT sample). The downstream site had a slightly more intolerant community as reflected by the EPT Biotic Index (4.6 downstream versus 5.2 upstream), and this lower BI brought the average of the EPT and BI metrics into the Good range. Because both sites were similar in biological, chemical, and physical characteristics, no definite conclusions could be drawn to account for the differences in bioclassifications between the two sites.

Eno River, ORW reclassification study, Orange and Durham Counties.

At the request of North Carolina Public Interest Research Group, six fish community sites in the Eno River watershed in Orange and Durham Counties were sampled in April of 2005. The purpose of this study was to determine if any portions of a 17 river mile section of the river below Hillsborough and its tributaries might qualify to be reclassified to Outstanding Resource Water status (Biological Assessment Unit Memorandum F-050823). Based on DWQ's historical fish community and benthic macroinvertebrate data, the mainstem reach of the Eno River from some point yet to be determined around the western edge of the Eno River State Park to a point 0.5 mile upstream of Durham's emergency raw water pumping facility meets the necessary criteria to be reclassified. In addition, the Buckquarter and Rhodes Creek watersheds both qualify for reclassification to ORW based on the 2005 NCIBI ratings of Excellent.

Knap of Reeds Creek TMDL Stressor Study

A TMDL stressor study was conducted on four sites in the Knap of Reeds Creek watershed in Granville County in April of 2004: Camp Butner (NC National Guard Training Facility); SR 1004; above John Umstead WWTP; and below John Umstead WWTP (Biological Assessment Unit Memorandum B-041109B). The upstream site, Knap of Reeds Creek at Camp Butner, rated Excellent. The three sites downstream of the Dam on Lake Butner all rated Fair. The SR 1004 site showed little change from previous samplings. The composition of the macroinvertebrate community above and below John Umstead WWTP are very similar suggesting that changes to Plant operations and recent upgrades have

not degraded water quality further, as had been the case historically. The dramatic difference between the benthic community at the upstream Camp Butner site and the sites downstream of Lake Butner strongly suggests that the Lake Butner Dam is the primary stressor in this section of stream. The general effects of dams on streams and rivers have been well documented. Lack of flow leads to lower dissolved oxygen levels, higher temperatures in warmer months and less dilution for downstream pollutants. The hydrologic changes due to this dam throughout the past 50 years have resulted in stagnant conditions at certain times of the year and the presence of lentic species at other times (e.g. *Chaoborus sp*. found up to 4.6 miles downstream).

Fish Tissue Monitoring

Eno River near Durham

Largemouth bass, sunfish, and catfish samples were collected from the Eno River near Durham during 2003 and analyzed for mercury contamination. The samples were collected as part of an eastern North Carolina mercury assessment. All largemouth bass, (8 of 16 total samples) contained mercury concentrations exceeding the state criteria of 0.4 ppm. Mercury levels in all samples ranged from 0.11 to 1.3 ppm (Appendix F-13).

NEUSE RIVER SUBBASIN 02

Description

This subbasin contains the most urbanized areas in the entire basin, including the greater Raleigh metropolitan area (Figure 4). Major tributaries to the Neuse River in this subbasin are Crabtree Creek, Walnut Creek (including Lakes Johnson and Raleigh) and Swift Creek (including Lakes Wheeler and Benson).

This subbasin consists primarily of piedmont streams and includes four level IV ecoregions (Griffith *et al*., 2002). The headwaters of Crabtree Creek and a small portion of the Swift Creek headwaters lie within the Triassic basins ecoregion along the western edge of the subbasin. Most of the middle section of the subbasin is located in the Northern Outer Piedmont ecoregion where Crabtree and Walnut Creeks flow into the Neuse River. Smaller streams in these areas have a tendency to dry up under low flow conditions. The southern half of the subbasin is located within the Rolling Coastal Plain and Southeastern Floodplain and Low Terraces ecoregions. Swift Creek is the largest tributary to the Neuse River in this lower part of the subbasin (Figure 4). The other main tributaries in these two ecoregions are Poplar Creek, Polecat Branch, and Bawdy Creek.

The greater Raleigh metropolitan area lies in the northern half of this subbasin, and includes the cities of Raleigh, Cary, Morrisville, and Garner. The most recent landuse coverage (1993-1995) showed more than 50% of the subbasin as forest or wetland. However, due to aggressive urban sprawl in the northern part of this subbasin towards the Wake County line and east of Raleigh, the percentage of urban land use has increased, reducing the forested and wetland coverage. Such land use practices will likely adversely affect stream water quality in and around these urban areas. Cities in the southern half of the subbasin include Clayton, Smithfield and Selma. Land around Clayton is also rapidly being developed, which may have an unfavorable effect on water quality.

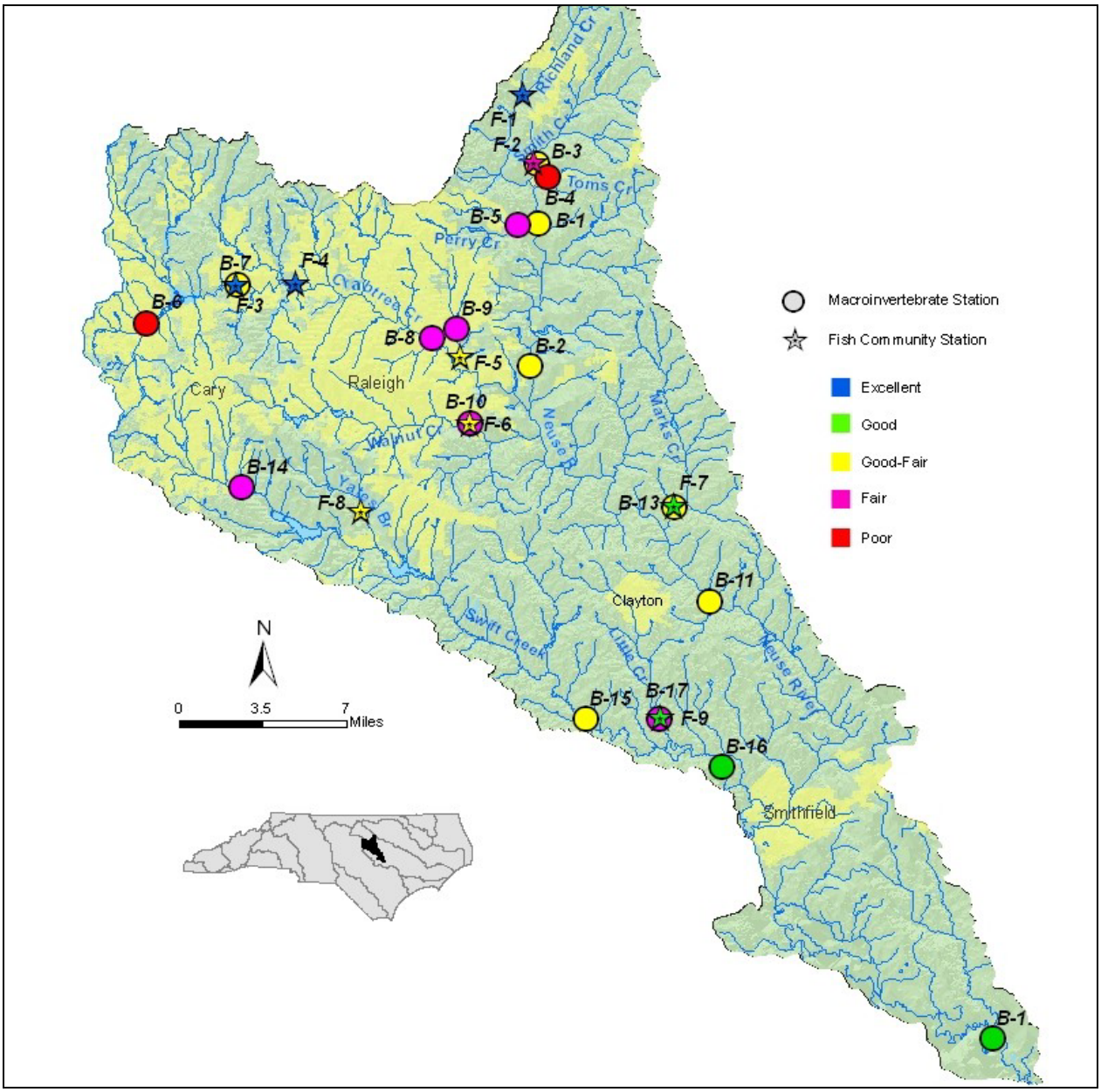


Figure 4. Sampling sites in subbasin 02 in the Neuse River basin.

Overview of Water Quality

Based on benthic macroinvertebrate data, 12 of the 17 sites sampled in subbasin 02 have retained the bioclassifications they were assigned in 2000 (Table 3). Two sites improved; Smith Creek at SR 2045 increased from Fair to Good-Fair and Marsh Creek near US 1 increased from Poor to Fair. The remaining three sites all received lower bioclassification ratings than in 2000.

Three of the four fish community sites that were sampled in the last basinwide cycle maintained their water quality ratings. However, Smith Creek at SR 2045 in Wake County has shown highly variable NCIBI metrics between monitoring years, causing a substantial rating decrease from Excellent in 2000 to Fair in 2005. The change in the fish community trophic structure of Smith Creek is probably a result of the short distance to the Neuse River confluence, which is likely influencing fish recruitment.

Nonpoint runoff from both urban areas (stormwater and suspended sediments) and agricultural areas are the main contributors to water quality degradation. There are 52 permitted dischargers in this subbasin. Most dischargers are small. However, there are six facilities whose permitted discharge is more than 2.5 MGD. Five of the six, Johnston County WWTP (7 MGD), Raleigh WWTP (60 MGD), Riverplace II (5MGD), Clayton WWTP (2.5 MGD) and Wake Forest WWTP (6 MGD), discharge into the Neuse River. The Cary WWTP (12 MGD) discharges to Crabtree Creek.

There are eight ambient monitoring sites located in this subbasin. One station, Neuse River at SR 2000, has had stable water chemistry since 2000. The remaining seven stations have had parameters that have exceeded water quality standards or action level standards greater than 10% of the time at a 95% statistical confidence level (see Ambient Monitoring Report).

Table 3. Waterbodies monitored in Subbasin 02 in the Neuse River basin for basinwide assessment, 2000 and 2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Neuse R	Wake	US 401	Good-Fair	Good-Fair
B-2	Neuse R	Wake	US 64	Good-Fair	Good-Fair
B-3	Smith Cr	Wake	SR 2045	Fair	Good-Fair
B-4	Toms Cr	Wake	SR 2044	Fair	Poor
B-5	Perry Cr	Wake	SR 2006	Fair	Fair
B-6	Crabtree Cr	Wake	NC 54	Poor	Poor
B-7	Crabtree Cr	Wake	Umstead Park	Good-Fair	Good-Fair
B-8	Crabtree Cr	Wake	US 1	Fair	Fair
B-9	Marsh Cr	Wake	near US 1	Poor	Fair
B-10	Walnut Cr	Wake	Sunnybrook Rd	Good-Fair	Fair
B-11	Neuse R	Johnston	NC 42	Good	Good-Fair
B-12	Neuse R	Johnston	SR 1201	Good	Good
B-13	Marks Cr	Johnston	SR 1714	Good-Fair	Good-Fair
B-14	Swift Cr	Wake	SR 1152	Fair	Fair
B-15	Swift Cr	Johnston	SR 1555	Good-Fair	Good-Fair
B-16	Swift Cr	Johnston	SR 1501	Good	Good
B-17	Little Cr	Johnston	SR 1562	Fair	Fair
F-1	Richland Cr	Wake	US 1	--	Excellent
F-2	Smith Cr	Wake	SR 2045	Excellent	Fair
F-3	Crabtree Cr	Wake	off SR 1650	--	Excellent (2004)
F-4	Crabtree Cr	Wake	SR 1664	Excellent	Excellent
F-5	Marsh Cr	Wake	SR 2277	--	Good-Fair
F-6	Walnut Cr	Wake	SR 2544	Good-Fair	Good-Fair
F-7	Marks Cr	Johnston	SR 1714	Good	Good
F-8	Yates Br	Wake	US 401	--	Good-Fair (2004)
F-9	Little Cr	Johnston	SR 1562	--	Good

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

Four fish community sites in this subbasin were sampled for the first time during this basinwide monitoring cycle. Crabtree Creek off SR 1650 and Yates Branch at US 401 were both sampled in the summer of 2004 as part of the North Carolina State University (NCSU) Urban Index Study, and are being supplementally included in this monitoring cycle. The Marsh Creek watershed was sampled at SR 2277 for the first time in 2005. This stream was on the list of new sites to be sampled by BAU when a special study request from the Raleigh Regional Office was received, and is therefore being considered as both a basinwide site and a special study. There are nine NPDES facilities in this subbasin located upstream of the 2004/2005 fish basinwide assessment sites. A whole effluent toxicity limit violation was reported on 8/8/05 for the North Cary Water Reclamation Facility (NC0048879), which is permitted to discharge 12 MGD to Crabtree Creek at a location about two miles above the fish community site in Umstead State Park.

Neuse River, US 401, Wake County

The Neuse River at US 401 is 30 meters wide with a drainage area of 817.4 square miles. The conductivity was 129 µmhos/cm. Land cover surrounding the site is forest (60%) and residential (40%). The substrate was predominantly sand (90%). Although areas of bank erosion were present, the riparian zone was broad on both sides of the stream with no obvious breaks. Stream banks were stable with diverse trees, shrubs, and grass that provided minimal shading. Hydrologically, the site was a deep sandy run with some lateral pools. In-stream habitat for macroinvertebrate colonization consisted of snags, logs, undercut banks, and root mats. The overall habitat score was 43.

There are five major and 22 minor NPDES dischargers upstream of this site.

The bioclassification for this site has been stable at Good-Fair over the nine times it has been sampled for benthos since 1983. Previous indications of improving water quality based on the decreasing biotic index were not upheld during the 2005 basinwide sampling. The biotic index increased from 5.8 in 2000 to 6.1 in 2005. EPT richness and EPT abundance values also declined.

Neuse River, US 64, Wake County

This section of the Neuse River is approximately 25 meters wide with a drainage area of 870.3 square miles. The conductivity was 125 µmhos/cm. Land cover surrounding the site is a mixture of forest (60%), commercial (20%), and residential (40%). The substrate was mostly sand (50%) but also contained some boulder (10%), rubble (10%), gravel (10%), and silt (20%). Although areas of bank erosion were present, the riparian zone was broad on both sides of the stream with no obvious breaks. Stream banks were stable with diverse trees, shrubs, and grass that provided minimal shading. Hydrologically, the site was a deep sandy run with some lateral pools. A small riffle with larger substrates was present at the bridge. In-stream habitat for macroinvertebrate colonization consisted of snags, logs, rocks, and macrophytes. Undercut banks and root mats were rare. The overall habitat score was 63.

This site was initially sampled in 1986 following a dairy waste spill, when it was rated Fair. Recovery was documented in 1991 to Good-Fair and in 1995 to Good. Water quality declined to Good-Fair following Hurricane Fran in 1996. In 2000 and 2005, it was still Good-Fair, with signs of water quality degradation (decreased EPT S and increased NCBI).

Richland Creek, US 1, Wake County.

This site is located in northern Wake County about 2.5 miles upstream of the Neuse River confluence and drains a 10.5 square mile area of western Wake Forest. At this crossing, the average width of this stream was six meters and the substrate was composed of shifting sand and silt. Habitat types included snag pools of varying depths from deadfalls, sandy runs, and a few stick riffles. Although the riparian zone was intact with no breaks, the canopy was open, there was evidence of terrace cutting, and the banks were sloughing in many areas. The total habitat score was 43.

Despite the low scoring habitats at this site, there was a diverse community of fish. Although this station was not sampled during the last basinwide monitoring cycle for fish, it has been sampled twice over the last 10 years, collectively representing a total of 23 species. In 1995, 18 species were collected and the site was rated Good (NCIBI score of 52). During the 2005 monitoring cycle, 19 species were caught and the fish community rating improved to Excellent (NCIBI score = 54), because of an increase in number of suckers collected, including v-lip and notchlip redhorse. The dominant species in 2005 was the white shiner (n=136, 27% of the catch). However, neither of these assessments produced any intolerant species such as the chainback darter, which is found in neighboring watersheds.

Smith Creek, SR 2045, Wake County

Smith Creek is a tributary to the Neuse River, which is located less than a mile downstream of this site. Land cover surrounding the catchment of this seven meter wide, shallow (0.2 meter deep), sandy stream is a mixture of forest (60%), residential (20%), and industrial (20%). Smith Creek drains an area of 22.7 square miles and its headwaters include the rapidly developing towns of Wake Forest and Rolesville. Conductivity was 111 µmhos/cm. The riparian zone is wide, shaded, and forested with some bank erosion. The substrate is almost all sand (80%) with a few small gravel riffles Instream habitat for macroinvertebrate colonization consisted mainly of sticks, snags, and root mats. The overall macroinvertebrate community habitat score was 56 and the fish community habitat score was 46.

Three minor NPDES dischargers lie within five miles upstream: Whippoorwill Valley WWTP, Wake Forest WTP, and Jones Dairy Farm. Jones Dairy Farm has had four limit violations for total chlorine in 2000 and two in 2001, one violation for ammonia in 2001, two violations for BOD and TSS in 2002, and one violation for fecal coliform bacteria in 2004.

Based upon the benthos sample, this site was given a Good-Fair bioclassification. Fourteen EPT taxa were collected in 2005. This was up slightly from 2000 (12 EPT taxa, bioclassification of Fair).

The fish community has been sampled at this location in the last three basinwide monitoring cycles, with ratings of Good-Fair, Excellent, and Fair, respectively. Species richness and composition has fluctuated over the ten-year monitoring period and may reflect differences in historic flows and the close proximity to the Neuse River, affecting fish recruitment. Frequent flooding events prior to the 2000 sample may have

enhanced the fish communities' diversity by lengthening the free flowing sections of the stream (i.e. breaching beaver impoundments). In 2005, the total number of fish more than doubled from the 2000 sample and the number of species increased by six (23 in 2005 vs. 17 in 2000, and 14 in 1995). However, the 2005 rating dropped from Excellent to Fair because the trophic structure was extremely skewed towards tolerant insectivores. Most notably, the Eastern mosquitofish (tolerant and abundant in shallow sandy streams) made up of almost 45% of the total catch in 2005. There were also two more sunfish species, and two less darter species collected (including the intolerant chainback darter).

Toms Creek, SR 2044, Wake County

Tom's Creek is a small, two meter wide, sandy stream with a drainage area of 3.2 square miles. Conductivity was 82 μmhos/cm. Land cover surrounding the site was predominantly residential (60%). The substrate was all sand and instream habitat for macroinvertebrate colonization was poor. The riparian zone was wide, shaded, and forested. Breaks were present but rare. Stream banks were stable with diverse trees, shrubs, and grasses that provided good shading with breaks for light penetration. Hydrologically, the stream was a shallow, sandy run. The overall habitat score was 51.

Deerchase WWTP, a minor discharger, lies within a mile upstream and has had no reported limit violations in the last five years.

Rocky riffle areas in this stream supported 17 EPT taxa in 1991, including several abundant intolerant taxa. Sediment from nearby development in 1995 buried the riffles and eliminated the intolerant taxa, dropping EPT richness to 10 and the bioclassification to a Fair rating. No recovery was evident in 2000 or 2005 in either the habitat or benthic community. Eleven EPT taxa were collected in 2000 and the bioclassification remained Fair. Six EPT taxa were collected in 2005 and the bioclassification dropped to Poor.

The NCDWQ's Watershed Assessment and Restoration Project found that the relatively undeveloped headwaters of Tom's Creek has better water quality than the rest of the catchment. Other nearby streams have been subjected to development and loss of riparian buffers (see Special Study memo B-020228).

Perry Creek, SR 2006, Wake County

Perry Creek is a small, sandy, shallow tributary of the Neuse River. It is approximately four meters wide and drains an area of 11.6 square miles. Land cover surrounding this catchment is a mixture of forest (60%) and residential (40%). The substrate was 80% sand and 20% gravel. Instream habitat for macroinvertebrate colonization consisted mainly of sticks, snags, logs, undercut banks and root mats. The riparian zone was wide, forested, and shaded. Stream banks were stable with diverse trees, shrubs, and grasses. The overall habitat score was 62. Conductivity was 124 μmhos/cm.

This site has been sampled five times since 1995. This site received a Fair rating in 2000 and 2005,

with eight EPT taxa collected in 2000 and 11 EPT taxa collected in 2005. Dominant taxa included *Baetis intercalaris, Pseudocloeon propinquum, Stenonema modestum, Cheumatopsyche, Hydropsyche betteni, Oecetis persimilis,* and *Triaenodes ignitus.*

Crabtree Creek, NC 54, Wake County

This site is located on the southern edge of Morrisville, approximately one mile upstream of Lake Crabtree. The stream was six meters wide with a drainage area of 9.0 square miles. The visible land cover was forest (50%), residential (20%), commercial (20%), and industrial (10%). Flow conditions were normal and the stream was turbid and smelled of sewage. Conductivity was 108 μmhos/cm. The substrate consisted of an embedded mix of boulder (5%), rubble (10%), gravel (25%), sand (30%), and silt (30%). Hydrologically, the stream was a shallow run with a few gravel riffles that were embedded and silty. Instream habitat for macroinvertebrate colonization consisted mainly of sticks, snags, logs, undercut banks and root mats. The riparian zone was wide on the right bank (> 18 meters) and narrower on the left bank (12-18 meters), forested, and shaded. Stream banks were moderately eroded but stable with diverse trees, shrubs, and grasses. The overall habitat score was 60.

This site received a Poor bioclassification in 2005, unchanged from 1995 and 2000. Both taxa richness and EPT richness have decreased by 50% since the 2000 sample. *Caenis, Cheumatopsyche, Hydropsyche betteni,* and *Oecetis nocturna* were the only four EPT taxa collected in 2005.

Crabtree Creek, In Umstead Park off SR 1650, Wake County

This 12 meter wide site is located within Umstead State Park. At this forested crossing, Crabtree Creek drains 54 square miles of the westernmost part of the subbasin, including a six-mile section of the I-40 corridor and the urbanized areas of Morrisville and Cary. At the time of sampling, a majority of the substrates at this site (cobble, gravel, sand, boulder, and bedrock) were covered in thick periphyton and there was a slight smell of chlorine from the upstream treatment plant. The conductivity was 196 μmhos/cm. Instream habitats were composed of good pools, riffles, bedrock shelves, deadfall snags, and boulders. The riparian coverage of Crabtree Creek inside the state park was diverse and extensive. The overall macroinvertebrate community habitat score was 87. However, the fish community habitat score of 70 reflected infrequent riffles and high embeddedness of substrates.

The Cary WWTP (NC0048879) is located approximately one mile above this site, discharging into Crabtree Creek. One limit violation for ammonia occurred in 2004 and one limit violation for BOD occurred in 2001. Colonial Pipeline (NC0081469), a minor discharger, is located three miles upstream of this site. This facility had one limit violation for xylene and one violation for toluene in 2005.

This site received a Good-Fair rating in 2005 and has rated Good-Fair since 1995. In 1994, facility upgrades to Cary's WWTP were completed. Before the upgrades, this site received a Fair rating in 1987

and 1994 suggesting that the facility upgrades to Cary's WWTP may have contributed to the improvement in water quality. However, in 2005 both taxa richness and EPT richness decreased and the biotic index increased suggesting a slight decline in water quality.

The fish community was sampled at this site for the first time in 2004 as part of the NCSU urban index study. A diverse assemblage of fish (22 species) was collected including 5 exotic species (green sunfish, bluegill, white crappie, channel catfish, and flathead catfish. The site was rated Excellent, with an NCIBI score of 56. Despite a specific conductance of 391µmhos/cm, the upstream WWTP does not seem to be having a negative affect on the fish community in this section of Crabtree Creek.

Crabtree Creek, SR 1664 (Duraleigh Road), Wake County

This site is located on the western edge of Raleigh, almost four miles downstream of the site located in Umstead State Park. The drainage area is 84 square miles here and includes the additional tributaries of Reedy, Sycamore, Turkey, and Richland Creeks. Overall, the instream and riparian habitats were good quality at this site (total habitat score = 79), and consisted of runs, deep pools, riffles, snags and deadfalls. Substrates primarily include sand, cobble, gravel, and boulder.

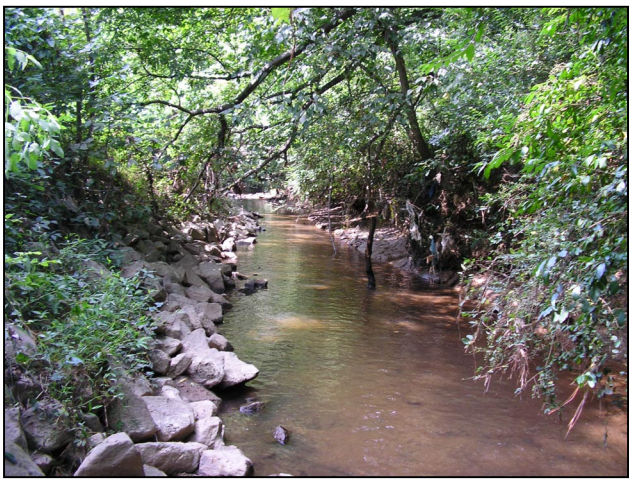
The fish community has been sampled here during two basinwide cycles (2000 and 2005) with consecutive ratings of Excellent (NCIBI scores = 54 and 58, respectively). In 2005, the fish community was very diverse, with a total of 26 species collected (seven more than in 2000). The most abundant "additional" species include the v-lip redhorse (n=33) and the bull chub (n=21). Much like the Crabtree Creek site off SR 1650, this sample highlights both the exceptional diversity of fish fauna in this stream and the extensive, high quality riparian coverage within Umstead State Park.

Crabtree Creek, US 1, Wake County

Crabtree Creek at this location receives nonpoint runoff from the city of Raleigh. The stream here was 16 meters wide with a drainage area of 114.8 square miles. The visible land cover was predominantly commercial (70%). At the time of sampling, the site smelled of urine and a large amount of trash was present in and around the stream. The conductivity was 154 µmhos/cm. The substrate was predominantly sand (70%) with small amounts of rubble (10%) and gravel (20%). Stream banks were severely eroded with sparse mixed vegetation. The riparian zone was narrow (< 12 meters) and varies from having occasional breaks in places to being almost nonexistent in others. Instream habitat was sparse and consisted of sticks, snags, root mats, and undercut banks. The overall habitat score was 43.

This site has consistently been rated Fair since 1984. Based on the benthic data no major changes in water quality have been observed. EPT taxa richness has been similar for the samples collected from this site (range from 11 to 16) as well as the EPT biotic index (range from 6.6 to 7.0).

Marsh Creek, Near US 1, Wake County



Marsh Creek is a small (two to four meters wide) stream draining a mostly residential section of North Raleigh. Its catchment drains an area of 6.1 square miles and the visible land cover is primarily commercial (50%) and residential (40%). Within this 100 meter section of Marsh Creek, the stream banks are vertical, sparsely vegetated, and severly eroded. Rip-rap is present along the entire left bank to provide bank stabilization. The small amounts of rubble and gravel substrates present are severely embedded (> 50%) with sand and silt. Instream habitat available for macroinvertebrate colonization was sparse and was predominantly undercut banks and root mats. The overall habitat score was 45. The conductivity was 110 µmhos/cm.

In 1995, Marsh Creek received a Fair rating with an EPT richness of 6 and a biotic index of 6.9. In 2000, the benthic fauna was very sparse and this site was rated Poor (EPT richness = 3, BI = 7.4). In 2005, the EPT richness (6) and biotic index (7.0) were comparable to 1995 values thus the site received a Fair rating. The decrease in the 2000 rating may have been due to the absence of *Stenonema modestum*, which were common in 1995 and abundant in 2005.

Marsh Creek, SR 2277 (Yonkers Road), Wake County.

Marsh Creek drains the northeast side of Raleigh and flows into Crabtree Creek about 0.6 miles downstream from this site. At this location, this small urban watershed has a drainage area of 8.5 square miles. Substrates in this entrenched section of Marsh Creek consisted primarily of sand, gravel and claypan with “clay boulders”. At the time of sampling, there was an abundance of urban debris in the stream and in the riparian areas. Instream habitat types were primarily sandy or clay runs with a few snag riffles, and deadfall stumps. The vegetated canopy was good and the riparian zone widths were extensive. The total habitat score was 48.

The fish community was sampled here for the first time in the 2005 basinwide monitoring cycle, with a rating of Good-Fair (NCIBI score = 44). A moderately diverse community of fish was captured (species n=14), but the total abundance of individuals was low (n=194). The metrics that reduced the NCIBI rating include those reflecting species richness. Most notably, only one sucker species was captured and no intolerant species were collected, such as the Roanoke darter that resides in nearby Crabtree Creek. Given the urban nature of this stream, these issues concerning the fish community were expected.

Walnut Creek, Sunnybrook Road, Wake County

Walnut Creek drains a 29.4 square mile watershed at this location including the urban areas of northeast Cary and southern Raleigh along the I-440 beltline corridor. The conductivity was 148 µmhos/cm. The watershed contains a large amount of impervious surfaces. As a result, this 5 meter wide sandy stream is very flashy (i.e., flow is prone to increase and decrease very quickly). Scour is a major problem for the macroinvertebrate community. Substrates in this section of the creek are primarily sand and bedrock. Boulders were also present within the first 100 feet of the site. Habitats were composed of riffles (at the bridge), deadfalls, snags, and deep pools, likely created during high flow events. The vegetated canopy was good and the riparian corridor was extensive, with no breaks. The benthic community habitat score was 65 and the fish community habitat score was 55.

The benthos bioclassification of Good-Fair in 2000 was an improvement from the Fair rating given on three previous occasions. However, in 2005, the rating reverted back to Fair. Other than *Procloeon*, which was collected for the first time in 2005, no notable differences between the 2000 and 2005 benthic communities were observed. Dominant taxa included *Pseudocloeon propinquum, Stenonema modestum,* and *Triaenodes ignitus.*

The fish community at this crossing has been sampled during all basinwide cycles to date (since 1991). The current sample produced a second rating of Good-Fair since 2000 and illustrates a relatively unchanged, diverse community of fish. However, this stream is still showing an unbalanced trophic structure, dominated by insectivores, and an increasing percentage of tolerant species (40% in 2005 vs. 22% in 2000). Like the 2000 sample, the swallowtail shiner was the numerically dominant species in the 2005 assessment and represented 35% of the total catch.

Neuse River, NC 42, Johnston County

At this location, the Neuse River near Clayton drains a 1141.3 square mile watershed including the southern portion of Wake County and the town of Clayton. The conductivity was 246 µmhos/cm. The stream is 25 meters wide and one to two meters deep. The substrate was mostly sand (60%) and instream habitat for macroinvertebrate colonization was poor. The riparian zone was wide with no breaks and forested. Stream banks were moderately eroded with diverse trees, shrubs, and grasses. Hydrologically, the stream was a deep, sandy run. Riffles and pools were nonexistent. The overall habitat score was 41.

The Raleigh WWTP (NC0029033) is located approximately seven miles above this site, discharging into the Neuse River. One limit violation for BOD and one for fecal coliform bacteria occurred in 2002.

In 2000, water quality improved to Good in this part of the Neuse River, up from the 1980s when it was rated Good-Fair. In 2005, the bioclassification reverted back to Good-Fair. The biotic index steadily declined from 6.2 in 1983 to 5.6 in 2000 but increased to 6.1 in 2005.

Neuse River, SR 1201, Johnston County

At this most downstream site within the subbasin, the Neuse River is 20 meters wide with a drainage area of 1664.2 square miles. The conductivity was 96 µmhos/cm. Land cover is predominantly forest (70%) with some residential and agriculture. The substrate is nearly all sand and instream habitat for macroinvertebrate colonization was poor consisting of only a few snags and logs. Stream banks were severely eroded with sparse vegetation. Hydrologically, the stream is a deep, sandy run with few pools and no riffles. The overall habitat received a score of 40.

The Johnston County WWTP (NC0030716) is located approximately 15 miles above this site, discharging into the Neuse River. Six limit violations for mercury occurred in 2005 and one in 2002. Four limit violations for flow and two limit violations for BOD occurred in 2003. The Clayton WWTP (NC0025453) is located 26 miles upstream of this site. This facility had one limit violation for Nitrogen and one for ammonia in 2005, one violation for flow in 2003, two violations for ammonia in 2002, and two violations for BOD in 2001.

In the four times since 1991 that this site has been sampled, it has consistently received a bioclassification of Good. The intolerant stonefly *Paragnetina kansensis* was abundant here and this is one of the few sites in the basin where the caddisfly *Ceraclea ophioderus* was found.

Marks Creek, SR 1714, Johnston County

Marks Creek is located near Garner in an area of transition from Piedmont to Coastal Plain and is a tributary to the Neuse River. The drainage area is 26.4 square miles. Although the land immediately surrounding this site is completely forested, land cover in this rural watershed is largely agricultural with some suburban areas. The conductivity was 80 µmhos/cm. At this location, the creek was an average of seven meters wide. Substrates included sand, rubble, gravel, bedrock, clay, and silt. Instream benthic habitats were primarily, rocks, sticks, snags, logs, and root mats. The overall benthic habitat score was 74. Instream fish habitats were primarily sandy runs, deadfalls, and deep pools. Using the Mountain/Piedmont Streams habitat criteria, the total habitat score was 62 (Appendix F-7). With the Coastal Plain Streams criteria, the total fish habitat score was 78 (Appendix F-8).

In the past 15 years this site has been sampled for benthic macroinvertebrates four times and has received a Good-Fair rating each time. Based on the benthic data no major changes in water quality have been observed. EPT taxa richness has been similar for the four samples collected from this site (range from 16 to 19) as well as the EPT biotic index (range from 4.5 to 5.1). Dominant taxa included *Baetis intercalaris, Isonychia, Stenonema modestum, Tricorythodes, Chimarra, Nectopsyche exquisita,* and *Hydropsyche betteni. Cheumatopsyche*, a moderately tolerant caddisfly that had been abundant in past collections, was not collected in 2005.

The fish community at this location has been rated Good during all basinwide assessments to date since 1991. The diversity of fish is quite high, with 23 species represented in 2005 out of 28 known species

from this watershed. This is the highest number of species collected from Marks Creek in any of the four assessments. The NCIBI score of 52 is also the highest score to date. As in the 2000 assessment, the percentage of omnivores + herbivores (typical in streams transitioning from Piedmont to coastal Plain) was low, but there was one more intolerant species collected (chainback darter). Overall, no substantial changes in the fish community or in the metrics were noted since the last monitoring cycle.

Swift Creek, SR 1152, Wake County

This site in the uppermost portion of Swift Creek is approximately 1.5 miles above the backwaters of Lake Wheeler. Here, the stream is six meters wide and has a drainage area of 21.7 square miles. Land cover is predominantly residential (70%). The conductivity was 72 µmhos/cm. The substrate was mostly sand with some areas of embedded gravel. Instream habitat for macroinvertebrate colonization consisted mostly of snags and logs. Less common were rocks, sticks, leafpacks, undercut banks, and root mats. Stream banks were severely eroded with sparse mixed vegetation. Hydrologically, the stream was a shallow, sandy run with few pools and one small gravel riffle. The overall habitat received a score of 64.

Based upon benthic invertebrate data, this site has received a bioclassification of Fair in each of the four years it has been sampled (1989, 1995, 2000, and 2005). Taxa richness and biotic index have varied little between 1985 and 2000 suggesting stable water quality. Dominant taxa included *Caenis, Stenonema modestum,* and *Cheumatopsyche.*

Swift Creek, SR 1555, Johnston County

This 10 meter wide site was moved one bridge crossing downstream from the 1995 sample (SR 1525) at the request of the NC Wildlife Resources Commission, in an effort to avoid disturbing rare and endangered mussels in this watershed. While there was a good mix of rubble and gravel here, rocks were highly embedded. Sedimentation also had filled in most of the pools. The drainage area is 114.5 square miles and the conductivity was 84 µmhos/cm. Rocks, sticks, snags and logs were common instream habitats that were available for macroinvertebrate colonization. Stream banks were moderately eroded with diverse trees, shrubs, and grasses. The overall habitat score was 71.

There are six minor dischargers located within 14 miles upstream. The White Oak Plantation WWTP (NC0060330) is located approximately five miles above this site. In the past five years, this facility has had six limit violations for BOD (one in 2004, two in 2003, three in 2002, and one in 2000), one violation for fecal coliform bacteria (2002), and one for dissolved oxygen (2002). The Mount Auburn Training Center (NC0049034) and Mill Run Mobile Home Park (NC0056499) are located eight miles upstream. The Mount Auburn Training Center has had limit violations for BOD, ammonia, pH, total chlorine, and flow. Pope Industrial Park is located 14 miles upstream and has had numerous violations for BOD, ammonia, pH, fecal coliform bacteria, TSS, flow, and dissolved oxygen.

A Good-Fair bioclassification was given to this site in 2000 and 2005, the same bioclassification rating the segment just upstream received in 1995. Sixteen EPT taxa were collected in 2000 and 2005. The biotic index decreased from 5.8 in 2000 to 4.8 in 2005 suggesting a slight improvement in water quality. Dominant taxa included *Baetis intercalaris, Stenonema modestum, Cheumatopsyche*, and *Hydropsyche betteni*.

Swift Creek, SR 1501, Johnston County

This site in the most downstream portion of Swift Creek is in an area intermediate between the piedmont and coastal plain ecoregions. Here the stream is approximately 17 meters wide and has a drainage area of 146.0 square miles. Land cover is mostly forest and agriculture. The conductivity was 81 μmhos/cm. As with the upstream sites, sedimentation is a problem filling in most of the pools. Substrate is almost all sand (90%) and most of the habitat was limited to snags and logs. The riparian zone was wide and intact. Stream banks were moderately eroded with diverse trees, shrubs, and grasses. The overall habitat score was 61.

There are one major and six minor NPDES dischargers above this site. In addition to the dischargers listed above, the Clayton WWTP is located eight miles upstream.

NCBI and EPT taxa richness have been fairly stable at this site (NCBI range = 5.4 to 5.8, EPT richness range = 19 to 29). The bioclassification at this site increased from Good-Fair in 1991 to Good in 1995, 2000, and 2005 due to an increase in EPT abundance and a decrease in biotic index values. Dominant taxa included *Baetis intercalaris, Isonychia, Stenonema modestum, Cheumatopsyche, Chimarra*, and *Nectopsyche exquisita*.

Yates Branch, US 401, Wake County.

Yates Branch is a tributary to Swift Creek that drains a portion of southwest Raleigh, before flowing into Lake Benson. At this site, the drainage area is 10.1 square miles and the stream was four meters wide. Substrates in this section of the stream were almost all sand, but included some silt. Functional habitats, primarily including shallow runs and some deadfalls, were scarce. At the time of sampling there was an abundance of debris in and around the stream. The riparian zone, which is being taken over by kudzu, was narrow with breaks common. The total habitat score at this site (36) was the lowest of the 9 fish sites sampled in subbasin 02.

The fish community was sampled here for the first time in 2004 as part of the NCSU urban stream index study. The stream was rated Good-Fair with an NCIBI score of 42. Although species diversity was good (n = 20), the trophic structure was unbalanced with a majority of insectivores (95%) and a low percentage of omnivores + herbivores collected (3%). No species of suckers were collected, nor were there any intolerant species captured during this assessment.

Little Creek, SR 1562, Johnston County

Little Creek is a tributary to Swift Creek that drains all of southern Clayton. Although this stream is technically a Piedmont stream, it lies within a portion of the subbasin in transition between the Piedmont and the Coastal Plain (Griffith et al. 2002). A 10 meter section of this reach cuts through and old stream bed to form a small gravel riffle. As a result, Piedmont criteria were used to assign bioclassification ratings since the stream was first sampled in 1991. At this location, Little Creek has a drainage area of 17.3 square miles and was 10 meters wide. Substrates in this creek were almost entirely sand, with sparse habitats of shifting sandy runs and snag pools. The riparian zone was composed of sparse mixed vegetation, but the width of coverage was greater than 18 meters. Using the Mountain/Piedmont habitat criteria, the total benthic habitat score was 78 and the total fish habitat score was 55. Coastal Plain criteria should have been used to assess habitats here, and likely would have reflected better habitat quality due to the emphasis on channel modification and bank stability in place of riffle quality criteria emphasized in the Piedmont habitat assessment form.

This site has consistently received a Fair rating. No major changes in water quality have been observed from benthic data since this site was first sampled in 1991. EPT taxa richness has been similar for the four samples collected from this site (range from 10 to 13) as well as the EPT biotic index (range from 5.5 to 6.2). Dominant taxa included *Isonychia, Stenonema modestum*, and *Hydropsyche betteni*.

Little Creek was first sampled for fish in 2005 because it represented a watershed with no fish community data, and because of recent controversy over the presence of the dwarf wedge mussel and the construction of the U.S. 70 bypass around Clayton. Four basinwide monitoring cycles (1991 through 2005) have produced benthic macroinvertebrate ratings of Fair each time at this location. These benthos ratings remained Fair in 2000 and 2005 despite the rerouting of the Clayton WWTP to the Neuse River prior to 2000, which indicates that nonpoint urban runoff may be a problem. The fish community was rated Good with an NCIBI score of 46. A diverse assemblage of fish, represented by 24 species, was collected. The numerically dominant species was the redbreast sunfish (15% of the total catch). However, the trophic structure of the fish community was skewed towards a majority of insectivores (91%). Furthermore, only four omnivorous bull chubs (2% of the total catch) and no herbivores were collected. The lack of habitat diversity in this section of Little Creek may be contributing to this trophic imbalance. However, this stream is in a transitional area from Piedmont to Coastal Plain, which may explain the dominance of insectivores.

Special Studies

Perry Creek/Marsh Creek NCSU landuse change study, Wake County

The fish communities of Marsh Creek, downstream of Yonkers Road (SR 2277) and Perry Creek, upstream of Perry Creek Road (SR 2006) were sampled in April and June of 2005 (Biological Assessment Unit Memorandum F-051017). Marsh Creek was scheduled to be sampled as a basinwide site, and the Perry Creek sample was requested by researchers at North Carolina State University for comparative purposes. The data was used in a study of temporal landuse changes in these watersheds. The Marsh Creek watershed had a greater percentage of its total watershed in impervious land cover and a lesser percentage in forested land cover than did the Perry Creek watershed. The Marsh Creek watershed had a total habitat score of 48 out of 100 and was rated Good-Fair with an NCIBI score of 44. Perry Creek had a slightly higher total habitat score (60 out of 100) and was also rated Good-Fair with an NCIBI score of 40.

Rocky Branch, SR 1009, Wake County

Rocky Branch was sampled at two sites (immediately upstream and downstream of South Saunders Street, SR 1009) on October 31 of 2005 as part of a teaching laboratory in an upper level Fisheries Science class at North Carolina State University (NCSU) (Biological Assessment Unit Memorandum F-051220). This stream was assessed here because the stream has a long history of environmental degradation and neglect. Although the fish community was lacking in intolerant species and the trophic structures were skewed towards tolerant insectivores, both sites were surprisingly rated Good-Fair, with NCIBI scores of 40.

NEUSE RIVER SUBBASIN 03

Description

This subbasin is located in southern Wake and central Johnston counties and spans the Northern Outer Piedmont and the Rolling Coastal Plain level IV ecoregions (Griffith et al. 2002). As such, it encompasses part of the transitional zone between the Piedmont and the Coastal Plain. In the Piedmont, streams have characteristically low to moderate gradient with substrates of cobble, gravel, and sand. Streams in the Coastal Plain are of similar gradient but have mostly sandy substrates.

Land cover is roughly one-half forest/wetland and one-quarter urban; cropland makes up the majority of the remainder of land cover. Primary crops are tobacco, hay, cotton, soybeans, corn, wheat, sweet potatoes, and peanuts. Cattle, hog, and poultry production also occurs in this subbasin. Urban areas include portions of Apex, Holly Springs, and Fuquay-Varina.

Middle Creek is the largest stream in this subbasin, flowing from one end to the other (Figure 5). All other streams in this subbasin are tributaries to Middle Creek. This stream generally has moderate flow, and it is rated with piedmont criteria for benthic macroinvertebrate and fish community data. However, many tributaries to Middle Creek are slow moving and exhibit coastal plain ecoregion characteristics. Many of these tributaries to Middle Creek drain agricultural areas.

There are three major and 11 minor active NPDES permitted dischargers in the subbasin. The major NPDES facilities are listed in Table 4.

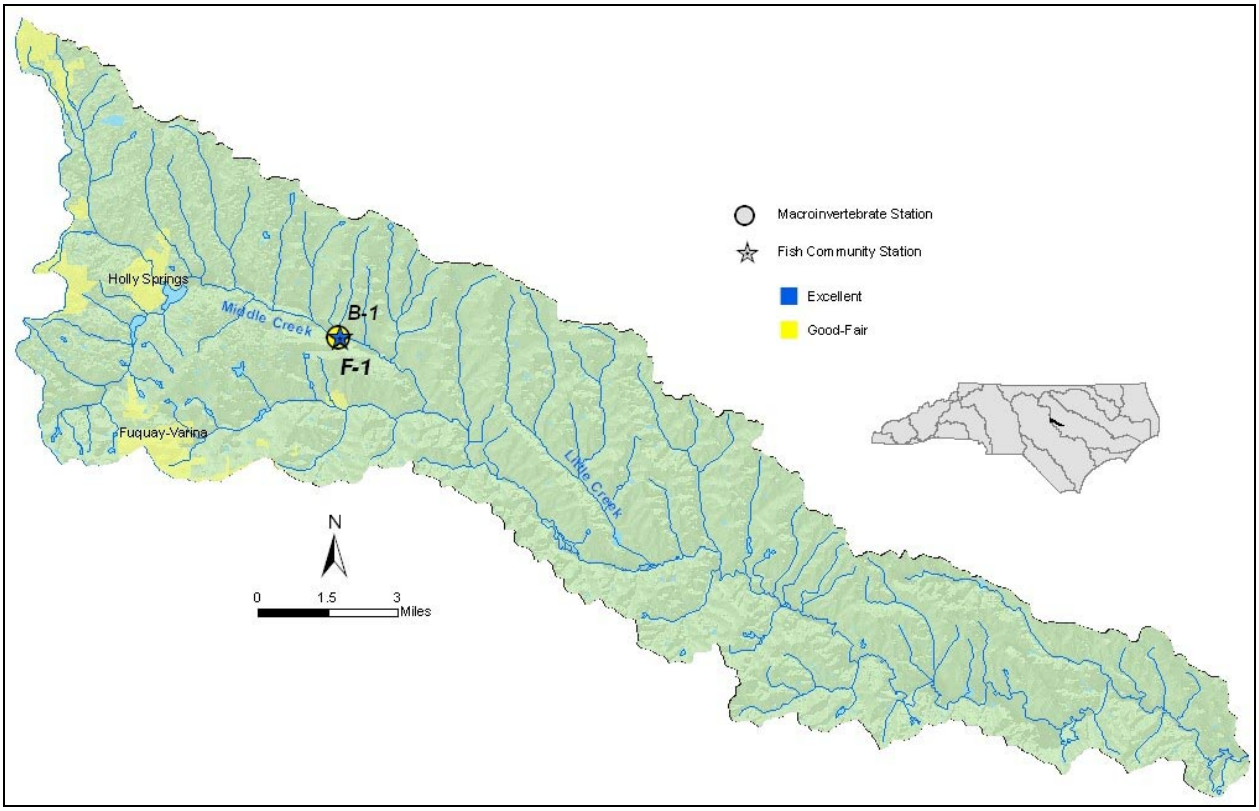


Figure 5. Sampling sites in subbasin 03 in the Neuse River basin.

Table 4. Major active NPDES dischargers in Subbasin 03 in the Neuse River basin as of December 2005.

Permit	Facility	County	Receiving Waterbody	Permitted Flow (MGD)
NC0064050	Apex Water Reclamation Facility	Wake	Middle Creek	3.60
NC0065102	South Cary WRF	Wake	Middle Creek	16.00
NC0066516	Terrible Creek WWTP	Wake	Terrible Creek	6.00

Overview of Water Quality

A 1.4-mile segment of Middle Creek beginning at its headwaters is 303(d)-listed (as of 2004), due to low dissolved oxygen levels.

Ambient monitoring of Middle Creek at NC 50 (AMS J5000000) showed frequent elevated levels of iron, with 17 of 19 measurements not meeting the action level standard. The nutrient problems reported in the previous basinwide report (elevated nitrate+nitrite-nitrogen and total Kjeldahl nitrogen) were not evident for the current reporting period.

Three facilities in the subbasin are required to perform effluent toxicity testing: Apex Water Reclamation Facility, Terrible Creek WWTP, and Motiva Enterprises LLC-Wake. The NPDES permits for Apex Water Reclamation Facility and for Terrible Creek WWTP specify chronic toxicity testing. Between January 2001 and October 2005, the Apex Water Reclamation Facility reported two whole effluent toxicity (WET) NPDES permit limit violations. No WET NPDES permit limit violations occurred at the Terrible Creek WWTP for the same time period. The NPDES Permit for Motiva Enterprises specifies acute toxicity monitoring. The WET test results submitted by Motiva indicate no acute effluent toxicity for the period January 2001 through October 2005.

Middle Creek at SR 1375 was the only site sampled for macroinvertebrates in 2005. The site retained the Good-Fair rating earned in 2000.

Table 5. Waterbodies monitored in Subbasin 03 in the Neuse River basin for basinwide assessment, 2000 and 2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Middle Cr	Wake	SR 1375	Good-Fair	Good-Fair
F-1	Middle Cr	Wake	SR 1375	--	Excellent (2004)

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

Middle Creek at NC 50 was not sampled for benthic macroinvertebrates in 2005, as it was too deep to wade. Sampling should be attempted again in 2010. Middle Creek at SR 1504 in Johnston County (which was sampled to fulfill a request from Raleigh Regional Office) should be added to the list of basinwide sites to gain water quality data from the lower part of the subbasin.

The fish community of Middle Creek at SR 1375 was sampled for the first time in 2004 as part of an urban index study at North Carolina State University (NCSU) and is being supplementally included in this monitoring cycle.

Middle Creek, SR 1375 (Lake Wheeler Rd), Wake County.

This site is located northeast of Fuquay Varina about three miles below Cary's South WWTP (NC0065102, 16MGD), and drains 35.6 square miles (upper third) of the subbasin. At this location, the stream was an average of eight meters wide and exhibits Coastal Plain characteristics. Substrates in this section of Middle Creek consisted primarily of sand and gravel. Habitats include woody debris, deadfalls, undercuts, root mats, leaf packs, snag pools, and gravel riffles. Although this stream has been historically noted as having eroding banks, breaks in the riparian zone were rare, and plant coverage was good in this section of the stream. Using the Mountain Piedmont habitat criteria, the total habitat score was 63 (Appendix F7). Using the Coastal Plain habitat criteria, the score was 74 (Appendix F8). Bluegreen algal mats in the stream indicate the high nutrient load from the 11 NPDES dischargers and nonpoint runoff in the upstream watershed. Accordingly, specific conductance measurements were 221 and 283 µS/cm during the benthos and fish community samples, respectively.

Prior to 2005, this site had been sampled four times for benthic macroinvertebrates; the first collection was in 1986. At that time the site received a Fair bioclassification because of a high biotic index. The only other time the site received a Fair rating was in 1995 due to a low number of EPT taxa. On all other occasions, the site has received a rating of Good-Fair. A standard qualitative benthic sample was collected on 25 July 2005 and again rated Good-Fair with only a slightly higher biotic index (6.1) than the lowest attained in any previous year (6.0 in 1995 and 2000). The number of EPT taxa present in 2005 was one less than the highest number previously attained (14 in 1986).

The dominant taxa in 2005 were mayflies (*Stenonema modestum* and *S. exiguum*) and caddisflies (*Cheumatopsyche* and *Hydropsyche betteni*). Plecoptera were absent, and have only been collected here during the 1986 sample when *Perlesta placida* were abundant.

There has been a shift in the substrate composition observed since 1986, with a replacement of larger substrate by smaller (Figure 6). This shift to finer substrates has been reflected by the appearance of *Tricorythodes*, a mayfly that inhabits such substrates, in 2000 and 2005. The shift in substrate composition may also help to explain the loss of *P. placida* and the Megaloptera fauna (*Corydalus cornutus*, *Nigronia*, and *Sialis*, which were all last observed at the site in 1995) as the larger substrate that those taxa prefer was replaced.

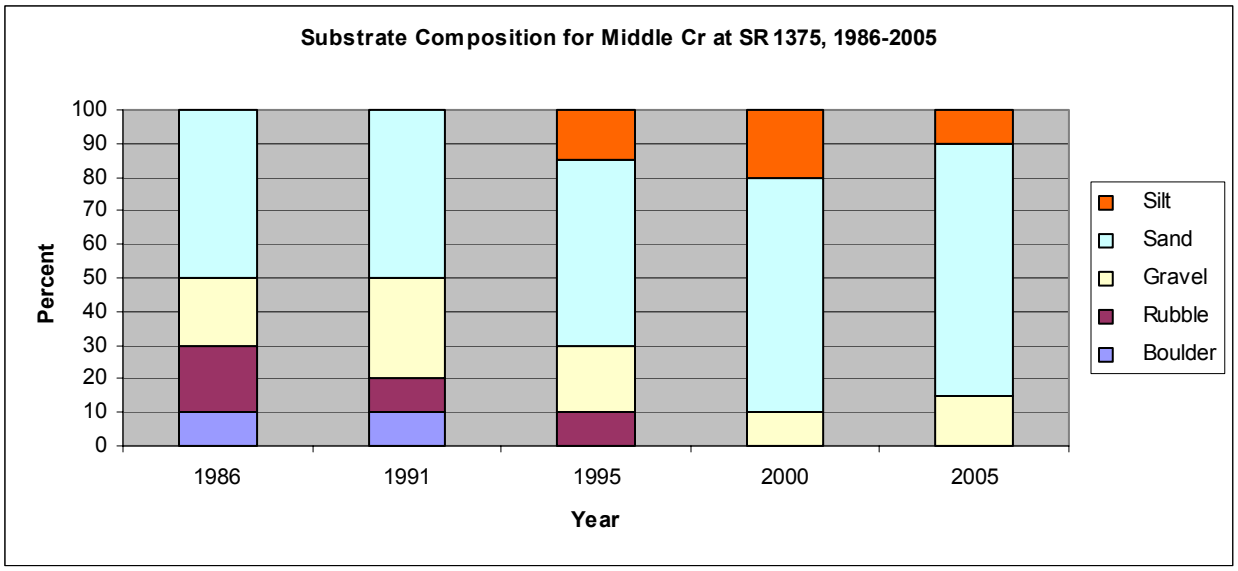


Figure 6. Visual estimates of substrate composition for Middle Creek at SR 1375 for the years 1986, 1991, 1995, 2000, and 2005.

The fish community of Middle Creek has been sampled at one upstream and three downstream sites, but never at Lake Wheeler Rd (SR 1375). This site was sampled in 2004 as part of the NCSU urban index study. An extremely diverse community of fish with a good trophic structure was present during this sample, with a total of 231 fish collected, representing 28 species, including two intolerant species (Roanoke darter and chainback darter). The stream was rated Excellent and the NCIBI score was 54. The Middle Creek watershed has always shown a high diversity of fish with a total of 42 known fish species throughout the watershed and an average of 21 species collected from the five fish community sites sampled since 1991. The fish fauna in this stream are clearly not showing any negative affects from the elevated conductivity or the shift to smaller substrates. Sustained flows from the upstream dischargers may be supporting the diverse assemblage of fish at this site. However, the fish community should continue to be sampled in subsequent monitoring cycles, as it may eventually show signs of stress from the changing substrate.

Special Studies

Drought Study

As part of an assessment of the effects of the period of low rainfall between 1999 and 2002 in North Carolina, the basinwide site on Middle Creek at NC 50 was sampled for macroinvertebrates in 2002 (Biological Assessment Unit Memorandum B-040823). The site received a rating of Good-Fair in 2000 during basinwide sampling, and Fair in 2002.

Planning Section Requests

Two additional sites on Middle Creek were requested for sampling by the Planning Section to assess impacts from activities in the upper part of the watershed, and from an area of rapid development around Smithfield (Biological Assessment Unit Memorandum B-060109). The road crossing at SR 1504 in Johnston County and the upstream crossing of SR 1301 in Wake County were selected. Neither site had been sampled for benthic invertebrates prior to 2005. The bioclassification of Fair at SR 1301 and high conductivity (319 µmhos/cm) noted at the time of sampling indicates nonpoint urban runoff and the upstream discharger (Apex Water Reclamation Facility). The site at SR 1504 received a rating of Good-Fair; high conductivity (221 µmhos/cm) was also noted here, though there are no permitted dischargers within 10 upstream miles of the site.

Terrible Creek, SR 2751, Wake County.
At the request of Raleigh Regional Office, Terrible Creek (at SR 2751 in Wake County) was assessed for its fish community below the Fuquay Varina wastewater treatment plant outfall in response to repeated weekly and monthly permit violations of total ammonia nitrogen, 5-day biochemical oxygen demand, and fecal coliform bacteria (Biological Assessment Unit Memorandum F-051010). During this assessment, water quality measurements (including a slightly elevated conductivity of 97 µmhos/cm) were within normal ranges for their respective water quality standards and the fish community was rated Good with an NCIBI score of 52. Based on these findings, it was determined that the Fuquay Varina wastewater discharge seemed to be having a minimal impact on the Terrible Creek fish community.

NEUSE RIVER SUBBASIN 04

Description

Neuse subbasin 04 is located primarily in southern Johnston County and is composed almost entirely of the Rolling Coastal Plain ecoregion as defined by Griffith *et al*. (2002). The uppermost portion of the subbasin lies in Wake County. Very small segments of the subbasin also reside in Sampson and Wayne Counties. Streams are characteristically of low to moderate gradient with sandy substrates.

Land cover in the subbasin consists of mixed forest, forested wetlands, pasture, and cropland. Roughly half is forest/wetland, and the majority of the remainder is cropland. Primary crops are cotton, soybeans, corn, wheat, sweet potatoes, peanuts, and tobacco. Hog and chicken production also occurs in the subbasin. Municipalities in the subbasin include the towns of Benson and Four Oaks.

Subbasin 04 includes the entire watershed of Black Creek, to its confluence with the Neuse River (Figure 7). Mill Creek and all of its tributaries (including Hannah Creek and Stone Creek) are also included in this subbasin to the Neuse River confluence.

There are two active permitted NPDES dischargers in subbasin 04. Details for the major discharger are listed in Table 6.

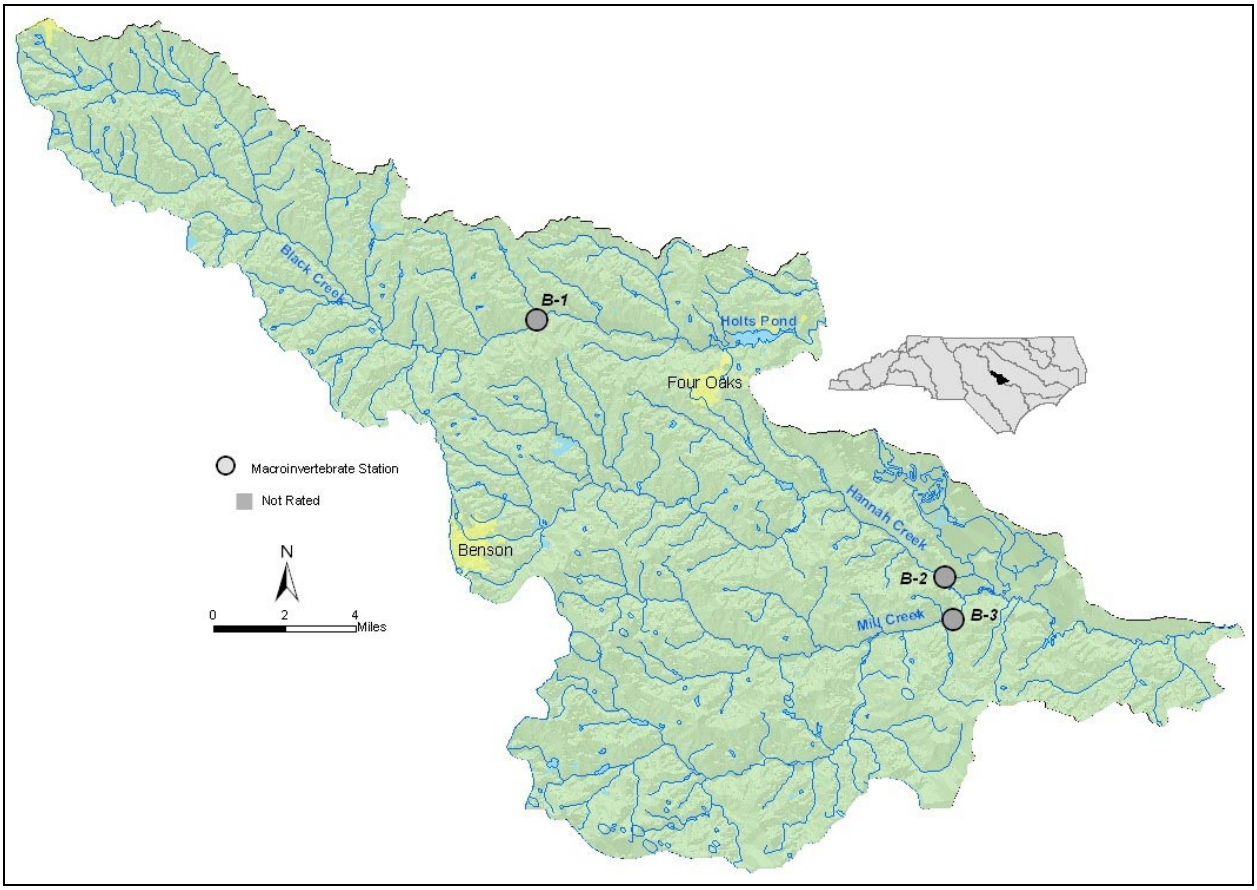


Figure 7. Sampling sites in Subbasin 04 in the Neuse River basin.

Table 6. Major active NPDES permitted dischargers in Subbasin 04 in the Neuse River basin as of December 2005.

Permit	Facility	County	Receiving Waterbody	Permit Flow (MGD)
NC0020389	Benson WWTP	Johnston	Hannah Creek	1.5

Overview of Water Quality

Black Creek is 303(d)-listed for two miles from the dam at Holts Lake to the Neuse River confluence for low dissolved oxygen. Hannah Creek is 303(d)-listed for 10 miles from its source to NC 96, also for low dissolved oxygen. Both segments were first listed in 2004.

Benson WWTP is the only facility within the subbasin required to perform whole effluent toxicity testing. The NPDES permit for Benson WWTP specifies chronic toxicity testing. No WET NPDES permit limit violations were reported for the facility for the period January 2001 through October 2005.

Three benthic basinwide sites were sampled in 2005, though none received a bioclassification. Black Creek at SR 1330 in Johnston County is transitional between a Swamp and Coastal A stream, and therefore should not be rated until criteria are developed for such streams. Both Hannah Creek at SR 1009 and Mill Creek at SR 1009 in Johnston County were sampled in late September, an extraordinarily dry month for the area, which resulted in abnormally low flows. Mean daily discharge for the month of September at the USGS gage on Little River near Princeton (within 15 miles of the benthic sites on Hannah and Mill Creeks) for 25 years is shown in Figure 8. Because of the extreme low flow conditions in September 2005 the sites on Hannah and Mill Creeks were not rated.

Low-gradient streams in the area may be subject to low flows. Many are of a transitional nature between continuously-flowing and swampy streams, though great depths would preclude winter sampling using swamp methods. Until criteria are developed for such transitional streams, benthic data will not be useful in assisting with water quality decisions for most streams in the subbasin.

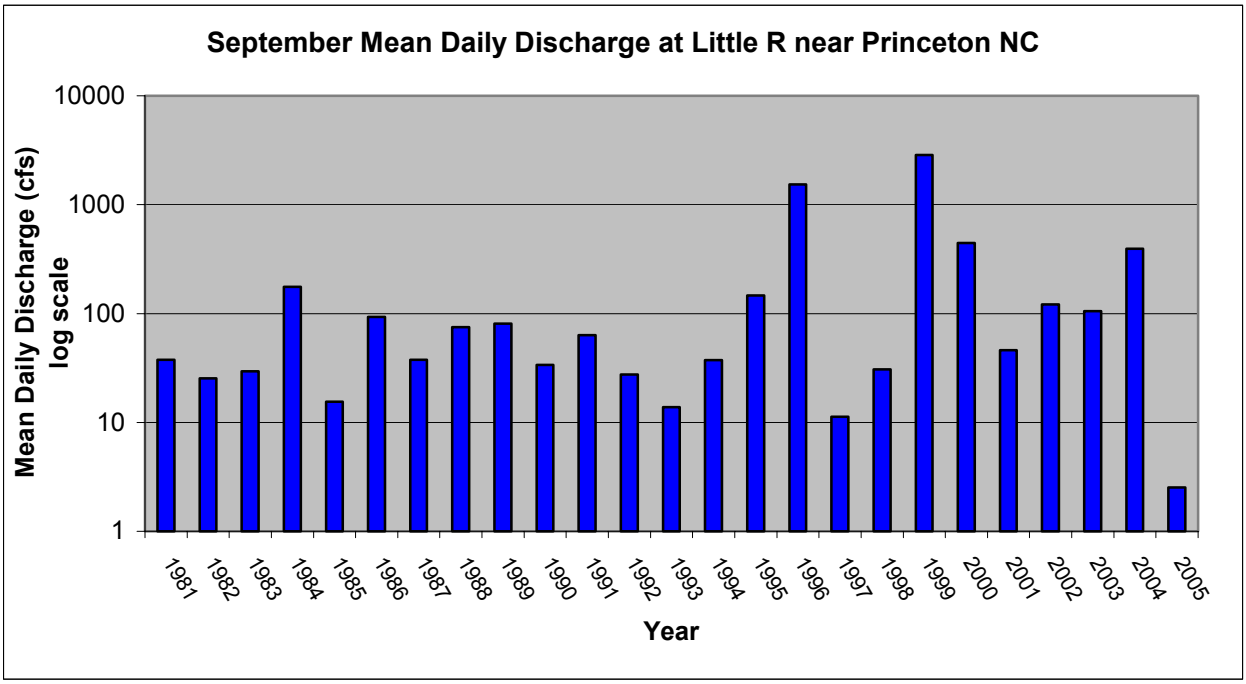


Figure 8. September mean daily discharge for Little River near Princeton NC (USGS 2088500), 1981 through 2005.

Table 7. Waterbodies monitored in Subbasin 04 in the Neuse River basin for basinwide assessment, 2000-2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Black Creek	Johnston	SR 1330	---	Not Rated
B-2	Hannah Creek	Johnston	SR 1009	Fair	Not Rated
B-3	Mill Creek	Johnston	SR 1009	Good-Fair	Not Rated

[1]B = benthic macroinvertebrate monitoring site

River and Stream Assessment

As in 2000, Stone Creek at SR 1138 in Johnston County was not sampled for macroinvertebrates in 2005. As indicated in the previous basinwide report, the stream is swampy and deep; therefore it is not conducive to benthic sampling using either swamp or standard qualitative protocols and should be dropped from basinwide surveys.

Prior to this basinwide work in 2005, Black Creek at SR 1330 in Johnston County had not been sampled since 1995. Due to the characteristics of the site (as described below), it is recommended that the site be dropped from the list of basinwide sites in the subbasin.

Mill Creek at SR 1009 in Johnston County was also visited for fish community assessment but not sampled because the waterbody is a braided swamp that is too deep to wade.

Black Creek, SR 1330, Johnston County

The drainage area of Black Creek at SR 1330 is 73 square miles. There is one minor permitted NPDES discharger approximately 14 stream miles upstream.

A standard qualitative benthic sample was collected on 25 July 2005. The stream had a variable width, which averaged five meters, and a mean depth of 0.5 meters. Substrates were primarily silt with some sand, except for the single riffle that had a gravel substrate. Channelization and bank erosion were not evident. Macrophytes were abundant. Sticks, snags and logs, and root mats were all present but rare. Leaf packs and undercut banks were absent. Hydrologically, the stream was composed entirely of pools with the exception of the single riffle. The riparian zone was wide and entirely intact on both sides. The overall habitat score was 70 using Coastal Plain criteria. Conductivity was 68 µmhos/cm.

Prior to 2005, the site had been sampled twice. As suggested in the previous basinwide report, the ratings for 1991 and 1995 were changed to Not Rated due to the swamp-like nature of this stream. On those two occasions the site was sampled in the summer and originally rated using Piedmont criteria. It was also noted in that report that high water levels would prohibit sampling with Swamp methods in the winter.

In 2005 a sampleable site was found at SR 1330 with a wadeable riffle, though upstream and downstream of the riffle was swampy. Stream sites such as those found on Black Creek are difficult to classify as either Swamp or Coastal A since the amount of rainfall in the winter and spring can produce flows characteristic of either stream type in a given year. Until criteria can be developed for transitional sites similar to Black Creek at SR 1330, such sites should not be rated. Until new criteria are developed, Black Creek at SR 1330 should be dropped as a basinwide site.

Hannah Creek, SR 1009, Johnston County

The drainage area of Hannah Creek at SR 1009 is 64 square miles. The single active NPDES discharger in the subbasin, Benson WWTP, is located near the source of the stream.

The stream for much of its length near the road crossing was deep (approximately 1.5 meters average depth) and sluggish. However, a shallow site with very low flow was found approximately 100 meters upstream of the road crossing.

An EPT sample was collected on 29 September 2005. The stream was about two meters wide at the sampling point, with an average depth of 0.2 meters. Channel modification was not evident. Substrates were a mix of gravel and sand, with small amounts of silt and detritus. Sticks, snags, and logs were common. Undercut banks, root mats, and leaf packs were all rare. Macrophytes were absent. The site was moderately diverse hydrologically, with pools, runs and shallow gravel riffles all present. Erosional areas were present on both banks. Grasses were dominant on one bank, giving a high potential for bank failure during high flow. Breaks in the moderately narrow riparian zone were common on one side and rare in the wide zone on the other side. The overall habitat score was 70 using Coastal Plain criteria. Conductivity was 91 µmhos/cm.

Five EPT taxa were present at the site. The only mayfly present was *Stenonema modestum*, which was rare. No stoneflies were present. Four caddisflies were present: *Cheumatopsyche* and *Nectopsyche exquisita* were both common; *Oecetis persimilis* and *Pycnopsyche* were both rare.

Prior to 2005, the site had been sampled three times using EPT methods (1991, 1995, 2000) and once using standard qualitative methods (2001). Twice the site was rated as Good-Fair (1995, 2001), and twice as Fair (1991, 2000). In 2005, only 16 EPT specimens were collected, representing five taxa. Previously, the lowest number of EPT taxa collected was eight in 1991. Though EPT richness was low in 2005, the EPT BI was nearly as low as the previous low in 2001 (4.8 and 4.7 respectively). Because of extreme low flow conditions resulting from a very dry September for the area (as discussed above), the site was not rated for 2005.

Mill Creek, SR 1009, Johnston County

The drainage area of Mill Creek at SR 1009 is 85 square miles. There are no active permitted NPDES dischargers upstream of the site.

An EPT collection was made on 22 September 2005. The stream was about seven meters wide at the sampling point with a mean depth of approximately one meter. Channelization was not evident. Substrates were primarily sand with some gravel and silt present. Sticks, snags and logs were abundant. Undercut banks, root mats, and macrophytes were common. Leaf packs were present but rare. Hydrologically, the stream was a run with low flow. Riffles and pools were absent. Both banks had areas of moderate erosion; grasses were the dominant bank vegetation, with the potential of bank failure at high flow. The riparian zone was intact and wide to moderately wide on both sides of the stream. The overall habitat score was 54 using Coastal Plain criteria. Conductivity was 80 µmhos/cm.

Four EPT taxa were present at the site. Of those, two were mayflies: *Stenonema modestum*, which was common; and *Stenacron interpunctatum*, which was rare. The other two were caddisflies: *Cheumatopsyche*, which was rare; and early-instar *Triaenodes*, which was common.

The site had been sampled three times before 2005. On each previous occasion it had rated Good-Fair with either 12 or 13 EPT taxa present. The EPT biotic index has changed little between all years sampled, with a range of values between 4.8 and 5.3. Because of extreme conditions resulting from a very dry September (as discussed above), the site was not rated for 2005.

Special Studies

Follow-up to 2000 Basinwide Sampling
Following the Fair rating obtained during the 2000 basinwide benthic invertebrate sampling at Hannah Creek at SR 1009 in Johnston County, the site was sampled again in 2001 (Biological Assessment Unit Memorandum B-020111). The Good-Fair rating received in 2001 kept the downstream segment of Hannah Creek off of the state's 303(d) list.

Planning Section Request
A site was requested on upper Hannah Creek within the 303(d)-listed segment to assess whether the low dissolved oxygen levels observed there are associated with natural conditions (Biological Assessment Unit Memorandum B-060109). The road crossing at SR 1159 was selected for sampling; the site had not been sampled for benthic invertebrates before. The site received a bioclassification of Fair after sampling in July 2005. Without historic benthic data for comparison, it was not possible to determine whether low dissolved oxygen conditions are natural for the stream.

NEUSE RIVER SUBBASIN 05

Description

Neuse subbasin 05 is composed of the Rolling Coastal Plain, Southeastern Floodplains and Low Terraces (in the Neuse River corridor), and Carolina Flatwoods ecoregions as defined by Griffith *et al*. (2002). Streams characteristically possess silt and sand substrates and are of low gradient, but may be of moderate gradient in the western portion of the subbasin. Land cover among the three ecoregions consists of mixed forest, deciduous forest, forested wetlands, pasture, and cropland. Crops present are cotton, soybeans, corn, wheat, sweet potatoes, peanuts, tobacco, and blueberries. Hog and poultry production occurs in the subbasin. Neuse River and its floodplains provide a corridor for wildlife.

Subbasin 05 includes the southeast corner of Wayne County, most of Lenoir County, and small portions of Greene, Craven, and Jones Counties. One-half of the subbasin is covered by forest/wetland; most of the remainder is covered by cropland, and a small portion by urbanization. The subbasin includes the town of Goldsboro and Seymour Johnson AFB, and the towns of Kinston and LaGrange. Neuse River from the mouth of Stoney Creek (and including that stream) to the mouth of (though not including) Contentnea Creek is within the subbasin (Figure 9). Subbasin 05 also includes all tributaries of Neuse River in that section. Major tributaries are Bear Creek, Falling Creek, Southwest Creek, Stoney Creek, Moseley Creek, Briery Run and Stonyton Creek.

There are eight active permitted NPDES dischargers in the subbasin; four are major and four minor. The four major dischargers are listed in Table 8.

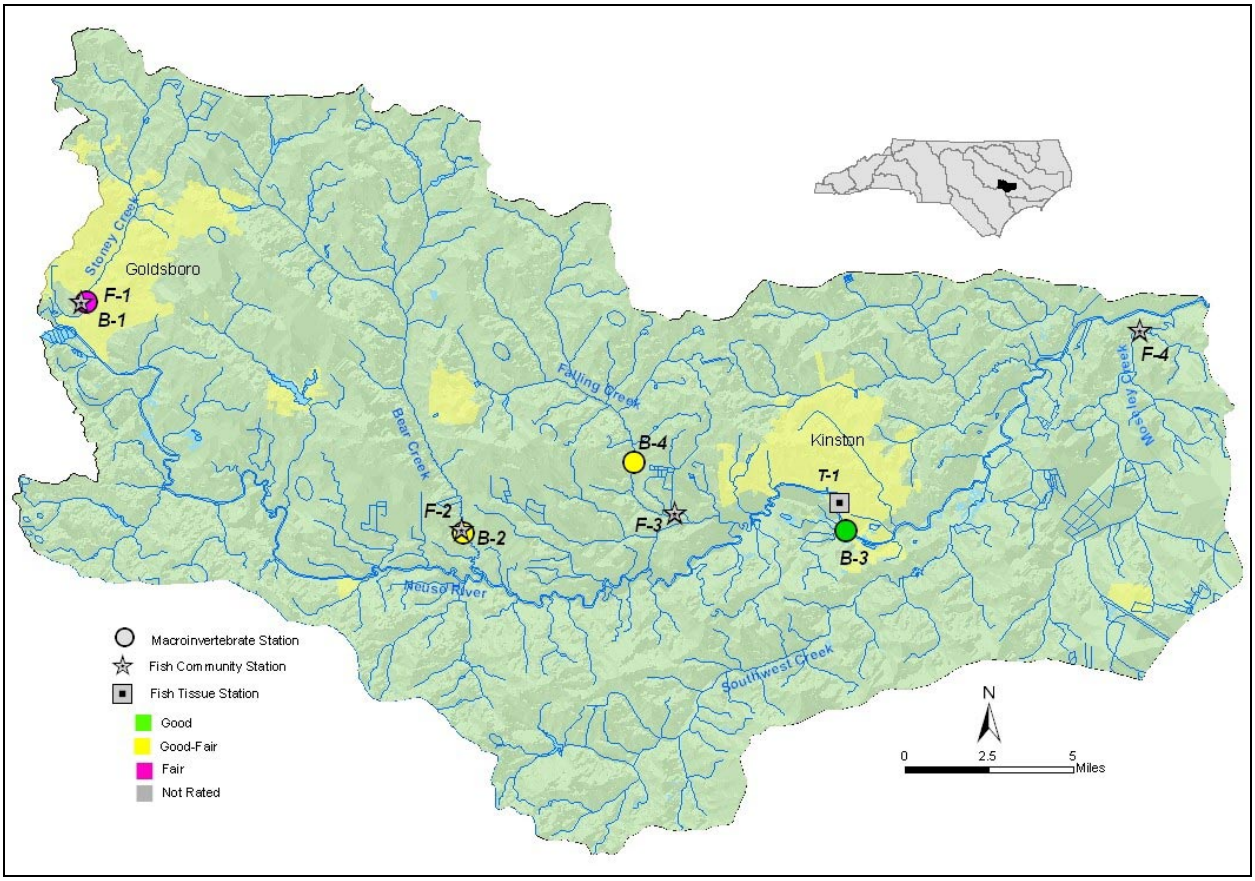


Figure 9. Sampling sites in Subbasin 05 in the Neuse River basin.

Table 8. Major active NPDES permitted dischargers in subbasin 05 in the Neuse River basin as of December 2005.

Permit	Facility	County	Receiving Waterbody	Permit Flow (MGD)
NC0003760	Unifi-Kinston LLC	Lenoir	Neuse River and Beaverdam Branch	3.60
NC0020541	Peachtree WWTP	Lenoir	Neuse River	6.75
NC0023949	Goldsboro WWTP	Wayne	Neuse River	17.60
NC0024236	Kinston Regional Water Reclamation Facility	Lenoir	Neuse River	11.85

Overview of Water Quality

Neuse River is 303(d)-listed (beginning in 2004) for 63 miles through the entire length of the subbasin due to levels of methylmercury in the tissue of certain fish species which are above the acceptable standard (median and/or mean of 0.4 mg/kg or greater); a likely source for the mercury is from atmospheric deposition ultimately originating from global industry. Stoney Creek is listed (beginning in 1998) for its entire length beginning in 1998 for impaired biological integrity. Walnut Creek is listed (beginning in 1998) for its entire length for aquatic weeds and for low dissolved oxygen.

There are two ambient monitoring stations on Neuse River: one at SR 1915 near Goldsboro (AMS J5970000); the other at NC 11 bypass in Kinston (AMS J6150000). Both stations have recorded frequent elevated levels of iron, with 17 of 20 results above the action level standard at SR 1915 and 15 of 20 above the standard level at NC 11 bypass. However, high levels of iron are common in streams across the state.

Four facilities within the subbasin are required to perform toxicity testing: Goldsboro WWTP; Kinston Regional Water Reclamation Facility; Peachtree WWTP; and Unifi-Kinston LLC. The NPDES permits for all four facilities specify chronic toxicity testing. No WET NPDES permit limit violations were reported from any of the facilities for the period January 2001 through October 2005.

The four sites sampled for macroinvertebrates in 2000 were sampled again in 2005. Three of the four sites retained the same bioclassification in 2005 as in 2000: Stoney Creek at SR 1920 received a classification of Fair in both years; Bear Creek at SR 1311 received a Good-Fair classification; Neuse River at NC 58 received a Good classification. Falling Creek near SR 1546 improved its rating from Fair in 2000 to Good-Fair in 2005.

Table 9. Waterbodies monitored in Subbasin 05 in the Neuse River basin for basinwide assessment, 2000-2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Stoney Cr	Wayne	SR 1920	Fair	Fair
B-2	Bear Cr	Lenoir	SR 1311	Good-Fair	Good-Fair
B-3	Neuse R	Lenoir	NC 58	Good	Good
B-4	Falling Cr	Lenoir	near SR 1546	Fair	Good-Fair
F-1	Stoney Cr	Wayne	SR 1920	Not Rated	Not Rated
F-2	Bear Cr	Lenoir	SR 1311	Not Rated	Not Rated
F-3	Falling Cr	Lenoir	SR 1340	Not Rated	Not Rated
F-4	Moseley Cr	Craven	SR 1475	Not Rated	Not Rated

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

As in 2000, Southwest Creek at SR 1804 was not sampled for benthos. The stream is deep and has little flow at the site, is therefore not conducive to sampling, and should be dropped from the list of basinwide sites in the subbasin. Neuse River at SR 1731/Wayne County should be considered as a possible basinwide site in 2010. It was sampled in 2000, as described below.

Locations visited but not sampled for fish community assessments because either the stream was too deep to sample or because the waterbody was a braided swamp included Southwest Creek at SR 1804, NC 58, US 258, and NC 11, Deep Run at SR 1141, and Hardy Mill Run at SR 1300, all in Lenoir County. All of the fish community sites sampled in this subbasin have been sampled during a minimum of three basinwide monitoring cycles. However, they are not assigned ratings, because NCIBI metrics and scoring criteria development is still underway for Coastal Plain streams. There are no NPDES facilities located upstream of the fish community sites on Stoney, Bear, and Moseley Creeks.

Stoney Creek, SR 1920, Wayne County

The drainage area of Stoney Creek at SR 1920 is 26 square miles. There are no active permitted NPDES dischargers upstream of the site. A portion of Seymour Johnson Air Force Base and much of the town of Goldsboro is within the drainage area of the site.

A standard qualitative benthic sample was collected on 29 September 2005. The stream was about three meters wide at the sampling point, with a mean depth of 0.3 meter. Channel modification was not evident. Substrate was primarily sand with some gravel. Some cobble and detritus were also present. Undercut banks were abundant, sticks and snags were common, leaf packs were present but rare, and aquatic macrophytes were absent. Hydrologically the site was primarily a run. Pools were infrequent and did not vary much in size. Riffles were present as well. Bank vegetation was sparse, allowing for bank failure during high flows. The riparian zone was wide and intact on both sides of the stream. The overall habitat score was 72 using Coastal Plain criteria. Conductivity in this tannin-stained stream was 121 µmhos/cm. Prior to 2005 the site had been sampled for macroinvertebrates four times: once in 1995, twice in 2000, and once in 2001 (the latter during the winter sampling period). As in 2005, the site had rated Fair on each prior occasion, except in 1995 when it rated Poor. Conductivity has been increasing from the first measurement in June 2000 when it was 91 µmhos/cm. The EPT BI has been decreasing during each normative summer sampling event from 1995 up to present, from 6.0 to 5.4 (it is better to look at the EPT BI rather than the overall BI when looking for trends due to the fact that both EPT and standard qualitative sampling has been done at the site).

Abundant taxa in 2005 were a mayfly (*Stenonema modestum*), two damselflies (*Argia, Calopteryx*), several dragonflies (*Boyeria vinosa, Gomphus, Progomphus obscurus, Tetragoneuria*), two case-building caddisflies (*Oecetis persimilis, Triaenodes ignitus*), a net-building caddisfly (*Cheumatopsyche*), three riffle beetles (*Ancyronyx variegatus, Macronychus glabratus, Stenelmis sinuata*), a non-biting midge (*Polypedilum flavum*), a sideswimmer (*Crangonyx*), the invasive and commonly-encountered Asian Clam (*Corbicula fluminea*), and a snail (*Physella*). Most of the abundant organisms are moderately to highly tolerant of pollutants.

First records for the site in 2005 include a damselfly (*Ischnura*), several dragonflies (*Erythemis, Hagenius brevistylus, Libellula, Neurocordulia, Tetragoneuria*), and a riffle beetle (*Microcylloepus pusillus*).

The number of fish and number of species has gradually increased over time (Figure 10). The most abundant species for all years has been the American eel; it has constituted 29 to 41 percent of all the fish collected. In 2005, four species of darters were collected including the intolerant Roanoke darter. This is the first time an intolerant species has been collected and the first time four species of darters have been collected at the site. Based upon DWQ data, 23 species of fish are now known from the site.

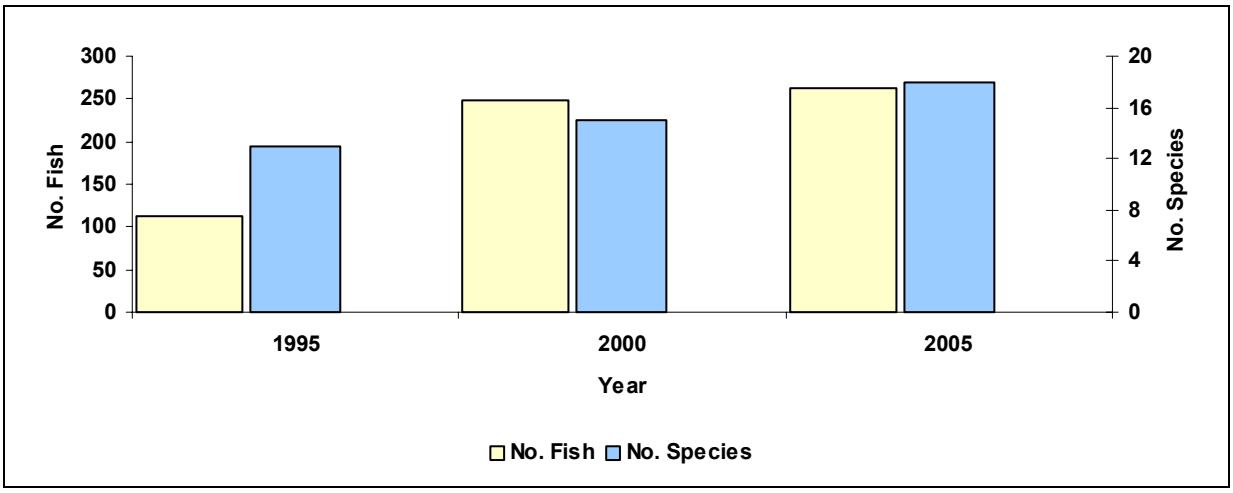


Figure 10. Number of species and individuals of fish at Stoney Creek at SR 1920, Wayne County.

Bear Creek, SR 1311, Lenoir County

The drainage area of Bear Creek at SR 1311 is 62 square miles. There are no active permitted NPDES dischargers upstream of the site. A portion of the town of LaGrange lies within the drainage area.

An EPT macroinvertebrate sample was collected on 26 July 2005. The stream was about 11 meters wide at the sampling point, with a mean depth of approximately 0.3 meter. Channel modification was not evident. Substrate was nearly homogeneous and sandy with a small amount of silt present. Sticks and snags were common, leaf packs were present but rare, and undercut banks, root mats and aquatic macrophytes were absent. Hydrologically, the stream at the site was a run with pools and riffles absent. Only sparse vegetation was present on the banks, allowing for the potential of erosion during high flows. The riparian zone was wide and intact on both stream sides. The overall habitat score was 54 using Coastal Plain criteria. Conductivity was 99 µmhos/cm.

Abundant taxa at the site in 2005 were a mayfly (*Stenonema modestum*), a stonefly (*Perlesta*), two net-spinning caddisflies (*Cheumatopsyche, Hydropsyche rossi*), a case-building caddisfly (*Nectopsyche exquisita*). A mayfly, *Brachycercus*, was recorded from the site for the first time, as was a caddisfly, *Lype diversa*.

The site had been sampled three times prior to 2005. It has rated as Good-Fair for each sampling event up through 2005 except for 1995, when it rated as Fair. For 2005 the site showed the greatest number of EPT taxa over all sampling events, and showed a BI (of 4.9) which was equal to the lowest value seen previously (in 1991).

The fish community in Bear Creek was sampled during the past three basinwide cycles and as part of the post-Hurricane Fran study in October 1996. When contrasted to the other data, the post-hurricane data showed an impacted fish community with only 12 species and 88 individuals collected (Figure 11). However, the fish communities before and since then were very similar in terms of diversity and

abundance. The dominant species has been the satinfin shiner and in 2005 also the American eel. Based upon DWQ data, 38 species of fish are now known from the site including 10 species of sunfish, 8 species of minnows, 4 species of darters, and 2 species of lampreys. In 2005 however, only two species of sunfish were collected, the fewest of any fish community site in the Coastal Plain. The percentage of tolerant fish has declined from 53 percent in 1995 to 33 percent in 2005.

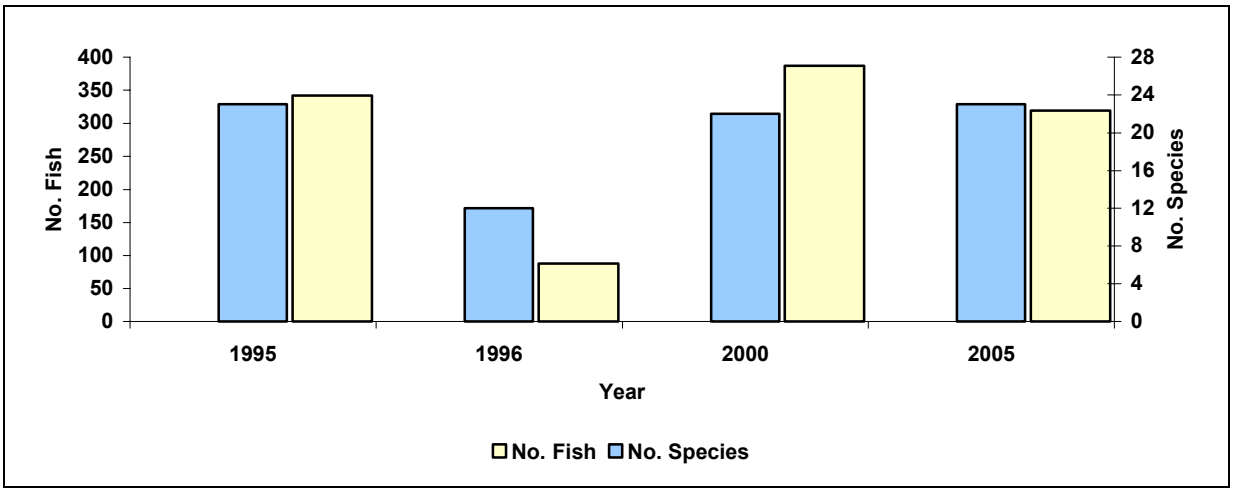


Figure 11. Number of species and individuals of fish at Bear Creek at SR 1311, Lenoir County.

Neuse River, NC 58, Lenoir County

The drainage area of Neuse River at NC 58 is 2700 square miles. There are no active permitted NPDES dischargers within 10 miles upstream of the site. The closest discharger is LaGrange WWTP, which discharges to Mosely Creek, is approximately 12 straight-line miles above the site, and is classified as a minor discharger. The closest major upstream discharger is Goldsboro WWTP which discharges to Neuse River and is approximately 25 straight-line miles above the site.

A standard qualitative benthic sample was collected on 16 September 2005. The stream was about 50 meters wide and not wadeable through the middle, so the average depth was not able to be determined. Channel modification was not evident. The substrate was almost entirely silt/clay. Snags were common, sticks and leaf packs were present but rare. No other macroinvertebrate habitat was available at the site. The stream is a large, low-gradient river at NC 58. As such, it is mostly a deep-water run. Bank vegetation was sparse allowing for erosion during high flows. The riparian zone was relatively wide on both banks, intact on the right bank but with infrequent breaks on the left. The overall habitat score was 35 using Piedmont criteria. Conductivity was 185 µmhos/cm.

The site had been sampled 10 times prior to 2005. Eight of those sampling events occurred during annual sampling between 1983 and 1991, with the exception of 1989. The site has rated Good after each sampling event up to and including 2005 except for three collections from 1985 through 1987 inclusive, when the site rated Good-Fair. The biotic index has fluctuated between 5.1 and 6.3 with no clear trends. Likewise, the number of EPT taxa shows no trend.

Abundant taxa at the site were several mayflies (*Baetis intercalaris, Pseudocloeon dardanum, P. ephippiatum, Caenis, Stenonema integrum*), a stonefly (*Paragnetina kansensis*), several caddisflies (*Cheumatopsyche, Hydropsyche incommoda, Hydropsyche rossi, Chimarra, Nectopsyche exquisita*), a whirligig beetle (*Gyrinus*), two riffle beetles (*Macronychus glabratus, Stenelmis*), a predaceous diving beetle (*Neoporus*), and two non-biting midges (*Cricotopus bicinctus, Polypedilum flavum*). Most of the abundant taxa are moderately to highly tolerant to pollutants. The notable exception is *Chimarra*, which is intolerant.

Macrostemum has been recorded from the site for each sampling event through 1995 (when it was abundant), but has not been recorded since. Similarly, gastropods have been recorded for each sampling effort through 1995 (at which time *Ferrissia* and *Physella* were common and *Micromenetus dilatatus* rare), but have been absent in 2000 and 2005.

Falling Creek, near SR 1546, Lenoir County

The drainage area of Falling Creek at the Atlantic and East Carolina train trestle is 43 square miles. The site was identified in the previous basinwide report as being at SR 1519. There is one active permitted NPDES discharger about 7.5 stream miles upstream of the site. The discharger is classified as minor.

An EPT benthic sample was collected on 26 July 2005. The stream was about eight meters wide at the sampling point with an average depth of about 0.4 meter. Channel modification was not evident. Substrate was mostly sand with some silt. Sticks, snags and logs, undercut banks, root mats, leaf packs, and aquatic macrophytes were all present but rare. Hydrologically, the stream at the site was a run with infrequent pools. Though erosional areas were present, bank vegetation was diverse and included trees, shrubs, and grasses. The riparian zone was wide and intact on both banks. The overall habitat score was 64 using Coastal Plain criteria. Conductivity was 88 µmhos/cm.

The site had been sampled for macroinvertebrates three times prior to 2005, though two of those sampling events were outside of the normative summer sampling window. In summer 2001 the site rated as Good-Fair. It retained that rating in 2005. Between 2001 and 2005 the EPT biotic index increased slightly (from 5.2 to 5.5), and the number of EPT taxa fell slightly (from 14 to 12).

Abundant taxa at the site in 2005 were two mayflies (*Caenis*, *Stenonema modestum*) and several caddisflies (*Cheumatopsyche, Hydropsyche venularis, Nectopsyche exquiseta, Oecetis persimilis*). New records for the site are two mayflies (*Caenis, Stenacron interpunctatum*), and a caddisfly (*Nectopsyche pavida*).

Falling Creek, SR 1340, Lenoir County

The watershed of Falling Creek includes the Town of LaGrange and the central portion of Lenoir County; a small portion of southern Green County is also within its watershed. There is one NPDES facility within the creek's watershed. The WWTP serving the Town of LaGrange discharge 0.75 MGD to UT Moseley Creek, a tributary to Falling Creek located approximately 10.5 miles upstream from the fish monitoring site. Over the period 2000 – 2005 there were four permit limit violations, the most recent being in January 2005 for fecal coliform bacteria whose numbers exceeded the permitted weekly geometric mean.

The conductivity during fish community sampling, 1995 – 2005, has ranged from 80 to 97 µmhos/cm. This site has very high instream and riparian habitat characteristics; the habitat score in 2000 was 95 and in 2005 was 94 (Appendix F-8).

The dominant species have been the American eel and the dusky shiner. In 2005 large schools of dusky shiners inhabited the stream; approximately 41 percent of all the fish collected were of this species. Based upon DWQ data, 34 species of fish are now known from the site including 9 species of sunfish, 7 species of minnows, and 4 species of darters. More species were collected in 2006 at this site (n = 26) than at any other site in the Coastal Plain. The number of species collected at this site has ranged from 22 to 26 (Figure 12). The number of fish collected has progressively increased over time.

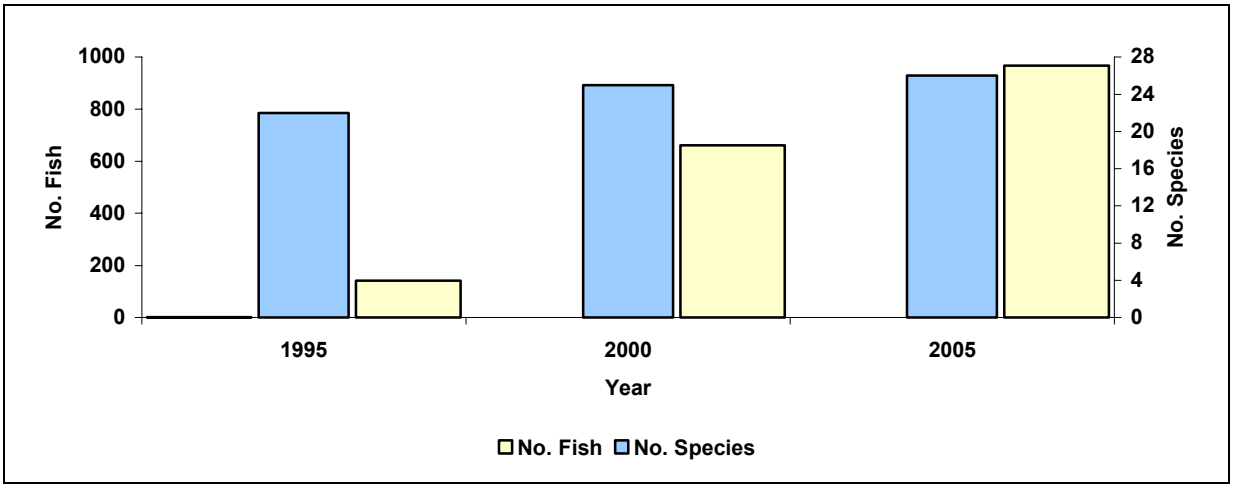


Figure 12. Number of species and individuals of fish at Falling Creek at SR 1340, Lenoir County.

Moseley Creek, SR 1475, Craven County

Moseley Creek's headwaters are in northwestern Jones County. The channelized and de-snagged creek flows towards the north draining northeastern Lenoir and western Craven counties. The conductivity during fish community sampling, 1995 – 2005, has ranged from 154 to 200 µmhos/cm. The habitat scores have ranged from 39 (following Hurricane Fran) to 64 in 2005 (Appendix F-8).

The fish community at this site has been sampled five times; four times for basinwide surveys and once in 1996 as part of a post-Hurricane Fran study. Based upon DWQ data, 30 species of fish are now known from the site including 9 species of sunfish, 7 species of minnows, and 3 species of darters. In 2005, no suckers were collected; a situation encountered at only two other sites in the Coastal Plain (Turkey Creek and Hominy Swamp in Subbasin 10).

The number of fish species collected at this site has ranged from 15 to 25 (Figure 13). The number of fish collected during the past two monitoring periods was greater than the number collected in 1991 – 1996. The percentage of tolerant fish has declined from 48 percent in 1996 to 30 percent in 2005. The dominant species has included the redbreast sunfish (1991, 1995, 2000, and 2005), the eastern silvery minnow (1995), the eastern mosquitofish (1996), the satinfin shiner (2000), and the highfin shiner (2005).

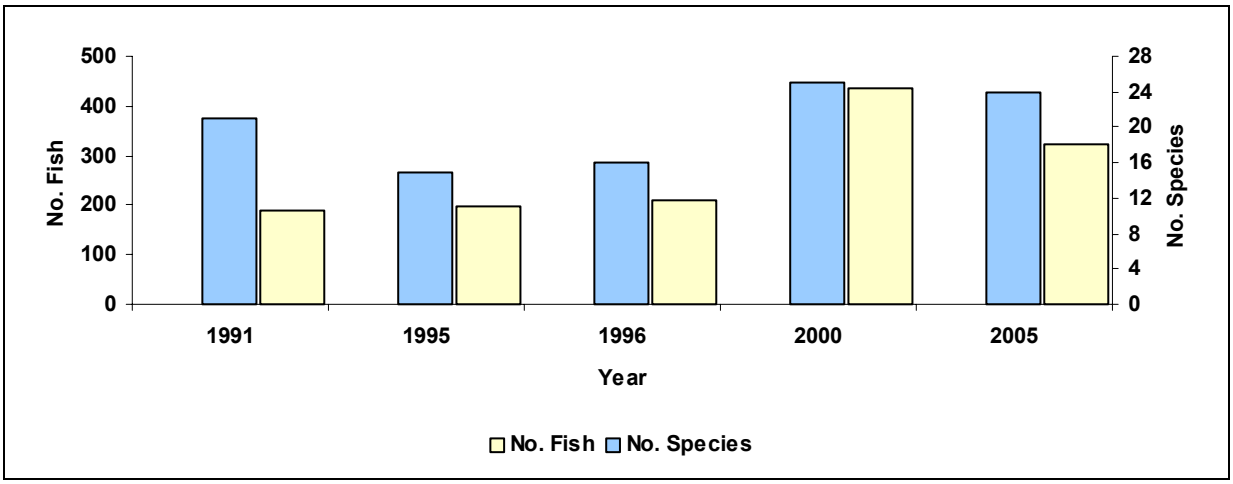


Figure 13. Number of species and individuals of fish at Moseley Creek at SR 1475, Craven County.

Special Studies

Neuse River at SR 1731, Wayne County

The site was sampled on 13 October 2000 for benthic macroinvertebrates as a possible basinwide site. The site had not been sampled previously. It received a classification of Good, with 63 total taxa and a BI of 5.2.

Follow-up to 2000 Basinwide Sampling
Following the Fair rating resulting from sampling of benthic macroinvertebrates at Falling Creek near SR 1546 during 2000 basinwide sampling, follow-up sampling was performed at the site in 2001 (Biological Assessment Unit Memorandum B-020111). The Good-Fair rating received in 2001 kept the stream segment off of the state's 303(d) list.

Watershed Assessment and Restoration Project (WARP), Stoney Creek Watershed
Due to the listing of Stoney Creek on the state's 303(d) list in 1998, several sites on the stream (Wayne Memorial Blvd, Ashe Street Park, SR 1920/Wayne Co.) were sampled for macroinvertebrates in 2000 and 2001 for a more intensive study of the watershed (Biological Assessment Unit Memorandum B-021023). Button Branch and The Slough are streams in an adjacent watershed, which were sampled as reference sites in 2001. Agricultural and urban runoff, a lack of in-stream habitat, and low dissolved oxygen levels were suggested causes for the degraded benthic community existing at all sites on Stoney Creek.

Ecosystem Enhancement Project (EEP), Stoney Creek Watershed
Following up on the WARP study on Stoney Creek, additional sites were sampled within the watershed (Stoney Run at SR 1547/Wayne Co.; Billy Branch at SR 1565/Wayne Co.; UT Stoney Creek at SR 1565/Wayne Co.) to determine the usefulness of macroinvertebrates as a measurement for the success of a restoration project (Biological Assessment Unit Memorandum B-040504). The report concluded that, due to the unstable hydrology of the tributaries to Stoney Creek, macroinvertebrates would not be adequate for assessment of the results of improvements within the upper portions of the watershed.

Planning Section Request
A site on Bear Creek upstream of the basinwide site at SR 1311 was requested by the Planning Section to assess the impact of development in the upper portion of the watershed (Biological Assessment Unit Memorandum B-051130). Bear Creek at SR 1715/Wayne County was sampled for macroinvertebrates in July 2005 and received a bioclassification of Fair.

Fish Tissue Monitoring

Neuse River near Goldsboro
Largemouth bass, striped bass, sunfish, and catfish samples were collected from the Neuse River near Goldsboro during 2000 and analyzed for mercury and heavy metal contaminants. The samples were collected as part of an eastern North Carolina mercury assessment. Three largemouth bass, and one striped bass (4 of 21 total samples) contained mercury concentrations exceeding the state criteria of 0.4 ppm. Mercury levels in all samples ranged from 0.10 to 0.52 ppm. Results for other metals were non-detectable or below EPA and North Carolina screening values. Two additional largemouth bass samples were collected from the Goldsboro station during 2003 and analyzed for organics and PCB contaminants. The samples contained trace amounts of DDE, a DDT metabolite, and dieldrin but concentrations were well below US EPA, US FDA, and State of North Carolina criteria. PCB contaminants were not detected.

Neuse River near Kinston
Largemouth bass, striped bass, sunfish, and catfish samples were collected from the Neuse River near Kinston during 2000 and analyzed for mercury and heavy metal contaminants. All largemouth bass samples (7 of 20 total samples) contained mercury concentrations exceeding the state criteria of 0.4 ppm. Mercury levels in all samples ranged from 0.11 to 1.40 ppm. Results for other metals were non-detectable or below EPA and North Carolina screening values (Appendix F-13).

NEUSE RIVER SUBBASIN 06

Description

Neuse subbasin 06 is composed of the Northern Outer Piedmont, Rolling Coastal Plain, and (in the Neuse River corridor) Southeastern Floodplains and Low Terraces ecoregions as defined by Griffith *et al*. (2002). As such it encompasses part of the broad transitional zone between the Piedmont and the Coastal Plain. Streams are characteristically of low to moderate gradient. Stream substrates are composed of cobble, gravel, and sand in the piedmont, and of gravel, sand, silt, and clay in the coastal plain. Land cover among the three ecoregions consists of mixed forest, deciduous forest, forested wetlands, pasture and cropland. Crops present are cotton, soybeans, corn, wheat, sweet potatoes, peanuts, tobacco, and hay. Cattle, poultry, and hog production occur in the subbasin. Neuse River and its floodplains provide a corridor for wildlife.

Subbasin 06 includes eastern Wake County, northwest Johnston County, and east-central Wayne County; a small portion of Franklin County at the headwaters of Little River is included as well (Figure 14). Land cover is slightly more than one-half forest/wetland, with most of the remainder crop and pasture land. About three percent of the area is urban. The subbasin includes the towns of Zebulon, Wendell, Kenly, and the eastern outskirts of Goldsboro. Waterbodies in the subbasin are Little River and its tributaries from the headwaters of the stream to Neuse River. The upper segment of the Little River is fairly fast-flowing, before dropping out of the piedmont into the Coastal Plain. Some smaller streams in the upper segment are susceptible to lack of flow during dry periods because of poor groundwater storage. The lower segment of the river in Johnston and Wayne counties has a much lower gradient and is evaluated with coastal plain biocriteria. Buffalo Creek is the major tributary to Little River. This stream starts within the piedmont, but most of the stream has coastal plain characteristics. The upper segment (north of Wendell) is one of few locations in Wake County with large stands of bald cypress (LeGrand 2003). The lower reach has many areas of slower flowing-water habitat due to an abundance of beaver dams.

There are six active permitted NPDES dischargers in the subbasin; all are classified as minor. Four of these facilities discharge to the Little River and two have outfalls on Buffalo Creek.

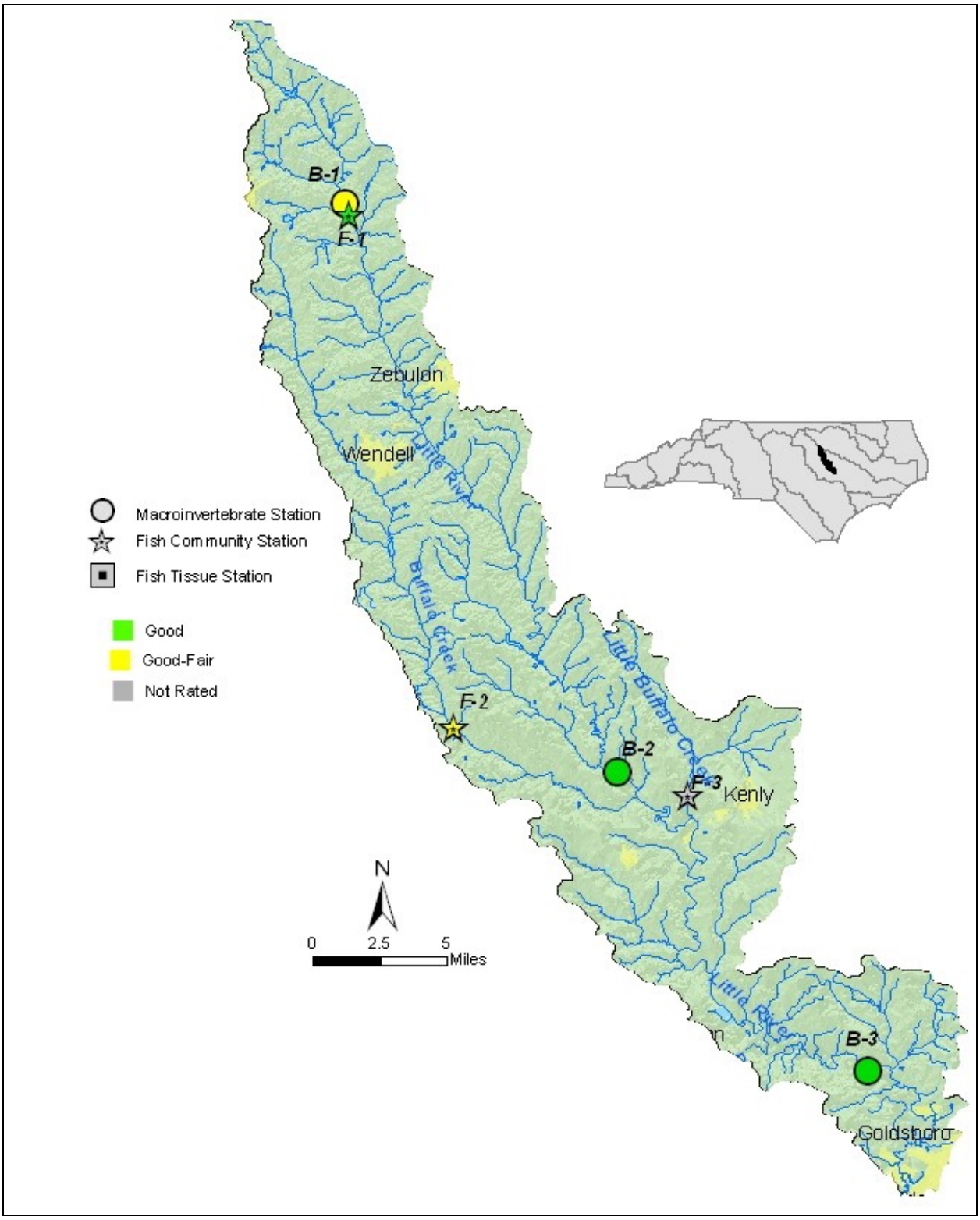


Figure 14. Sampling sites in Subbasin 06 in the Neuse River basin.

Overview of Water Quality

Little River is 303(d)-listed in two contiguous segments from Little Buffalo Creek to 4.2 miles upstream of NC 581. The combined segments have been listed since 2004 for low dissolved oxygen.

Buffalo Creek is 303(d)-listed in two contiguous segments from the dam at Robertsons Pond to its confluence with Little River. The combined segments have been listed since 1998 for impaired biological integrity. Buffalo Creek was the only site revisited for fish sampling in this monitoring cycle, and continues to show a stable community of fish, and an unchanged water quality rating of Good-Fair. The Buffalo Creek WWTP (NC0064556) is located about 1.5 miles above the fish community site at SR 1941 and is permitted to discharge 0.5 MGD to Buffalo Creek. There is another minor NPDES discharger (Pace Mobile Home Park, NC0064246) located several miles above this fish community site. There have been no effluent toxicity violations at either of these facilities.

An ambient monitoring station exists on Little River at SR 2320 in Johnston County (AMS J5850000). Elevated levels of iron have been recorded frequently at the station, with 16 of 18 instances of levels above the action level standard.

Two facilities in subbasin 06 are required to perform toxicity testing: Kenly WWTP, and Princeton WWTP. The NPDES permits for both facilities specify chronic toxicity testing. No WET NPDES permit limit violations were reported for either facility for the period January 2001 through October 2005.

The three benthic sites on Little River which were sampled in 2000 were sampled again in 2005. Two of the three sites were unchanged in bioclassification between the two years; Little River at NC 96 retained its classification of Good-Fair; Little River at SR 2130 retained its classification of Fair. The third site, Little River at NC 581, improved from Good-Fair in 2000 to Good in 2005.

Table 10. Waterbodies monitored in Subbasin 06 in the Neuse River basin for basinwide assessment, 2000-2005.

Map #[1]	Waterbody	County	Location	2000	2004/2005
B-1	Little R	Wake	NC 96	Good-Fair	Good-Fair
B-2	Little R	Johnston	SR 2130	Good	Good
B-3	Little R	Wayne	NC 581	Good-Fair	Good
F-1	Little R	Wake	SR 2224	--	Good
F-2	Buffalo Cr	Johnston	SR 1941	Good-Fair	Good-Fair
F-3	Little Buffalo Cr	Johnston	SR 2143	--	Not Rated

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

Buffalo Creek at SR 1941 was not sampled for macroinvertebrates in 2005 due to imperceptible flow and apparent stagnation. An attempt should be made to sample the site again in 2010.

The Little River at SR 2224 and Little Buffalo Creek at SR 2143 represent previously unassessed fish sites in this subbasin. Little Buffalo Creek is currently not rated, because metrics and criteria for rating Coastal Plain streams are still being developed. Locations visited but not sampled for fish community assessments because either the stream was too deep to sample or because the waterbody was a braided swamp included Spring Branch at SR 2320 and at SR 2356 in Johnston County.

Little River, NC 96, Wake County

The drainage area of Little River at NC 96 is 21 square miles. There are no active permitted NPDES dischargers upstream of the site.

A standard qualitative benthic sample was collected on 27 July 2005. The mean stream width was approximately 5 meters and quite variable. The average stream depth at the site was 0.3 meter. There has been no modification of the channel. The substrate is almost entirely bedrock. Macrophytes were common. Boulders and cobbles, sticks and leaf packs, snags, logs, undercut banks and root mats were all present but rare. Pools were frequent, riffles infrequent and of moderate length. Banks were stable with no evidence of erosion. The riparian zone was wide and intact on both sides of the stream. The overall habitat score was 58 using Piedmont criteria. Conductivity was 64 µmhos/cm.

The site has been sampled intensively for macroinvertebrates, particularly between September 1983 and November 1984 when the site was sampled each month with two exceptions. Since then, the site has been sampled in 1991, twice in 1995, and in 2000 (the only time that abbreviated EPT sampling methods were used). The site has received bioclassifications of Good-Fair for each normative summer (June through September) sampling event up to and including 2005. For all summer standard qualitative samples, the biotic index has ranged from 5.9 to 6.5 (with no trend evident), and the number of EPT taxa has ranged from 18 to 23 (with no trend evident). Dissolved oxygen has been low each of the three times it was measured (summer 1995, 2000, and 2005), ranging from 2.6 to 4.0 mg/L.

In 2005 the site was observed to be highly productive. *Hydropsyche betteni* and *Chimarra* were noted as being highly abundant during sampling. Other abundant taxa were several mayflies (*Caenis, Stenacron interpunctatum, Stenonema modestum, Tricorythodes*), a commonly encountered caddisfly (*Oecetis persimilis*), a damselfly (*Enallagma*), a riffle beetle (*Stenelmis mirabilis*), a dobsonfly (*Corydalus cornutus*), several non-biting midges (*Ablabesmyia mallochi, A. monilis, Dicrotendipes neomodestus, Polypedilum flavum*), a black fly (*Simulium*), a sideswimmer (*Hyalella*), the common and introduced Asian Clam (*Corbicula fluminea*), a snail (*Campeloma decisum*), a flatworm (*Dugesia tigrina*), and water mites (Acari). Tolerance values for abundant taxa ranged from intolerant (2.0 for *Stenelmis mirabilis*) to tolerant (8.9 for *Enallagma*) to pollutants.

Heterocloeon (a mayfly), which has been either common or abundant during previous summer sampling events, was absent in 2005. Stoneflies are rarely encountered at the site during summer sampling, and 2005 was not an exception. *Lepidostoma* (a case-building caddisfly) has been present (and sometimes abundant) during each sampling event through late 1984, but has not been recorded since sampling in 1991. Another commonly-encountered case-building caddisfly (*Micrasema watauga*) at the site prior to 1991 sampling has also been absent since. *Corbicula fluminea*, as noted above, was abundant in 2005; the only prior record of the species was in 1995 when it was rare. New records for the site are several caddisflies (*Molanna, Oecetis nocturna, Oxyethira*), a damselfly (*Ischnura*), and a horse fly (*Chrysops*).

Little River, SR 2224, Wake County

This site is located southeast of Wake Forest in northern Wake County, and captures 25.5 square miles of the Little River watershed in the uppermost tip of the subbasin. The watershed characteristics here are Coastal Plain like, including slow moving, tannin stained water with low dissolved oxygen, and substrates of sand and gravel. Habitats also typify coastal plain streams at this location with bar development, an open canopy, deep pools, and an abundance of stick and log snags, and leafpacks. The riparian zone was intact and wide in this section of the stream. The total habitat score was 54 and 78 with Piedmont and Coastal Plain criteria, respectively (appendices F-7 and F-8).

The fish community was sampled here for the first time in 2004 as part of the NCSU urban index study. This river was also sampled for fish at a site less than a mile upstream in the 2000 basinwide cycle with a total of 11 species collected and a rating of Good-Fair. During the 2004 assessment, almost twice the number of species were captured (n=20) including several typical Coastal Plain species (flier, American eel, bluespotted sunfish, sawcheek darter) and the site received a rating of Good with an NCIBI score of 52.

Little River, SR 2130, Johnston County

Little River at SR 2130 has a drainage area of 130 square miles. There are two active permitted NPDES dischargers upstream of the site, both classified as minor. The closest facility is about 18 stream miles upstream of the site.

A standard qualitative benthic sample was collected on 28 July 2005. The stream was about 12 meters wide at the reach sampled, with an average depth of 0.3 meter. Channel modification was not evident. Substrate was sand for roughly one-half of the area, with the remainder a good mix of boulder, cobble, and gravel with a small amount of silt. Substrate embeddedness was about 50 percent. Sticks and leaf packs, snags and logs, undercut banks, and root mats were common. Aquatic macrophytes were absent. Hydrologically, the stream at the site was primarily a run with infrequent riffles and pools. The water was slightly turbid. Bank vegetation was sparse, allowing for erosion during high flows. The riparian zone was wide and intact on both sides of the stream. The overall habitat score was 57. Conductivity was 68 µmhos/cm.

The site has been sampled during the normative summer sampling period on four occasions prior to 2005: twice in 1991, and once each in 1995 and 2000. The site was also sampled in March 1988. For summer sampling, the site has received bioclassifications of Good each time (including 2005), with the exception of 1995 when it received a Good-Fair rating. For summer standard qualitative samples, the biotic index has ranged from 5.4 to 6.0 with no trend evident. The number of EPT taxa was the highest in 2005 (28 taxa) for all summer sampling events at the site.

Two caddisflies (*Cheumatopsyche* and *Chimarra*) were observed to be dominant during sampling in 2005. Other abundant taxa were several mayflies (*Caenis, Isonychia, Stenonema modestum,*

Tricorythodes), three case-building caddisflies (*Nectopsyche exquisita, N. pavida, Oecetis persimilis*), a whirligig beetle (*Dineutus*), two riffle beetles (*Dubiraphia, Macronychus glabratus*), two dragonflies (*Gomphus, Neurocordulia obsoleta*), a non-biting midge (*Pentaneura*), a sideswimmer (*Crangonyx*), two snails (*Amnicola, Helisoma anceps*), a flatworm (*Dugesia tigrina*), and water mites (Acari). Tolerance values for the abundant taxa ranged from intolerant (2.8 for *Chimarra*) to tolerant (7.9 for *Cragonyx*).

The highest number of EPT taxa during summer sampling was recorded for 2005, with 28 EPT taxa present. Previous numbers of EPT taxa for summer sampling ranged from 16 to 24. New records for the site include two mayflies (*Callibaetis, Pseudocloeon dardanum*), a damselfly (*Calopteryx*), a dragonfly (*Progomphus*), a stonefly (*Acroneuria abnormis*), several caddisflies (*Hydropsyche rossi, Hydroptila, Oxyethira, Protoptila, Oecetis nocturna, Triaenodes ignitus*), and a riffle beetle (*Microcylloepus pusillus*).

In the previous basinwide report concern was expressed at the loss of a caddisfly (*Brachycentrus nigrosoma*) and a snail (*Elimia*) at the site. *Elimia* was common in 2005 and therefore can no longer be considered a loss. *Brachycentrus nigrosoma* was only recorded once, in 1995, when it was rare. It would be difficult to make the argument that the absence of the caddisfly from subsequent samples is significant when it was rare the single time it was collected and absent during two prior sampling events.

Buffalo Creek, SR 1941, Johnston County

This site is located approximately nine river miles above the confluence with the Little River and has a drainage area of 41.2 square miles. Land use in this rural watershed is mostly forested and agricultural. The average width of this site was 6 meters. Instream habitats were comprised of deep swift sandy runs with abundant deadfall snags. Vegetative cover was good and the riparian corridor was wide. The total habitat score was 60 using the Mountain/Piedmont criteria and 83 using Coastal Plain criteria (Appendices F-7 and F-8).

Buffalo Creek has been sampled for fish here now during three basinwide cycles and continues to show a stable, Coastal Plain like assemblage with an unchanged rating of Good-Fair (NCIBI score = 44 in 2000 and 2005). During the current assessment, 16 species of fish were represented, but the total number of fish collected was roughly half of the total catch in the last cycle (n=139 in 2000, n=73 in 2005). Comparable to the 2000 sample, redbreast sunfish (n=16) and tessellated darter (n=12) were the two dominant fish collected, representing 22 and 16% of the fish captured, respectively. Similar to the Little River site, no exotic species were collected during this monitoring effort.

Little Buffalo Creek, SR 2143, Johnston County

This site on Little Buffalo Creek was sampled for the first time for fish community assessments in 2005. The creek is a tributary to the Little River and drains northeastern Johnston County, northwest of the Town of Kenly, and also a portion of southwest Wilson County. There are no NPDES facilities within the creek's watershed upstream of the monitoring site. This site was upstream from the maximum extent of the former impoundment created by Lowell Mill Dam on the Little River. The dam was breached on December 28, 2005 and will now permit upstream migration of anadromous fish (e.g., American shad and striped bass) to almost 40 additional miles of rivers and streams in Johnston County.

In 2005, only 100 fish, representing 16 species, were collected from this very blackwater stream. The dominant species were the redfin pickerel and bluegill. Little Buffalo Creek was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected. The fauna was typical of that found in many Coastal Plain streams (i.e., pirate perch, flier, bluespotted sunfish, and eastern mudminnow).

Little River, NC 581, Wayne County

Little River at NC 581 has a drainage area of 280 square miles. The nearest active permitted NPDES discharger is about 14 stream miles upstream of the site, and is classified as minor.

A standard qualitative benthic sample was collected on 28 July 2005. The stream was about 16 meters wide at the reach sampled, with a mean depth of 0.6 meter. Channel modification was not evident. Substrate was a mix of sand and silt with a small amount of gravel. Sticks, snags and logs, undercut banks, root mats, leaf packs, and aquatic macrophytes were all present but rare. Hydrologically, the stream reach was a run with pools absent. One rocky riffle of generous length was present about 80m upstream of the road crossing. The current was slow to moderate. Banks were sparsely vegetated or otherwise composed of grasses, allowing for erosion during high flows. The riparian zone was wide on both sides, but with frequent breaks on one side of the stream. The overall habitat score was 52 using Coastal Plain criteria. Conductivity was 88 µmhos/cm.

Two caddisflies (*Chimarra, Nectopsyche exquisita*) were both observed to be dominant during sampling in 2005. Other abundant taxa were two mayflies (*Isonychia, Stenonema modestum*), a damselfly (*Argia*), a dragonfly (*Gomphus*), two caddisflies (*Cheumatopsyche, Oecetis persimilis*), a whirligig beetle (*Dineutus*), three riffle beetles (*Dubiraphia, Macronychus glabratus, Stenelmis*), a dobsonfly (*Corydalus cornutus*), two non-biting midges (*Cryptochironomus, Polypedilum scalaenum*), megadriles (related to earthworms), a commonly-encountered invasive clam (*Corbicula fluminea*), a snail (*Amnicola*), and water mites (Acari). Tolerance values for abundant taxa range from intolerant (2.8 for *Chimarra*) to highly tolerant (9.0 for megadriles).

New macroinvertebrate taxa recorded for the site in 2005 include two mayflies (*Pseudocloeon dardanum, Tricorythodes robacki*), a damselfly (*Ischnura*), and dragonfly (*Helocordulia*), a stonefly (*Acroneuria*

abnormis), a microcaddisfly (*Protoptila*), several non-biting midges (including *Cryptochironomus*, a psammophilic midge) and megadriles.

The benthos at this site has been sampled three times prior to 2005 (in 1991, 1995, and 2000). The site rated as Good in 1991, as Good-Fair in 1995 and 2000, and has returned to a Good rating after sampling in 2005. The biotic index has ranged from 5.5 to 6.1 with no trend evident. The number of EPT taxa has ranged from 17 to 25, again with no clear trend evident over the four sampling events. There has been a shift in the observed substrate composition, from larger substrate particles to smaller with time (Figure 15). The sudden appearance and abundance of megadriles may be a reflection of the high amount of silt observed in 2005.

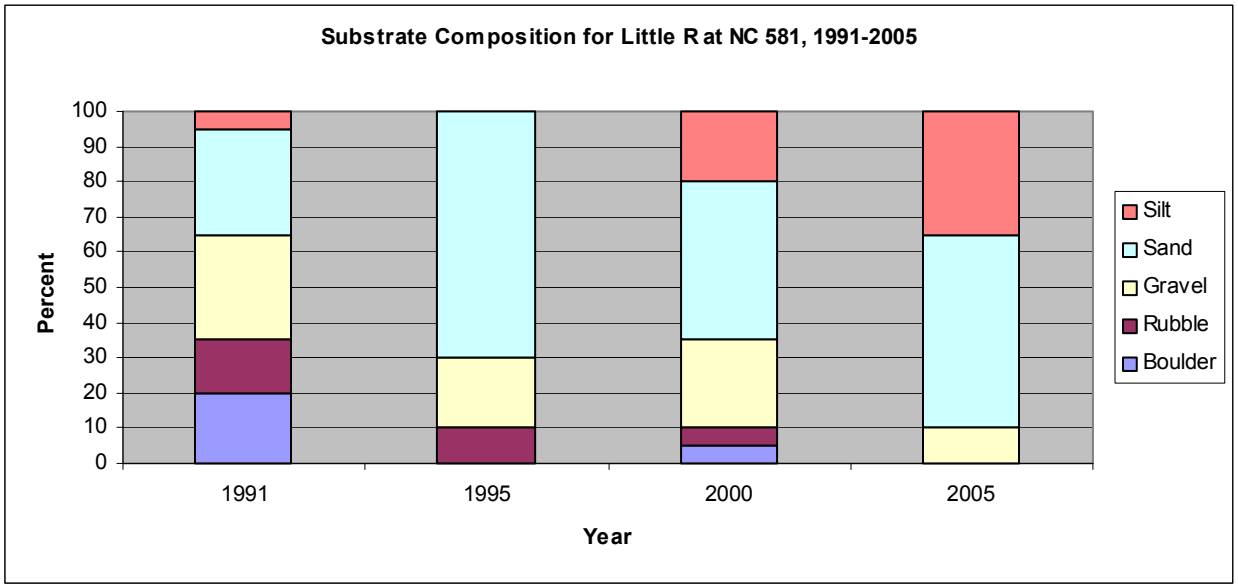


Figure 15. Visual estimates of substrate composition for Little River at NC 581 for the years 1991, 1995, 2000, and 2005.

Special Studies

Planning Section Requests

Two additional benthic sites were requested by the Planning Section for sampling in 2005. Buffalo Creek at SR 1007 was selected to help remedy a need for more water quality data in the upper part of its watershed. The site had been sampled once before, in 1991, when it received a classification of Poor. The site rated as Fair after it was sampled in July 2005. Little River at SR 1234 satisfied a request for a site within a 303(d)-listed segment of the stream to assess whether low dissolved oxygen levels are associated with natural conditions. The site had not been sampled before. After sampling in July 2005 the site received a classification of Good-Fair. Without prior benthic data for comparison the question of whether low dissolved oxygen levels at the site are natural can not be addressed (Biological Assessment Unit Memorandum B-060109).

Buffalo Creek, SR 1007, Wake County.

At the request of Raleigh Regional Office, Buffalo Creek was sampled for fish at SR 1007 in Wake County. The request was made in anticipation of future development in this rural watershed in eastern Wake County above Wendell Lake. This monitoring site is located in an area of transition between the Northern Outer Piedmont and the Rolling Coastal Plain level IV ecoregions (Griffith et al, 2002) and contains several Coastal Plain type species. The fish community sample showed a fairly good trophic structure (number of species = 17) despite a low total number of fish collected (n=130). Using the NCIBI, the water quality rating for Buffalo was Good, with an NCIBI score of 48.

NEUSE RIVER SUBBASIN 07

Description

This is the largest subbasin in the Neuse River basin, encompassing over 1,000 square miles in nine different counties, including portions of Franklin, Wake, Johnston, Nash, Wilson, Wayne, Pitt, Lenoir, and almost all of Greene County (Figure 16). It contains all the Contentnea Creek catchment, including Buckhorn Reservoir and its two primary tributaries, Moccasin Creek and Turkey Creek. Buckhorn Reservoir was expanded in 1999 (from 750 Acres to 2,300 Acres), flooding some stream sites that had previously been sampled by the NCDWQ in 1995.

The streams in the western part of the subbasin (approximately west of US 301) have piedmont characteristics, while those east of US 301 are considered coastal plain. Many of the streams in the coastal plain portion of this subbasin are slow-flowing and swamp-like.

Most of subbasin 07 lies within the Rolling Coastal Plains Ecoregion but the western portion is in the Northern Outer Piedmont and the Southeastern Floodplains and Low Terraces is located along the Neuse River (Griffith *et al*. 2002). The Rolling Coastal Plain has more relief, higher elevations and better drainage. Agricultural practices in the area include corn, soybean, tobacco, cotton, sweet potatoes, wheat and peanuts. Much of the Northern Outer Piedmont is comprised of gneiss, schist rocks with granitic plutons veneered with saprolite. Loblolly pine and local communities of disjunct mountain trees cover the land. The fall-line is along the eastern portion of this ecoregion. The Southeastern Floodplains and Low Terraces is a riverine ecoregion that acts as an essential wildlife corridor and habitat. Large sluggish rivers, backwaters, ponds, swamps, and oxbow lakes dominate the hydrography. The soils are alluvium and terrace deposits of sand, clay and gravel. Vegetation is mostly oak dominated bottomland hardwood forests and river swamp forests of bald cypress and water tupelo. Based upon CGIA coverage 1993 – 1995, approximately 40% of the land cover is cultivated crop and 53% is forest or wetland (NCDENR 2002).

There are many hog facilities with the greatest concentrations along lower Contentnea Creek, Sandy Run/Little Contentnea Creek, and Nahunta Swamp. Most of this subbasin has a high nonpoint source pollution potential, including runoff from cropland, forageland, and animal operations (NRCS 1995). Small towns are scattered throughout subbasin 07, with the town of Wilson being the biggest municipality, located in the north central part of the subbasin. Water quality in this subbasin is potentially affected by a combination of nonpoint source runoff and 16 NPDES permitted dischargers. Four of these are major dischargers and one minor discharger is also required to perform WET testing.

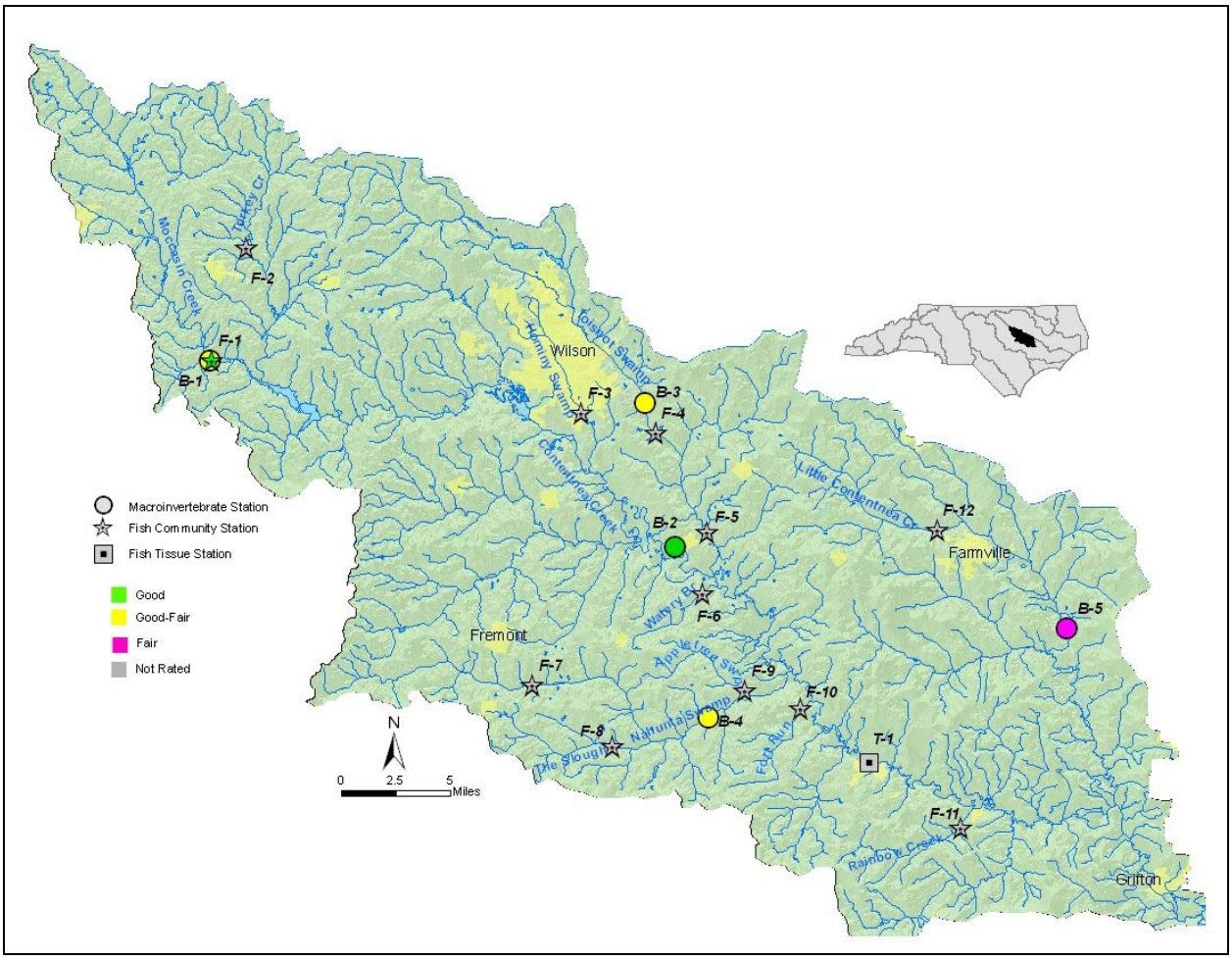


Figure 16. Sampling sites in Subbasin 07 of the Neuse River basin.

Overview of water quality

All of the benthic basinwide sites in Neuse subbasin 07 either retained or improved upon the bioclassifications obtained in 2000. This is consistent with the relationship between rainfall and nonpoint pollution. During drier years such as 2005, nonpoint source pollution is less of an issue than in wetter years such as 2000. Moccasin Creek at NC 231 and Little Contentnea Creek at US 264A retained the same bioclassifications at Good-Fair and Fair respectively. Toisnot Swamp at US 264A and Nahunta Swamp at SR 1058 both improved from Fair to Good-Fair while Contentnea Creek at NC 222 rose from Good-Fair to Good. Although the Biotic Index (BI) improved at some sites, many of the improvements in this subbasin are due to increased taxa richness, including at Nahunta Swamp, SR 1058, where the highest diversity in the subbasin (richness = 98) was found. The one ratable fish community site in this subbasin (Moccasin Creek at NC 231) continues to show high quality water despite a decrease in bioclass from Excellent to Good. The Zebulon WWTP (NC0079316) discharges 1.9 MGD of effluent about 9.5 miles above the Moccassin Creek fish community site. No effluent toxicity violations have been reported for this facility.

There are four ambient monitoring stations within Neuse subbasin 07; Contentnea Creek near SR 1800 at Grifton (J7810000), Little Contentnea Creek at SR 1125 near Ballards Crossroads (J7739550), Contentnea Creek at NC 123 at Hookerton (J7450000), and Contentnea Creek at NC 581 near Lucama (J6740000). Iron concentrations exceeded action level water quality standards at all sites. Iron exceeded these action level standards in 79 to 100% of samples collected across stations. In addition, at

Contentnea Creek (J6740000), the dissolved oxygen (DO) was less than 5.0 mg/L 10.3% of the time and manganese exceeded the water quality standard for Water Supply classification in 37% of the samples collected.

Table 11. Waterbodies monitored in Subbasin 07 in the Neuse River basin for basinwide assessment, 2000-2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Moccasin Cr	Nash	NC 231	Good-Fair	Good-Fair
B-2	Contentnea Cr	Wilson	NC 222	Good-Fair	Good
B-3	Toisnot Swp	Wilson	US 264A	Fair	Good-Fair
B-4	Nahunta Swp	Greene	SR 1058	Fair	Good-Fair
B-5	L Contentnea Cr	Pitt	US 264A	Fair	Fair
F-1	Moccasin Cr	Johnston	NC 231	Excellent	Good
F-2	Turkey Cr	Nash	SR 1109	Not Rated	Not Rated
F-3	Hominy Swp	Wilson	SR 1606	Not Rated	Not Rated
F-4	Toisnot Swp	Wilson	US 264	Not Rated	Not Rated
F-5	Toisnot Swp	Wilson	NC 222	Not Rated	Not Rated
F-6	Watery Br	Greene	NC 58	Not Rated	Not Rated
F-7	Nahunta Swp	Wayne	SR 1537	Not Rated	Not Rated
F-8	The Slough	Wayne	SR 1535	Not Rated	Not Rated
F-9	Appletree Swp	Greene	SR 1216	Not Rated	Not Rated
F-10	Fort Run	Greene	NC 58	Not Rated	Not Rated
F-11	Rainbow Cr	Greene	SR 1091	Not Rated	Not Rated
F-12	Little Contentnea Cr	Pitt	SR 2107	Not Rated	Not Rated

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

Three benthic sites sampled in the previous basinwide cycle were not sampled in 2005 for various reasons. Turkey Creek at SR 1109 had no flow, Wheat Swamp at NC 58 was too deep at the time of swamp sampling, and Contentnea Creek at SR 1800 was too large and may require the use of a boat to sample in subsequent years.

Six of the fish community sites in this subbasin had never been sampled before this monitoring cycle. All of these new sites are currently not rated. However, revisions to the NCIBI metrics and scoring criteria are currently underway for the Coastal Plain ecoregion. Locations visited but not sampled for fish community assessments included Nanhunta Swamp at SR 1353, Wayne County (the stream was too deep to sample), Great Swamp at SR 1353, Wayne County, and Sandy Run at US 258/13, Greene County (these waterbodies were braided swamps).

Moccasin Creek, NC 231, Nash County

The Zebulon WWTP (NC0079316) is seven miles above this site, discharging into a UT of Moccasin Creek. Oxygenation ditches and UV-B treatment of effluent at the plant greatly improve the water quality in the receiving stream. (See special study section for subbasin 07).

At four meters wide, Moccasin Creek at NC 231 has a watershed area of 56.6 square miles. It scored well on the overall habitat assessment with a rating of 82. Habitat consisted mostly of rocks and root mats with sangs and leafpacks lacking. The substrate was predominantly cobble and gravel with small amounts of boulder and sand. Pools were infrequent. As in the drought year 2002 (116 μmhos/cm), the conductivity was elevated at 109 μmhos/cm. In 2000 the measurements were 63 μmhos/cm and 85 μmhos/cm. A moderate amount of erosion was observed. Trash was present in the stream channel at the time of sampling.

Moccasin Creek at NC 231 has been sampled for macroinvertebrates six times prior to the 2005 basinwide cycle. EPT samples were collected in 1991 (Good-Fair), 1995 (Good-Fair), 1996 (Fair), 2000 (two Good-Fair ratings), and in 2002 (Not Rated) for a study on the effects of drought. An EPT sample was collected again in 2005. As in the past, the rating obtained was Good-Fair. The EPT BI (5.6) and EPT taxa richness (15) were comparable to values obtained in the past (EPT BI 5.2 to 6.0 and EPTs 12 to 17). Some improvement has occurred at this site since the drought of 2002. Three more EPT taxa were found in 2005 and the BI dropped by 0.4. *Hexagenia* was collected at this site for the first time in 2005 and *Serratella deficiens* (TV=2.8) was the only intolerant taxa found in that sample.

This site has been sampled for fish in all of the basinwide monitoring cycles to date. The fish community declined from a rating of Excellent (NCIBI score of 58 in 2000) to Good with the highest NCIBI score for that rating (52). Most notably, the trophic structure in this transitional (Piedmont to Coastal Plain) section of the stream was skewed towards a high percentage of insectivores (90%) and the percentage of omnivores+herbivores was low (5%). However, only one less species was captured in the current sample (n=25) in comparison to data from the last monitoring cycle. The change in bioclass is likely a result of natural variation, but may also be related to the post-hurricane de-snagging efforts that occurred in this reach of Moccasin Creek since the 2000 fish community sample. Bluegill was the dominant fish species collected in this sample.

Turkey Creek, SR 1109, Nash County

The watershed of Turkey Creek drains southeastern Franklin and southwestern Nash counties. The 2005 fish community assessment site was moved approximately 3.3 miles downstream from the site monitored in 2000 (at SR 1131) to coincide with the benthic macroinvertebrate site. The difference in watershed size was 7.5 square miles. The SR 1131 and the SR 1109 sites are regional fish community reference sites whose data will be used to determine metric criteria for rating Coastal Plain streams. There are no NPDES facilities in the watershed upstream of the monitoring site.

The stream is on the eastern edge of the Northern Outer Piedmont and the western edge of the Rolling Coastal Plain Level IV ecoregions (Griffith *et al*. 2002). Habitat assessments scored the site 68 using Mountain/Piedmont criteria and 91 using Coastal Plain criteria (Appendix F-7, and Appendix F-8). The substrate is gravel, sand, sticks, and large, coarse woody debris. Instream habitats consist of large coarse woody debris, deadfalls, and pools. The riparian zone is intact and wide along both banks.

In 2005, 239 fish, representing 18 species and 6 species of sunfish, were collected from this site. The dominant species was the highfin shiner. In 2005, no suckers were collected; a situation encountered at only two other sites in the Coastal Plain (Moseley Creek in Subbasin 05 and Hominy Swamp in Subbasin 07). The fauna was typical of that found in many Coastal Plain streams (i.e., American eel, pirate perch, mud sunfish, flier, bluespotted sunfish, and tadpole madtom).

Contentnea Creek, NC 222, Wilson County

The Wilson WWTP (14.0 MGD to Contentnea Creek, NC0023906), approximately seven miles above NC 222, had a limit violation in 2001 for fecal coliform bacteria, in 2003 for flow and BOD, and in 2005 for Ammonia. Approximately 20 miles upstream on Bailey Branch, the Town of Bailey maintains two WTP's; Well #1 (NC0086061) and Well #2 (NC0086541). The Zebulon WWTP (NC0079316) is 30 miles upstream on a UT to Moccasin Creek.

The width of Contentnea Creek at NC 222 was 16 meters with a drainage area of 382.8 square miles. The substrate was sand (65%) gravel (25%), cobble (5%), and silt (5%). Colonizable habitat was sparse but included snags, rootmats, and leafpacks. The overall habitat score was 77 based on Coastal Plain criteria. Water chemistry was similar to that measured in 2000. The conductivity was 133 μmhos/cm. Dissolved oxygen measured 5.1 mg/L and the pH was 6.7.

Biological integrity seems to be improving at this site as the macroinvertebrate bioclassification improved from Good-Fair in 2000 to Good in 2005. Total taxa richness, EPT taxa richness and the Biotic Index (BI) were all slightly better than 2000, with values of 81, 22, and 6.2 in 2005 respectively. However, the improvement in the EPT BI was more evident; that value improved from 5.6 in 2000 to 4.8 in 2005. In general, more intolerant EPT taxa replaced more tolerant ones. For mayflies, *Isonychia*, *Stenonema exiguum*, *Pseudocloeon propinquum* and *Plauditus dubius* replaced *Stenonema integrum*, *Paracloeodes*, *Hexagenia*, *Pseudocloeon ephippiatum*, and *Acerpenna pygmea*. In the Order Trichoptera, *Neureclipsis*,

Oecetis sp D (Floyd), and *Cheumatopsyche* replaced *Pycnopsyche*. In addition, *Neoperla* was also collected in 2005 and was not present in 2000.

Hominy Swamp, SR 1606, Wilson County

The watershed of Hominy Swamp drains the City of Wilson in central Wilson County. The watershed is urban and there are no NCPDES facilities upstream of the monitoring site. This site received the lowest habitat score of any non-channelized fish community site in the Coastal Plain in 2005 (score = 46) (Appendix F-8). The conductivity was also elevated at 196 µmhos/cm, indicative of nonpoint source urban runoff. It was also elevated in 1995 (242 µmhos/cm).

In 2005, only 97 fish, representing 10 species were collected in contrast to 270 fish representing 19 species, which were collected in 1995. The dominant species during both periods was the tolerant eastern mosquitofish. Hominy Swamp was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected. A greater percentage of tolerant fish (73 percent) were present at this site than at any other site in the Coastal Plain, except for at Big Chinquapin Branch (Jones County, Subbasin 11). In 2005, no suckers were collected; a situation encountered at only two other sites in the Coastal Plain (Moseley Creek in Subbasin 05 and Turkey Creek in Subbasin 07).

Toisnot Swamp, US 264A, Wilson County

Wilson Technical Community College, a minor discharger (0.0144 MGD to UT Toisnot Swamp, NC0084581) lies approximately 3 miles above US 264A. It is required to perform WET testing but received no notices of violation from 2000 to 2005. However, it did have one limit violation in July of 2001 for toluene. There is one other NPDES discharger about 20 miles above this site on Toisnot Swamp, Southern Nash High School (NC0037915).

Toisnot Swamp, a Coastal Plain stream, was nine meters wide at US 264A at the time of sampling the summer of 2005. The drainage area at this point is 63.3 square miles. Pool variety was poor. The substrate was mostly sand (85%) and silt (15%). Macroinvertebrate habitat was sparse, though snags and root mats were present. The resulting overall habitat score was 75, an increase from 66 in 2000. The conductivity was 63 µmhos/cm.

Toisnot Swamp has been sampled at this location three times prior to 2005. Full Scale samples were collected in 1996 (Fair) and 2001 (Good-Fair), while the last basinwide EPT sample rated Fair in 2000. An EPT sample was collected from Toisnot Swamp again in 2005, and was rated Good-Fair. The biological integrity has steadily improved from 1996 to 2005. Only 5 EPT with an EPT BI of 5.8 were found in 1996. In 2005, 14 taxa were collected with a resulting EPT BI of 4.8. Half of the taxa were abundant and the EPT abundance tripled. *Chimarra*, *Hydropsyche rossi, Nectopsyche pavida*, *Oecetis sp A* (Floyd), and *Oecetis nocturna* were all new taxa found in 2005. Intolerant taxa included *Nectopsyche* (TV=2.9) and *Oecetis sp A* (TV=2.0).

Toisnot Swamp, US 264, Wilson County

The watershed of Toisnot Swamp drains southern Nash and north central Wilson County including the eastern edge of the City of Wilson. There are two NPDES facilities upstream from the fish community monitoring sites. One facility (NC0037915, Southern Nash High School) is located approximately 22 miles upstream and discharges 0.015 MGD to the swamp. The other facility (NC0084581, Wilson Technical Community College) is located approximately 4.5 miles upstream and discharges 0.0144 MGD to an unnamed tributary to the swamp. Neither facility because of its size and distance upstream of the site should be having much of an impact on the aquatic community at the US 264 site. The habitat score at this site was 89 in 2005 (Appendix F-8).

The fish community at this site was last sampled in 1991. At that time, 187 fish representing 22 species were collected. The dominant species were the redbreast sunfish and bluegill. In 2005, 129 fish representing 22 species were collected; the dominant species were bluegill, redbreast sunfish, and the American eel. The diversity of fish was good but the abundance was low and 14 of the 22 species were represented by only 1 or 2 fish per species. Thus, the percentage of fish with multiple age groups was low, only 35 percent. Based upon DWQ data, 29 species of fish are now known from the site including nine species of sunfish and four species of darters. The diversity of minnows is rather low, only three species were collected at the site and none in 2005.

Toisnot Swamp, NC 222, Wilson County

This fish community site is located approximately 6.5 miles below the site at US 264 and approximately 2.7 miles above the swamp's confluence with Contentnea Creek. Although there are two NPDES facilities located above the site, neither facility because of its size and distance upstream should be having much of an impact on the aquatic community at the NC 222 site. The conductivity during fish community sampling, 1995 – 2005, has ranged from 77 to 98 µmhos/cm. The habitat scores have ranged from 74 in 2000 to 88 in 2005 (Appendix F-8). The major difference in scores between years was attributed to the differences in the weighting of the metrics in earlier versions of the habitat assessment forms.

The fish community in Toisnot Swamp was sampled during the past three basinwide cycles. Based upon DWQ data, 32 species of fish are now known from the site including 5 species of sunfish, 6 species of minnows, and 6 species of darters. In 2005, the numbers of fish and species declined from the 2000 totals (Figure 17). The declines were due to an absence of dusky shiner, swallowtail shiner, and eastern silvery minnow and overall declines in redbreast sunfish, bluegill, and satinfin shiner. The water was deeper and the wetted stream width wider in 2005 than in 2000 which may have been partly responsible for the decreases between years. The dominant species since 1995 have been the redbreast sunfish, eastern mosquitofish, and tessellated darter. The percentage of tolerant fish has ranged from 37 to 46 percent and the number of intolerant species present has been two or three species.

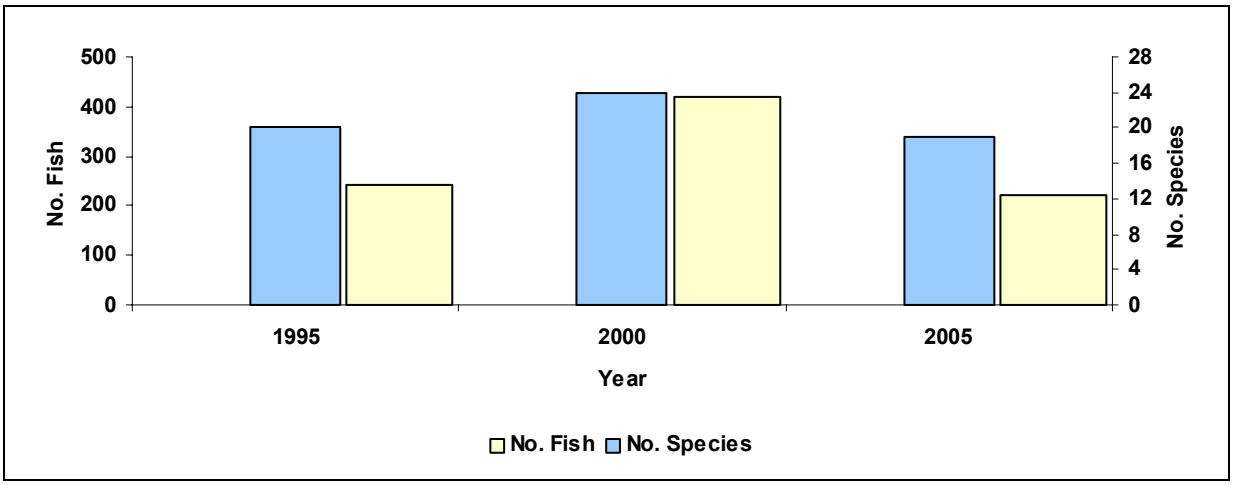


Figure 17. Number of species and individuals of fish at Toisnot Swamp at NC 222, Wilson County.

Watery Branch, NC 58, Greene County

This site on Watery Branch was sampled for the first time for fish community assessments in 2005. This small creek (watershed area = 6.5 square miles) drains northwestern Greene and northeastern Wayne counties. There are no NPDES facilities within the creek's rural watershed upstream of the monitoring site. The site was approximately one mile above its confluence with Contentnea Creek. This creek was the only fish community site in the Coastal Plain where the pH was less than 6.0 s.u. (pH = 5.5 s.u., Appendix F-10).

In 2005, 198 fish, representing 14 species, were collected. The dominant species was the dusky shiner, almost 40 percent of all the fish collected were of this species. Watery Branch was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected. The fauna was typical of that found in many Coastal Plain streams (i.e., golden shiner, creek chubsucker, redfin pickerel, bluespotted sunfish, and redbreast sunfish).

Nahunta Swamp, SR 1537, Wayne County

This site on Nahunta Swamp was sampled for the first time for fish community assessments in 2005. The swamp drains northern Wayne and northeastern Johnston counties and is a tributary to Contentnea Creek. The watershed includes the towns of Fairmont and Pineville. There are no NPDES facilities currently discharging within the swamp's watershed upstream of the monitoring site. Prior to November 2003, North Wayne Junior High School (0.2 miles upstream) and C. B. Aycock High School (2 miles upstream) collectively discharged 0.022 MGD into the swamp upstream

of the monitoring site. These two facilities were inactive as of November 20, 2003.

In 2005, 259 fish, representing 23 species, including five species of sunfish, 5 species of minnows, and 3 species of darters were collected. The dominant species was the tessellated darter, almost 40 percent of all the fish collected were of this species. The fauna was typical of that found in many Coastal Plain streams (i.e., American eel, dusky shiner, creek chubsucker, redfin pickerel, and redbreast sunfish).

Nahunta Swamp, SR 1058, Greene County

Nahunta Swamp is classified as a Coastal A stream. The substrate was 80% sand and 20% silt. The width at SR 1058 was estimated at 10 meters with a drainage area of 78.6 square miles. The overall habitat score was 76, similar to the 69 received in 2000. The moderate amount of macroinvertebrate habitat included sticks, snags, and root mats but leafpacks were lacking. The stream was a long run without any pools. Conductivity measurements have been consistent (92 to 99 µmhos/cm) since 1995. The DO reading was 5.6 mg/L.

This site has been sampled for macroinvertebrates six times prior to the 2005 basinwide cycle. Full Scale samples were conducted in 1988 (Fair), 1990 (two Good-Fair ratings), 1995 (Fair), and 2000 (Fair). On EPT sample in 1999 rated Fair. The bioclassification was Good-Fair in 2005, with the highest taxa richness (96) and EPT taxa richness (19) ever recorded at this site. In fact, this site contained the highest diversity of macroinvertebrate fauna in subbasin 07. Twenty four new taxa were found at this site in 2005. This list included two ephemeropterans (*Hexagenia* and *Tricorythodes*), and three new caddisflies (*Chimarra*, *Oecetis nocturna* and *Nectopsyche pavida*). Odonate and Coleoptera richness was very high, with 15 taxa in each order. Notable taxa in these groups included the beetles *Scirtes*, *Hydrochus*, *Coptotomus*, *Celina*, and *Hydrovatus* as well as the odonates *Stylurus*, *Helocordulia*, and *Pachydiplax longipennis*. Other notable taxa in the sample were *Belostoma* and Pyralidae, an intolerant family of aquatic moths (TV=2.0).

The Slough, SR 1535, Wayne County

The Slough is a small tributary to Nahunta Swamp and drains the north central region of Wayne County. There are no NPDES facilities within the watershed upstream of the monitoring site. The conductivity during fish community sampling, 1995 – 2005, has ranged from 80 to 97 µmhos/cm. The habitat scores have ranged from 69 in 2000 to 79 in 2005 (Appendix F-8).

The fish community at this site has been sampled during the past three basinwide cycles. Based upon DWQ data, 30 species of fish are now known from the site including 7 species of sunfish, 8 species of minnows, and 5 species of darters. The number of species collected at this site has ranged from 14 to 21 (Figure 18). The number of fish and species collected during the most recent monitoring periods was less than the numbers collected in 2000. The percentage of tolerant fish declined from 27 percent in 1995 to 14 percent in 2005. The dominant species has usually been the dusky shiner and the redbreast sunfish.

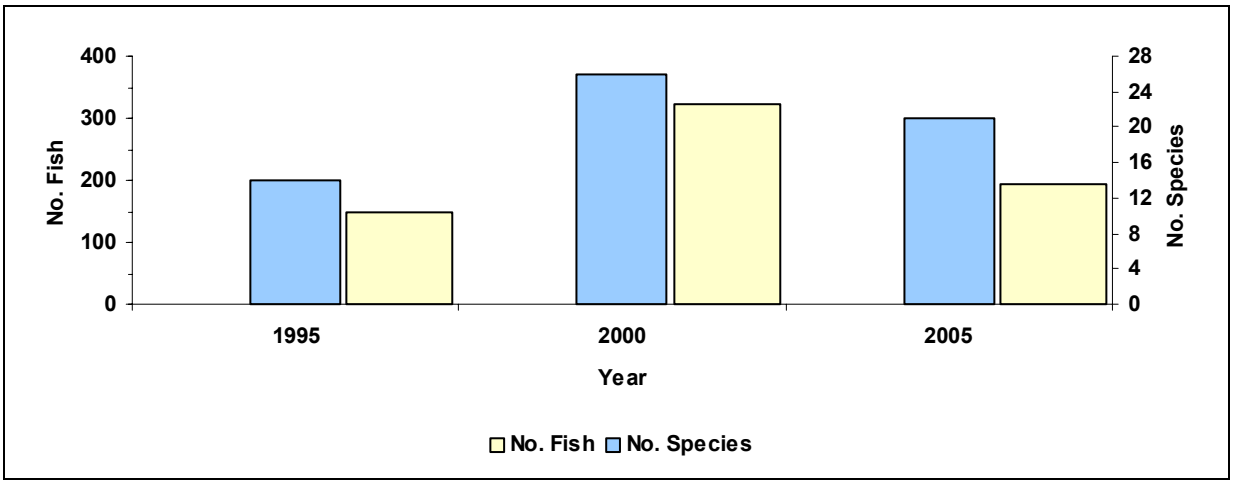


Figure 18. Number of species and individuals of fish at The Slough at SR 1535, Wayne County.

Appletree Swamp, SR 1216, Greene County

This site on Appletree Swamp was sampled for the first time for fish community assessments in 2005. The swamp drains northern western Greene and northeastern Wayne counties and is a tributary to Nahunta Swamp. There are no NPDES facilities within the swamp's rural watershed upstream of the monitoring site. The site is 0.4 miles above its confluence with Nahunta Swamp.

In 2005, 221 fish, representing 19 species, were collected. The dominant species was the dusky shiner, 41 percent of all the fish collected were of this species. The fauna was typical of that found in many Coastal Plain streams (i.e., the American eel, eastern mosquitofish, and tessellated darter). In 1960, Bayless and Smith (1962) collected 27 species at this site, including 11 species of centrarchids (sunfish, crappie, and bass). The dominant species then was the golden shiner and the pumpkinseed sunfish. Based upon Bayless and Smith (1962) and DWQ data, 32 species are now known from this site.

Fort Run, NC 58, Greene County

This site on Fort Run was sampled for the first time for fish community assessments in 2005. The creek drains west central Greene County and is a tributary to Contentnea Creek. There are no NPDES facilities within the creek's rural watershed upstream of the monitoring site. The site is 0.7 miles above its confluence with Nahunta Swamp.

This was the only fish community site monitored in 2005 in the Coastal Plain that did not have any canopy over the creek (Appendix F-8). The loss of tree canopy was attributed to hurricane destruction and subsequent harvesting or removal of the downed trees. Despite the destruction, the

riparian zones were wide and intact and overall, the habitat was of moderate quality (score = 75). With an open canopy, there was an abundance of several species of submerged macrophytes. The water was very dark, but the pH was not unusually low (pH = 6.0 s.u.). The creek was narrow and deep.

In 2005, only 67 fish, representing 15 species, were collected at this site. This was the second fewest fish collected at any Coastal Plain site in 2005. The diversity of fish was moderate but the abundance was low and 6 of the 15 species were represented by only 1 or 2 fish per species. Thus, the percentage of fish with multiple age groups was low, only 33 percent. The dominant species was the redbreast sunfish and golden shiner. Despite the low abundances, the fauna was typical of that found in many Coastal Plain streams (i.e., creek chubsucker, yellow bullhead, pirate perch, eastern mosquitofish, flier, and bluespotted sunfish).

Rainbow Creek, SR 1091, Greene County

This site on Rainbow Creek was sampled for the first time for fish community assessments in 2005. The creek drains southeastern Greene County and is a tributary to Contentnea Creek. There are no NPDES facilities within the creek's rural watershed upstream of the monitoring site. The site, upstream from the Town of Hookerton, is 1.4 miles above the creek's confluence with Contentnea Creek. Although the habitat was of high quality (habitat score = 87) the riparian zones had been logged in the past and had re-vegetated with thick stands of Oriental bittersweet and privet.

In 2005, 164 fish, representing 17 species including 4 species sunfish and 3 species daters, were collected. The dominant species was the dusky shiner, almost 30 percent of all the fish collected were of this species. The fauna was typical of that found in many Coastal Plain streams (i.e., the American eel, margined madtom, redfin pickerel, redbreast sunfish, and tessellated darter). In 1960, Bayless and Smith (1962) collected 18 species at this site. The dominant species then was the margined madtom and dusky shiner. Based upon Bayless and Smith (1962) and DWQ data, 22 species are now known from this site and the fish community did not seemed to have changed in the past 45 years.

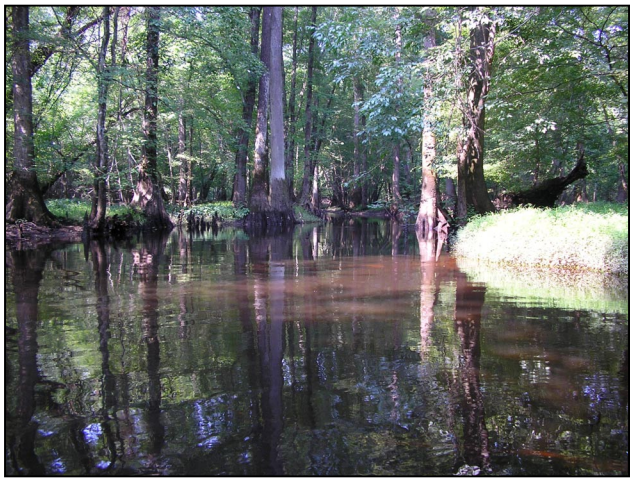
Little Contentnea Creek, SR 2107, Pitt County

As the name implies, Little Contentnea Creek is a tributary to Contentnea Creek. The tributary drains the southwestern corner of Pitt County, north of the Town of Farmville and also portions of northeastern Wilson and northern Green counties. There are no NPDES facilities within the rural watershed upstream of the monitoring site. The creek may have been channelized more than 50 years ago, but the riparian forests have re-vegetated since then. The conductivity during fish community sampling, 1995 and 2005, has been 99 and 95 µmhos/cm, respectively. The habitat scores were 54 in 1995 and 80 in 2005 (Appendix F-8). The major difference in scores between years was attributed to the different versions of the assessment criteria and the weighting of the criteria that were in use in 1995 and 2005.

The fish community at this site was last sampled in 1995. At that time only 34 fish representing 12 species were collected. Eight of the 34 fish were bluegill. In 2005, 119 fish representing 19 species were collected. The most abundant species was the bluegill, almost 40 percent of all the fish collected were of this species. Little Contentnea Creek was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected in 2005. Based upon DWQ data, 20 species are now known from this site.

In 1960, Bayless and Smith (1962) collected 20 species at a site on the creek approximately 3.6 miles upstream (at SR 1231, Pitt County). Minnows that were common in 1960, highfin shiner, dusky shiner, and ironcolor shiner, have not been collected at the lower site by DWQ in either 1995 or 2005.

Little Contentnea Creek, US 264A, Pitt County



Little Contentnea Creek at US 264A lies approximately 3.5 miles downstream of the Farmville WWTP (3.5 MGD to Little Contentnea Creek, NC0029572).

At US 264A, this Coastal A stream was eight meters wide. Flow was present but the stream had swamp-like characteristics such as tannic water and a slightly braided channel. The drainage area is 91.4 square miles. The substrate was mostly sand with some silt. Macroinvertebrate habitat included sticks, snags roots, macrophytes and leafpacks. Like many of the streams in the area, pool variety was lacking. Overall, the habitat scored well at 87 based on Coastal stream criteria. As in 2000, the conductivity measured 105 μmhos/cm (110 μmhos/cm in 2000).

This site has been sampled for macroinvertebrates twice before the 2005 basinwide cycle. Both an EPT sample in 2000 and a Full Scale sample in 2001 rated Fair. An EPT sample was collected again in 2005. The rating remained the same as in 2000 and 2001, Fair. The EPT taxa richness increased from six (2000) and four (2001) to nine and the EPT BI improved from 6.1 to 5.4 in 2005. New taxa included *Phylocentropus*, *Triaenodes ignitus*, *Oecetis sp E,* and *Hydroptila*.

Special Studies

Neuse Basin 303(d) Resamples

In 2001, five subbasin 07 sites were selected for macroinvertebrate resampling to determine their status on the 303(d) list of impaired streams. All sites except one were most recently rated Fair in 2000. A second Fair rating was required to place a given site on the list. Turkey Creek at SR 1109 improved to a Good-Fair bioclassification in 2001. It was very sandy with important mussel populations but recurring low DO values. Beaverdam Creek at SR 1111 also improved to Good-Fair but was expected to alternate between Fair and Good-Fair depending on stream flow conditions. Little Contentnea Creek at US 264A retained its Fair rating. Low DO may be an issue here. Contentnea Creek at SR 1606 was last sampled in 1996 when it received a Fair rating. In 2001, habitat was lacking at SR 1606 so the site was moved one road crossing downstream to SR 1622. The rating at this site improved to Good-Fair, but this reach of Contentnea Creek may be affected by both nonpoint and point source pollution from the town of Wilson and may be stressed by low DO in the summer months. Finally, Toisnot Swamp at US 264 also improved from Fair to Good-Fair, although it was characterized by low EPT richness. (See BAU memorandum B-020111 for more information).

Stantonsburg WWTP study: Contentnea Creek

The Raleigh Regional Office (RRO) requested that the BAU sample for benthos both above and below the Stantonsburg WWTP in 2002. It was suspected that the plant was dumping sludge into Contentnea Creek. The benthic community was assessed by boat. No sludge deposits were observed at either site.

In addition, there were no major differences between the upstream (borderline Good-Fair) and downstream site (Fair). However, Contentnea Creek is a stressed system affected by runoff from Hominy Creek and sedimentation from urban drainages in Wilson. (See BAU memorandum B-020507 for more information).

North Carolina Drought study
Moccasin Creek at NC 231 was sampled for macroinvertebrates in 2002 as part of an ongoing study exploring the effects of the drought on North Carolina streams. Low flows reduce the area of in-stream habitat, reduce the connectivity within the channel, increase temperatures and decrease dissolved oxygen levels. This site received a Fair bioclassification with 12 EPT taxa present. This was down from a Good-Fair in 1998, before the drought, when 17 EPT taxa were collected. (See BAU memorandum B-040823 for more information).

Bruce Foods Corporation study: Hominy Swamp
Bruce Foods operates a sweet potato cleaning, processing, and canning facility in Wilson. The RRO found wastewater from lagoons and spray fields was leaking into Hominy Swamp and its tributaries. In 2001, biological samples were collected from upstream and downstream of the facility. The upstream site, Hominy Swamp at SR 1606 (Wilson County), rated Poor as a result of the highly urban watershed that contains the town of Wilson. Channelization, eroding banks, very few riffles, a sandy substrate, and little in-stream habitat characterized this site. The downstream site also received a bioclassification of Poor. (See BAU memorandum B-010418 for more information).

CAWS Project sampling of Rainbow Swamp at 1091, Greene County
The Collaborative Assessment of Watersheds and Streams (CAWS) project sampled streams to determine causes and sources of benthic impairments to streams. Rainbow Swamp at 1091 was sampled for macroinvertebrates in 2001 as a non-channelized reference site for Clayroot Swamp. The EPT sample was not rated but the EPT taxa richness was 11 (3 to 9 at Clayroot Swamp sites) and the EPT BI was 4.86 (5.5 to 5.9 in Clayroot Swamp). (See BAU memorandum B-010522 for more information).

Stoney Creek WARP Study
In 2002, the Watershed Assessment and Restoration Program (WARP) conducted a macroinvertebrate study on Stoney Creek. Stoney Creek is influenced by agricultural practices, hydromodification, as well as urbanization from the city of Goldsboro. It is on the 303(d) list of impaired streams. Button Branch at SR 1556 (Wayne County) was a small stream selected as a reference site for the upper portions of Stoney Creek. It was too small to rate, but the EPT taxa richness was 10; twice that of a similarly sized impacted stream in the study. In addition, more intolerant taxa were present, the DO was higher and the conductivity was lower in Button Branch. The Slough at SR 1535 was also sampled as a reference site for the lower portions of Stoney Creek. Although it does have some agricultural impacts, this site rated Good-Fair and supports a benthic community with a much higher biological integrity than the benthic fauna found in Stoney Creek. (See BAU memorandum B-021023 for more information).

Special Request Sites from WaRO and RRO, 2005
UT Moccasin Creek, NC 39, Wake County

The Raleigh Regional Office (RRO) requested a benthic sample 350 meters downstream of the Zebulon WWTP on a UT of Moccasin Creek at NC 39. (Note: Many of the DWQ's records for this site list it as Little Creek but maps suggest it is a UT of Moccasin Creek). Despite the low DO reading of 4.2 mg/L and the high conductivity measurement of 429 μmhos/cm, this site rated solidly in the Good-Fair range. The Biotic Index (BI) was 6.3 and 16 of the 71 taxa present were EPT taxa. The benthic community reflects the low DO value measured in this stream. The midge community also indicates organic enrichment. Indicator taxa suggest that low flow may also be an issue during portions of the year. Intolerant taxa at this site include *Ablabesmyia annulata* (tv=2) and *Tanytarsus sp 4* (tv=2.7). (See BAU memorandum B-050131 for more information).

Nahunta Swamp, SR 1537, Wayne County

At the request of the Washington Regional Office (WaRO), a benthic sample was collected from Nahunta Swamp at SR 1537, upstream of the current basinwide site. The purpose of this sample was to obtain data in the upper watershed. The DO measured 5.6 and the conductivity was 88.5. The substrate was almost 100% sand. The upper reaches of Nahunta Swamp at SR 1537 rated Good-Fair. The BI was 6.8 and the EPT taxa richness was 16 although no stoneflies were present. Eighty eight taxa were found at this site including fifteen beetle taxa. Abundant taxa indicate possible low flow, low DO, and organic enrichment at this site. *Micropsectra*, *Nectopsyche exquisita*, *Oecetis sp A* and *Oecetis sp D* were the only intolerant taxa found. (See BAU memorandum B-050131 for more information).

Fish Tissue Monitoring

Contentnea Creek at Snow Hill

Largemouth bass, sunfish, redhorse sucker, and catfish samples were collected from Contentnea Creek at Snow Hill during 2003 and analyzed for mercury. The samples were collected as part of an eastern North Carolina mercury assessment. Individuals from all species (15 of 24 total samples) contained mercury concentrations exceeding the state criteria of 0.4 ppm. Mercury levels in all samples ranged from 0.13 to 0.82 ppm (Appendix F-13).

NEUSE RIVER SUBBASIN 08

Description

This subbasin consists of the Neuse River and its tributaries from Contentnea Creek to New Bern (approximately 22 river miles) (Figure 19). Most of this subbasin lies within Craven County. The two largest tributaries in this subbasin are Core Creek and Bachelor Creek. The headwaters of Core Creek have been channelized to promote drainage.

Land use is approximately 25% agricultural and 66% forest. There are some urban areas in the headwaters of Bachelor Creek. The only major discharger in the subbasin is Weyerhaeuser (NC0003191). This facility has a permitted flow of 32 MGD into the Neuse River above New Bern. The only other facility in subbasin 08 is also required to perform whole effluent toxicity (WET) testing. Craven County Wood Energy (NC0075281) discharges 0.2 MGD into Bachelor Creek.

The majority of subbasin 08 is in the Carolina Flatwood Eco-Region, but the extreme western portion is part of the Swamps and Peatland Ecoregion, and the southern portion lies within the Mid-Atlantic Floodplains and Low Terraces (Griffith *et al.* 2002). The coastal plain Carolina Flatwoods were historically shallow coastal waters and contain terraces and other coastal formations. The soils are either loamy soils or clayey, sandy, organic soils. The ecoregion is a center for biota and plant diversity. Pine Flatwoods, Pine Savannas, freshwater marshes, pond pine woodlands, and pocosins were naturally prevalent. Now, loblolly plantations dominate the scenery. Artificial drainage is quite common in agricultural areas within the ecoregion. The flat Swamp and Peatland ecoregion consists of poorly drained organic soils of peat and muck. The soils are dark and nutrient poor. Vegetation consists of a dense shrub layer with Bald Cypress, Atlantic white cedar, stunted Pond Pines, Swamp Red Bay, Sweet Bay and Swamp Tupelo. Pocosin lakes dot the landscape but large portions on the ecoregion have been cleared for corn, soybean and wheat. Large sluggish rivers, deep water swamps, and oxbow lakes characterize the Mid-Atlantic Floodplains and Low Terraces. The soils are made up of alluvial deposits and support Cypress Gum Swamps and Bottomland Hardwoods of Wetland Oaks, Green Ash, Red Maples, and Hickories.The Neuse River flood plain includes an extensive swamp forest, usually dominated by tupelo gum. Another significant natural area is Dover Bay, an unusual, double Carolina Bay.

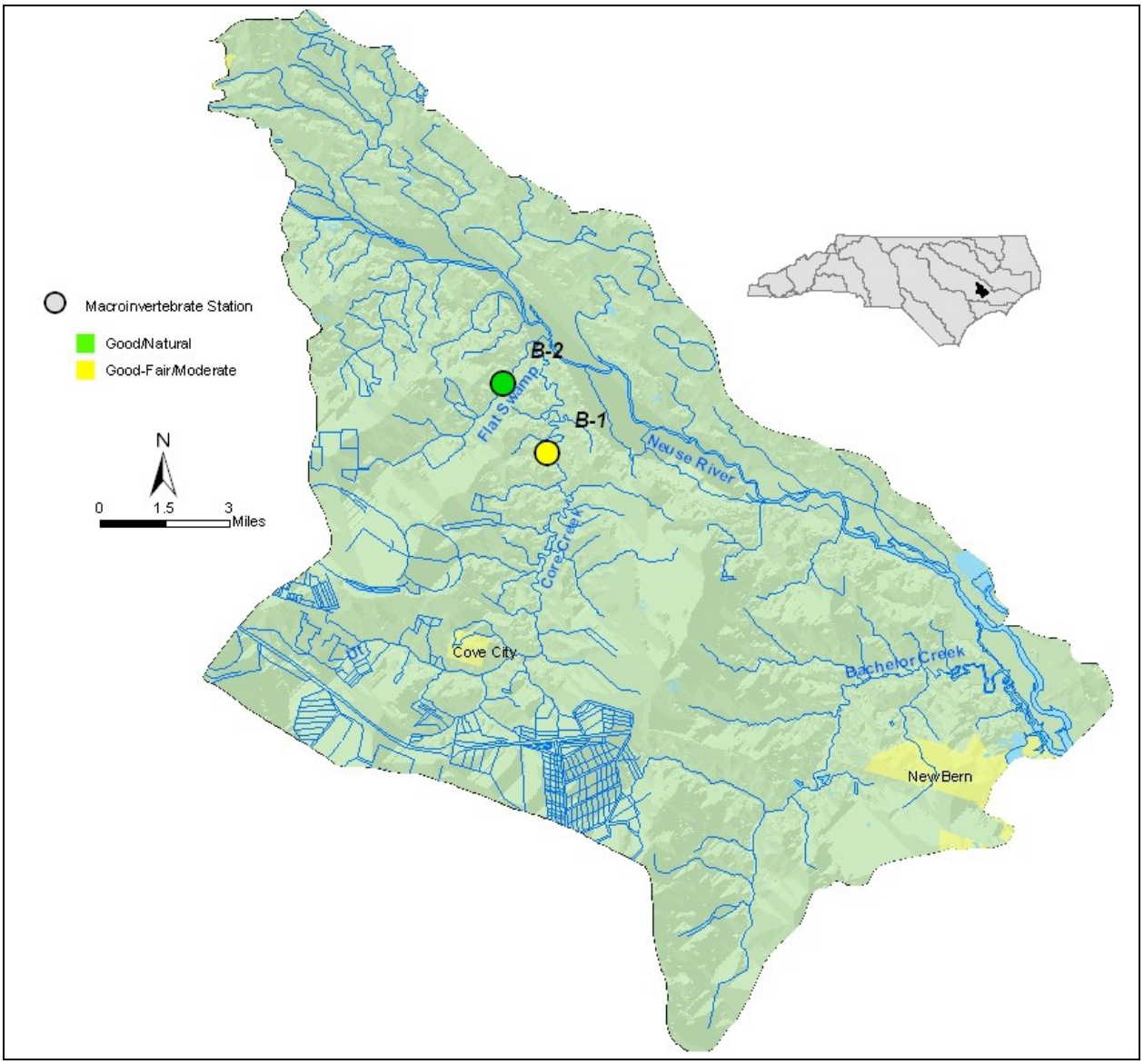


Figure 19. Sampling sites in Subbasin 08 of the Neuse River basin.

Overview of water quality

Both Core Creek at NC 55 and Flat Swamp at NC 55 showed improvement over the 2000 macroinvertebrate sampling effort. For the first time, Core Creek at NC 55 rated Good-Fair. Flat Swamp showed improved biological indices and retained it's Natural rating. Agricultural activities and hydromodification affect Core Creek just below SR 1239 in Craven county. Craven County Wood Energy (NC0075281) discharges 0.2 MGD into Bachelor Creek and had one WET permit limit failure in September of 2004 and one Limit Violation for oil and grease in March of 2003.

There are six ambient monitoring stations within Neuse subbasin 08. Although there were a few scattered readings of low pH and high turbidity levels at many of these sites, neither of these parameters exceeded the action level water quality standards in greater than 10% of the samples. Iron and copper were the only parameters to exceed action level water quality standards at any of the sites. At Neuse River at SR 1470 near Fort Barnwell (J7850000), iron exceeded standards in 80% of the samples, at Neuse River at Land Landing near Perfection (J7860000) 70% of the samples exceeded standards, and

at Neuse River at SR 1400 at Streets Ferry (J7930000) iron readings exceeded the standards in 68% of the samples collected. Iron was not measured at the other three sites in the subbasin. Copper exceeded standards in 10% of the samples at Neuse River at CM 52 below Swift Creek at Askin (J8250000), and 15% of samples at Neuse River at CM 52 at Mouth of Narrows near Washington Forks (J8290000).

Table 12. Waterbodies monitored in Subbasin 08 in the Neuse River basin for basinwide assessment, 2000-2005.

Map #[1]	Waterbody	County	Location	2000	2005
B-1	Core Creek	Craven	NC 55	Fair	Good-Fair
B-2	Flat Swamp	Craven	NC 55	Natural	Natural

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.

River and Stream Assessment

Core Creek, NC 55, Craven County

Core Creek at NC 55 was 12 meters wide with a drainage area of 53.9 square miles. It is a Coastal A stream with sand and detritus substrate. Snags, undercut banks, and roots provided most of the available habitat for macroinvertebrates. Water chemistry readings were similar to those recorded at this site in 2000. The DO was low at 4.2 mg/L (5.5 in 2000). Conductivity, although elevated, shows a steady improvement from 210 μmhos/cm in 1995, to 191 in 2000, and 150 in 2005. The pH was 6.8. In 2005, the overall habitat score was 75.

This site has been sampled using the macroinvertebrate Full Scale method during the past three basinwide cycles and has always rated Poor or Fair. An additional EPT sample in 1991 rated Fair. In 2005 the rating jumped to Good-Fair. The Biotic Index was 6.6 (6.9 in 2000) and the total taxa richness increased from 61 in 2000 to 73 in 2005. Five of those additional taxa were EPT's as the EPT taxa rose from 3 (1995), to 10 (2000), to 15 in 2005. Although the three *Oecetis* species found in 2000 were not seen in 2005, they were replaced with three *Triaenodes* species including *T. perna* and *T. ochraceous*. Additional new EPT's found in 2005 included *Hexagenia*, *Centroptilum*, *Acentrella*, *Chimarra*, and *Nectopsyche exquisita*. Amphipods were dominant at the site. Other taxa of interest include *Pelocoris*, *Isochaetides curvetosus*, and *Stenonema integrum*. Although there is an obvious increase in biological integrity over the past 10 years, the taxa present suggest possible low DO and low flow conditions may still affect the benthic community at this site.

Flat Swamp, NC 55, Craven County

Flat Swamp at NC 55 is classified as a swamp stream and drains the Dover Pocosin. At the sample location, the site was 5 meters wide with a drainage area of 11.9 square miles. A beaver dam was present. The substrate was comprised of sand and detritus. Sticks, undercut banks, and root mats provided the majority of the colonizable substrate. The DO reading was 10.8 mg/L (12.0 in 2000). Conductivity was 136 μmhos/cm in 2005 and 121 μmhos/cm in 2000. The pH was 6.8. The overall habitat score in 2005 was 69.

Flat swamp retained the Natural swamp rating obtained in 2000 during the current basinwide cycle benthic sampling effort. The BI improved from 7.82 to 6.78 and the EPT taxa richness increased from 8 to 11. However, total taxa richness decreased slightly from 55 to 48. Only seven of the 48 taxa present were abundant. These included the mayfly *Stenonema modestum*, the midge *Orthocladious dorensis* gr, the damselfly *Argia*, the crustaceans *Palaemonetes*, *Lirceus*, and *Gammarus*, as well as the fingernail

clam *Pisidium*. Overall, the biological community in Flat Swamp suggests an improvement over conditions in 2000.

Special Studies

Core Creek TMDL Study
In 2004, the BAU conducted a benthic TMDL study of Core Creek. The entire stream was placed on the impaired streams list due to sedimentation and biological impairment. Pesticide spills caused two fish and amphibian kills in 2003. Two sites, above and below SR 1239 were sampled as swamp streams in the spring of 2004. The upstream site rated Moderate with a BI of 6.82, Total EPT of 5, Total Richness of 36 and a habitat score of 86. The EPT taxa at this site were fairly intolerant. The downstream site was channelized and received a rating of Severe, a BI of 6.94, an EPT taxa richness of 6, a total richness of 48 and a habitat score of 38. The downstream community was similar to that upstream but the habitat was severely degraded. It was determined that the most likely stressors to this system are lack of flow indicative of streams in the area, lack of adequate macroinvertebrate habitat due to channelization, and periodic toxic inputs from agricultural activities. (See BAU memorandum B-040712 for more information).

NEUSE RIVER SUBBASIN 09

Description

This coastal plain subbasin contains Swift Creek and its tributaries (Figure 20). Much of the Swift Creek catchment has been channelized, and a US Department of Agriculture study indicated moderate non-point source pollution potential (USDA 1995). Primary land use for the subbasin is agricultural (25%) with patchy forested (73%) areas. Many hog farms are located in the subbasin, especially in the northwest portion.

Approximately 90% of subbasin 09 is located within the Mid-Atlantic Flatwoods Ecoregion, but portions lie within the Mid-Atlantic Floodplains and Low Terraces as well as the Rolling Coastal Plain (Griffith *et al.* 2002). The middle portion of the Coastal Plain has less relief and more poorly drained soils of clay and sand. Due to the naturally slow subsurface drainage in the Mid-Atlantic Flatwoods, artificial drainage is common to allow the production of corn, peanuts, and cotton. Large sluggish rivers, deep water swamps, and oxbow lakes characterize the Mid-Atlantic Floodplains and Low Terraces. The soils are made up of alluvial deposits and support cypress gum swamps and bottomland hardwoods of wetland oaks, green ash, red maples, and hickories. The Rolling Coastal Plain is biologically less diverse and has more relief, higher elevations and better drainage. Area crops include corn, soybean, tobacco, cotton, sweet potatoes, wheat and peanuts.

There are only a few small towns in this subbasin. There are no major dischargers or facilities required to perform whole effluent toxicity (WET) testing; the largest discharger of the three present is the Vanceboro WWTP (NC0031828) which discharges 0.3 MGD into Swift Creek. Weyerhaeuser's Ayden Mill outfall (NC0073229) and Vanceboro's WTP (NC0080071) are also in this subbasin.

MacDonald *et al,* (1981) listed Creeping Swamp as an important natural area. This is one of the few large, non-channelized streams in this part of the state. It was extensively studied as a site for comparisons with nearby channelized streams (Chapin 1975, Kuenzler, *et al,* 1977, Maki, *et al,* 1980). These studies demonstrated the detrimental effects of channelization, including a large increase in nutrient export as well as loss of wildlife habitat. Natural swamp streams tend to stop flowing during summer months, and may have very low dissolved oxygen concentrations. Channelized streams in this part of the state, however, will have year round flow, and usually maintain high dissolved oxygen concentrations.

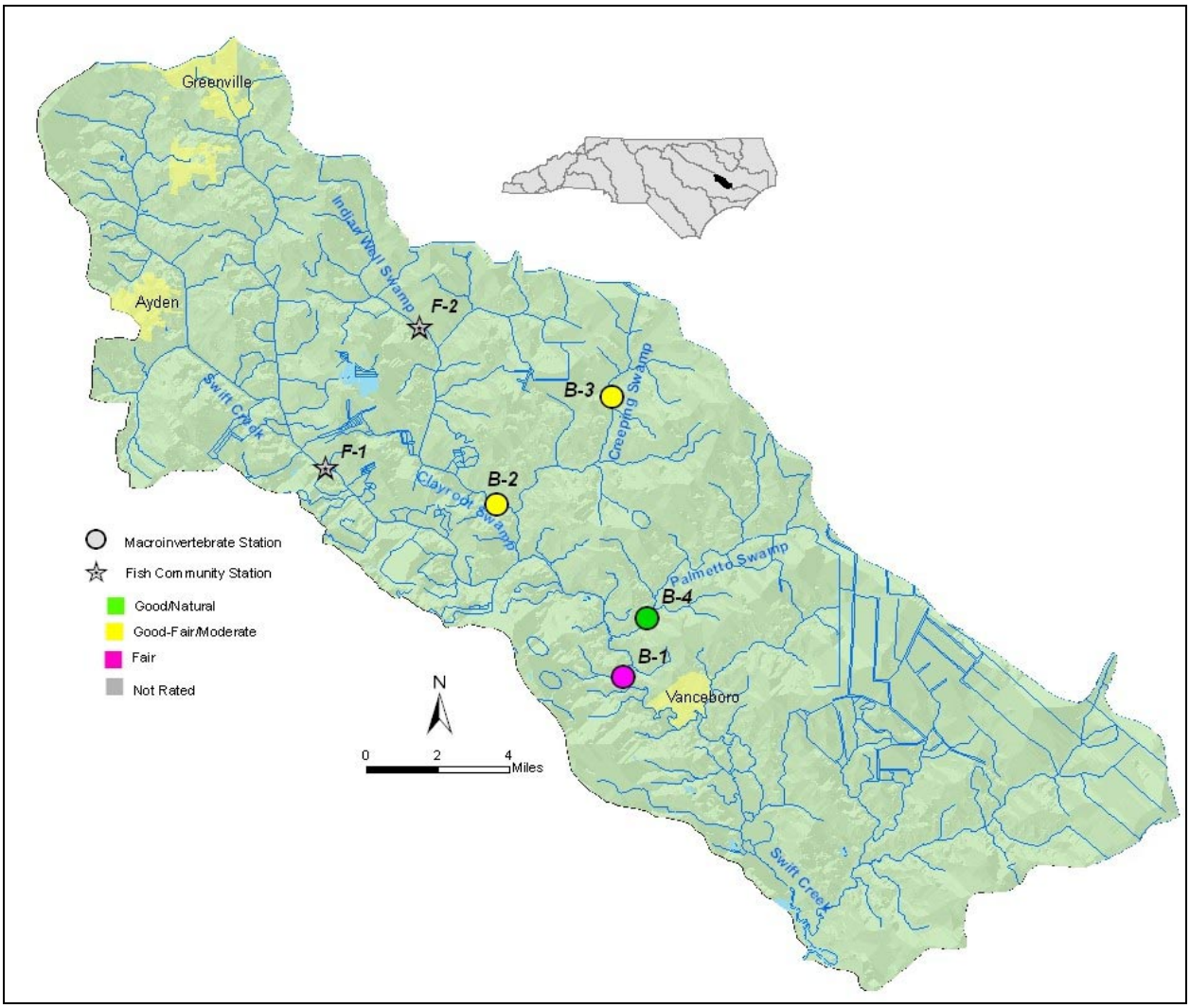


Figure 20. Sampling sites in Subbasin 09 of the Neuse River basin.

Overview of Water Quality

Both Swift Creek at NC 118 and Palmetto Swamp at NC 43 retained their bioclassifications from the 2000 basinwide cycle, of Fair and Natural respectively. The rating at Clayroot Swamp, SR 1941 improved from Poor to Good-Fair, due in large part to an increase in diversity. Conversely, Creeping Swamp at NC 102 fell from a Natural to a Moderate swamp bioclassification due mostly to a decrease in diversity. This is of concern because Creeping Swamp has been recognized as an important natural resource in the Coastal Plain of North Carolina (MacDonald, *et al,* 1981). There are no major dischargers or facilities required to perform Whole Effluent Toxicity (WET) testing in this subbasin. The largest discharger of the three present is the Town of Vanceboro's WWTP (NC0031828) which discharges 0.3 MGD into Swift Creek. Weyerhaeuser's Ayden Mill outfall (NC0073229) shows sporadic total nitrogen, BOD, flow, pH, and suspended solids monitoring violations from 2001 to 2005. The Town of Vanceboro's WTP (NC0080071) showed one limit violation in 2003 for total suspended solids.

There are three ambient monitoring stations within Neuse subbasin 09. Although pH, Chlorophyll-*a*, and arsenic were occasionally above water quality standards, only iron and copper surpassed these action levels in more than 10% of the samples collected. At Creeping Swamp at NC 43 near Vanceboro (J8150000) iron was recorded higher than action level water quality standards in 63% of the samples

while at Swift Creek at Mouth near Askin (J8210000) copper readings above standards were observed in 15% of the samples collected.

Table 13. Waterbodies monitored in Subbasin 09 in the Neuse River basin for basinwide assessment, 2000-2005.

Map #	Waterbody	County	Location	2000 Bioclassification	2005 Bioclassification
B-1	Swift Cr	Craven	NC 118	Fair	Fair
B-2	Clayroot Swp	Pitt	SR 1941	Poor	Good-Fair
B-3	Creeping Swp	Pitt	NC 102	Natural	Moderate
B-4	Palmetto Swp	Craven	NC 43	Natural	Natural
F-1	Swift Cr	Pitt	SR 1753		Not Rated
F-2	Indian Well Swp	Pitt	SR 1753		Not Rated

River and Stream Assessment

Locations visited but not sampled for fish community assessments because either the stream was too deep to sample or because the waterbody was a braided swamp included Palmetto Swamp at SR 1641, NC 17, and NC 43, Fisher Swamp at SR 1621, and Beaverdam Swamp at SR 1621, all in Craven County. A NCIBI metric and scoring criteria revision is currently underway for Coastal Plain ecoregion. Therefore, no fish community sites in this subbasin were assigned ratings. All four basinwide locations were re-sampled for benthos in 2005. In addition, two special study sites were also sampled for benthos (Swift Cr SR 1931: Pitt County and Clayroot Swamp NC 102: Pitt County).

Swift Creek, SR 1753, Pitt County

Swift Creek is a large tributary to the Neuse River. The watershed of Swift Creek drains the agricultural areas of southeastern and south central Pitt County and the suburbs of the southern part of the City of Greenville. The 2005 fish community assessment site was moved approximately eight miles downstream from the site monitored in 1995 (at NC 102) because that site and the site on Fork Swamp (also at NC 102) had historically dense growths of the aquatic macrophyte *Egeria densa*, Brazilian elodea, and could not be sampled in 2000. Sprigs of elodea were periodically observed floating downstream during the fish community assessment in 2005.

The difference in watershed size between the NC 102 and the SR 1753 sites was approximately 54 square miles. There is one NPDES facility (NC0073229, Weyerhaeuser Company-Ayden) in the watershed, located approximately nine miles upstream of the monitoring site on an unnamed tributary to Swift Creek. There is no permitted limit to its discharge and because of the volume of its discharge and distance upstream, it should not be having an impact on the aquatic community at the monitoring site.

Swift Creek is a shallow, sandy bottom, entrenched stream that has been channelized and appeared to be maintained as a channelized waterbody. The stream has the second lowest habitat score of any fish community site in the Coastal Plain in 2005 (score = 44, Appendix F-8).

In 2005, 347 fish, representing 22 species, were collected. The dominant species was the redbreast sunfish, approximately 30 percent of all the fish collected were of this species. Despite the habitat alterations, the fauna included many species typically found in other Coastal Plain streams (i.e., longnose gar, American eel, satinfin shiner, dusky shiner, eastern mosquitofish, bluespotted sunfish, bluegill, and

tessellated darter). Swift Creek was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected.

Indian Well Swamp, SR 1753, Pitt County

This site on Indian Well Swamp was sampled for the first time for fish community assessments in 2005. The swamp drains southeastern Pitt County and is a tributary to Clayroot Swamp. There are no NPDES facilities within the creek's rural residential and agricultural watershed upstream of the monitoring site. Like Swift Creek, Indian Well Swamp has been channelized, entrenched, and detached from its flood plain except for during extreme flow events. It had more growths and overall diversity of submerged and emergent aquatic macrophytes than did Swift Creek.

In 2005, 218 fish, representing 23 species, were collected. The dominant species was the redbreast sunfish, approximately 20 percent of all the fish collected were of this species. Other common species included tessellated darter, redfin pickerel, and comely shiner. This stream supported a large biomass of fish including large specimens of longnose gar, bowfin, channel catfish, chain pickerel, redbreast sunfish, and largemouth bass. Like Swift Creek, Indian Well Swamp was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected.

Swift Creek, NC 118, Craven County

An active clearcut logging operation was present along the right bank of Swift Creek at NC 118. Logging was occurring right up to the floodplain at this 7 meter wide swamp-like site. Immediately above this reach, Swift Creek has been channelized. Floating items tend to get caught up at the sample location, creating large mats of floating material. The drainage area is 204 square miles. The substrate scored very low and was predominantly detritus and silt. Conductivity in 2005 increased to 184 µmhos/cm, as compared to 168 µmhos/cm in 2000. Dissolved oxygen (DO) at 1.6 mg/L was extremely low in 2005. In 2000 it measured 7.6 mg/L. The overall habitat score was 76, similar to the 2000 value of 69.

Swift Creek at NC 118 has been sampled three times prior to 2005. In 1991 an EPT sample rated Good-Fair and Full Scale samples in 1995 and 2000 both rated Fair. This site received a Fair rating in 2005 as well. Both the EPT taxa richness and the Biotic Index (BI) remained essentially unchanged between 2000 and 2005. The EPT richness was 13 (13 in 2000) and the BI scored 6.9 (6.8 in 2000). However, the total taxa richness fell from 78 to 64 in 2005. Only 13 of the 64 taxa were recorded as abundant. Most of these were coleopterans, crustaceans, and Mollusca. *Argia*, *Polypedilum illinoense*, *Caecidotea*, *Corbicula fluminea*, and *Sphaerium* indicate that Swift Creek may periodicially have low DO, low flow and organic enrichment issues. Only two intolerant taxa were present; *Oecetis Sp A* (TV=2), and *Nectopsyche* (TV=2.9).

Clayroot Swamp, SR 1941, Pitt County

Clayroot Swamp at SR 1941 is a channelized sandy bottom stream approximately 4 meters wide. The drainage area at this location is 44.3 square miles. The habitat score was 56 out of 100. The low score was due to channel modification, the paucity of colonizable instream habitat, lack of pool variety, increased light penetration and the replacement of the left riparian area with a road. A conductivity measurement of 182 μmhos/cm in 2005 was comparable to the 176 μmhos/cm measured in 2000. The DO was 6.7 mg/L in 2005. Filamentous algae was common at this site.

Clayroot Swamp at SR 1941 was sampled with the EPT method in 1991 (Fair), 1995 (Poor), and 2000 (Poor). A 2000 Swamp sample resulted in a Not Rated classification. In 2005, however, the EPT bioclassification improved drastically to Good-Fair. The EPT BI improved slightly from 5.9 to 5.4 in 2005 but the big difference between the sampling cycles lies in taxa richness. Only 3 trichopteran taxa were collected in the 1995 and 2000 EPT samples, but that increased to 6 trichopterans and 10 ephemeropterans in 2005. *Stenonema modestum*, *Pseudocloeon propinquum*, *Cheumatopsyche*, *Triaenodes ignites*, and *Nectopsyche exquisita* were all abundant. Uncommon taxa included *Barbaetis cestus, Pseudocloeon ephippiatum*, and *Acerpenna pygmea*. *Nectopsyche* was the only intolerant taxon present.

Creeping Swamp, NC 102, Pitt County

Creeping Swamp is classified as a swamp B stream. At NC 102, it was 5 meters wide with considerable braiding. The drainage area is 7.3 square miles. Habitat problems were a lack of colonizable instream habitat, homogeneous substrate and a lack of pools. The overall habitat score was 74. The substrate was mostly sand with some gravel and silt. The conductivity in 2005 was 60 μmhos/cm.

Only 26 taxa were collected from Creeping Swamp at NC 102 in 2005. This is four fewer than in 2000. The BI increased slightly from 6.9 to 7.1. This indicates a slight decrease in biological integrity. In 2000, the site received a Natural rating while in 2005 it fell to Moderate. Only 5 taxa were abundant; *Simulium*, the midges *Tvetenia*, and *Orthocladious obumbratus*, and the crustaceans *Lirceus*, and C*rangonyx*. Notable taxa include the midges *Heterotrissocladius* and *Kiefferulus*.

Palmetto Swamp, NC 43, Craven County

Palmetto Swamp at NC 43 is classified as a swamp B stream. It was 7 meters wide with some braiding present. A weir was present, which constricted flow and diverted it onto the floodplain. The drainage area at this location is 22.3 square miles. Macroinvertebrate habitat consisted mostly of sticks, root mats, leafpacks and snags. Sand and silt comprised most of the fairly homogenous substrate. The habitat score was 76. Lower scores were assigned to colonizable habitat, substrate, and pool variability. Elevated conductivity measurements (120 μmhos/cm) were present in 2005.

In 2005, Palmetto Swamp retained the Natural bioclassification it received in 2000. However, total taxa richness fell to 67% of what it was in 2000. In addition, 25% of the EPT taxa identified in 2000 were not collected in 2005. Many of the missing taxa were ephemeropterans, oligochaetes, gastropods, and Chironomidae. However, the BI improved from 7.1 in 2000 to 6.5 in 2005. Notable taxa included the stonefly *Taeniopteryx*, the caddisfly *Platycentropus*, and the midge *Potthastia longimana*.

Special Studies

Swift Creek, SR 1931/1465, Pitt County

The WaRO wanted biological information from Swift Creek between Fork Swamp and Clayroot Swamp to fill in a data gap. Brazilian elodea (*Egeria densa*) was abundant at this site. The DO was 8.7 mg/L and the conductivity was 117 µmhos/cm. The overall habitat scored 71 using Coastal stream criteria. This site rated Good in 2005. Although no stoneflies were present, 27 out of the 83 taxa at this site were EPT. The BI was 6.5. Several intolerant taxa were present including the tricopterans *Nectopsyche pavida*, *Nectopsyche exquisita*, and *Oecetis sp D*. (See BAU memorandum B-060131 for more information).

Clayroot Swamp, NC 102, Pitt County

Chris Roessler of the TMDL Unit of the Division of Water Quality (DWQ) requested that the BAU collect an EPT sample at Clayroot Swamp NC 102 as part of the 2001 CAWS project (Collaborative Assessment of Watersheds and Streams) for impaired streams. The goal was to identify the sources of impairment. During sampling, very little flow was observed. The highly erodable and channelized sandy soil banks resulted in high sedimentation. Very little colonizable habitat was present and high conductivities and the abundance of algae suggested nutrient enrichment. Eight EPT taxa were collected with an EPT BI of 5.9 and an overall rating of Fair. (See BAU memorandum B010522 for more information).

NEUSE RIVER SUBBASIN 10

Description

Most of the waters in this subbasin are estuarine, including the Neuse River and the downstream portion of most of its main tributaries. Subbasin 10 is contained within the Level IV ecoregions of the Nonriverine Swamps and Peatlands, Carolina Flatwoods, and Mid-Atlantic Floodplains and Low Terraces (Griffith *et al*. 2002). Specifically, the catchments of Upper Broad Creek are comprised of Mid-Atlantic Floodplains and Low Terraces and are characterized by large, low gradient and tannic rivers, deep-water swamps, and extensive bottomland hardwood wetlands and cypress-gum swamps (Griffith *et al*. 2002). The catchment of SW Prong Slocum Creek is contained within Carolina Flatwoods and is typified by poorly drained soils and very low topographic relief with large areas of Carolina bays and pocosins (Griffith *et al*. 2002). Freshwater is confined primarily to the upper segments of tributary waters and that is where most of DWQ's benthic macroinvertebrate sampling is concentrated. Landuse in the subbasin is mostly a mix of forest and agriculture. Overall, runoff remains the most important cause of nonpoint source pollution in this subbasin. Although large-scale agricultural operations are common in this subbasin, there are also large tracts of protected forest and pocosin wetlands associated with Croatan National Forest and the Light Ground Pocosin. Moderate residential growth continues throughout most of the subbasin although the largest concentrations of suburban impacts are associated with New Bern, Havelock, and Oriental. There are five major dischargers in subbasin 10 and include: New Bern WWTP (NC0021253; 1.9 MGD), Fairfield Harbor Subdivision WWTP (NC0033111; 1.0 MGD), Phillips Plating Company (NC0001881; 0.10 MGD), and USMC Cherry Point (NC0003816; 3.5 MGD) all of which discharge to the Neuse River. The remaining major discharger in this subbasin is the Havelock WWTP (NC0021253; 1.9 MGD), which discharges to East Prong Slocum Creek.

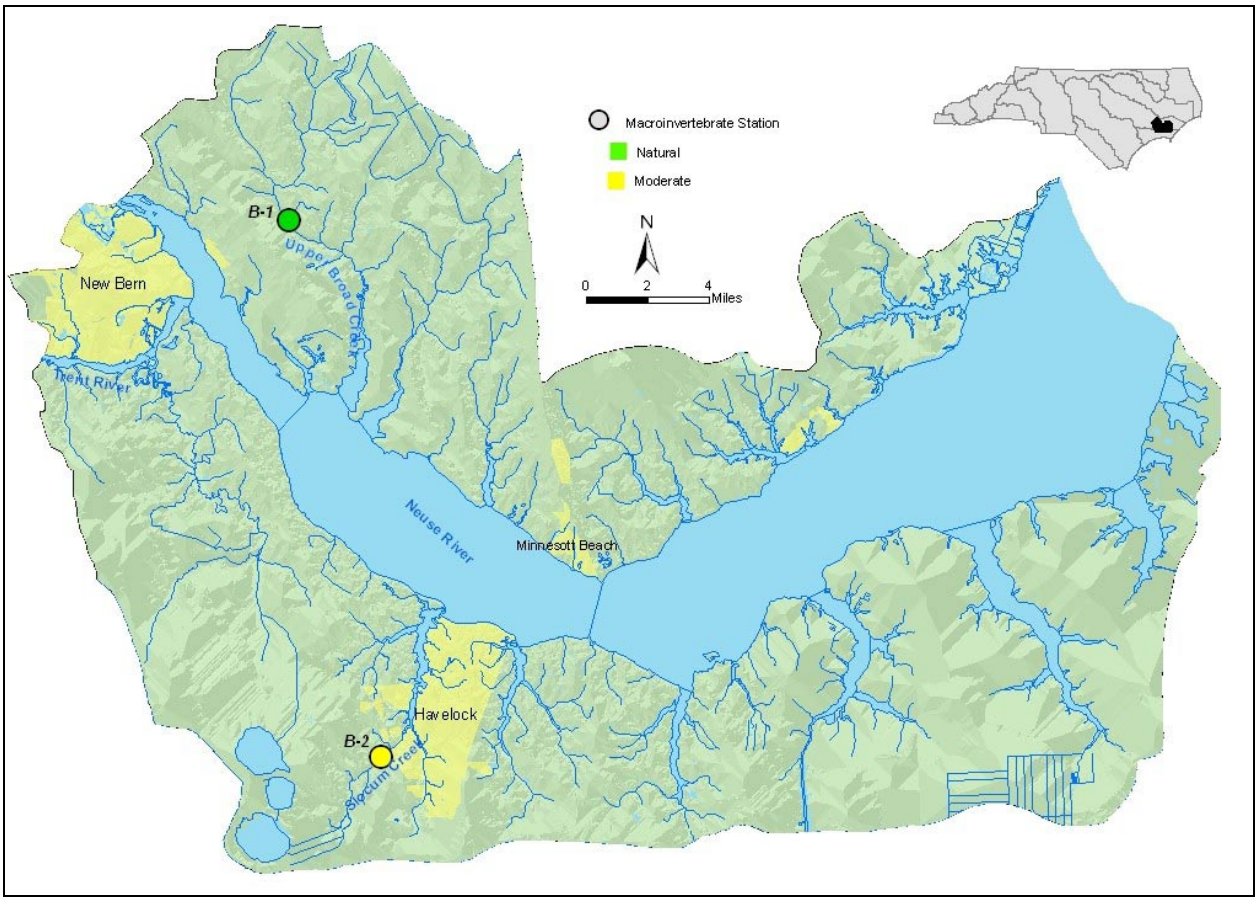


Figure 21. Sampling sites in Subbasin 10 of the Neuse River Basin.

Overview of Water Quality

All streams sampled for benthic macroinvertebrates in subbasin 10 were classified using Swamp criteria. Based on benthic macroinvertebrate data, Upper Broad Creek improved from Moderate to Natural between 2000 and 2005, while SW Prong Slocum Creek maintained a Moderate bioclassification through the same time period (Figure 21, Table 14). All but one (Fairfield Harbor Subdivision WWTP) of the five major NPDES dischargers in this subbasin is required to perform Whole Effluent Toxicity testing (WET). Since 2000, the Havelock WWTP has had one WET limit noncompliance, the USMC Cherry Point WWTP has had two WET limit violations, and the New Bern WWTP has had seven WET violations. These violations lead the facility to enter into a Special Order of Consent (SOC) agreement with DWQ to correct these violations. After the rescission of the SOC in July of 2003, this facility underwent treatment upgrades and there have been no WET violations since. The final facility required to perform WET testing is the Phillips Plating Company and they have had no failing tests since 2000.

The are 17 ambient monitoring sites in this subbasin. Of these 17, only six locations have had 10% of values exceeding water quality standards at the 95% statistical confidence level since 2000. The Neuse River (.5 miles upstream of Union Point) at New Bern has had only one parameter (Copper) exceeding water quality standards or action levels. The Neuse River (at mouth of Broad Creek) near Thurman has been stable since 2000 with only Chlorophyll *A* and pH exceeding water quality standards or action levels greater than 10% of the time at a 95% statistical confidence level. Just downstream, the Neuse River (near Thurman) pH was the only parameter exceeding water quality standards or action levels. The Neuse River (near Riverdale) has also exceeded water quality standards or action levels at the 95% confidence level for pH and Copper since 2000. Furthermost downstream, the Neuse River (near Minnesott Beach) has had stable water chemistry since 2000 with only one parameter (Copper) exceeding water quality standards or action levels greater than 10% of the time at a 95% statistical confidence level while the last ambient chemistry station in this subbasin Back Creek (SR 1300) near Merrimon has had three parameter exceedences at the 95% confidence level and included dissolved oxygen, pH, and copper.

The six-month average stream discharge from September 2004 through February 2005 was 141 cubic feet per second (cfs) at the Trent River near Trenton (Figure 22). This average was significantly less than the same six-month average stream discharge (648 cfs) from September 1999 through February 2000. The attenuated six-month average discharge in this catchment preceding the February 2005 sampling relative to the larger discharges preceding the February 2000 sample possibly explains the improved community metrics (and bioclassification) observed at Upper Broad Creek as well as the improved community metrics measured at SW Prong Slocum Creek in 2005. In catchments where non-point pollution is the primary stressor, lower flows tends to improve water quality as fewer pollutants are washed from the land into waterbodies.

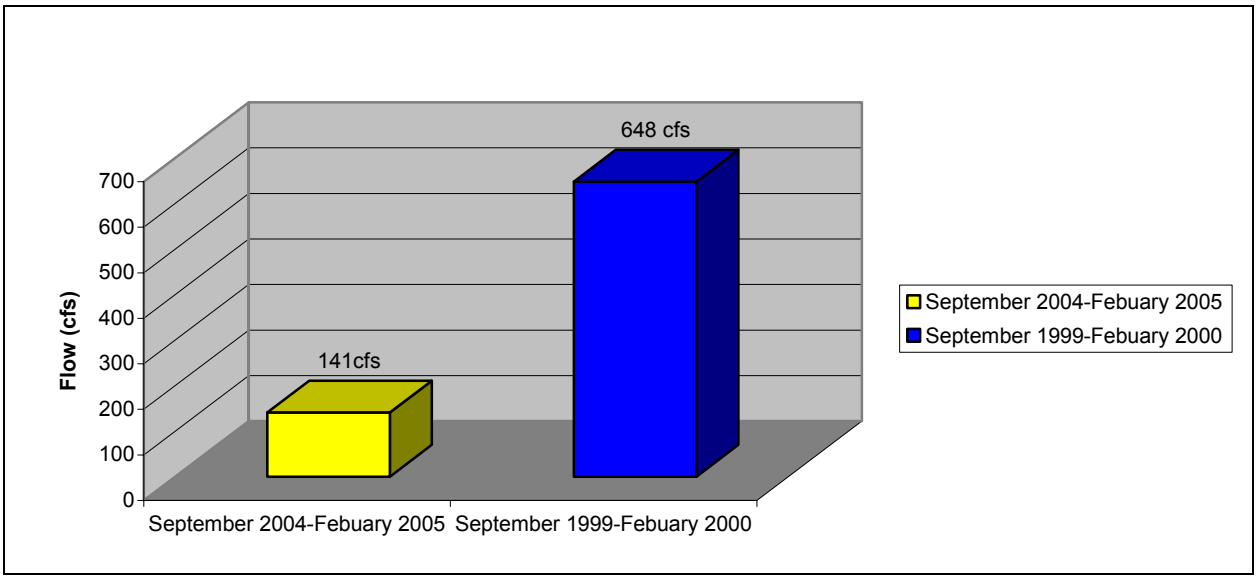


Figure 22. **Six month average stream discharge (cfs) Trent River near Trenton: September - February (2000 and 2005).**

Table 14. **Waterbodies monitored in subbasin 10 in the Neuse River basin for basinwide assessment, 2000 - 2005.**

Map #	Waterbody	County	Location	2000 Bioclassification	2005 Bioclassification
B-1	Upper Broad Cr	Craven	NC 55	Moderate	Natural
B-2	SW Prong Slocum Cr	Craven	SR 1746	Moderate	Moderate

River and Stream Assessment

Upper Broad Creek, NC 55, Craven County

This segment of Upper Broad Creek is approximately nine meters wide with a drainage area of 3.2 square miles. The channel of this swamp stream was well defined and flow was strong. Land use in this catchment is primarily a mixture of agriculture and forest. Substrate was nearly all sand (70%) with the remainder comprised of silt (30%). The most notable habitat problems along this segment of Upper Broad Creek included a lack of root mats and undercut banks. The habitat received a score of 78 and the conductivity was 65 μmhos/cm, which was somewhat lower than the 84 μmhos/cm measured in 2000.

This site has been sampled once before (2000) when it received a Moderate bioclassification with 35 total taxa, four EPT taxa, a BI of 7.2, an EPTBI of 7.3, and an EPT abundance (EPTN) of six. In 2005, this site improved and received a Natural bioclassification with 48 total taxa, eight EPT taxa, a BI of 6.9, an EPTBI of 6.3, and an EPTN of 25. There were several EPT taxa collected for the first time at this location and included the mayfly *Stenacron interpunctatum*, the stonefly *Perlesta*, and the caddisflies *Cheumatopsyche, Oecetis georgia, O. nocturna,* and *O* sp. E. In addition, the pollution tolerant chironomid *Chironomus* was common in 2000 but absent in 2005. The catchment upstream of this location is primarily non-point agriculture. The lower flows in

2005 versus those seen in 2000 (Figure 22) may explain the improvement in bioclassification at this location.

SW Prong Slocum Creek, SR 1746, Craven County

This location on Southwest Prong Slocum Creek is approximately six meters in width and has a drainage area of 12.5 square miles. Landuse upstream of this segment is entirely contained within the Croatan National Forest and its channelized headwaters originate in the Lakes Pocosin. The channel of this swamp stream was well defined and flow was very strong. Substrate was nearly all sand (70%) with the remainder comprised of silt (30%). The main habitat problems here were a lack of root mats and undercut banks. The habitat received a score of 79. Conductivity was 68 μmhos/cm and was much lower than measured in 2000 (91 μmhos/cm).

Southwest Prong Slocum Creek has been sampled at this location once before (2000) and resulted in a Moderate bioclassification with 48 total taxa, 13 EPT taxa, a BI of 6.5, and an EPTBI of 4.9. In 2005, this site was again rated as Moderate with a near identical total taxa richness (47) and an identical EPT taxa richness of 13. However, the BI and the EPTBI were both lower in 2005 at 5.4 and 3.9 respectively. The lower EPTBI in 2005 can be explained by the decrease in the abundance of more tolerant EPT taxa from 2000 to 2005 (e.g., *Caenis*) and by the increase in abundance of more intolerant EPT taxa from 2000 to 2005 (e.g., *Leptophlebia*, *Chimarra*, and *Lype diversa*). Similarly, the BI also decreased in 2005 due to a decrease in the abundance in some chironomid taxa from 2000 (e.g., *Conchapelopia* and *Tribelos*). The catchment upstream of this location is primarily non-point agriculture. The lower flows in 2005 versus those seen in 2000 (Figure 22) may explain the improvement in bioclassification at this location.

Special Studies

EEP Local Watershed Plan Study

Ecosystem Enhancement Program (EEP) staff requested five macroinvertebrate swamp samples in subbasin 10 in order to characterize the existing watershed as part of Phase I of the Local Watershed Plan. Four of these samples (Mill Swamp, Cedar Gut, East Prong Slocum Creek, and UT West Prong Clubfoot Creek) resulted in Moderate bioclassifications while one collection on Fork Run resulted in a Severe bioclassification.

NEUSE RIVER SUBBASIN 11

Description

This subbasin is located within the Level IV ecoregions of Nonriverine Swamps and Peatlands, Carolina Flatwoods, and the Mid-Atlantic Floodplains and Low Terraces (Griffith *et al* 2002). Island Creek's catchment is in the Nonriverine Swamps and Peatlands ecoregion. This ecoregion area is dominated by flat land, organic, poorly drained organic soils and large areas of pocosins, pocosin lakes, and tupelo-cypress swamp forests (Griffith *et al* 2002). The remaining streams sampled in this subbasin are found in the Carolina Flatwoods and can be found in areas of poorly drained soils, very low topographic relief and large areas of Carolina bays and pocosins (Griffith *et al*. 2002). The primary landuse here is agriculture and forest with the only suburban area concentrated around the small town of Trenton. There are no major permitted discharges in this subbasin. However, there are numerous large-scale swine operations in this subbasin, particularly concentrated in the Jones/Lenior county boundary area. A small portion of the Croatan National Forest is also located within this subbasin.

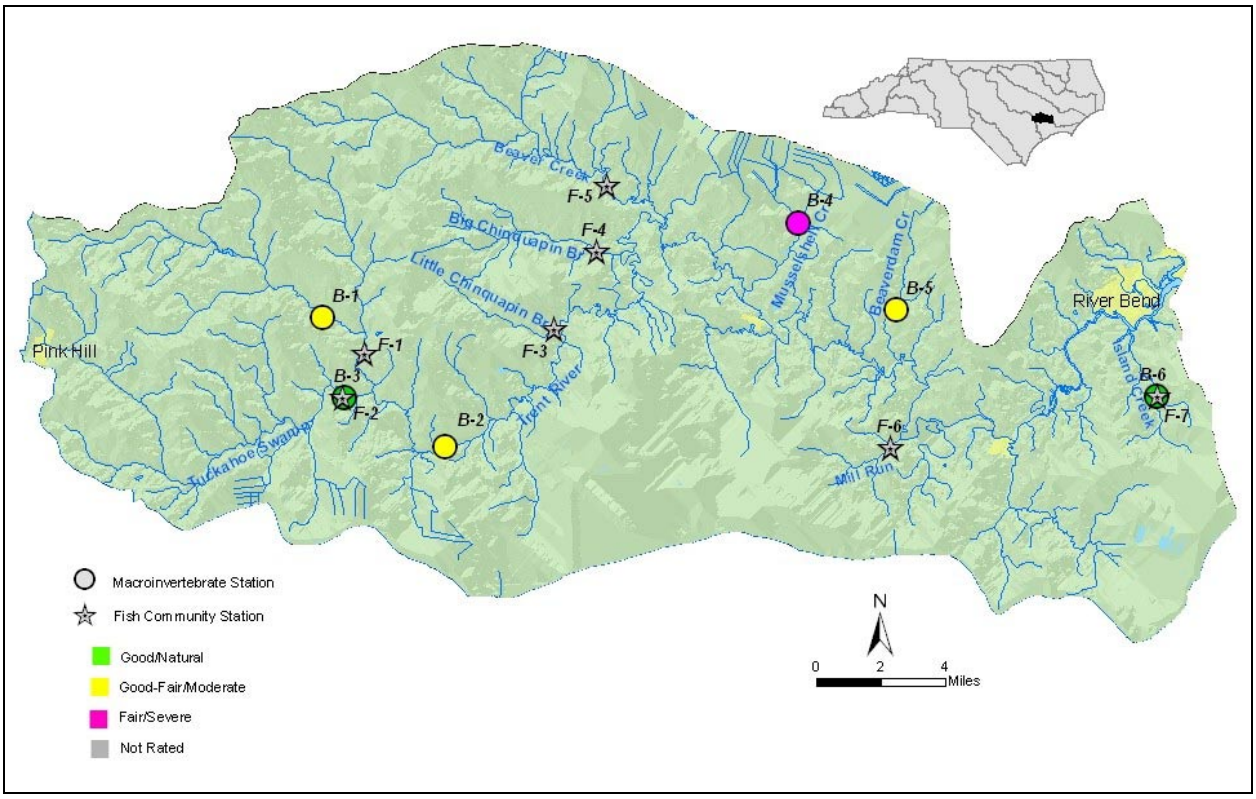


Figure 23. Sampling sites in subbasin 11 of the Neuse River basin.

Overview of Water Quality

All streams in subbasin 11 (except for Trent River at Beck's Bank) were sampled for benthic macroinvertebrates using swamp criteria. The Trent River at Beck's Bank was sampled using Full-Scale methods. The Trent River at SR 1153 (Moderate), Tuckahoe Creek (Natural), Musselshell Creek (Severe) and Island Creek (Natural) all had identical bioclassifications from 2000 to 2005. By contrast, the Trent River at Beck's Bank improved from Fair in 2000 to Good-Fair in 2005 while Beaverdam Creek declined slightly from Natural in 2000 to Moderate in 2005 (Figure 23, Table 15). There are three ambient chemistry monitoring sites on the Trent River in this subbasin (SR 1129 near Trenton, US 17 at Pollocksville, and Channel Marker 14 near Rhems). Since 2000, none of these locations have

experienced greater than 10% of values exceeding water quality parameters at or above the 95% statistical confidence level. There are no major NPDES dischargers in this subbasin.

The six-month average stream discharge from February 2005 through July 2005 was 166 cubic feet per second (cfs) at Trent River near Trenton (Figure 24). This average was less than the six-month average stream discharge (231 cfs) measured from December 1999 through May 2000. The attenuated six-month average discharge preceding the July 2005 sampling event relative to the greater flows preceding the May 2000 collection possibly explains the improved community metrics and bioclassification observed at the Trent River (near Comfort) in 2005. In catchments where non-point pollution is the primary stressor, lower flows tends to improve water quality as fewer pollutants are washed from the land into waterbodies.

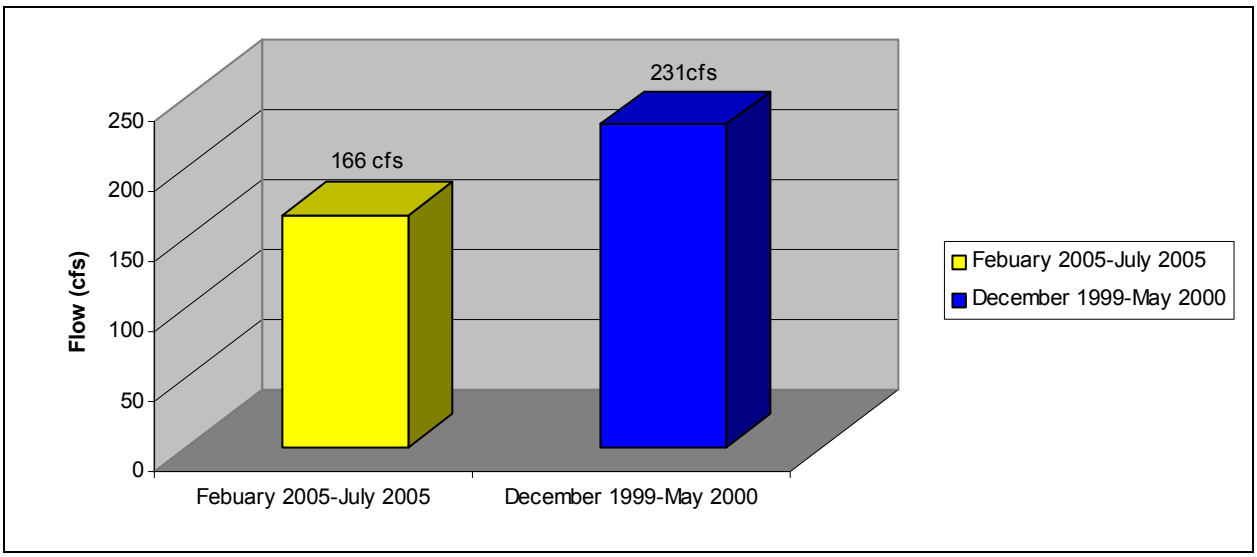


Figure 24. Six month average stream discharge (cfs) Trent River near Trenton: December 1999-May 2000 and February 2005-July 2005.

Table 15. Waterbodies monitored in Subbasin 11 in the Neuse River Basin for Basinwide Assessment, 1999 - 2005.

Map #[1]	Waterbody	County	Location	2000 Bioclassification	2005 Bioclassification
B-1	Trent R	Jones	SR 1153	Moderate	Moderate
B-2	Trent R	Jones	Beck's Bank (Near Comfort)	Fair	Good-Fair
B-3	Tuckahoe Cr	Jones	SR 1142	Natural	Natural
B-4	Musselshell Cr	Jones	SR 1320	Severe	Severe
B-5	Beaverdam Cr	Jones	SR 1002	Natural	Moderate
B-6	Island Cr[2]	Jones	SR 1004	Natural[1]	Natural
F-1	Trent R	Jones	SR 1130		Not Rated
F-2	Tuckahoe Swp	Jones	SR 1142	Not Rated	Not Rated
F-3	L Chinquapin Br	Jones	SR 1131		Not Rated
F-4	Big Chinquapin Br	Jones	SR 1129		Not Rated
F-5	Beaver Cr	Jones	SR 1316		Not Rated
F-6	Mill Run	Jones	NC 58	Not Rated	Not Rated
F-7	Island Cr	Jones	SR 1004	Not Rated	Not Rated

[1]B = benthic macroinvertebrate monitoring sites; F = fish community monitoring sites.
[2]This sample collected in 1999.

River and Stream Assessment

Locations visited but not sampled for fish community assessments because either the stream was too deep to sample or because the waterbody was a braided swamp included Vine Swamp at SR 1920, Heath Mill Run at SR 1002, Crooked Run at SR 1123, Beaverdam Creek at SR 1002, and Musselshell Creek at NC 41 and at SR 1320, all in Jones County. A NCIBI metric and scoring criteria revision is currently underway for Coastal Plain ecoregion. Therefore, no fish community sites in this subbasin were assigned ratings. All six benthic basinwide locations were re-sampled and rated in 2005.

Trent River, SR 1153, Jones County

This location of the Trent River is six meters in width, has a drainage area of 28.0 square miles, and is approximately midway through the catchment. The channel was well defined although the flow was very slow. Substrate was a near even mix of silt (60%) and sand (40%). Landuse in this catchment is comprised of scattered residential areas, agriculture, animal operations, and forest. Indeed, there was a new subdivision just upstream from the sampling site that was not there five years ago and swine farm odors were noted at the time of sampling. The main habitat problems along this reach were the high percentage of silt substrate, and a lack of snags. Conductivity was 110 µmhos/cm and the habitat received a score of 73.

This site was sampled in 2000 and received a Moderate bioclassification with 57 total taxa, seven EPT taxa, a BI of 6.7, and an EPTBI of 5.8. The 2005 sample also resulted in a Moderate bioclassification. Although there were more total taxa (68) and more EPT taxa (14), the BI increased to 7.3 while the EPTBI was unchanged (5.8). The increase in the overall BI may indicate the formation of a slightly more tolerant invertebrate community at this location and may be related to increased 2005 runoff (Figure 24) from the new residential areas upstream. Additional pollution tolerant taxa present in 2005 for the first time include the chironomids *Orthocladius oliveri* (abundant) and *Procladius* (common), the latter being an organic pollution indicator.

Trent River, SR 1130, Jones County

This fish community site is in the upper part of the Trent River watershed where it drains western Jones and southeastern Lenoir counties. There are no NPDES facilities in the rural watershed. The very high quality instream and riparian habitats included large, coarse, submerged, woody debris, macrophytes, stick riffles, deep snag pools, undercut banks and roots, cypress knees, and wide and intact bottomland forested riparian zones. The habitat score was 91 (Appendix F-8).

The fish community in the Trent River was last sampled in November 1991. At that time, 206 fish representing 16 species were collected. The dominant species was the dusky shiner; 55 percent of all the fish collected were of this species. In 2005, 627 fish representing 24 species were collected; the dusky shiner again was the dominant species. Based upon DWQ data, 24 species are now known from this site. This site and Tuckahoe Swamp were the only two sites in the Coastal Plain from

which the relatively uncommon ironcolor shiner was collected in 2005. This stream supported a large biomass of fish including large specimens of bowfin, chain pickerel, redfin pickerel, and redbreast sunfish.

Trent River, Beck's Bank (Near Comfort), Jones County

This segment of the Trent River is approximately twelve river miles downstream from the SR 1153 location and is eight meters in width with a drainage area of 118 square miles. Substrate was mostly sand (60%) with silt (30%) and gravel (10%) making up the remainder. Landuse in this catchment is predominately agriculture, animal operations and forest with scattered areas of residences. The main habitat problems observed were moderate areas of streambank erosion and a paucity of large snags. The habitat received a score of 79 and the conductivity was 114 µmhos/cm.

This site was sampled once previously (2000) and resulted in a Fair bioclassification with a total tax richness of 50, an EPT richness of seven, a BI of 6.8, and an EPTBI of 5.9. The 2005 collection improved to a Good-Fair bioclassification with an increase in total taxa richness (58), EPT richness (12), and a decrease in BI (6.0) and EPTBI (4.7). There were several EPT taxa collected for the first time at this location and included the mayflies *Acerpenna pygmaea, Brachycercus* and the caddisflies *Nectopsyche exquisita, Oecetis persimilis, Pycnopsyche, Triaenodes ignitus,* and *Phylocentropus.* The improvement at this site could possibly be the result of lower flows in 2005 versus those seen in 2000 (Figure 24). In catchments where non-point pollution is the primary stressor, lower flows tend to improve water quality as fewer pollutants are washed from the land into waterbodies.

Tuckahoe Creek, SR 1142, Jones County

Tuckahoe Creek was five meters in width and has a drainage area of 52.4 square miles. The watershed upstream of this road crossing is composed chiefly of agriculture, animal operations, and scattered tracts of forest with very scattered residences. The channel was well defined and flow was robust. Substrate was primarily sand (70%), with silt (20%) and limestone outcrops (10%) comprising the remainder. The only habitat deficiencies noted along this reach was a lack of snags and the habitat received a score of 80. Conductivity during the winter benthos sample was 110 µmhos/cm and swine farm odors were noted at the time of sampling. As was noted during the Fish Community assessment, Tuckahoe Swamp has very high quality instream and riparian habitats (habitat scores = 92 and 88 in 2000 and 2005, respectively; Appendix F-8). This site is a fish community regional reference site. The conductivity during fish community sampling, 2000 and 2005, was 134 and 103 µmhos/cm, respectively.

This location of Tuckahoe Creek has been sampled once previously in 2000 resulting in a Natural bioclassification. The 2005 sample also produced a Natural bioclassificaion. It is interesting to note that in 2000 and 2005 the total taxa richness (69 and 64), EPT taxa richness (10 and 13), BI (6.7 and 6.5) and EPTBI (5.8 and 5.7) have all remained very stable suggesting stable water chemistry in this catchment.

Notable intolerant EPT taxa present in 2005 included the mayfly *Leptophlebia* and the caddisflies *Oecetis* sp E, *Oecetis persimilis*, *Phylocentropus*, and *Nectopsyche exquisita*.

In 2000, 424 fish representing 19 species were collected at this site. In 2005, the number of fish collected declined to 376 but the number of species increased to 23. Four of the 23 species were darters, but only three species of sunfish were collected. The dominant species in 2000 was the dusky shiner, 39 percent of all the fish collected were this species. In 2005 the dominant species was the eastern mosquitofish, 43 percent of all the fish collected were this species. In 2000 it had represented only 3 percent of the fauna. The dusky shiner has decreased to 16 percent of the fauna in 2005. Whether this shift from a dominant intermediate species to a dominant tolerant species continues bears monitoring into the future.

In 1960, Bayless and Smith (1962) collected 26 species at this site. The dominant species was the margined madtom. Based upon DWQ and Bayless and Smith (1962) data, 33 species are known from the site including 7 species of sunfish, 8 species of minnows, and 5 species of darters. However, five species of minnows that were common in 1960, comely shiner, eastern silvery minnow, golden shiner, spottail shiner, and swallowtail shiner, and the Roanoke darter have not been collected at this site by DWQ in either 2000 or 2005. This site and the Trent River were the only two sites in the Coastal Plain from which the relatively uncommon ironcolor shiner was collected in 2005.

Little Chinquapin Branch, SR 1131, Jones County

The watershed of Little Chinquapin Branch drains west central Jones. This site is the lower of the two crossings on SR 1131 and has a natural, free-flowing channel with wide riparian zones and high quality instream habitats (habitat score = 87, Appendix F-8). The upper site on SR 1131 has been channelized and is bordered by an agricultural field. The fish community site, approximately 0.3 miles above the branch's confluence with the Trent River, has a watershed drainage area of only 3.9 square miles. It was the smallest watershed evaluated by the fish community assessment program in 2005. There are no NPDES facilities within the entire watershed. The conductivity was elevated at 182 µmhos/cm (Appendix F-10) and indicative of nonpoint source runoff.

The fish community in Little Chinquapin Branch was last sampled in July 1991. At that time, 85 fish representing nine species were collected. The dominant species was the redbreast sunfish; 46 percent of all the fish collected were of this species. In 2005, 349 fish representing 17 species were collected; the eastern mosquitofish was the dominant species (30 percent), followed by the dusky shiner (20 percent). The fauna was typical of that found in many Coastal Plain streams (i.e., the American eel, creek chubsucker, margined madtom, redfin pickerel, pirate perch, redbreast sunfish, and tessellated darter). Little Chinquapin Branch was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected.

Big Chinquapin Branch, SR 1129, Jones County

This site on Big Chinquapin Branch was sampled for the first time for fish community assessments in 2005. The stream drains the agricultural area, row crops and confined animal operations, of northwestern Jones County and there are no NPDES facilities within the stream's rural residential and agricultural watershed upstream of the monitoring site. This silt and sandy bottom, entrenched stream has been channelized and appeared to be maintained as a channelized waterbody. There were drag line or backhoe "teeth" marks along the stream bottom, bank, and into the limestone bedrock. Despite the channelization, the stream still maintained its sinuosity. The stream had also been de-snagged. There were no growths of macrophytes and coarse woody debris and snags were scarce. The stream had the lowest habitat score of any fish community site in the Coastal Plain in 2005 (score = 43, Appendix F-8).

Big Chinquapin Branch also had the greatest conductivity of any fish community site in the Coastal Plain in 2005 (381 µmhos/cm, Appendix F-10), indicative of nonpoint source runoff. At the request of BAU staff, investigations by staff from the Washington Regional Office and from the Division of Soil and Water Conservation did not find any major spill or leakage from nearby farms in the past two years that may have accounted for the elevated conductivity measurement (David May and Joseph Gyamfi, pers. comm., February 23, 2006). The canopy was minimal and late afternoon photosynthesis, along with the underlying limestone, contributed to an elevated pH (compared to other streams in the subbasin) of 7.2 s.u. The dissolved oxygen saturation was also elevated at 91 percent.

In 2005, 413 fish representing 17 species were collected at this site. Almost three-fourths of all the fish were comprised by two tolerant species – the eastern mosquitofish (47 percent) and redbreast sunfish (25 percent). A greater percentage of tolerant fish (73 percent) was present at this site than at any other site in the Coastal Plain, except for Hominy Swamp (Wilson County, Subbasin 07). Like other channelized streams, this stream supported a large biomass of fish including large specimens of bowfin, creek chubsucker, chain pickerel, redbreast sunfish, pumpkinseed sunfish, and largemouth bass. One intolerant chainback darter was also collected and probably was a waif from the Trent River. The monitoring site is located 0.8 miles above the stream's confluence with the Trent River.

Beaver Creek, SR 1316, Jones County

This site on Beaver Creek was sampled for the first time for fish community assessments in 2005. The stream drains an agricultural area, row crops and confined animal operations, of northwestern Jones and northeastern Lenoir counties and there are no NPDES facilities within the stream's rural residential and agricultural watershed upstream of the monitoring site. This site was entrenched and may have been channelized a very long time ago. There were two distinct channels, one 4.5 m wide on the left and the other 1.5 m wide on the right, in the lower two-thirds of the reach. The two channels joined to form a single channel for the last one-third of the reach. The instream and riparian habitats were of high quality (habitat score = 80). The substrate was sand, silt, muck, limestone outcrops, and coarse woody debris. There were deep pools, cypress knees, some

macrophytes, and mature trees in the narrow riparian zones. The conductivity was also elevated at 260 µmhos/cm (Appendix F-10), the second greatest of any Coastal Plain fish community site in 2005 and indicative of nonpoint source runoff.

In 2005, 355 fish representing 18 species were collected at this site. The fauna was typical of that found in many Coastal Plain streams (i.e., the American eel, creek chubsucker, margined madtom, redfin pickerel, pirate perch, eastern mosquitofish, redbreast sunfish, and tessellated darter). The dominant species was the dusky shiner.

In 1960, Bayless and Smith (1962) collected 22 species at this site. The dominant species was the redbreast sunfish. Based upon DWQ and Bayless and Smith (1962) data, 26 species are known from the site including 8 species of sunfish, 5 species of minnows, and 4 species of darters. However, four species of minnows that were common in 1960, satinfin shiner, eastern silvery minnow, comely shiner, and swallowtail shiner, and the Roanoke darter were not collected at this site by DWQ in 2005.

Musselshell Creek, SR 1320, Jones County

Musselshell Creek is approximately four meters wide at this location and has a drainage area of 6.3 square miles. This segment of Musselshell Creek is completely channelized and flows through an agricultural field. Substrate was nearly all silt (70%) with sand (30%) comprising the remainder. In fact, the instream silt accumulation was thick enough to impede wading. Landuse in this catchment is almost all agriculture with only small tracts of forest and farm residences making up the rest. There were numerous habitat problems at this site (e.g., channelization, lack of snags, streambank erosion, poor riparian area, etc.) and the habitat received one of the lowest habitat scores in the entire Neuse basin (29). Conductivity was 89 µmhos/cm and was a slight improvement from the 109 µmhos/cm measured in 2000.

Musselshell Creek has been sampled at SR 1320 twice previously using swamp methods. Sampling in 1995 and 2000 both produced Severe bioclassifications with very low total taxa richness (15 and 26), low EPT taxa richness (one and two), and high biotic indices (7.6 and 7.3) respectively. The 2005 sample also resulted in a Severe bioclassification with low total taxa richness (31), EPT taxa richness (four) and a high biotic index (7.2). These data clearly indicate a pollution tolerant invertebrate community. Notably pollution tolerant taxa present at this location include the organic indicator chironomids *Procladius*, *Chironomus*, and *Cricotopus bicinctus*. In addition, the low dissolved oxygen indicator gastropod *Physella* was collected (common) at this location for the first time.

Beaverdam Creek, SR 1002, Jones County

This segment of Beaverdam Creek is roughly six meters in width and has drainage area of 5.9 square miles. Substrate was a mixture of sand (60%), silt (30%), and limestone outcrops (10%). Although there was some channel braiding, the overall channel was well defined and flow was robust. Landuse in the catchment is nearly all forest and pocosin with only scattered areas of agriculture. There were no significant habitat problems noted and the site received a habitat score of 81. The low conductivity (42 μmhos/cm) reflects the relatively undisturbed nature of the catchment, and this value has been relatively stable since 1995, 1997, and 2000 with values measured at 60 μmhos/cm, 41 μmhos/cm, and 56 μmhos/cm respectively.

Beaverdam Creek has been rated here on two previous occasions with one sample (1997) producing a Moderate bioclassification and one (2000) producing a Natural bioclassification. The 2005 sample yielded a Moderate bioclassification. The reason for the decline in the bioclassificaiton from 2005 to 2000 was due to the very small increase in BI (6.9 versus 6.7) and the decreased total taxa richness (43 versus 52). The combination of these two metrics was just enough to drop this site from a Natural to Moderate bioclassification.

Mill Run, NC 58, Jones County

Mill Run drains east central Jones County, including the White Oak Pocosin. There are no NPDES dischargers in the watershed upstream of the monitoring site. This site is a fish community regional reference site because of its watershed characteristics and high quality instream and riparian habitat characteristics. The habitat scores have been 97 in 2000 and 95 in 2005. However, the conductivity is elevated. In 2000 the conductivity was 212 μmhos/cm, in 2005 it was 169 μmhos/cm (Appendix F-10). These elevated measurements are indicative of nonpoint source runoff even though the watershed is primarily forested.

In 2000, 345 fish representing 19 species were collected at this site. In 2005, the numbers of fish and species declined slightly to 303 and 17, respectively. Twenty three species are now known from this site based upon DWQ data. The four dominant species in 2000 were the American eel (30 percent), redbreast sunfish (21 percent), dusky shiner (18 percent), and tessellated darter (10 percent). The four dominant species in 2005 were dusky shiner (29 percent), tessellated darter (18 percent), American eel (15 percent), and redbreast sunfish (12 percent). Mill Run was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected in 2005.

Island Creek, SR 1004, Jones County

This reach of Island Creek, and its entire catchment is contained within the Croatan National Forest. Here, Island Creek is six meters wide with a drainage area of 7.8 square miles. Substrate was sand (70%) and silt (30%) with a well defined channel and excellent flow. No significant habitat deficiencies were observed and the site received a habitat score of 83. The conductivity was 99 μmhos/cm at the time of winter benthos sampling and was lower than levels measured in 1999 (130 μmhos/cm).

This site is a fish community regional reference site because of its watershed characteristics and high quality instream and riparian habitat characteristics. The habitat scores have been 87 in 2000 and 90 in 2005. However, the conductivity has been at times elevated. In March and August 1995 the conductivity was 105 and 217 μmhos/cm, respectively, in 2000 it was 270 μmhos/cm, and in 2005 it was 99 μmhos/cm (Appendix F-10). These elevated measurements are indicative of nonpoint source runoff even though the watershed is primarily forested.

Island Creek at this location has an extensive sampling history (seven total collections) with a mix of sampling types employed. This complex collection history is related to the fact that Island Creek sometimes flows year-round, and sometimes does not. Therefore, some years it is sampled using Full-Scale or EPT methods in the summer while in other years it is sampled using Swamp protocols in the winter. This site was sampled using Swamp methods in early March. The 2005 collection resulted in a Natural bioclassification, which is unchanged from the previous Swamp sample (1999). In addition, one Full-Scale (1998) and one EPT sample (1991) both resulted in Good bioclassifications. This site consistently has one of the highest total taxa diversities and EPT diversities of any stream in the lower Neuse. For 2005, 76 total taxa and 25 EPT taxa were collected. Notably intolerant EPT taxa present in 2005 included the mayflies *Paraleptophlebia*, *Leptophlebia*, the stonefly *Acroneuria abnormis*, and the caddisflies *Chimarra*, *Heteroplectron americanum*, *Lepidostoma*, *Lype diversa*, *Micrasema wataga*, and *Paranyctiophylax moestus*. The presence of these taxa, along with the historically high total taxa and EPT richness levels at this site suggest that in most years this stream flows year round. The majorities of the EPT taxa collected in 2005 require year-round flow to complete their life cycle and are typically absent from systems where year-round flow is absent.

In terms of fish, Island Creek has been sampled eight times for benthic macroinvertebrates and four times for fish. These collections include basinwide sampling, reference site sampling, and hurricane recovery evaluation. The two most recent fish community assessments were made under two very different flow regimes. In 2000, the flows were noticeably low, whereas in 2005 the watershed had received heavy rain the preceding days and the flow was high, and swift, but the water was still very darkly stained.

The number of fish and species at this site has fluctuated considerably (Figure 25). In 2005 the number of fish collected was the fewest ever and the number of species was approximately one-half of the known fauna at the site. Species notably absent in 2005 included the American eel, redfin pickerel, chain pickerel, bluespotted sunfish, redear sunfish, and tessellated darter. Nearby Mill Creek also a regional reference site with a much larger watershed than that of Island Creek (21 *vs*. 5.7 square miles) also received rain and its water level was also greater in 2005 than in 2000. However, that community experienced only a 12 percent decrease in the number of fish and a 11 percent decrease in the number of species. By contrast, the community in Island Creek, experienced a 63 percent decline in the number of fish and a 33 percent decline in the number of species. The number of fish collected was the fewest of any site in the Coastal Plain in 2005. The number of species was also the fewest (shared by Hominy Swamp, Wilson County, Subbasin 07). Island Creek was also the only site from which at least one

species of darter was collected and was 1 of 9 sites in the Coastal Plain from which no intolerant species were collected in 2005. The 2005 data may be aberrant.

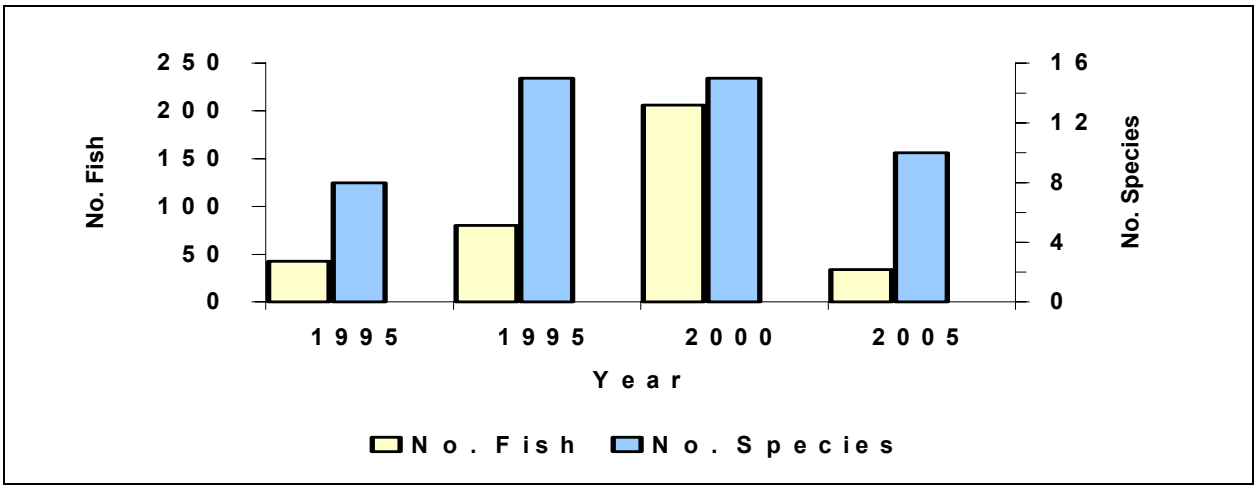


Figure 25. Number of species and individuals of fish at Island Creek at SR 1004, Jones County.

NEUSE RIVER SUBBASIN 12

Description

This subbasin, and all the streams assessed within it, is contained within the Level IV ecoregions of Rolling Coastal Plain and Southeastern Floodplains and Low Terraces (Griffith *et al* 2002). Rolling Coastal Plain is typified by moderate stream gradients and moderately well drained soils while Southeastern Floodplains and Low Terraces have low gradient streams and large rivers and are geographically dominated by bottomland hardwood forests and tupelo-cypress swamp forests (Griffith *et al* 2002). The primary landuse here is agriculture, animal operations, and scattered tracts of forest, although this subbasin also includes the city of Goldsboro.

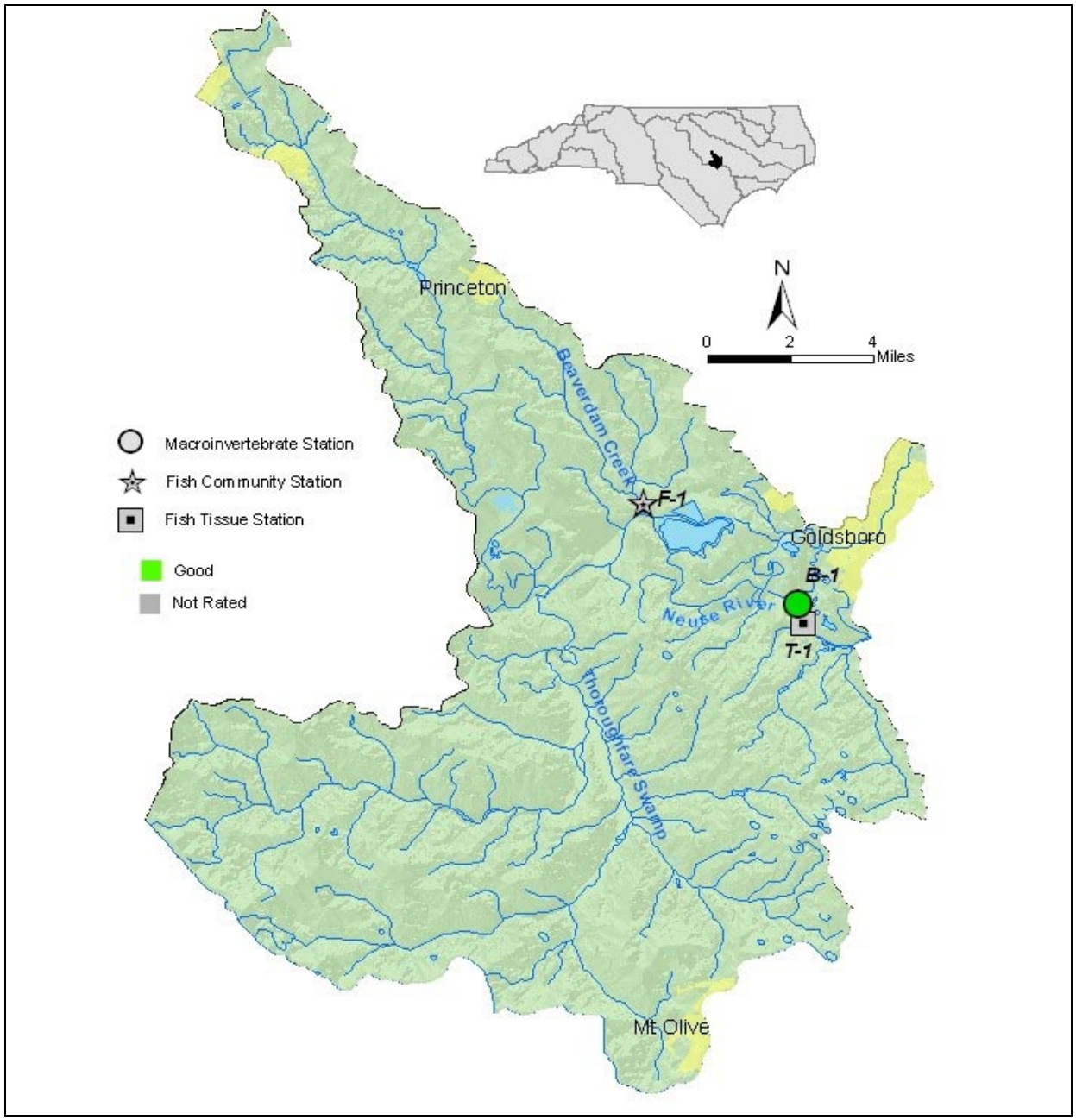


Figure 26. Sampling sites in subbasin 12 of the Neuse River basin.

Overview of Water Quality

All streams sampled for benthic macroinvertebrates in subbasin 12 were classified using Piedmont criteria. Based on benthic macroinvertebrate data, the Neuse River at US 117 improved from Good-Fair in 2000 to Good in 2005 (Figure 26, Table 16). There is only one major NPDES facility in this subbasin (CP&L-Lee; NC0003417, variable flow limit). This facility has two permitted discharges and neither of them have had any WET violations since 2000. There are no ambient water chemistry stations in this subbasin.

The six-month average stream discharge from May 2005 through October 2005 was 856 cubic feet per second (cfs) at the Neuse River (US 117) near Goldsboro (Figure 27). This average was significantly less than the six-month average stream discharge (2073 cfs) from March 2000 through August 2000. The attenuated six month average discharge preceding the October 2005 sampling event relative to the greater flow preceding the August 2000 collection possibly explains the improved community metrics and bioclassification observed at the Neuse River (US 117) in 2005. In catchments where non-point pollution is the primary stressor, lower flows tends to improve water quality as fewer pollutants are washed from the land into waterbodies.

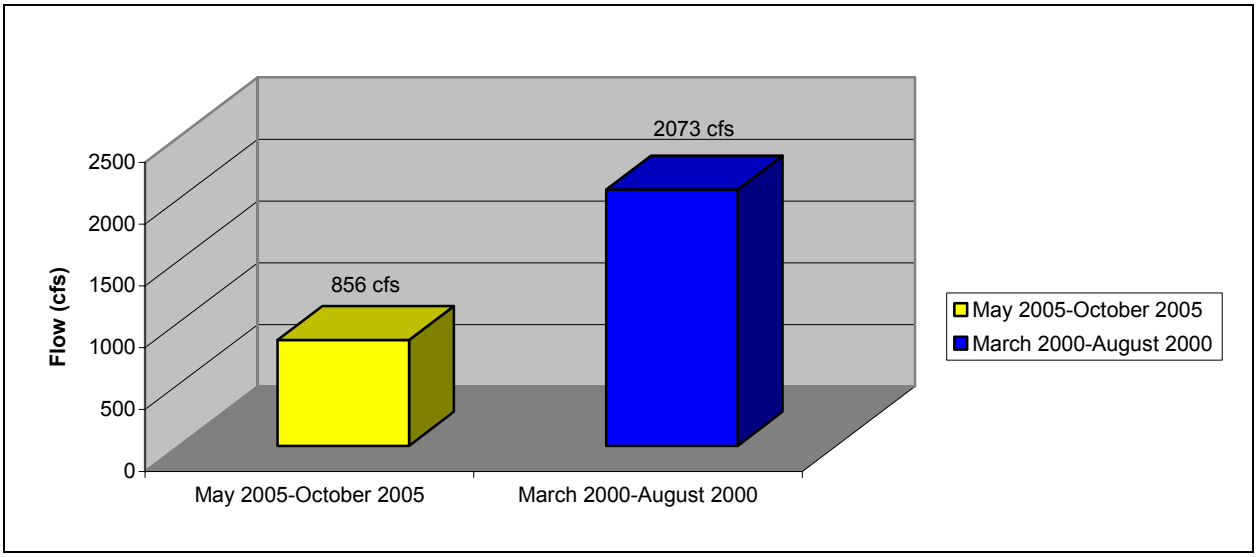


Figure 27. Six month average stream discharge (cfs) Neuse River, US 117 (Goldsboro): May-October 2005 and March 2000-August 2000.

Table 16. Waterbodies monitored in subbasin 12 in the Neuse River basin for basinwide assessment, 1999 - 2005.

Map #	Waterbody	County	Location	2000 Bioclassification	2005 Bioclassification
B-1	Neuse R	Wayne	US 117	Good-Fair	Good
F-1	Beaverdam Creek	Wayne	SR 1007		Not Rated

River and Stream Assessment

Beaverdam Creek, SR 1007, Wayne County

This site on Beaverdam Creek was sampled for the first time for fish community assessments in 2005. The stream drains western Wayne and eastern Johnston counties. There are no NPDES facilities within the creek's rural watershed upstream of the monitoring site. The locale appeared to have once been an old mill site. Instream and riparian habitats included bottomland cypress forest, macrophytes, deep pools, and deadfalls and snags; the habitat score was 80.

In 2005, 511 fish, representing 22 species, were collected. The dominant species was the eastern mosquitofish, approximately 50 percent of all the fish collected were of this species. Other common species included the American eel, comely shiner, redfin pickerel, bluespotted sunfish, redbreast sunfish, dollar sunfish, and tessellated darter. This stream supported a large biomass of fish including large specimens of most sunfish species (redbreast, bluegill, redear, and warmouth), largemouth bass, chain pickerel, redfin pickerel, and creek chubsucker.

In 1961, Bayless and Smith (1962) collected 26 species at this site, including the Carolina madtom, a species now of Special Concern (Appendix F-6). The dominant species then were the pirate perch and the comely shiner. Based upon DWQ and Bayless and Smith (1962) data, 34 species are known from the site including 10 species of sunfish, 5 species of minnows, and 6 species of darters. The creek's close proximity to the Neuse River, the monitoring site is located 0.3 miles above the creek's confluence with the Neuse River, good instream and riparian habitat diversity, and an abundance of prey items may explain the creek's high species diversity and the large sizes of many of the predatory species.

Neuse River, US 117, Wayne County

At this location, the Neuse River is approximately 50 meters wide and has a drainage area of 2,366 square miles. Landuse in the immediate catchment includes urban and suburban areas of Goldsboro. Further upstream of this site, the catchment if mostly agricultural with scattered areas of forest. Substrate was sand (70%) and silt (30%) and the primary habitat deficiencies noted were areas of streambank erosion and breaks in the riparian zone. The habitat received a score of 72 and the conductivity (160 μmhos/cm) reflected this segment's proximity to Goldsboro.

This site has been sampled on three previous occasions with one sample (1991) receiving a Good bioclassification while samples in 1995 and 2000 resulted in Good-Fair bioclassifications. The 2005 sample resulted in a Good bioclassification with 71 total taxa, 24 EPT taxa, and a BI of 5.2, all of which are improvements over these metrics from 1995 (S=53, EPTs=16, BI=5.4) and 2000 (S=66, EPTs=23, BI=6.0). Intolerant EPT taxa in 2005 not collected since 1995 included the the stonefly *Acroneuria abnormis*, and the caddisfly *Hydroptila*. The rare mayfly *Leptohyphes robacki* was also collected at this site in 2005 and represents only the 15th total collection statewide of this taxon by DWQ biologists and is only the fourth record from the Neuse basin. The improvement at this site could possibly be the result of lower flows in 2005 (Figure 27). In catchments

where non-point pollution is the primary stressor, lower flows tend to improve water quality as fewer pollutants are washed from the land into waterbodies.

REFERENCES

Bayless, J. D. and W. B. Smith. 1962. Survey and classification of the Neuse River and tributaries, North Carolina. Final report. Federal Aid in Fish Restoration. Job I-A, Project F-14-R. Raleigh, NC.

NCAC. 2004. North Carolina administrative code. Effective August 1, 2004. Environmental Management Commission. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Raleigh, NC.

NCDENR. 2001. Neuse River basin. Basinwide assessment report support document. Environmental Sciences Branch. North Carolina Department of Environment, and Natural Resources. Division of Water Quality. Water Quality Section. Raleigh, NC.

NCDENR. 2003. Standard Operating Procedures for Benthic Macroinvertebrates. Environmental Sciences Branch. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Raleigh, NC.

Griffith, G.E., Omernik, J.M., Comstock, J.A., Schafele, M.P., McNab, W.H., Lenat, D.R., MacPherson, T.F., Glover, J.B., and Shelburne, N.B., 2002. Ecoregions of North Carolina and South Carolina, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U. S. Geological Survey (map scale 1:1,500,000).

LeGrand, H. E. 2003. Inventory of the significant natural areas of Wake County, North Carolina. Natural Heritage Program. Division of Parks and Recreation. North Carolina Department of Environment and Natural Resources. Raleigh, NC.

GLOSSARY

7Q10	A value which represents the lowest average flow for a seven day period that will recur on a ten year frequency. This value is applicable at any point on a stream. 7Q10 flow (in cfs) is used to allocate the discharge of toxic substances to streams.
Bioclass	Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to each benthic sample based on the number of taxa present in the intolerant groups (EPT) and the Biotic Index value.
cfs	Cubic feet per second, generally the unit in which stream flow is measured.
Chl *a*	Chlorophyll *a*.
Class C Waters	Freshwaters protected for secondary recreation, fishing, aquatic life including propagation and survival, and wildlife. All freshwaters shall be classified to protect these uses at a minimum.
Conductivity	In this report, synonymous with specific conductance and reported in the units of μmhos/cm at 25 ^{o}C. Conductivity is a measure of the resistance of a solution to electrical flow. Resistance is reduced with increasing content of ionized salts.
Division	The North Carolina Division of Water Quality.
D.O.	Dissolved Oxygen.
Ecoregion	An area of relatively homogeneous environmental conditions, usually defined by elevation, geology, and soil type. Examples include Southern Outer Piedmont, Carolina Flatwoods, Sandhills, and Slate Belt.
EPT	The insect orders (Ephemeroptera, Plecoptera, Trichoptera); as a whole, the most intolerant insects present in the benthic community.
EPT N	The abundance of Ephemeroptera, Plecoptera, Trichoptera insects present, using values of 1 for Rare, 3 for Common and 10 for Abundant.
EPT S	Taxa richness of the insect orders Ephemeroptera, Plecoptera and Trichoptera. Higher taxa richness values are associated with better water quality.
HQW	High Quality Waters. Waters which are rated as excellent based on biological and physical/chemical characteristics through Division monitoring or special studies; primary nursery areas designated by the Marine Fisheries Commission; and all Class SA waters.
IWC	Instream Waste Concentration. The percentage of a stream comprised of an effluent calculated using permitted flow of the effluent and 7Q10 of the receiving stream.
Major Discharger	Greater than or equal to one million gallons per day discharge (≥ 1 MGD).
MGD	Million Gallons per Day, generally the unit in which effluent discharge flow is measured.
Minor Discharger	Less than one million gallons per day discharge (< 1 MGD).

NPDES	National Pollutant Discharge Elimination System.
NCBI (EPT BI)	North Carolina Biotic Index, EPT Biotic Index. A summary measure of the tolerance values of organisms found in the sample, relative to their abundance. Sometimes noted as the NCBI or EPT BI.
NCIBI	North Carolina Index of Biotic Integrity (NCIBI); a summary measure of the effects of factors influencing the fish community.
NSW	Nutrient Sensitive Waters. Waters subject to growths of microscopic or macroscopic vegetation requiring limitations on nutrient inputs.
NTU	Nephelometric Turbidity Unit.
ORW	Outstanding Resource Waters. Unique and special waters of exceptional state or national recreational or ecological significance, which require special protection to maintain existing uses.
Parametric Coverage	A listing of parameters measured and reported.
SOC	A consent order between an NPDES permittee and the Environmental Management Commission that specifically modifies compliance responsibility of the permittee, requiring that specified actions be taken to resolve non-compliance with permit limits.
Total S (or S)	The number of different taxa present in a benthic macroinvertebrate sample.
UT	Unnamed tributary.
WWTP	Wastewater treatment plant.

Appendix B-1. Summary of Benthic Macroinvertebrate Data, Sampling Methods and Criteria

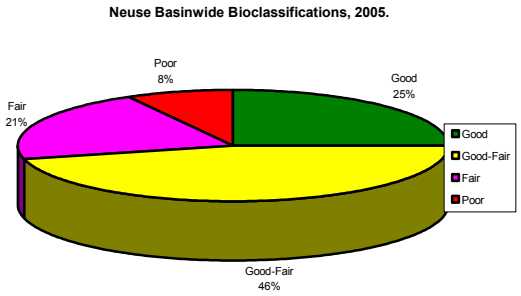
There were 12 subbasins sampled for macroinvertebrates in the Neuse River Basin in 2005. A total of 62 samples (including swamp samples) were collected which is nearly identical in number to the 61 total samples (including swamp samples) collected in 2000. In terms on non-swamp sites, there were no Excellent bioclassifications in 2005, which represented a decline from 2000 when 6% of the basin sites received Excellent ratings. In 2005, 25% of the sites received Good bioclassifications, which is essentially unchanged from 24% measured in 2000. Good-Fair ratings were the most prevalent bioclassification in 2005 comprising 46% of the waterbodies sampled and was an increase from 35% measured in 2000. In 2005, 21% of the locations received Fair bioclassifications, which was similar to the 29% assessed in 2000. Only 8% of the assessed waterbodies in the Neuse River Basin received Poor bioclassifications, which was up very slightly from the 6% noted in 2000. The most significant trends from 2000 to 2005 were the lack of any Excellent bioclassifications in 2005, the increase of Good-Fair bioclassifications in 2005, and the decrease in Fair ratings in 2005. This is the similar trend seen in the Neuse River Basin since 1991 (Appendix B-1). Remaining bioclassifications from 2000 to 2005 remained basically static and historic bioclassification summaries (1991-2005) can be found in Appendix B-1.

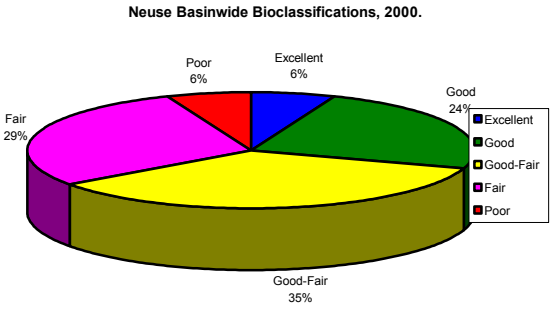
In terms of swamp ratings, 10 locations were sampled in 2005 and 11 in 2000. In 2005, Beaver Creek (SR 1315, Jones County) was too deep at each of three visits for safe sampling and was therefore not assessed. For 2005, 50% of swamp sites in the Neuse River Basin received a Natural rating compared to 55% in 2000. Moderate bioclassifications comprised 40% of the swamp ratings in 2005, which was an increase from the 27% measured in 2000. In 2005 10% of swamp locations received a Severe bioclassification, which was basically unchanged from the 9% in 2000. In addition, 9% of the 2000 samples received a Not Rated designation while all the swamp sites were assigned a bioclassification in 2005.

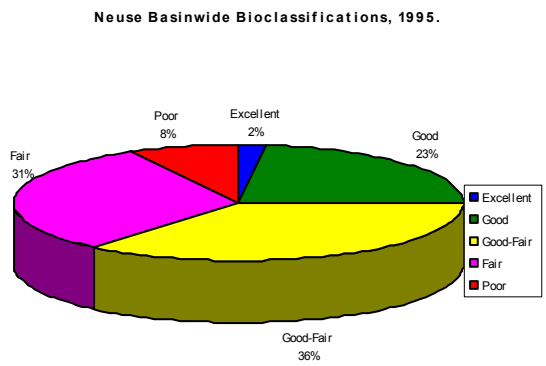
Based on 2005 non-swamp benthic macroinvertebrate data, water quality in the Neuse River basin primarily ranged among three bioclassifications: Good (25%) Good-Fair (46%) and Fair (21%). In 2000, these ranges were 24% (Good), 35% (Good-Fair) and 29% (Fair). As can be seen, the number of Good sites was essentially unchanged between sample years. Conversely, the number of Good-Fair bioclassifications increased by 11% from 2000 to 2005 and the number of Fair bioclassifications decreased through the same period by 9%. Moreover, and of particular concern, there were three Excellent bioclassifications in 2000 (two on the Eno River and one on the Little River) and all three of these previous Excellent sites decreased in bioclassification to Good-Fair (two Eno River sites: SR 1336, SR 1004), Good (Eno River, SR 1561) and Good (Little River, SR 1461).

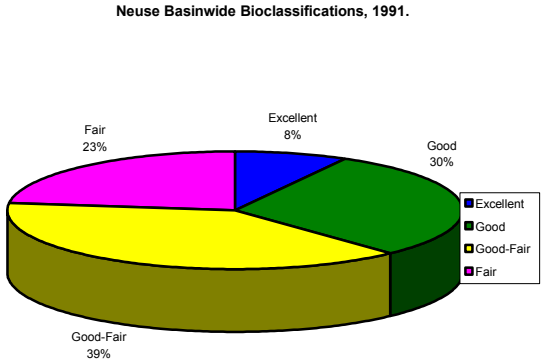
In terms of swamp ratings, 10 locations were sampled in 2005 and 11 in 2000. In 2005, Beaver Creek (SR 1315, Jones County) was too deep at each of three visits for safe sampling and was therefore not assessed. For 2005, 8% of swamp sites in the Neuse River Basin received a Natural rating compared to 10% in 2000. Moderate bioclassifications comprised 6% of the swamp ratings in 2005, which was a slight increase from the 5% measured in 2000. In both 2005 and 2000 2% of all swamp sites received Severe ratings. Only 2% of swamp sites were not rated in 2000 while all swamp sites received a bioclassification in 2005.

Historic summaries of bioclassifications at Neuse basinwide benthos sites (2005 to 1991) are presented below. Through this time period the most significant trends are the increase in Good-Fair bioclassifications and the decrease in Excellent bioclassifications.









Significantly rare invertebrate taxa collected in the Neuse River basin in 2005 including the mayfly *Leptohyphes robacki* (Neuse River at US 117, Little River NC 581), and the caddisfly *Oxyethira* (Little River NC 96 and SR 2130, Eno River at US 15/501).

Sampling Methods:

Standard Qualitative (Full Scale) Method
Benthic macroinvertebrates can be collected from wadeable, freshwater, flowing waters using three sampling procedures. The Biological Assessment Unit's standard qualitative (Full Scale) sampling procedure includes 10 composite samples: two kick-net samples, three bank sweeps, two rock or log washes, one sand sample, one leafpack sample, and visual collections from large rocks and logs (NCDENR 2003). The samples are picked on-site. The purpose of these collections is to inventory the aquatic fauna and produce an indication of relative abundance for each taxon. Organisms are classified as Rare (1 - 2 specimens), Common (3 - 9 specimens), or Abundant (≥ 10 specimens).

EPT Method
Benthic macroinvertebrates can also be collected using the EPT sampling procedure. Four rather than 10 composite qualitative samples are taken at each site: 1 kick, 1 sweep, 1 leafpack and visual collections (NCDENR 2003). Only EPT taxa are collected and identified and only EPT criteria are used to assign a bioclassification.

Swamp Method
In streams with only winter flow, the Biological Assessment Unit's swamp sampling protocol is employed. This collection method consists of a total of nine sweep samples (one series of three by each field team member) are collected from each of the following habitat types: macrophytes, root mats/undercut banks,

and detritus deposits. If one of these habitat types is not present, a sweep from one of the other habitats is substituted. A sweep for the swamp method is defined as the areas that can be reached from a given standing location. Three log/debris washes are also collected, as are visual collections.

Habitat Evaluation
An assessment form has been developed by the Biological Assessment Unit to better evaluate the physical habitat of a stream. The habitat score, which ranges between 1 and 100, is based on the evaluation of channel modification, amount of instream habitat, and type of bottom substrate, pool variety, bank stability, light penetration, and riparian zone width. Higher numbers suggest better habitat quality, but no criteria have been developed to assign impairment ratings.

Data Analysis
Criteria for bioclassifications for standard qualitative samples in piedmont ecoregions are given below and are based on EPT S and the NCBI.

Tolerance values for individual species and biotic index values have a range of 0 - 10, with higher numbers indicating more tolerant species or more polluted conditions. Water quality scores (5 = Excellent, 4 = Good, 3 = Good-Fair, 2 = Fair and 1 = Poor) assigned with the biotic index numbers are averaged with EPT taxa richness scores to produce a final bioclassification. Criteria for piedmont and coastal plain streams are used for the Neuse River basin. EPT abundance and Total taxa richness calculations also are used to help examine between-site differences in water quality.

EPT S and BI values can be affected by seasonal changes. DWQ criteria for assigning bioclassification are based on summer sampling: June - September. For samples collected outside summer, EPT S can be adjusted by subtracting out winter/spring Plecoptera or other adjustment based on resampling of summer site. The BI values also are seasonally adjusted for samples outside the summer season.

Table 1. Criteria for Standard Qualitative (Full Scale) Samples.

Score	BI Values Piedmont	BI Values Coastal Plain
5	<5.14	< 5.42
4.6	5.14—5.18	5.47—5.46
4.4	5.19—5.23	5.47—5.51
4	5.24—5.73	5.52—6.00
3.6	5.74—5.78	6.01—6.05
3.4	5.79—5.83	6.06—6.10
3	5.84—6.43	6.11—6.67
2.6	6.44—6.48	6.68—6.72
2.4	6.49—6.53	6.73—6.77
2	6.54—7.43	6.78—7.68
1.6	7.44—7.48	7.69—7.73
1.4	7.49—7.53	7.74—7.79
1	> 7.53	>7.79

Criteria for bioclassifications for EPT samples in piedmont and coastal plain ecoregions are given below and are based on EPT S.

Table 2. Criteria for EPT Samples.

Score	EPT Values Piedmont	EPT Values Coastal Plain
Excellent	>27	>23
Good	21-27	18-23
Good-Fair	14-20	12-17
Fair	7-13	6-11
Poor	0-6	0-5

Table 3. Benthic macroinvertebrate basinwide monitoring data collected in the Neuse River, 2000-2005. Basinwide sites are in bold.

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
030401									
UT Falls Lk	Bentham Dr	Wake	27-1	8/15/2005	23	8	6.13	5.93	Not Rated
				8/29/2002	33	7	6.33	5.89	Not Rated
UT Falls Lk	SR 2002	Wake	27-1	8/15/2005	35	9	6.13	5.46	Not Rated
				8/29/2002	17	0	7.41	0.00	Not Rated
Eno R	SR 1336	Orange	27-2-(1)	6/29/2005	---	16	---	5.23	Good-Fair
				8/7/2000	---	21	---	4.96	Good
Sevenmile Cr	SR 1120	Orange	27-2-6-(0.5)	6/29/2005	---	20	---	4.85	Good-Fair
				8/7/2000	---	18	---	5.00	Good-Fair
Eno R	SR 1561	Orange	27-2-(7)	6/29/2005	87	22	5.67	4.69	Good
Eno R	SR 1659 Cabes Ford	Orange	27-2-(10)	6/28/2005	67	20	5.30	4.24	Good-Fair
				9/5/2002	---	21	---	4.30	Good
				8/7/2000	75	26	4.76	4.24	Excellent
Eno R	US 15/501	Durham	27-2-(10)	6/28/2005	75	17	5.93	4.99	Good-Fair
				8/8/2000	83	36	5.49	4.98	Excellent
Eno R	SR 1004	Durham	27-2-(19.5)	6/27/2005	81	25	6.01	4.86	Good-Fair
				8/9/2000	62	24	5.58	4.76	Good
S Fk Little R	SR 1538	Orange	27-2-21-2	6/29/2005	---	24	---	4.68	Good
				8/4/2000	---	23	---	4.50	Good
N Fk Little R	SR 1519	Orange	27-2-21-3	8/4/2000	---	17	---	5.10	Good-Fair
N Fk Little R	SR 1538	Orange	27-2-21-3	6/30/2005	---	24	---	4.49	Good
				8/8/2000	---	20	---	4.35	Good-Fair
Little R	SR 1461	Durham	27-2-21-(3.5)	6/30/2005	91	30	5.49	4.54	Good
				10/1/2003	---	29	---	4.39	Excellent
				5/6/2003	---	23	---	4.23	Good-Fair
				1/9/2003	---	19	---	3.92	Good-Fair
				9/5/2002	---	7	---	4.47	Not Rated
				8/8/2000	88	34	5.27	4.39	Excellent

Table 3 (continued).

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
Flat R	SR 1614	Durham	27-3-(1)	7/1/2005	96	27	5.77	4.58	Good
				10/1/2003	---	22	---	4.51	Good
				4/2/2003	---	19	---	3.41	Good-Fair
				1/9/2003	---	18	---	3.69	Good-Fair
				9/5/2002	---	10	---	4.63	Not Rated
				8/3/2000	90	30	5.47	4.84	Good
S Flat R	SR 1109	Person	27-3-3	4/7/2004	---	16	---	5.17	Not Rated
S Flat R	SR 1112	Person	27-3-4	4/7/2004	---	24	---	5.33	Good-Fair
Deep Cr	SR 1715	Person	27-3-4	6/30/2005	---	22	---	4.36	Good
				8/4/2000	---	21	---	4.70	Good
Flat R	SR 1004	Durham	27-3-(9)	8/9/2000	48	13	6.85	5.96	Fair
Knap of Reeds Cr	Above WWTP	Granville	27-4-(6)	4/15/2004	61	14	6.56	5.78	Fair
Knap of Reeds Cr	Below WWTP	Granville	27-4-(6)	4/15/2004	60	15	6.29	5.33	Fair
				8/9/2000	51	8	7.10	6.56	Fair
Knap of Reeds Cr	Camp Butner	Granville	27-4-(6)	4/22/2004	131	41	5.24	4.40	Excellent
Knap of Reeds Cr	SR 1004	Granville	27-4-(6)	4/15/2004	65	13	6.60	5.29	Fair
Ellerbe Cr	SR 1636	Durham	27-5-(2)	8/23/2000	41	6	7.29	6.72	Fair
L Lick Cr	Gibson Rd	Durham	27-9-(0.5)	4/5/2005	24	3	6.96	6.63	Not Rated
L Lick Cr	Off Mineral Springs Rd	Durham	27-9-(0.5)	4/5/2005	43	3	6.75	6.98	Not Rated
L Lick Cr	SR 1814	Durham	27-9-(0.5)	3/6/2000	26	2	7.07	7.23	Poor
L Lick Cr	Stallings Road	Durham	27-9-(0.5)	4/6/2005	41	4	6.90	6.57	Not Rated
UT L Lick Cr	Lynn Road	Durham	27-9-(0.5)	4/6/2005	27	2	6.87	6.35	Not Rated
UT L Lick Cr	Off Santee Road	Durham	27-9-(0.5)	4/5/2005	39	12	6.10	4.96	Not Rated
Lick Cr	SR 1905	Durham	27-11-(0.5)	3/6/2000	26	12	6.70	5.70	Fair
Smith Cr	SR 1710	Granville	27-12-2-(1)	6/27/2005	76	20	5.87	4.97	Good-Fair
				8/10/2000	---	21	---	5.18	Good
New Light Cr	SR 1911	Wake	27-13-(0.1)	12/5/2001	---	21	---	4.90	Good-Fair
New Light Cr	SR 1912	Wake	27-13-(0.1)	6/28/2005	---	18	---	5.00	Good-Fair
				12/5/2001	---	30	---	5.23	Good
				8/10/2000	---	23	---	5.22	Good
Upper Barton Cr	NC 50	Wake	27-15-(1)	6/27/2005	---	7	---	6.02	Fair
				9/24/2002	---	14	---	5.11	Good-Fair
				8/10/2000	---	14	---	5.44	Good-Fair
Upper Barton Cr	Tradescant Court	Wake	27-15-(1)	4/10/2001	79	18	5.48	4.67	Good-Fair
Horse Cr	SR 1923	Wake	27-17-(0.7)	8/20/2001	85	22	5.98	5.32	Good-Fair
UT Neuse R	End of Dunn Rd	Wake	27-(22.5)	8/15/2005	32	8	5.87	6.37	Not Rated
030402									
Neuse R	US 401	Wake	27-(20.7)	8/25/2005	56	14	6.14	5.60	Good-Fair
				7/6/2000	63	21	5.77	5.00	Good-Fair
Neuse R	US 64	Wake	27-(20.7)	8/26/2005	47	17	5.92	5.39	Good-Fair
				9/11/2000	45	16	5.87	5.18	Good-Fair
				10/13/2000	61	23	5.56	4.26	Good
Neuse R	NC 42, Clayton	Johnston	27-(36)	9/16/2005	82	25	6.13	4.98	Good-Fair
				10/8/2002	---	19	---	5.13	Good-Fair
				10/12/2000	63	25	5.46	4.64	Good
				9/11/2000	60	24	5.59	4.73	Good
Neuse R	SR 1201, near Princeton	Johnston	27-(36)	8/8/2005	47	20	5.26	4.71	Good
Richland Cr	US 1	Wake	27-21	3/17/2000	---	18	---	4.91	Good-Fair
Smith Cr	SR 2045	Wake	27-23-(2)	8/12/2005	---	14	---	4.76	Good-Fair
				8/20/2001	72	22	5.66	4.78	Good
				7/6/2000	---	12	---	5.11	Fair
Toms Cr	off powerline trail, upstream from Forestville Rd.	Wake	27-24	5/11/2000	45	14	4.98	3.55	Not Rated
Toms Cr	Forestville Rd	Wake	27-24	1/31/2001	53	17	5.03	4.00	Not Impaired
Toms Cr	Kimbel Rd	Wake	27-24	1/31/2001	29	6	7.26	6.11	Not Rated
				8/21/2000	36	6	6.79	6.26	Not Rated
Toms Cr	Roxbury Rd	Wake	27-24	6/20/2001	43	12	6.01	5.74	Not Rated
Toms Cr	SR 2044	Wake	27-24	8/25/2005	---	6	---	5.36	Poor
				6/20/2001	42	13	5.99	5.03	Not Rated
				7/6/2000	---	11	---	5.41	Fair
				5/11/2000	45	8	6.22	5.59	Not Rated
UT Perry Cr	SR 3514	Wake	27-25-(2)	5/10/2004	70	10	6.92	5.84	Fair

Table 3 (continued).

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
Perry Cr	Hunters Way	Wake	27-25-(2)	5/11/2004	44	5	6.97	6.97	Not Rated
Perry Cr	SR 2006	Wake	27-25-(2)	8/24/2005	---	11	---	6.01	Fair
				5/10/2004	63	9	6.89	6.26	Fair
				7/6/2000	---	8	---	5.23	Fair
Crabtree Cr	NC 54	Wake	27-33-(1)	8/24/2005	31	4	7.51	6.72	Poor
Crabtree Cr	In Umstead State Park	Wake	27-33-(3.5)	8/24/2005	35	10	6.41	5.77	Good-Fair
				9/6/2001	55	13	6.24	5.91	Good-Fair
				7/5/2000	55	13	6.19	5.98	Good-Fair
				7/5/2000	70	8	7.56	7.07	Poor
Crabtree Cr	US 1	Wake	27-33-(10)	8/24/2005	46	11	6.61	6.17	Fair
				8/30/2000	54	13	6.55	5.89	Fair
Black Cr	Weston Parkway	Wake	27-33-5	7/27/2000	---	8	---	6.34	Fair
Reedy Cr	Umstead State Park	Wake	27-33-8	5/19/2000	31	7	6.76	6.16	Not Rated
Reedy Cr	Umstead State park – restoration	Wake	27-33-8	5/19/2000	21	2	8.30	5.45	Not Rated
UT Turkey Cr	Above Delta Ridge	Wake	27-33-9-2	7/26/2000	26	6	5.26	5.14	Not Rated
UT Turkey Cr	below Delta Ridge, at temporary road crossing	Wake	27-33-9-2	7/26/2000	15	3	6.21	3.69	Not Rated
UT Richlands Cr	behind museum annex	Wake	27-33-11	1/22/2004	---	6	---	6.19	Not Rated
Hare Snipe Cr	US 70, Near Crabtree	Wake	27-33-12-(2)	3/17/2000	5	5	5.53	5.53	Poor
Mine Cr	off N Hills Dr, Raleigh	Wake	27-33-14	3/17/2000	---	3	---	6.93	Poor
Pigeon House Cr	Fenton St, Raleigh	Wake	27-33-18	2/27/2000	33	2	8.13	7.61	Poor
Marsh Cr	Near US 1, Bardwell Rd	Wake	27-33-20	8/25/2005	47	6	7.02	6.35	Fair
				7/27/2000	40	3	7.43	6.61	Poor
Walnut Cr	Sunnybrook Rd.	Wake	27-34-(4)	8/26/2005	51	12	6.77	5.66	Fair
				7/27/2000	61	15	6.37	5.58	Good-Fair
Rocky Br	Gorman Street	Wake	27-34-6	12/12/2000	13	1	7.74	7.00	Not Rated
Rocky Br	Dan Allen Dr	Wake	27-34-6	12/12/2000	15	1	6.61	6.20	Not Rated
Rocky Br	Near Pullen Rd	Wake	27-34-6	12/12/2000	13	1	7.59	6.20	Not Rated
Marks Cr	SR 1714	Johnston	27-38	8/9/2005	---	16	---	4.84	Good-Fair
				9/8/2000	---	19	---	5.12	Good-Fair
Mill Cr	SR 2044	Wake	27-39	5/12/2000	59	20	5.49	4.31	Not Impaired
Swift Cr	SR 1152, Holly Springs Rd	Wake	27-43-(1)	8/12/2005	---	9	---	6.29	Fair
				4/9/2001	55	10	6.83	6.45	Fair
				7/5/2000	---	9	---	6.81	Fair
				4/24/2000	56	12	6.84	6.41	Fair
Swift Cr	SR 1300	Wake	27-43-(1)	6/21/2001	56	9	6.86	6.61	Fair
				5/3/2000	63	9	7.44	6.32	Poor
Swift Cr	US 401	Wake	27-43-(1)	1/6/2004	50	5	6.70	6.24	Poor
Swift Cr	SR 1501	Johnston	27-43-(8)	8/8/2005	79	29	5.44	4.73	Good
				10/2/2000	67	21	5.52	4.84	Good
Swift Cr	SR 1555	Johnston	27-43-(8)	8/9/2005	---	16	---	4.81	Good-Fair
				10/2/2000	---	16	---	5.77	Good-Fair
UT Williams Cr	McKenan Rd	Wake	27-43-2	5/19/2000	43	7	6.62	6.59	Not Rated
Williams Cr	above US 1 in MacGregor Ctr in park	Wake	27-43-2	5/10/2000	32	8	7.00	6.78	Not Rated
	above US 1 in MacGregor office park	Wake	27-43-2	7/5/2000	---	5	---	6.72	Poor
	above US 64 in MacGregor West	Wake	27-43-2	5/19/2000	39	6	7.30	6.69	Not Rated
	MacGregor Office Park	Wake	27-43-2	4/10/2001	39	7	7.14	6.88	Not Rated
Speight Br	SR 1385 (Lilly Atkins Rd.)	Wake	27-43-3.5	5/2/2000	55	6	6.76	5.52	Not Rated
Dutchmans Br	Holly Springs Rd	Wake	27-43-4.5	4/9/2001	53	13	5.98	5.40	Fair

Table 3 (continued).

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
Yates Mill Br	US 401	Wake	27-43-5-(1.5)	1/6/2004	101	20	6.34	5.18	Good-Fair
Little Cr	SR 1562	Johnston	27-43-12	8/8/2005	---	11	---	5.49	Fair
				9/8/2000	---	11	---	6.20	Fair
030403									
Middle Cr	SR 1301 upstream crossing	Wake	27-43-15-(1)	7/25/2005	52	12	6.52	5.95	Fair
Middle Cr	SR 1375	Wake	27-43-15-(4)	7/25/2005	46	13	6.10	5.41	Good-Fair
				8/21/2000	42	13	6.01	5.78	Good-Fair
Middle Cr	NC 50	Johnston	27-43-15-(4)	10/8/2002	13	13	4.79	4.79	Not Rated
				8/21/2000	49	18	5.50	4.89	Good-Fair
Middle Cr	SR 1504	Johnston	27-43-15-(4)	9/29/2005	64	16	5.62	4.66	Good-Fair
030404									
Black Cr	SR 1330	Johnston	27-45-(2)	7/25/2005	71	11	6.59	5.22	Not Rated
Mill Cr	SR 1009	Johnston	27-52-(1)	9/22/2005	4	4	5.39	5.39	Poor
				8/24/2000	12	12	5.29	5.29	Good-Fair
Hannah Cr	SR 1159	Johnston	27-52-6	7/25/2005	62	7	7.08	5.46	Fair
				2/8/2005	50	6	6.50	5.15	Not Rated
Hannah Cr	SR 1009	Johnston	27-52-6	9/29/2005	5	5	4.84	4.84	Poor
				10/2/2001	69	12	6.30	4.73	Good-Fair
				8/15/2000	11	11	5.68	5.68	Fair
030405									
Neuse R	SR 1731	Wayne	27-(56)	10/13/2000	63	21	5.26	4.25	Good
Stoney Cr	Wayne Memorial Blvd	Wayne	27-62	2/14/2001	37	3	7.91	7.35	Not Rated
Stoney Cr	SR 1556	Wayne	27-62	2/16/2001	50	5	7.90	6.80	Not Rated
Stoney Cr	Ashe St Park	Wayne	27-62	6/15/2000	52	5	7.19	6.00	Fair
Stoney Cr	SR 1920	Wayne	27-62	9/29/2005	65	7	6.40	5.39	Fair
				2/19/2001	65	7	6.76	5.42	Fair
				8/22/2000	8	8	5.61	5.61	Fair
				6/15/2000	50	5	6.99	5.74	Fair
UT Stoney Cr	SR 1565	Wayne		3/23/2004	28	2	7.67	5.28	Poor
Stoney Run	SR 1547	Wayne	27-62-0.5	3/23/2004	43	3	7.60	6.85	Not Rated
Billy Br	Harding Dr	Wayne	27-62-3	3/23/2004	41	4	6.76	6.19	Not Rated
Bear Cr	SR 1715	Wayne	27-72-(0.1)	7/26/2005	61	7	6.60	5.31	Fair
Bear Cr	SR 1311	Lenoir	27-72-(5)	7/26/2005	15	15	4.91	4.91	Good-Fair
				8/22/2000	13	13	5.25	5.25	Good-Fair
Neuse R	NC 58	Lenoir	27-(75.7)	9/16/2005	62	20	5.69	4.75	Good
				10/17/2000	62	22	5.42	4.17	Good
Falling Cr	near SR 1546	Lenoir	27-77	7/26/2005	12	12	5.48	5.48	Good-Fair
				9/5/2001	64	14	5.95	5.23	Good-Fair
				10/5/2000	11	11	5.44	5.44	Fair
030406									
Little R	NC 96	Wake	27-57-(1)	7/27/2005	80	19	6.26	5.37	Good-Fair
				8/15/2000	20	20	5.10	5.10	Good-Fair
Little R	SR 2130	Johnston	27-57-(8.5)	7/28/2005	97	28	5.60	4.65	Good
				8/15/2000	66	19	5.51	4.68	Good
Buffalo Cr	SR 1007	Wake	27-57-16-(2)	7/27/2005	80	15	6.91	5.22	Fair
Buffalo Cr	SR 1941	Johnston	27-57-16-(3)	8/15/2000	73	15	6.28	5.48	Good-Fair
Little R	SR 1234	Wayne	27-57-(20.2)	7/28/2005	90	20	6.55	5.09	Good-Fair
Little R	NC 581	Wayne	27-57-(20.2)	7/28/2005	95	21	5.96	4.49	Good
				8/24/2000	60	17	5.57	4.48	Good-Fair
030407									
UT Moccasin Cr	NC 39	Wake		7/26/2005	71	16	6.2	5.4	Good-Fair
Moccasin Cr	NC 231	Nash	27- 53- (2)	7/25/2005	-	15	-	5.5	Good-Fair
				10/8/2002	-	12	-	5.9	Not Rated
				9/22/2000	-	17	-	5.3	Good-Fair
				8/15/2000	-	14	-	6	Good-Fair
Beaverdam Cr	Above SR 1111	Nash	27- 86- 3- 8	8/27/2001	75	15	6.2	5.5	Good-Fair
Contentnea Cr	SR 1622	Wilson	27- 86- (7)	8/30/2001	-	15	-	5.9	Good-Fair
Contentnea Cr	NC 222	Wilson	27- 86- (7)	7/26/2005	79	22	6.1	4.8	Good
				8/29/2000	78	20	6.3	5.6	Good-Fair

Table 3 (continued).

Subbasin/ Waterbody	Location	County	Index No.	Date	ST	EPT	NCBI	EPT NCBI	BioClass
Contentnea Cr	Below NC 222, Above WWTP	Wilson	27- 86- (7)	4/18/2002	42	13	6.1	5.4	Good-Fair
Contentnea Cr	Below WWTP	Greene	27- 86- (7)	4/18/2002	57	15	6.5	5.5	Fair
Hominy Swp	SR 1606	Wilson	27- 86- 8	3/14/2001	31	0	8.3	0	Poor
Hominy Swp	at Wilson WWTP	Wilson	27- 86- 8	3/14/2001	27	0	8.5	0	Poor
Toisnot Swp	US 264A	Wilson	27- 86- 11- (5)	7/25/2005	-	14	-	4.7	Good-Fair
				8/30/2001	62	12	6.3	5.8	Good-Fair
				10/5/2000	-	5	-	9.8	Fair
Nahunta Swp	SR 1537	Wayne	27- 86- 14	7/29/2005	88	16	6.7	5.3	Good-Fair
Nahunta Swp	SR 1058	Greene	27- 86- 14	7/27/2005	96	19	6.5	5	Good-Fair
				8/16/2000	72	9	6.5	5.4	Fair
The Slough	SR 1535	Wayne	27- 86- 14- 1	2/20/2001	85	18	6.4	4.7	Good-Fair
Button Br	SR 1556	Wayne	27- 86- 14- 3	2/16/2001	50	10	6.4	4.9	Not Rated
Rainbow Cr	SR 1901	Greene	27- 86- 21	3/19/2001	-	11	-	4.8	Fair
L Contentnea Cr	US 264A	Pitt	27- 86- 26	7/26/2005	-	9	-	5.4	Fair
				10/2/2001	51	4	6.7	6	Fair
				10/5/2000	-	6	-	6	Fair
030408									
Core Cr	SR 1239 upstream	Craven	27- 90	3/3/2004	36	5	6.8	5.3	Moderate
Core Cr	SR 1239	Craven	27- 90	3/3/2004	48	6	6.9	6.1	Severe
Core Cr	NC 55	Craven	27- 90	7/27/2005	72	15	6.5	5.6	Good-Fair
				8/16/2000	61	10	6.9	6.4	Fair
Flat Swp	NC 55	Craven	27- 90- 3	2/8/2005	48	11	6.7	5.3	Natural
				2/23/2000	55	8	7.8	6.9	Natural
030409									
Swift Cr	SR 1931/1465	Pitt	27- 97 -(0.5)	7/29/2005	82	27	6.4	5.5	Good
Swift Cr	NC 118	Craven	27- 97 -(0.5)	9/27/2005	62	13	6.8	5.9	Fair
				10/12/2000	78	13	6.8	6.1	Fair
Clayroot Swp	NC 102	Pitt	27- 97- 5	3/19/2001	-	8	-	5.8	Fair
Clayroot Swp	SR 1941	Pitt	27- 97- 5	7/28/2005	-	16	-	5.3	Good-Fair
				8/16/2000	-	3	-	5.8	Poor
				2/24/2000	56	8	7	5.4	Not Rated
Creeping Swp	NC 102	Pitt	27- 97- 5- 3	2/8/2005	26	2	7	7.4	Moderate
				2/24/2000	30	2	6.8	7.4	Natural
Palmetto Swp	NC 43	Craven	27- 97- 5.3	2/8/2005	40	6	6.5	6.1	Natural
				2/24/2000	60	8	7.1	6.4	Natural
030410									
Upper Broad Cr	NC 55	Craven	27-106-(1)	2/22/2005	48	8	6.9	6.3	Natural
				2/25/2000	35	4	7.2	7.3	Not Rated
Mill Swp	SR 1611	Craven	27-106-3	3/21/2005	54	2	8.1	6.6	Moderate
Cedar Gut	SR 1005	Pamlico	27-111-2	3/21/2005	38	4	7.0	5.6	Moderate
SW Pr Slocum Cr	SR 1746	Craven	27-112-1	2/22/2005	47	13	5.4	3.9	Moderate
				2/25/2000	48	13	6.5	4.9	Not Rated
E Pr Slocum Cr	Grey Fox Rd	Craven	27-112-2	3/22/2005	45	8	6.9	6.3	Moderate
UT W PR Clubfoot Cr	NC 101	Craven	27-123	3/22/2005	31	7	5.9	4.6	Moderate
Fork Run	SR 1005	Pamlico	27-125-2	3/23/2005	28	3	8.1	6.1	Severe
030411									
Trent R	SR 1153	Jones	27-101-(1)	2/23/2005	68	14	6.7	5.8	Moderate
				2/25/2000	57	7	7.3	5.8	Not Rated
Trent R	Near Comfort	Jones	27-101-(1)	7/28/2005	58	12	6.0	4.7	Good-Fair
				5/9/2000	50	7	6.8	5.9	Fair
Tuckahoe Swp	SR 1142	Jones	27-101-5-1	2/23/2005	64	13	6.4	5.7	Natural
				2/23/2000	69	10	6.7	5.8	Not Rated
Beaver Cr	SR 1315	Jones	27-101-15	3/2/2000	49	8	7.6	6.3	Not Rated
Musselshell Cr	SR 1320	Jones	27-101-17	3/3/2005	31	4	7.1	7.1	Severe
				2/24/2000	26	2	7.3	6.0	Not Rated
Crooked Run	SR 1123	Jones	27-101-18	3/2/2000	29	1	6.5	6.3	Not Rated
Beaverdam Cr	SR 1002	Jones	27-101-21	3/3/2005	43	10	6.9	5.8	Moderate
				2/24/2000	52	8	6.7	5.3	Not Rated
Island Creek	SR 1004	Jones	27-101-33	3/10/2005	76	25	5.8	4.9	Natural
030412									
Neuse R	US 117	Wayne	27-(56)	10/6/2005	71	24	5.2	4.3	Good
				8/29/2000	66	23	6.0	4.8	Good-Fair

Appendix F-1. Fish community sampling methods and criteria.

Sampling Methods

At each sample site, a 600 ft. section of stream was selected and measured (NCDENR 2001a; NCDENR 2001b). The fish in the delineated stretch of stream were then collected using two backpack electrofishing units and usually, two persons netting the stunned fish. A seine was also used where there were substantial riffles. In 2004 and 2005 Biological Assessment Unit Staff were assisted by staff from the NC DWQ and North Carolina State University (NCSU) and summer interns from NCSU. After collection, all readily identifiable fish were examined for sores, lesions, fin damage, or skeletal anomalies, measured (total length to the nearest 1 mm), and then released. Those fish that were not readily identifiable were preserved and returned to the laboratory for identification, examination, and total length measurement.

NCIBI Analysis

The NCIBI is a modification of the Index of Biotic Integrity initially proposed by Karr (1981) and Karr, *et al*. (1986). The IBI method was developed for assessing a stream's biological integrity by examining the structure and health of its fish community. The scores derived from this index are a measure of the ecological health of the waterbody and may not directly correlate to water quality. For example, a stream with excellent water quality, but with poor or fair fish habitat, would not be rated excellent with this index. However, in many instances, a stream which rated excellent on the NCIBI should be expected to have excellent water quality.

The Index of Biological Integrity incorporates information about species richness and composition, trophic composition, fish abundance, and fish condition. The NCIBI summarizes the effects of all classes of factors influencing aquatic faunal communities (water quality, energy source, habitat quality, flow regime, and biotic interactions). While any change in a fish community can be caused by many factors, certain aspects of the community are generally more responsive to specific influences. Species composition measurements reflect habitat quality effects. Information on trophic composition reflects the effect of biotic interactions and energy supply. Fish abundance and condition information indicate additional water quality effects. It should be noted, however, that these responses may overlap. For example, a change in fish abundance may be due to decreased energy supply or a decline in habitat quality, not necessarily a change in water quality.

The assessment of biological integrity using the North Carolina Index of Biotic Integrity (NCIBI) is provided by the cumulative assessment of 12 parameters or metrics (Table 1). The values provided by the metrics are converted into scores on a 1, 3, or 5 scale. A score of 5 represents conditions which would be expected for undisturbed reference streams in the specific river basin or ecoregion, while a score of 1 indicates that the conditions deviate greatly from those expected in undisturbed streams of the region. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score. Finally, the score (an even number between 12 and 60) is then used to determine the ecological integrity class of the stream from which the sample was collected.

The NCIBI has been revised (NCDENR 2001b). Currently, the focus of using and applying the NCIBI has been restricted to wadeable streams that can be sampled by a crew of four persons. The bioclassifications and criteria have also been recalibrated against regional reference site data (Biological Assessment Unit Memorandum F-20010820) (Tables 1 – 5). To qualify as a reference site, the site had to satisfy all seven criteria in the order listed in Table 2. Reference sites represented the least impacted or the most minimally impacted streams and the overall biological conditions of the fish communities that could be attained. It has been very difficult to identify reference sites that satisfy all of the criteria in Table 2 in the Piedmont outside of the Carolina Slate Belt ecoregion and in the Coastal Plain.

Table 1. Scoring criteria for the NCIBI for wadeable streams in the Outer Piedmont of the Neuse, Cape Fear, Roanoke, and Tar River basins ranging between 3.1 and 328 mi2.

No.	Metric		Score
1	**No. of species**		
	≥ 16 species		5
	10-15 species		3
	< 10 species		1
2	**No. of fish**		
	≥ 225 fish		5
	150-224 fish		3
	< 150 fish		1
3	**No. of species of darters**		
	Cape Fear	Neuse, Roanoke, and Tar	
	≥ 2 species	≥ 3 species	5
	1 species	1 or 2 species	3
	0 species	0 species	1
4	**No. of species of sunfish**		
	≥ 4 species		5
	3 species		3
	0, 1, or 2 species		1
5	**No. of species of suckers**		
	Cape Fear	Neuse, Roanoke, and Tar	
	≥ 2 species	≥ 3 species	5
	1 species	1 or 2 species	3
	0 species	0 species	1
6	**No. of intolerant species**		
	Cape Fear	Neuse, Roanoke, and Tar	
	≥ 1 species	≥ 3 species	5
	no middle score	1 or 2 species	3
	0 species	0 species	1
7	**Percentage of tolerant individuals**		
	≤ 35%		5
	36-50%		3
	> 50%		1
8	**Percentage of omnivorous and herbivorous individuals**		
	10-35%		5
	36-50%		3
	> 50%		1
	< 10%		1
9	**Percentage of insectivorous individuals**		
	65-90%		5
	45-64%		3
	< 45%		1
	> 90%		1
10	**Percentage of piscivorous individuals**		
	≥ 1.4-15%		5
	0.4-1.3%		3
	< 0.4%		1
	> 15%		1
11	**Percentage of diseased fish (DELT = diseased, fin erosion, lesions, and tumors)**		
	≤ 1.75%		5
	1.76-2.75%		3
	> 2.75%		1
12	**Percentage of species with multiple age groups**		
	≥ 50% of all species have multiple age groups		5
	35-49% all species have multiple age groups		3
	< 35% all species have multiple age groups		1

Table 2. Reference site selection hierarchy -- a watershed-based approach for streams.

Criterion	Qualification
1 -- Habitat	Total habitat score ≥ 65
2 – NPDES dischargers	No NPDES dischargers ≥ 0.01 MGD above the site or if there are small dischargers (~≤ 0.01 MGD), the dischargers are more than one mile upstream
3 – Percent urbanization	< 10% of the watershed is urban or residential areas
4 – Percent forested	≥ 70% of the watershed is forested or in natural vegetation
5 – Channel incision	At the site, the stream is not incised beyond natural conditions
6 – Riparian zone integrity	No breaks in the riparian zones or, if there are breaks, the breaks are rare
7 – Riparian zone width	Piedmont streams – width of the riparian zone along both banks is ≥ 12 m Coastal Plain streams – width of the riparian zone along both banks is ≥ 18 m
Exception 1	If the site satisfied Criteria 1 - 6, except one of the two riparian widths was less than one unit optimal, then the site still qualified as a reference site
Exception 2	If the site satisfied Criteria 1 - 3 and 5 - 7, but the percentage of the watershed in forest or natural vegetations was ≥ 60% (rather than ≥ 70%), then the site still qualified as a reference site. [Note: in the New River Basin this last exception is ≥ 50%.]

Table 3. Regional reference sites used for calibrating the North Carolina Index of Biotic Integrity in the Neuse River basin.

Subbasin/Waterbody	Station	County	Assessment Date
030401			
Deep Cr	SR 1734	Person	07/19/90
Deep Cr	SR 1734	Person	05/16/95
Deep Cr	SR 1734	Person	04/06/00
North Fork Little R	SR 1461	Durham	04/07/00
South Fork Little R	SR 1461	Durham	04/07/00
030407			
Turkey Creek	SR 1131	Nash	04/05/00
030411			
Tuckahoe Swp	SR 1142	Jones	06/12/00
Mill Run	NC 58	Jones	06/12/00
Island Cr	SR 1004	Jones	03/23/95
Island Cr	SR 1004	Jones	08/15/95
Island Cr	SR 1004	Jones	06/12/00

Table 4. Tolerance ratings and adult trophic guild assignments for fish in the Neuse River basin. Species collected in 2004 and 2005 are highlighted in blue. Common and scientific names follow Nelson, et al. (2004), except for *Scartomyzon*.

Family/Species	Common Name	Tolerance Rating	Trophic Guild of Adults
Petromyzontidae	**lampreys**		
Lampetra aepyptera	least brook lamprey	Intermediate	Non-feeding
Petromyzon marinus	sea lamprey	Intermediate	Parasitic
Acipenseridae	**sturgeons**		
Acipenser oxyrinchus	Atlantic sturgeon	Intermediate	Insectivore
Lepisosteidae	**gars**		
Lepisosteus osseus	longnose gar	Tolerant	Piscivore
Amiidae	**bowfins**		
Amia calva	bowfin	Tolerant	Piscivore
Anguillidae	**eels**		
Anguilla rostrata	American eel	Intermediate	Piscivore
Clupeidae	**herrings and shads**		
Alosa aestivalis	blueback herring	Intermediate	Insectivore
A. mediocris	hickory shad	Intermediate	Insectivore
A. pseudoharengus	alewife	Intermediate	Insectivore
A. sapidissima	American shad	Intermediate	Insectivore
Dorosoma cepedianum	gizzard shad	Intermediate	Omnivore
D. petenense	threadfin shad	Intermediate	Omnivore
Cyprinidae	**carps and minnows**		
Carassius auratus	goldfish	Tolerant	Omnivore
Clinostomus funduloides	rosyside dace	Intermediate	Insectivore
Ctenopharyngodon idella	grass carp	Tolerant	Herbivore
Cyprinella analostana	satinfin shiner	Tolerant	Insectivore
Cyprinus carpio	common carp	Tolerant	Omnivore
Hybognathus regius	silvery minnow	Intermediate	Herbivore
Luxilus albeolus	white shiner	Intermediate	Insectivore
L. cerasinus	crescent shiner	Intermediate	Insectivore
Lythrurus matutinus	pinewoods shiner	Intermediate	Insectivore
Nocomis leptocephalus	bluehead chub	Intermediate	Omnivore
N. raneyi	bull chub	Intermediate	Omnivore
Notemigonus crysoleucas	golden shiner	Tolerant	Omnivore
Notropis altipinnis	highfin shiner	Intermediate	Insectivore
N. amoenus	comely shiner	Intermediate	Insectivore
N. bifrenatus	bridle shiner	Intermediate	Omnivore
N. chalybaeus	ironcolor shiner	Intolerant	Insectivore
N. cummingsae	dusky shiner	Intermediate	Insectivore
N. hudsonius	spottail shiner	Intermediate	Omnivore
N. procne	swallowtail shiner	Intermediate	Insectivore
N. volucellus	mimic shiner	Intolerant	Insectivore
Phoxinus oreas	mountain redbelly dace	Intermediate	Herbivore
Pimephales promelas	fathead minnow	Tolerant	Omnivore
Semotilus atromaculatus	creek chub	Tolerant	Insectivore
Catostomidae	**suckers**		
Catostomus commersoni	white sucker	Tolerant	Omnivore
Erimyzon oblongus	creek chubsucker	Intermediate	Omnivore
E. sucetta	lake chubsucker	Intermediate	Insectivore
Hypentelium nigricans	Northern hog sucker	Intermediate	Insectivore
Ictiobus bubalus	smallmouth buffalo	Intermediate	Omnivore
Minytrema melanops	spotted sucker	Intermediate	Insectivore
Moxostoma collapsum	notchlip redhorse	Intermediate	Insectivore
M. macrolepidotum	shorthead redhorse	Intermediate	Insectivore
M. pappillosum	v-lip redhorse	Intermediate	Insectivore
Scartomyzon cervinus	blacktip jumprock	Intermediate	Insectivore

Table 4 (continued).

Family/Species	Common Name	Tolerance Rating	Trophic Guild of Adults
Ictaluridae	**North American catfishes**		
Ameiurus brunneus	snail bullhead	Intermediate	Insectivore
A. catus	white catfish	Tolerant	Omnivore
A. natalis	yellow bullhead	Tolerant	Omnivore
A. nebulosus	brown bullhead	Tolerant	Omnivore
A. platycephalus	flat bullhead	Tolerant	Insectivore
Ictalurus furcatus	blue catfish	Intermediate	Piscivore
I. punctatus	channel catfish	Intermediate	Omnivore
Noturus furiosus	Carolina madtom	Intolerant	Insectivore
N. gyrinus	tadpole madtom	Intermediate	Insectivore
N. insignis	margined madtom	Intermediate	Insectivore
Pylodictis olivaris	flathead catfish	Intermediate	Piscivore
Esocidae	**pikes**		
Esox americanus	redfin pickerel	Intermediate	Piscivore
E. niger	chain pickerel	Intermediate	Piscivore
Umbridae	**mudminows**		
Umbra pygmaea	Eastern mudminnow	Intermediate	Insectivore
Aphredoderidae	**pirate perches**		
Aphredoderus sayanus	pirate perch	Intermediate	Insectivore
Amblyopsidae	**cavefishes**		
Chologaster cornuta	swampfish	Intermediate	Insectivore
Atherinidae	**silversides**		
Menidia beryllina	inland silverside	Intermediate	Insectivore
Fundulidae	**topminnows**		
Fundulus diaphanus	banded killifish	Intermediate	Insectivore
F. lineolatus	lined topminnow	Intermediate	Insectivore
F. rathbuni	speckled killifish	Intermediate	Insectivore
Poeciliidae	**livebearers**		
Gambusia holbrooki	Eastern mosquitofish	Tolerant	Insectivore
Moronidae	**temperate basses**		
Morone americana	white perch	Intermediate	Piscivore
M. chrysops	white bass	Intermediate	Piscivore
M. saxatilis	striped bass	Intermediate	Piscivore
Centrarchidae	**sunfishes**		
Acantharchus pomotis	mud sunfish	Intermediate	Insectivore
Ambloplites cavifrons	Roanoke bass	Intermediate	Piscivore
Centrarchus macropterus	flier	Intermediate	Insectivore
Enneacanthus chaetodon	blackbanded sunfish	Intermediate	Insectivore
E. gloriosus	bluespotted sunfish	Intermediate	Insectivore
E. obesus	banded sunfish	Intermediate	Insectivore
Lepomis auritus	redbreast sunfish	Tolerant	Insectivore
L. cyanellus	green sunfish	Tolerant	Insectivore
L. gibbosus	pumpkinseed	Intermediate	Insectivore
L. gulosus	warmouth	Intermediate	Insectivore
L. macrochirus	bluegill	Intermediate	Insectivore
L. marginatus	dollar sunfish	Intermediate	Insectivore
L. microlophus	redear sunfish	Intermediate	Insectivore
Lepomis sp.	hybrid sunfish	Tolerant	Insectivore
Micropterus dolomieu	smallmouth bass	Intolerant	Piscivore
M. salmoides	largemouth bass	Intermediate	Piscivore
Pomoxis annularis	white crappie	Intermediate	Piscivore
P. nigromaculatus	black crappie	Intermediate	Piscivore

Table 4 (continued).

Family/Species	Common Name	Tolerance Rating	Trophic Guild of Adults
Percidae	**perches**		
Etheostoma collis	Carolina darter	Intermediate	Insectivore
E. flabellare	fantail darter	Intermediate	Insectivore
E. fusiforme	swamp darter	Intermediate	Insectivore
E. nigrum	johnny darter	Intermediate	Insectivore
E. olmstedi	tessellated darter	Intermediate	Insectivore
E. serrifer	sawcheek darter	Intolerant	Insectivore
E. vitreum	glassy darter	Intermediate	Insectivore
Perca flavescens	yellow perch	Intermediate	Piscivore
Percina nevisense	chainback darter	Intolerant	Insectivore
P. roanoka	Roanoke darter	Intolerant	Insectivore
Elassomatidae	**pygmy sunfishes**		
Elassoma zonatum	banded pygmy sunfish	Intermediate	Insectivore

Table 5. Revised scores and classes for evaluating the fish community of a wadeable stream using the North Carolina Index of Biotic Integrity in the Outer Piedmont (Cape Fear, Neuse, Roanoke, and Tar River basins).

NCIBI Scores	NCIBI Classes
54, 56, 58, or 60	Excellent
46, 48, 50, or 52	Good
40, 42, or 44	Good-Fair
34, 36, or 38	Fair
≤ 32	Poor

Criteria and ratings are applicable only to wadeable streams in the Piedmont region of the Neuse River basin and are the same as those for the Tar, Cape Fear, and Roanoke River basins. The definition of the Piedmont for these basins is based on a map of North Carolina watersheds by Fels (1997) and Griffith *et al*. (2002). Metrics and ratings should not be applied to non-wadeable streams and streams in the Coastal Plain region in each of these basins, nor in the Sand Hills region. These streams are currently not rated.

Blackspot and Other Diseases

Blackspot disease is a naturally occurring, common infection of fish by an immature parasitic stage of flukes. The life cycle involves fish, snails, and piscivorous birds. Although acute infections can be fatal, especially to small fish, fish can carry amazingly high worm burdens without any apparent ill effects (Noga 1996). The infections may often be disfiguring and render the fish aesthetically unpleasing (Figure 1).

Figure 1. Heavy infestation of blackspot disease in creek chub (left) and popeye caused by nematode infection in bluegill, Hardee Creek (Pitt County, Tar River basin) (right).

Although some researchers incorporate the incidence of black spot incidence into indices of biotic integrity (e.g., Steedman 1991), others, because of a lack of a consistent, inverse relationship to environmental quality, do not (e.g., Sanders *et al*. 1999). The disease is not considered in the NCIBI because it is widespread, affecting fish in all types of streams. This disease was noted in the North Fork Little River on white shiner (heavy infestations) and Roanoke bass and in Buffalo and Moccasin Creeks on white shiner.

Other diseases observed in 2004/2005 included:

- "Popeye" or exophthalmos in some bluegill from Eno and South Fork Little Rivers, Crabtree, Marsh, Little, Moccasin, Turkey, and Little Contentnea Creeks, and from Toisnot Swamp. "Popeye" was also found in some white shiner from South Flat River and in some redbreast sunfish from Falling Creek. The disease can be caused by bacterial and viral infections as well as nematode infections (Figure 1).
- Leaches were found on the caudal fin of a bluehead chub from Smith Creek in Granville County.
- An unspecified disease was found on a longnose gar from Swift Creek in Pitt County.
- Lesions were found on a largemouth bass from Big Chinquapin Branch in Jones County.

REFERENCES

Fels, J. 1997. North Carolina watersheds map. North Carolina State University Cooperative Extension Service. Raleigh, NC.

Griffith, G., Omernik, J. and J. Comstock. 2002. Ecoregions of North Carolina. United States Environmental Protection Agency. Research and Development. NHEERL. Western Ecology Division. Corvallis, OR.

Karr, J. R. 1981. Assessment of biotic integrity using fish communities. Fisheries. 6: 21 - 27.

_____, Fausch, K. D., Angermeier, P. L., Yant, P. R., and I. J. Schlosser. 1986. Assessing biological integrity in running water: a method and its rationale. Ill. Nat. Hist. Surv. Spec. Publ. 5.

NCDENR. 2001a. Standard operating procedure. Biological monitoring. Stream fish community assessment and fish tissue. Biological Assessment Unit. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Environmental Sciences Branch. Raleigh, NC.

_____. 2001b. Standard operating procedures for benthic macroinvertebrates. Biological Assessment Unit. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Environmental Sciences Branch. Raleigh, NC.

Nelson, J. S., Crossman, E. J., Espinosa-Pérez, H., Findley, L. T., Gilbert, C. R., Lea, R. N., and J. D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society, Special Publication 29, Bethesda, MD.

Noga, E. J. 1996. Fish disease. Diagnosis and treatment. Mosby-Year Book, Inc. St. Louis, MO.

Sanders, R. E., Miltner, R. J., Yoder, C. O., and E. T. Rankin. 1999. The use of external deformities, erosion, lesions, and tumors (DELT anomalies) in fish assemblages for characterizing aquatic resources: a case study of seven Ohio streams. pp. 25-246. *In* Simon, T. P. (ed.). Assessing the sustainability and biological integrity of water resources using fish communities. CRC Press. Boca Raton, FL.

Steedman, R. J. 1991. Occurrence and environmental correlates of blackspot disease in stream fishes near Toronto, Ontario. Trans. American Fisheries Soc. 120: 494 - 499.

Appendix F-2. A summary of fish community assessment data.

Monitoring efforts in 2004 and 2005 can be summarized as:

- In 2004 and 2005, fish community assessments were performed at 52 sites in the basin, 26 in the Piedmont and 26 in the Coastal Plain.
- Waterbodies that are true "swamps" (i.e., those with braided channels, imperceptible or very slow flows, and dense aquatic vegetation) were not sampled as part of the wadeable stream fish community assessment program.
- Fourteen of the 26 Piedmont sites previously sampled in 2000 were sampled again in 2005, including some, which are on the impaired streams list (Table 1).

Table 1. Fish community sites monitored in 2004 and 2005 that are included on the state's 303(d) list of impaired waters (NCDENR 2004).

Subbasin/Waterbody	Reach affected	Causes/potential sources
030401		
Knap of Reeds Cr	Butner Lake to Falls Lake	Impaired biological integrity: unknown source
Ellerbe Cr	Source to Falls Lake	Impaired biological integrity: urban runoff, storm sewers
030402		
Crabtree Cr	Crabtree Lake to Richland Cr	Impaired biological integrity, turbidity, low dissolved oxygen, urban runoff and development
Little Cr	Source to Swift Cr	Impaired biological integrity: unknown source
030406		
Buffalo Cr	Robertsons Pond to Little R	Impaired biological integrity: agriculture, construction
030407		
Nahunta Swp	Source to Contentnea Cr	Impaired biological integrity: agriculture
Little Contentnea Cr	Source to Contentnea Cr	Impaired biological integrity, low dissolved oxygen, agriculture, crop production
Hominy Swp	Source to Contentnea Cr	Impaired biological integrity: urban runoff, storm sewers
030409		
Swift Cr	Source to Neuse R	Impaired biological integrity: agriculture

- Nine of the 26 Piedmont sites were sampled for the first time during this basin cycle, including seven that were sampled in 2004 as part of the NCSU urban stream index study and supplementally added as basinwide monitoring sites.
- Fish community data from Marsh Creek was requested as part of a special study investigating land use changes in and around the City of Raleigh. This watershed was also targeted as part of the 2005 basinwide monitoring cycle because it was lacking fish community data.
- Some of the unassessed sites were in rural watersheds where there were no NPDES dischargers and were selected as potential candidates for fish community regional reference sites (e.g., Turkey Creek, Toisnot Swamp (US 264), Watery Branch, Nahunta Swamp, Appletree Swamp, Fort Run, Rainbow Creek, Indian Well Swamp, Trent River, Little Chinquapin Branch, Big Chinquapin Branch, Beaver Creek, and Beaverdam Creek). Only Turkey Creek possessed the instream, riparian, and watershed characteristics of exceptionally high quality to qualify the site as a new fish community regional reference sites (Table 2; Appendices F-1 and F-8).

Table 2. New regional reference sites identified in the Neuse River basin in 2005.

Subbasin/Waterbody	Station	County	Date
030401			
Buckquarter Cr	Buckquarter Cr Trail (Eno River State Park)	Orange	04/15/05
Rhodes Cr	off SR 1582	Orange	04/15/05
Stones Cr	US 70	Orange	04/14/05
030407			
Turkey Cr	SR 1109	Nash	05/02/05

- Three sites that were sampled as part of the Eno River ORW Special Study also qualified as new fish community regional reference sites (Table 2).

- Data from new reference sites may be used for any future recalibrations, revisions, or metric development of the North Carolina Index of Biotic Integrity within the Outer Piedmont or Coastal Plain ecoregions of the Neuse River basin.
- In the Piedmont, the most commonly collected species in 2004 and 2005 was the bluegill (collected at all 26 sites), followed by the swallowtail shiner and the redbreast sunfish (collected at 25 sites each). The most abundant species was the bluehead chub, representing 16 percent of the fish collected. Other abundant species included white shiner (13 percent), swallowtail shiner (12 percent), bluegill (11 percent), and redbreast sunfish (10 percent). Overall, 59 fish species were collected within the Piedmont region of the Neuse River basin during this monitoring cycle.
- In the Coastal Plain, the most commonly collected species in 2005 was the redbreast sunfish (collected at all 26 sites), followed by the eastern mosquitofish and tessellated darter (collected at 24 sites each). The most abundant species were the dusky shiner and the eastern mosquitofish, each representing 18 percent of all the fish collected. Other abundant species included the American eel (13 percent), redbreast sunfish (12 percent), and tessellated darter (10 percent). Overall, 49 fish species were collected within the Coastal Plain region of the Neuse River basin during this monitoring cycle.
- The drainage areas of the assessed watersheds in the Piedmont ranged from 5.8 to 84 square miles; in the Coastal Plain the drainage areas ranged from 3.9 to 114.7 square miles.
- All of the 26 streams in the Piedmont were evaluated and rated using the North Carolina Index of Biotic Integrity (NCIBI) (Appendices F-1 and F-3). The NCIBI scores ranged from 28 to 60 and the ratings ranged from Poor to Excellent (Figure 1; Appendix F-4). Twenty-four of the sites rated Good-Fair or better, 18 or 75 percent of which rated either Good or Excellent.
- The two degraded streams (bioclassifications of Poor or Fair) included Ellerbe Creek and Smith Creek (SR 2045, Wake County). Although not sampled since 1995, the urban watershed of Ellerbe Creek seemed to be supporting fewer fish. The fluctuations seen in the trophic structure of Smith Creek may be the effect of fish recruitment from the nearby (< 1 mile) Neuse River.
- Seventeen of the 26 Piedmont sites had been sampled in one or more previous basinwide monitoring cycles or as special studies. Of the 17 sites sampled in 1995 or 2000 and then again in 2005, 4 sites had NCIBI scores that did not change, 7 had scores that increased, and 6 had scores that decreased (Figure 2, top).
- Twelve of these 17 sites maintained their bioclassification since the last time they were sampled (Figure 2, bottom), 2 sites increased by one rating (Newlight and Richland Creeks), 2 declined by one rating (North Flat River and Moccasin Creek), and 1 site (Smith Creek, Wake County) showed the most pronounced decline (three ratings).

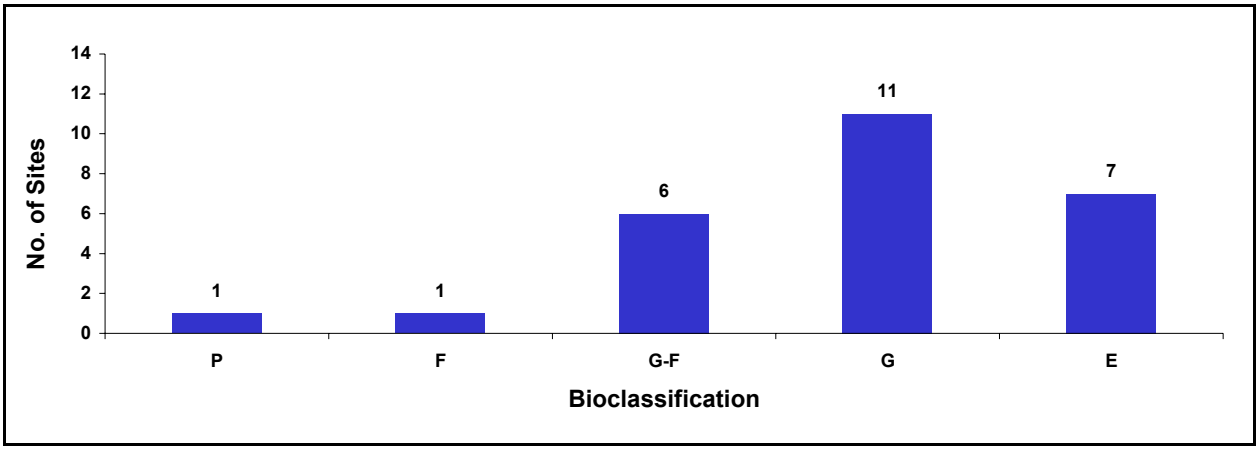


Figure 1. Distribution of the ratings of 26 fish community basinwide sites in the Piedmont portion of the Neuse River basin, 2005. Abbreviations are: P = Poor, F = Fair, G-F = Good Fair, G = Good, and E = Excellent.

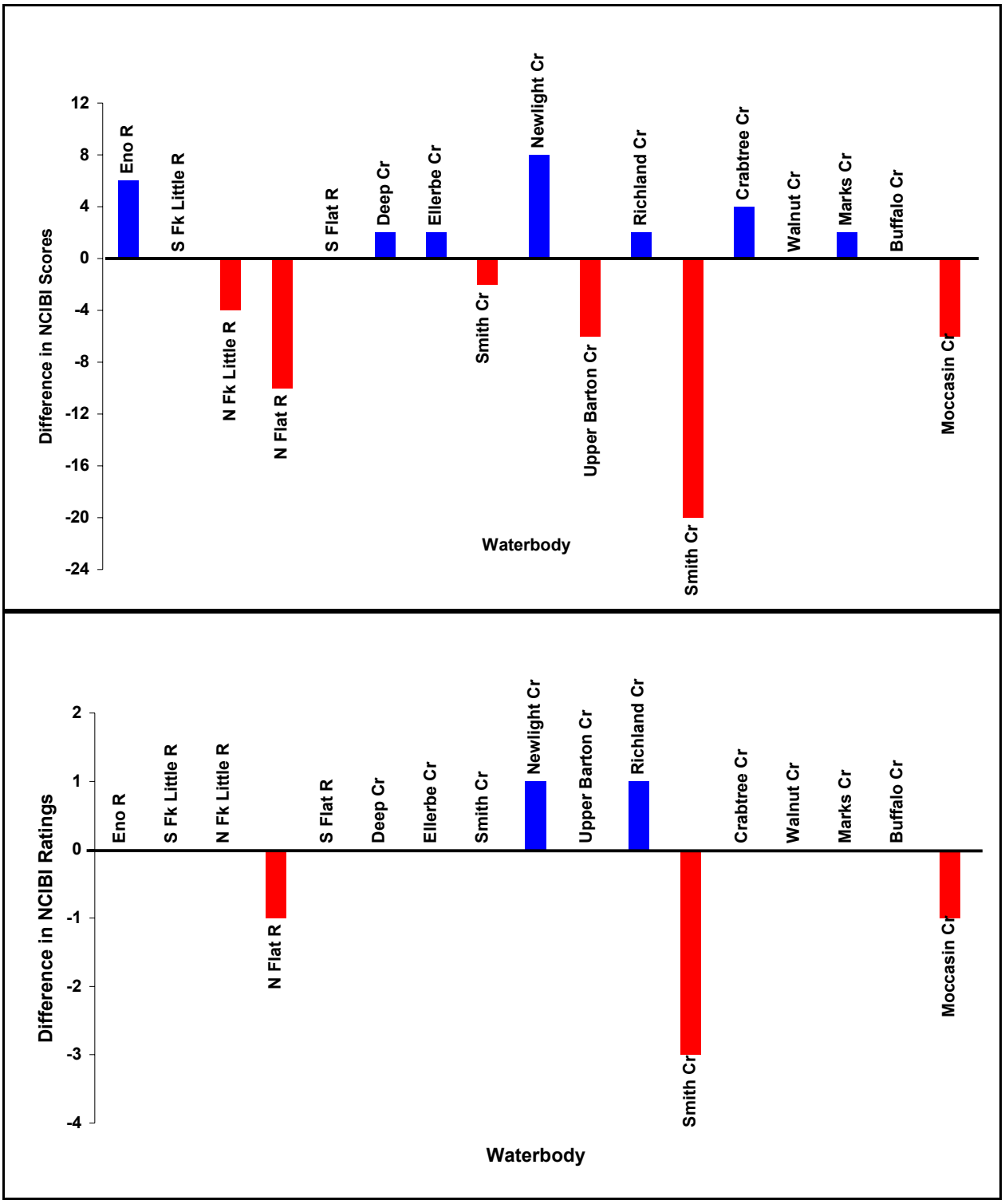


Figure 2. **A comparison of the NCIBI scores (top) and the bioclassifications (bottom) at 17 fish community sites in the Piedmont portion of the Neuse River basin, 2000 and 2005. For waterbodies with neither a red nor blue vertical bar (e.g. S Fk Little R or S Flat R), the difference between years was zero. [Note: Ellerbe, Newlight, and Richland Creeks were last sampled in 1995.]**

- By and large, many of the Coastal Plain streams, such as Bear Creek, Falling Creek, Toisnot Swamp, Tuckahoe Swamp, and others, are very species-rich. In some waterbodies, more than 30 species are known from an individual site.
- The habitat scores for the 26 sites in the Coastal Plain sampled in 2005 ranged from 42 to 95 (Appendix F-8). Almost 80 percent of the streams had overall moderate to high quality habitats; whereas 20 percent of the streams had overall low to poor quality habitats. With no exceptions, every stream that had been channelized had a habitat score less than 65.
- At Coastal Plain sites, specific conductance ranged from 65 to 381 µmhos/cm (Appendix F-10). Nonpoint source runoff from upstream landuses (agricultural uses or urbanization) seemed to be affecting the water quality at several sites based upon their elevated conductivities.

REFERENCES

NCDENR. 2004. North Carolina. Water quality assessment and impaired waters list (2004 integrated 305(b) and 303(d) report. Draft. April 2004. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Basinwide Planning Branch. Raleigh, NC.

Appendix F-3. Fish community data collected in the Neuse River basin, 1990 – 2005. Current basinwide sites are bolded.

Subbasin/Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
030401						
Eno R	**SR 1336**	**Orange**	27-2-(1)	04/07/05	60	Excellent
				04/04/00	54	Excellent
Eno R	US 70	Orange	27-2-(3.5)	09/30/03	50	Good
Eno R	SR 1569	Orange	27-2-(10)	09/30/03	60	Excellent
				08/03/98	60	Excellent
Eno R	SR 1003	Durham	27-2-(10)	08/03/98	60	Excellent
Eno R	off US 501	Durham	27-2-(19)	10/01/03	58	Excellent
Eno R	SR 1561	Orange	27-2-10	04/14/05	50	Good
Buckquarter Cr	ERSP- Buckquarter Cr trail	Orange	27-2-12	04/15/05	58	Excellent
Stones Cr	US 70	Orange	27-2-13-2	04/14/05	50	Good
Rhodes Cr	off SR 1582	Orange	27-2-14	04/15/05	58	Excellent
Warren Cr	off US 501-West Point Pk	Durham	27-2-17-1	04/28/05	44	Good-Fair
Crooked Cr	off US 501	Durham	27-2-18	04/28/05	52	Good
S Fk Little R	**SR 1461**	**Durham**	27-2-21-2	04/07/05	60	Excellent
				04/07/00	60	Excellent
N Fk Little R	**SR 1461**	**Durham**	27-2-21-3	04/07/05	52	Good
				04/07/00	48	Good
N Flat R	**SR 1715**	**Person**	27-3-2	04/06/05	46	Good
				04/06/00	56	Excellent
				06/10/99	50	Good
S Flat R	**NC 157**	**Person**	27-3-3	04/06/05	48	Good
				04/06/00	48	Good
Deep Cr	**SR 1734**	**Person**	27-3-4	04/06/05	58	Excellent
				04/06/00	56	Excellent
				05/16/95	56	Excellent
				07/19/90	60	Excellent
Knap of Reeds Cr	**off SR 1117**	**Granville**	27-4-(8)	07/19/04	40	Good-Fair
Ellerbe Cr	**SR 1709**	**Durham**	27-5-(0.7)	04/14/05	28	Poor
				04/11/95	26	Poor
Ellerbe Cr	SR 1636	Durham	27-5-(2)	04/11/95	28	Poor
Smith Cr	**SR 1710**	**Granville**	27-12-2-(2)	04/04/05	42	Good-Fair
				04/04/00	44	Good-Fair
				04/11/95	48	Good
Newlight Cr	**SR 1911**	**Wake**	27-13-(0.1)	04/04/05	50	Good
				05/16/95	42	Good-Fair
Upper Barton Cr	**NC 50**	**Wake**	27-15-(2)	04/04/05	46	Good
				04/03/00	52	Good
				05/18/95	48	Good
Lower Barton Cr	**SR 1844**	**Wake**	27-16-(1)	07/19/04	48	Good
Horse Cr	**SR 1923**	**Wake**	27-17-(0.7)	06/10/04	52	Good
030402						
Richland Cr	**US 1**	**Wake**	27-21-(1.5)	04/04/05	54	Excellent
				04/12/95	52	Good
Smith Cr	**SR 2045**	**Wake**	27-23-(2)	04/05/05	36	Fair
				04/03/00	56	Excellent
				05/18/95	42	Good-Fair
Perry Cr	SR 2006	Wake	27-25-(2)	06/14/05	40	Good-Fair
Crabtree Cr	**off SR 1650**	**Wake**	27-33-(3.5)	06/11/04	56	Excellent
Crabtree Cr	**SR 1664**	**Wake**	27-33-10	05/13/05	58	Excellent
				06/22/00	54	Excellent
Crabtree Cr	US 1/401	Wake	27-33-10	04/12/95	52	Good
Marsh Cr	**SR 2277**	**Wake**	27-33-20	04/05/05	44	Good-Fair
Walnut Cr	SR 1348	Wake	27-34-(1.7)	04/03/95	32	Poor
				06/25/91	46	Good
Walnut Cr	SR 1564	Wake	27-34-(4)	06/25/91	48	Good
Walnut Cr	**SR 2544**	**Wake**	27-34-(4)	04/05/05	44	Good-Fair
				04/11/00	44	Good-Fair
				04/04/95	34	Fair
				06/25/91	48	Good

Appendix F-3 (continued).

Subbasin/Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
Walnut Cr	SR 2542	Wake	27-34-(4)	04/04/95	32	Poor
Rocky Br	SR 1009 (upstream)	Wake	27-34-6	10/31/05	40	Good Fair
Rocky Br	SR 1009 (downstream)	Wake	27-34-6	10/31/05	40	Good Fair
Marks Cr	**SR 1714**	**Johnston**	27-38	04/08/05	52	Good
				04/05/00	50	Good
				05/18/95	50	Good
				09/23/91	46	Good
Swift Cr	SR 1152	Wake	27-43-(1)	04/24/00	34	Fair
				04/24/00	40	Good-Fair
				10/15/99	34	Fair
				10/15/99	40	Good-Fair
				08/20/99	38	Fair
				08/20/99	38	Fair
				06/25/99	40	Good-Fair
				06/25/99	38	Fair
				04/28/99	42	Good-Fair
				04/28/99	38	Fair
				04/27/95	28	Poor
Swift Cr	SR 1525	Johnston	27-43-(8)	04/27/95	34	Fair
				10/02/91	48	Good
Yates Br	**US 401**	**Wake**	27-43-5-(1.5)	07/20/04	42	Good-Fair
Little Cr	**SR 1562**	**Johnston**	27-43-12	04/18/05	46	Good
030403						
Middle Cr	SR 1404	Wake	27-43-15-(4)	04/27/95	54	Excellent
				06/04/91	48	Good
Middle Cr	**SR 1375**	**Wake**	27-43-15-(4)	07/20/04	54	Excellent
Middle Cr	SR 1531	Johnston	27-43-15-(4)	06/04/91	34	Fair
Middle Cr	NC 50	Johnston	27-43-15-(4)	06/01/95	52	Good
Middle Cr	SR 1504	Johnston	27-43-15-(4)	06/01/95	54	Excellent
				06/04/91	48	Good
Terrible Cr	SR 2751	Wake	27-43-15-8-(2)	04/08/05	52	Good
030404						
Black Cr	SR 1330	Johnston	27-45-(2)	05/25/95		Not Rated
Stone Cr	SR 1138	Johnston	27-52-5	05/25/95		Not Rated
				10/02/91		Not Rated
Hannah Cr	SR 1162	Johnston	27-52-6	05/25/95		Not Rated
				10/02/91		Not Rated
030405						
Stoney Cr	**SR 1920**	**Wayne**	27-62	04/20/05		Not Rated
				04/17/00		Not Rated
				07/20/95		Not Rated
Bear Cr	**SR 1311**	**Lenoir**	27-72-(5)	05/04/05		Not Rated
				06/14/00		Not Rated
				10/28/96		Not Rated
				05/22/95		Not Rated
Falling Cr	SR 1546	Lenoir	27-77	10/28/96		Not Rated
Falling Cr	**SR 1340**	**Lenoir**	27-77	05/04/05		Not Rated
				06/14/00		Not Rated
				05/22/95		Not Rated
Moseley Cr	**SR 1475**	**Craven**	27-77-2	05/17/05		Not Rated
				06/13/00		Not Rated
				10/29/96		Not Rated
				04/19/95		Not Rated
				06/27/91		Not Rated
Southwest Cr	SR 1804	Lenoir	27-80	05/22/95		Not Rated
Stonyton Cr	SR 1742	Lenoir	27-81	11/02/93		Not Rated
Briery Run	SR 1732	Lenoir	27-81-1	11/02/93		Not Rated
030406						
Little R	NC 96	Wake	27-57-(1)	04/04/00	40	Good-Fair
				07/19/95	50	Good
Little R	**SR 2224**	**Wake**	27-57-(1)	06/11/04	52	Good
Little R	SR 2130	Johnston	27-57-(8.5)	08/01/95	54	Excellent
Buffalo Cr	SR 1007	Wake	27-57-16-(2)	04/22/05	48	Good
Buffalo Cr	**SR 1941**	**Johnston**	27-57-16-(3)	04/18/05	44	Good-Fair
				04/05/00	44	Good-Fair
				07/19/95	52	Good

Appendix F-3 (continued).

Subbasin/Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
Little Buffalo Cr	**SR 2143**	**Johnston**	27-57-17	04/19/05		Not Rated
030407						
Moccasin Cr	SR 1001	Wake	27-86-2	06/06/91	42	Good-Fair
Moccasin Cr	**NC 231**	**Johnston**	27-86-2	05/02/05	52	Good
				06/22/00	58	Excellent
				10/31/96	54	Excellent
				07/21/95	56	Excellent
				06/06/91	54	Excellent
Turkey Cr	SR 1131	Nash	27-86-3-(1)	04/05/00		Not Rated
Turkey Cr	**SR 1109**	**Nash**	27-86-3-(1)	05/02/05		Not Rated
Hominy Swp	**SR 1606**	**Wilson**	27-86-8	05/02/05		Not Rated
				08/03/95		Not Rated
Toisnot Swp	SR 1945	Nash	27-86-11-(1)	06/05/91		Not Rated
Toisnot Swp	**US 264**	**Wilson**	27-86-11-(5)	05/03/05		Not Rated
				06/05/91		Not Rated
Toisnot Swp	NC 42	Wilson	27-86-11-(5)	06/05/91		Not Rated
Toisnot Swp	**NC 222**	**Wilson**	27-86-11-(5)	05/03/05		Not Rated
				05/25/00		Not Rated
				08/01/95		Not Rated
Watery Br	**NC 58**	**Greene**	27-86-12	04/21/05		Not Rated
Nahunta Swp	**SR 1537**	**Wayne**	27-86-14	04/20/05		Not Rated
The Slough	**SR 1535**	**Wayne**	27-86-14-1	04/20/05		Not Rated
				05/25/00		Not Rated
				08/03/95		Not Rated
Appletree Swp	**SR 1216**	**Greene**	27-86-14-7	04/22/05		Not Rated
Fort Run	**NC 58**	**Greene**	27-86-15	04/21/05		Not Rated
Tyson Marsh	US 13/NC 58	Greene	27-86-17	05/23/95		Not Rated
Rainbow Cr	**SR 1091**	**Greene**	27-86-21	05/05/05		Not Rated
Little Contentnea Cr	**SR 2107**	**Pitt**	27-86-26	05/18/05		Not Rated
				05/23/95		Not Rated
Sandy Run	US 258/13	Greene	27-86-26-5-1	05/23/95		Not Rated
030408						
Core Cr	SR 1001	Craven	27-90	10/28/96		Not Rated
				04/19/95		Not Rated
030409						
Swift Cr	NC 102	Pitt	27-97-(0.5)	05/22/95		Not Rated
Swift Cr	**SR 1753**	**Pitt**	27-97-(0.5)	05/18/05		Not Rated
Fork Swp	SR 1711	Pitt	27-97-4	08/14/95		Not Rated
				03/22/95		Not Rated
Clayroot Swp	SR 1941	Pitt	27-97-5	06/13/00		Not Rated
				05/22/95		Not Rated
				06/26/91		Not Rated
Indian Well Swp	**SR 1753**	**Pitt**	27-97-5-2	05/18/05		Not Rated
Creeping Swp	NC 43	Pitt	27-97-5-3	08/30/91		Not Rated
Creeping Swp	SR 1800	Pitt	27-97-5-3	08/30/91		Not Rated
Little Swift Cr	SR 1623	Craven	27-97-8	03/22/95		Not Rated
Fisher Swp	SR 1621	Craven	27-97-8-3	08/14/95		Not Rated
				03/22/95		Not Rated
030410						
Deep Run	NC 55	Pamlico	27-106-6	03/22/95		Not Rated
030411						
Trent R	**SR 1130**	**Jones**	27-101-(1)	05/05/05		Not Rated
				11/05/91		Not Rated
Tuckahoe Swp	**SR 1142**	**Jones**	27-101-5	05/16/05		Not Rated
				06/12/00		Not Rated
Little Chinquapin Br	**SR 1131**	**Jones**	27-101-11	05/16/05		Not Rated
				07/16/91		Not Rated
Big Chinquapin Br	**SR 1129**	**Jones**	27-101-14	05/16/05		Not Rated
Beaver Cr	**SR 1316**	**Jones**	27-101-15	05/05/05		Not Rated
Musselshell Cr	SR 1320	Jones	27-101-17	08/15/95		Not Rated
				03/23/95		Not Rated
Mill Run	**NC 58**	**Jones**	27-101-23	05/17/05		Not Rated
				06/12/00		Not Rated

Appendix F-3 (continued).

Subbasin/Waterbody	Location	County	Index No.	Date	NCIBI Score	NCIBI Rating
Island Cr	**SR 1004**	**Jones**	27-101-33	05/17/05		Not Rated
				06/12/00		Not Rated
				08/15/95		Not Rated
				03/23/95		Not Rated
030412						
Thoroughfare Swp	SR 1120	Wayne	27-54-5-(1.5)	07/20/95		Not Rated
Beaverdam Cr	**SR 1007**	**Wayne**	27-55	05/03/05		Not Rated

Appendix F-4. Fish community metric values from 26 wadeable streams in the Piedmont ecoregion of the Neuse River basinwide monitoring program, 2005[1]. Ratable streams are only those located in the Piedmont ecoregion.

Subbasin Waterbody	Location	County	d. a. (mi^2)	Date	No. Species	No. Fish	No. Sp. Darters	No. Sp. Sunfish	No. Sp. Suckers	No. Intol. Sp.	% Tolerant	% Omni. + Herb.	% Insect.	% Pisc.	% DELT	% MA	NCIBI Score	NCIBI Rating
030401																		
Eno R	SR 1336	Orange	26.7	04/07/05	18	266	4	4	3	3	16	21	77	2.3	0.8	67	60	E
S Fk Little R	SR 1461	Durham	39	04/07/05	20	485	3	5	3	3	23	23	76	1.7	0.4	80	60	E
N Fk Little R	SR 1461	Durham	29.7	04/07/05	16	523	3	4	2	3	15	44	54	1.7	0	44	52	G
N Flat R	SR 1715	Person	33	04/06/05	19	485	4	3	2	2	13	43	56	0.6	0	47	46	G
S Flat R	NC 157	Person	17.3	04/06/05	18	280	2	5	1	2	13	39	60	1.1	0.4	61	48	G
Deep Cr	SR 1734	Person	32.5	04/06/05	21	343	4	4	4	3	18	31	69	0.9	0	62	58	E
Knap of Reeds Cr	off SR 1117	Granville	42.7	07/19/04	19	287	0	7	0	0	42	3	89	8.4	0	42	40	G-F
Ellerbe Cr	SR 1709	Durham	8.9	04/14/05	9	81	0	4	1	0	33	6	94	0	0	44	28	P
Smith Cr	SR 1710	Granville	6.2	04/04/05	13	251	2	4	1	0	12	39	61	0	0	69	42	G-F
Newlight Cr	SR 1911	Wake	12.2	04/04/05	16	242	2	4	2	0	26	26	74	0.4	0	50	50	G
Upper Barton Cr	NC 50	Wake	5.8	04/04/05	14	591	2	3	3	0	7	32	68	0	0	71	46	G
Lower Barton Cr	SR 1844	Wake	7.8	07/19/04	13	290	1	3	2	0	17	10	86	4.8	0.7	62	48	G
Horse Cr	SR 1923	Wake	12	06/10/04	25	421	2	5	3	0	14	11	82	6.4	0	44	52	G
030402																		
Richland Cr	US 1	Wake	10.5	04/04/05	19	513	2	4	3	0	16	16	83	1.4	0	63	54	E
Smith Cr	SR 2045	Wake	22.6	04/05/05	23	1,080	1	7	1	0	60	8	91	0.9	0	48	36	F
Crabtree Cr	off SR 1650	Wake	54	06/11/04	22	253	3	4	1	1	31	16	70	13.8	0	50	56	E
Crabtree Cr	SR 1664	Wake	84	05/13/05	26	294	3	5	4	2	22	19	75	5.8	1.0	50	58	E
Marsh Cr	SR 2277	Wake	8.5	04/05/05	14	194	2	2	1	0	6	21	77	2.6	0.5	50	44	G-F
Walnut Cr	SR 2544	Wake	29.4	04/05/05	18	267	4	3	0	3	40	1	96	2.6	0	56	44	G-F
Marks Cr	SR 1714	Johnston	25.2	04/08/05	23	336	5	4	1	3	28	6	90	3.9	0	48	52	G
Yates Br	US 401	Wake	10.1	07/20/04	20	387	2	7	0	0	35	3	95	1.8	0	65	42	G-F
Little Cr	SR 1562	Johnston	17.3	04/18/05	24	204	3	7	2	2	24	2	91	6.4	0.5	50	46	G
030403																		
Middle Cr	SR 1375	Wake	35.6	07/20/04	28	231	5	7	2	2	34	13	78	9.5	0	46	54	E
030406																		
Little R	SR 2224	Wake	25.5	06/11/04	20	283	3	5	1	2	30	6	87	6.4	0	60	52	G
Buffalo Cr	SR 1941	Johnston	41.2	04/18/05	16	73	3	3	1	3	22	5	88	6.9	0	31	44	G-F
030407																		
Moccasin Cr	NC 231	Johnston	65	05/02/05	25	313	4	4	1	3	13	5	90	5.1	0.3	48	52	G

[1]Abbreviations are d. a. = drainage area, No. = number, Sp. = species, Intol. = intolerants, Omni. + Herb. = omnivores + herbivores, Insect. = insectivores, Pisc. = piscivores, DELT = disease, erosion, lesions, and tumors, MA = species with multiple age groups, E = Excellent, G = Good, G-F = Good-Fair, F = Fair, and P = Poor

Appendix F-5. Fish community metric values from 26 wadeable streams in the Coastal Plain (CA) ecoregion of the Neuse River basinwide monitoring program, 2005[1]. Ratable streams are only those located in the Piedmont ecoregion.

Subbasin Waterbody	Location	County	Eco-region	d. a. (mi^2)	Date	No. Species	No. Fish	No. Sp. Darters	No. Sp. Sunfish	No. Sp. Suckers	No. Intol. Sp.	% Tolerant	% Omni. + Herb.	% Insect.	% Pisc.	% DELT	% MA
030405																	
Stoney Cr	SR 1920	Wayne	CA	25.4	04/20/05	18	262	4	3	1	1	15	1	63	35.5	0	61
Bear Cr	SR 1311	Lenoir	CA	61.7	05/04/05	23	319	3	2	2	1	33	5	65	29.2	0	52
Falling Cr	SR 1340	Lenoir	CA	46.9	05/04/05	26	967	3	8	1	2	15	2	70	28.5	0.1	69
Moseley Cr	SR 1475	Craven	CA	45.7	05/17/05	24	322	2	8	0	1	30	6	83	10.6	0	58
030406																	
Little Buffalo Cr	SR 2143	Johnston	CA	21.8	04/19/05	16	100	1	5	1	0	22	7	63	30	0	38
030407																	
Turkey Cr	SR 1109	Nash	CA	37.2	05/02/05	18	239	2	6	0	1	32	0	95	4.6	0.4	78
Hominy Swp	SR 1606	Wilson	CA	9.8	05/02/05	10	97	1	4	0	0	73	0	88	12.4	0	50
Toisnot Swp	US 264	Wilson	CA	70	05/03/05	23	129	4	8	1	2	21	2	72	25.6	0.8	35
Toisnot Swp	NC 222	Wilson	CA	114.7	05/03/05	19	222	4	4	2	2	41	1	83	15.8	0	58
Watery Br	NC 58	Greene	CA	6.5	04/21/05	14	198	1	4	1	0	24	13	85	2.0	0	50
Nahunta Swp	SR 1537	Wayne	CA	24.9	04/20/05	23	259	3	5	1	1	14	3	86	10.8	0	48
The Slough	SR 1535	Wayne	CA	15.9	04/20/05	21	195	4	5	1	2	14	3	90	7.7	0	43
Appletree Swp	SR 1216	Greene	CA	8.4	04/22/05	19	221	2	3	1	1	25	3	87	10.0	0	53
Fort Run	NC 58	Greene	CA	9.8	04/21/05	15	67	1	4	1	1	52	28	66	6.0	0	33
Rainbow Cr	SR 1091	Greene	CA	14.2	05/05/05	17	164	3	4	1	1	18	2	73	24.4	0	53
Little Contentnea Cr	SR 2107	Pitt	CA	35.9	05/18/05	19	119	1	6	1	0	13	10	73	16.8	1.7	53
030409																	
Swift Cr	SR 1753	Pitt	CA	76.9	05/18/05	22	347	1	7	1	0	51	1	75	24.2	0.3	50
Indian Well Swp	SR 1753	Pitt	CA	13	05/18/05	23	218	1	6	1	0	37	7	74	18.8	0	48
030411																	
Trent R	SR 1130	Jones	CA	48	05/05/05	24	627	2	5	1	2	29	3	87	10.1	0	67
Tuckahoe Swp	SR 1142	Jones	CA	49.7	05/16/05	23	376	4	3	1	3	51	2	86	11.4	0	57
Little Chinquapin Br	SR 1131	Jones	CA	3.9	05/16/05	17	349	2	4	1	0	36	7	76	17.8	0	53
Big Chinquapin Br	SR 1129	Jones	CA	21	05/16/05	17	413	2	3	1	1	73	3	89	8.5	0.2	59
Beaver Cr	SR 1316	Jones	CA	40.9	05/05/05	18	355	3	5	1	2	26	2	77	21.1	0	67
Mill Run	NC 58	Jones	CA	21	05/17/05	17	303	2	5	1	0	20	6	76	18.2	0	65
Island Cr	SR 1004	Jones	CA	5.7	05/17/05	10	34	0	5	1	0	6	15	79	5.8	0	40
030412																	
Beaverdam Cr	SR 1007	Wayne	CA	15.3	05/03/05	22	511	3	7	1	1	59	1	87	11.55	0	59

[1]Abbreviations are d. a. = drainage area, No. = number, Sp. = species, Intol. = intolerants, Omni. + Herb. = omnivores + herbivores, Insect. = insectivores, Pisc. = piscivores, DELT = disease, erosion, lesions, and tumors, and MA = species with multiple age groups.

Appendix F-6. Fish distributional records for the Neuse River basin.

Based upon Menhinick (1991), DWQ's data, and data from other researchers, approximately 96 species have been collected from the Neuse River basin (Table 4 in Appendix F-1). The known species assemblage includes 23 species of minnows, 10 species of suckers, 17 species of sunfish and bass, and 10 species of darters. Five of these species have been given special protection status by the U. S. Department of the Interior, the NC Wildlife Resources Commission, or the NC Natural Heritage Program under the NC State Endangered Species Act (G.S. 113-331 to 113-337) (LeGrand *et al*. 2001; Menhinick and Braswell 1997) (Table 1).

Table 1. Species of freshwater fish listed as endangered, rare, threatened, special concern, or significantly rare in the Neuse River Basin in North Carolina.

Species	Common Name	State or Federal Status	State Rank[1]
Acipenser oxyrinchus	Atlantic sturgeon	Special Concern	S3
Lampetra aepyptera	least brook lamprey	Threatened	S2
Notropis bifrenatus	bridle shiner	Special Concern	S1
Noturus furiosus	Carolina madtom	Special Concern	S2
Etheostoma collis	Carolina darter	Special Concern	S2

[1]S1 = Critically imperiled in North Carolina because of extreme rarity or because of some factor(s) making it especially vulnerable to extirpation from North Carolina; S2 = Imperiled in North Carolina because of rarity or because of some factor(s) making it very vulnerable to extirpation from North Carolina; S3 = Rare or uncommon in North Carolina (LeGrand *et al*. 2001).

In 2004 and 2005, the Carolina darter was collected from Smith Creek in Granville County as part of DWQ's fish community monitoring program. This was the only listed species captured in the Neuse River basin at any of the fish community sites. The Carolina madtom, *Noturus furiosus*, a species of Special Concern and an endemic species in the Tar and Neuse River basins, was not collected from any stream in 2005. It has never been collected by DWQ Staff from the Neuse River basin.

At least 15 of the 96 species (about 16 percent of the total basin fauna) are exotics and were introduced either as sportfish, forage fish, baitfish, or for reasons unknown. In 2004 and 2005, 6 of the 68 species collected were exotic species. These six species included grass carp (Perry Creek Special Study), flathead catfish, channel catfish, green sunfish, redear sunfish, and white crappie. Other exotic species now found in the basin include threadfin shad, goldfish, common carp, crescent shiner, fathead minnow, smallmouth buffalo, blue catfish, white bass, and smallmouth bass. The white sucker may not be native based upon recent DWQ records.

Streams that did not have any exotic species in 2004/2005 included Stoney, Buffalo, Little Buffalo, Turkey, Rainbow, Little Contentnea, Little Chinquapin, and Island Creeks; Nahunta, Appletree, and Toisnot (NC 222) Swamps, Watery Branch, The Slough, and Fort Run. No streams in the Piedmont that have ever been sampled by DWQ have an intact, native fish fauna; at least one introduced species has been found in each of these streams. The only streams in the Coastal Plain that have been sampled by DWQ that have an intact, native fauna are Stoney, Turkey, Little Contentnea, and Little Chinquapin Creeks.

New county distributional records in 2004/2005 from DWQ's fish community monitoring efforts were:

- longnose gar – Jones County;
- bowfin – Greene and Wilson counties;
- flat bullhead – Person and Johnson counties;
- snail bullhead – Wake County;
- white catfish – Jones County;
- flathead catfish – Johnston County;
- dollar sunfish – Wayne County;
- redear sunfish – Wayne and Wilson counties; and
- Johnny darter – Jones, Wayne and Wilson counties.

In the Neuse River Basin Johnny and tessellated darters in certain streams exhibited characteristics of both species (varying degrees of completeness of the infraorbital canal and lateral line scale counts). Specimens of the Johnny darter were found in the Coastal Plain as far east as Wilson, Wayne, and Jones counties, whereas specimens of the tessellated darter were found as far west in the Piedmont as Johnston and Wake counties. The transitional zone (the Fall Line) between the Northern Outer Piedmont and the Rolling Coastal Plain appeared to be the area of character overlap and confusion.

REFERENCES

LeGrand, H. E., McRae, S. E., Hall, S. P., and J. T. Finnegan. 2004. Natural Heritage Program list of the rare animal species of North Carolina. North Carolina Natural Heritage Program, Office of Conservation and Community Affairs, North Carolina Department of Environment and Natural Resources. Raleigh, NC.

Menhinick, E. F. 1991. The freshwater fishes of North Carolina. North Carolina Wildlife Resources Commission. Raleigh, NC.

_____ and A. L. Braswell (eds). 1997. Endangered, threatened, and rare fauna of North Carolina. Part IV. A reevaluation of the freshwater fishes. Occas. Papers N.C. State Mus. Nat. Sci. and N.C. Biol. Surv. No. 11. Raleigh, NC.

Appendix F-7. Instream and riparian habitat evaluations at 26 fish community monitoring sites in the Piedmont region of the Neuse River basin.

A method has been developed by the Biological Assessment Unit to evaluate the physical habitats of a stream (NCDENR 2001a). Unlike the Coastal Plain criteria which uses seven metrics, the Mountain/ Piedmont criteria uses eight habitat characteristics. These metrics include channel modification, amount of instream habitat, type of bottom substrate, pool variety, riffle variety, bank stability, light penetration, and riparian zone width. The eight metrics are individually converted into numerical scores. The total habitat score ranges between 1 and 100. Higher numbers suggest better habitat quality, but criteria have not been developed to assign impairment ratings.

Fish community sampling was conducted in 2004/2005 at 26 sites within the Piedmont. Knap of Reeds, Marks, Little, Middle, Buffalo, and Turkey Creeks, and the Little River were located in transitional areas between the Piedmont and Coastal Plain. All of these sites, except Turkey Creek, were rated with Piedmont criteria. Habitat scores ranged from 34 (Ellerbe Creek) to 93 (N Fk Little River) (Table 1).

Table 1. Rankings of waterbodies in the Piedmont region of the Neuse River basin according to the total habitat scores, 2004 and 2005.

Subbasin	Waterbody	Location	County	Score
		Moderate to high quality habitats		
1	N Fk Little R	SR 1461	Durham	93
1	N Flat R	SR 1715	Person	92
1	Deep Cr	SR 1734	Person	86
7	Moccasin Cr	NC 231	Johnston	85
1	Eno R	SR 1336	Orange	81
1	S Fk Little R	SR 1461	Durham	80
2	Crabtree Cr	SR 1664	Wake	79
2	Crabtree Cr	off SR 1650	Wake	70
		Low to poor quality habitats		
3	Middle Cr	SR 1375	Wake	63
2	Marks Cr	SR 1714	Johnston	62
6	Buffalo Cr	SR 1941	Johnston	60
1	S Flat R	NC 157	Person	59
1	Upper Barton Cr	NC 50	Wake	57
1	Smith Cr	SR 1710	Granville	56
2	Walnut Cr	SR 2544	Wake	55
2	Little Cr	SR 1562	Johnston	55
1	Knap of Reeds Cr	SR 1117	Granville	54
1	Horse Cr	SR 1923	Wake	54
6	Little R	SR 2224	Wake	54
2	Marsh Cr	SR 2277	Wake	48
1	Newlight Cr	SR 1911	Wake	47
1	Lower Barton Cr	SR 1844	Wake	47
2	Smith Cr	SR 2045	Wake	46
2	Richland Cr	US 1	Wake	43
2	Yates Branch	US 401	Wake	36
1	Ellerbe Cr	SR 1709	Durham	34

Eight streams had moderate to high quality habitats (score ≥ 65); whereas 18 streams had low to poor quality habitats (score < 65) (Table 1). Major differences between the two types were in the instream habitats, bottom substrates, and riffle habitats (Table 3). Low scores were attributable to nonpoint sedimentation from bank erosion and urban development.

Table 2. Habitat evaluations at 26 basinwide fish community sites in the Piedmont ecoregion of the Neuse River basin, 2004 and 2005.

Subbasin	Stream	Location	County	Width (m)	Channel	Instream Habitat	Substrate	Pools	Riffles	Bank Stability-L	Bank Stability-R	Shade	Riparian Zone-L	Riparian Zone-R	Total Score
030401															
	Eno R	SR 1336	Orange	10	5	16	12	10	8	5	5	10	5	5	81
	S Fk Little R	SR 1461	Durham	13	5	18	12	10	14	5	4	7	2	3	80
	N Fk Little R	SR 1461	Durham	13	5	20	14	9	14	6	6	9	5	5	93
	N Flat R	SR 1715	Person	12	5	18	12	9	16	6	6	10	5	5	92
	S Flat R	NC 157	Person	9	5	12	8	6	6	5	5	7	3	4	59
	Deep Cr	SR 1734	Person	12	5	18	12	9	10	6	6	10	5	5	86
	Knap of Reeds Cr[1]	off SR 1117	Granville	6	5	13	2	10	2	2	2	8	5	5	54
	Ellerbe Cr	SR 1709	Durham	9	2	7	2	6	0	1	1	5	5	5	34
	Smith Cr	SR 1710	Granville	6	5	10	4	9	5	3	3	7	5	5	56
	Newlight Cr	SR 1911	Wake	6	4	12	3	5	5	3	3	2	5	5	47
	Upper Barton Cr	NC 50	Wake	5	5	10	3	6	5	5	5	8	5	5	57
	Lower Barton Cr	SR 1844	Wake	7	5	9	2	8	1	2	2	10	5	3	47
	Horse Cr	SR 1923	Wake	6	5	12	3	9	3	4	4	5	5	4	54
030402															
	Richland Cr	US 1	Wake	6	5	8	3	9	1	2	2	3	5	5	43
	Smith Cr	SR 2045	Wake	10	5	8	3	8	1	4	4	7	3	3	46
	Crabtree Cr	off SR 1560	Wake	10	5	14	8	3	7	5	5	7	5	5	70
	Crabtree Cr	SR 1664	Wake	14	5	16	10	9	10	6	6	7	5	5	79
	Marsh Cr	SR 2277	Wake	6	5	8	3	6	5	3	3	9	3	3	48
	Walnut Cr	SR 2544	Wake	8	5	11	3	8	2	4	4	8	5	5	55
	Marks Cr[1]	SR 1714	Johnston	7	5	14	3	10	5	6	6	3	5	5	62
	Yates Br	US 401	Wake	4	5	8	3	3	1	1	1	8	3	3	36
	Little Cr	SR 1562	Johnston	10	5	14	3	9	1	3	3	7	5	5	55
030403															
	Middle Cr[1]	SR 1375	Wake	9	5	16	3	10	5	4	4	8	4	4	63
030406															
	Little R[1]	SR 2224	Wake	7	5	12	3	9	2	5	5	3	5	5	54
	Buffalo Cr[1]	SR 1941	Johnston	6	5	14	3	10	1	5	5	7	5	5	60
030407															
	Moccasin Cr	NC 231	Johnston	10	5	18	10	9	14	4	5	10	5	5	85

[1]also evaluated with Coastal Plain habitat criteria (Appendix F-8.)

Table 3. Mean habitat scores for 26 fish community sites in the Piedmont portion of the Neuse River basin, 2005.

Habitat characteristics	Low - Poor Quality Habitat	Moderate - High Quality Habitat	Max. score
Instream habitat	10.8	16.6	20
Substrate	3.2	9.8	15
Riffles	2.9	9.6	16

Characteristics of moderate to high quality habitat Piedmont streams include (Figure 1):

- instream habitats composed of rocks, sticks, leafpacks, snags and logs, and undercut banks and root mats;
- a substrate of cobble and gravel with low embeddedness;
- frequent pools and riffles of varying depths and widths; and
- stable banks with a good tree canopy and a medium to wide riparian zone with no or rare breaks in riparian coverage.

Figure 1. Instream habitats composed of rocks, sticks, leafpacks, snags and logs, and root mats; stable banks with a good tree canopy and a wide riparian zone. Picture A = Crabtree Creek, off SR 1650, Wake County and Picture B = North Fork Little River, SR 1461, Durham County.

Characteristics of low to poor quality habitat Piedmont streams include (Figure 2):

- highly embedded substrates of primarily sand;
- an absence of riffles; if present, they are usually caused by embedded, coarse woody debris in the current, and
- entrenched channel with unstable, vertical, and sparsely vegetated banks.

Figure 2. **Sandy substrates without riffles, vertical and eroding banks, and sparsely vegetated riparian zone (Picture A). Picture A = Richland Creek, US 1, Wake County, and Picture B = Ellerbe Creek, SR 1709, Durham County.**

Fifteen sites had habitat data from two or three different collection periods (Figure 3). At 8 of the 15 sites, the habitat scores varied by no more than ± 7 points and overall, was stable at these sites. At the seven remaining sites, substantial declines were documented which were not entirely due to differences in the assessment criteria and the weighting of the criteria that were in use in 1995 and 2005 (e.g., at Ellerbe and Walnut Creeks). Nonpoint source runoff and upstream development seemed to be having an increasing impact at Smith Creek (Granville County), Smith Creek (Wake County), and Upper Barton Creek. At Marks Creek the decline in habitat between 1995 and 2000 (from 82 to 56 points) was due to harvesting of the riparian forests which buffered both sides of the creek. The habitat assessment method is a useful monitoring tool for documenting temporal changes in instream and riparian habitat quality and is reproducible with small variability among trained staff.

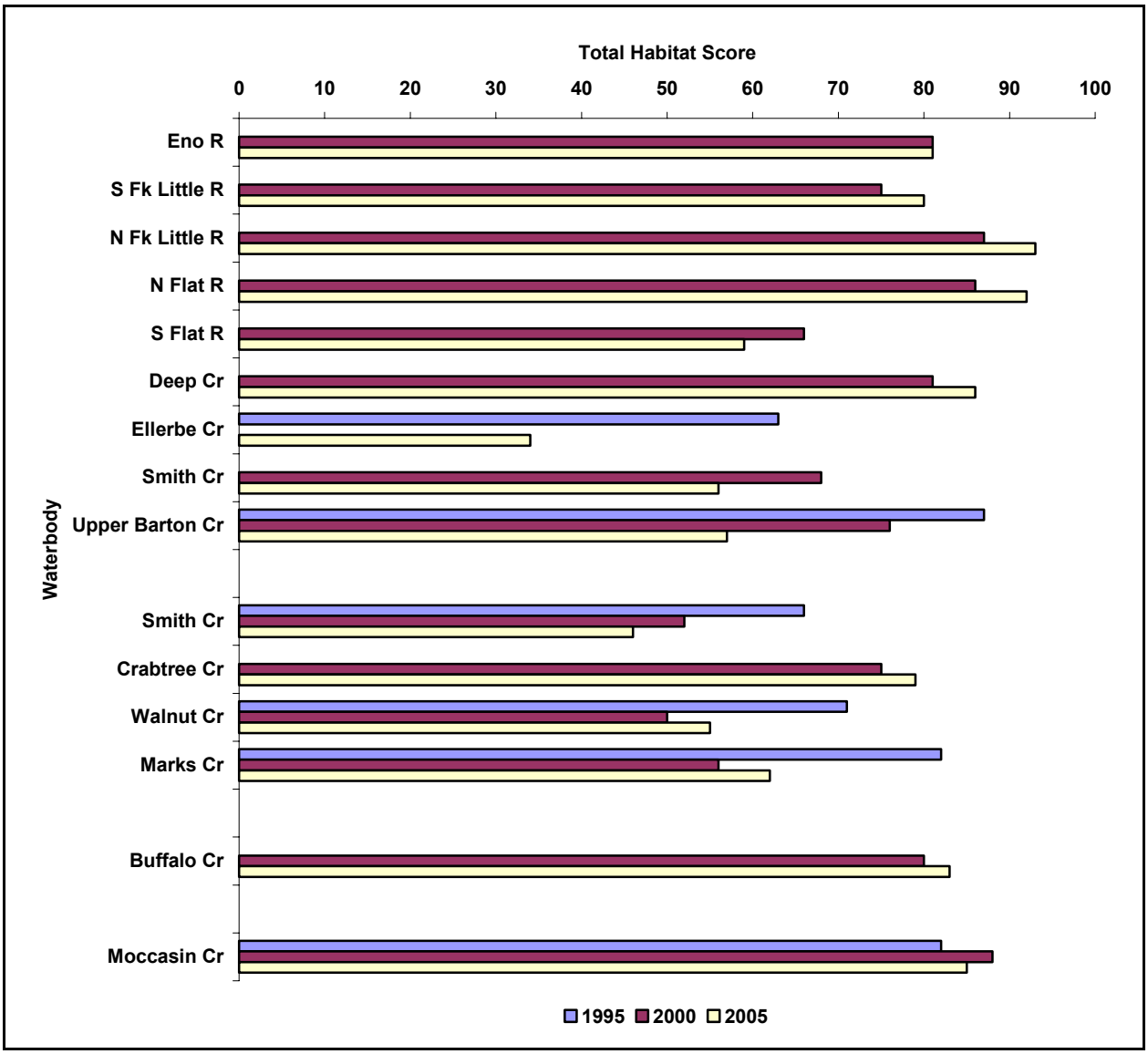


Figure 3. Total habitat scores at 15 fish community sites in the Piedmont region of the Neuse River basin, 1995, 2000, and 2005. [Note: data on Buffalo Creek are based upon Coastal Plain habitat criteria.]

Habitat and NCIBI Relationships

Since 1991, 102 fish community samples have been collected from the Piedmont portion of the Neuse River basin, of which, 84 of these samples (all since 1995) have associated habitat measurements. As a broad generalization with some exceptions, this data set showed that as instream and riparian habitats deteriorated, so did the fish community ratings (Figure 4). Median habitat scores for Excellent and Good sites were 81 and 66, respectively. [Note: two of the sites that rated Excellent have habitat scores similar to those sites that rated Poor to Good-Fair.]

Although the instream and riparian habitats of Richland Creek in Wake County are relatively poor (habitat score = 43), this stream continues to support a highly diverse community of fish. The 2000 Smith Creek site at SR 2045 (Wake County) rated Excellent because of its trophically balanced fish assemblage, despite only moderate habitat qualities (habitat score = 52). Good-Fair, Fair, and Poor sites had median habitat scores between 58 and 66. [Note: some of the sites rated Poor had habitat characteristics similar

to those at sites rated Good or Excellent.] In the case of Swift Creek at SR 1152 (Wake County), it seemed that some event impacted the fish community prior to sampling in 1995 causing its only rating of Poor. The stream has since maintained a rating of Fair or Good-Fair.

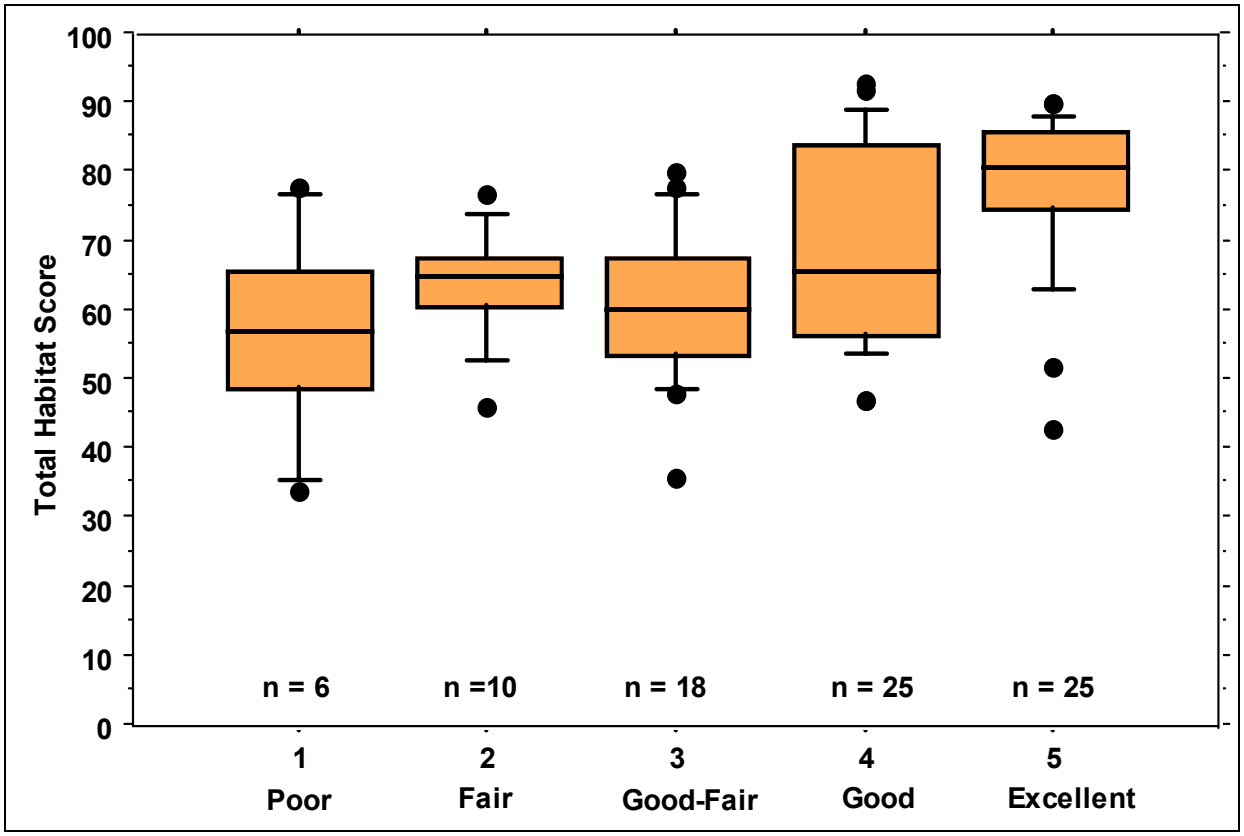


Figure 4. Relationships between habitat scores and NCIBI ratings in the Neuse River basin, 1995 - 2005.

Analysis of a smaller data set of the 26 Piedmont fish community sites sampled during the 2004/2005 monitoring cycle showed NCIBI ratings of Excellent or Good for all of the waterbodies with moderate to high quality habitats (Table 4). Fish communities that rated Fair or Poor were only found where the habitats were of low to poor quality. Most of the streams with lower quality habitats that rated better than Good-Fair have naturally occurring, highly diverse communities of fish, and lie within areas of geologic transition between the Northern Outer Piedmont and the Rolling Coastal Plain ecoregions (Griffith *et al.* 2002). However, the South Flat River site in Person County is located in an area of transition between the Southern Outer Piedmont and the Carolina Slate Belt ecoregions (Griffith *et al.* 2002). Upper Barton and Lower Barton Creeks seem to be experiencing nonpoint sedimentation from urban development in North Raleigh, shown by increased embeddedness of substrates and a decline in riffle quality and frequency. This change in habitat was prominent at the Upper Barton Creek site, showing fewer riffles and pools that are filling in since the 2000 basin sample. Finally, Horse Creek still appeared to be showing damaging effects from recent hurricanes.

Table 4. NCIBI ratings and habitat quality for 26 streams in the Piedmont region of the Neuse River basin, 2004 and 2005.[1]

NCIBI Rating	Waterbodies with Low to Poor Quality Habitat (Score < 65)	Waterbodies with Moderate to High Quality Habitat (Score ≥ 65)
Excellent	Middle Cr, Richland Cr	Deep Cr, Eno R, S Fk Little R, Crabtree Cr (both sites)
Good	Marks Cr, S Flat R, Upper Barton Cr, Little Cr, Horse Cr, Little R, Newlight Cr, Lower Barton Cr,	N Fk Little R, N Flat R, Moccasin Cr
Good-Fair	Buffalo Cr, Smith Cr, Walnut Cr, Knap of Reeds Cr, Marsh Cr, Yates Br	
Fair	Smith Cr	
Poor	Ellerbe Cr	

[1]Blue denotes streams with moderate to high quality habitats and fish communities rated Good or Excellent. Red denotes streams with low to poor quality habitats and fish communities rated Fair or Poor.

REFERENCES

Griffith, G., Omernik, J. and J. Comstock. 2002. Ecoregions of North Carolina. United States Environmental Protection Agency. Research and Development. NHEERL. Western Ecology Division. Corvallis, OR.

NCDENR. 2001a. Standard operating procedures for benthic macroinvertebrates. Biological Assessment Unit. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Environmental Sciences Branch. Raleigh, NC.

Appendix F-8. Habitat evaluations and stream and riparian habitats at 26 fish community monitoring sites in the Coastal Plain region of the Neuse River basin, 2005.

A method has been developed by the Biological Assessment Unit to evaluate the physical habitats of a stream (NCDENR 2001a). Unlike the Mountain/Piedmont criteria which uses eight metrics, the Coastal Plain criteria uses seven habitat characteristics. These metrics include channel modification, amount of instream habitat, type of bottom substrate, pool variety, bank stability, light penetration, and riparian zone width. The seven metrics are individually converted into numerical scores. The total habitat score ranges between 1 and 100. Higher numbers suggest better habitat quality, but criteria have not been developed to assign impairment ratings.

Fish community sampling was conducted in 2005 at 26 sites in the Coastal Plain Level III ecoregion (Table 1). Five sites in the Piedmont, sampled in either 2004 or 2005, were also evaluated with Coastal Plain criteria because their streams are either in the transition area between the Piedmont and the Coastal Plain (portions of Subbasins 2, 3, and 6) (Appendix F-7) or because the streams appeared to have characteristics more of Coastal Plain streams than Piedmont streams.

In the Coastal Plain there are two major types of wadeable streams that are sampled for the fish community assessment program – those that have a natural channel with sinuosity and those that been channelized, either historically or still being periodically maintained. The degree of channelization may range from those that are "straight as an arrow" (e.g., Swift Creek and Indian Well Swamp) to those that have retained some sinuosity in the channel but are periodically de-snagged and deepened (Moseley Creek and Big Chinquapin Branch). In eastern North Carolina streams were channelized to convey water away from the land to render the lands suitable for agricultural and forestry purposes. In some areas, streams were channelized to alleviate flooding in residential and urban areas upstream.

The habitat scores for the 26 sites sampled in 2005 ranged from 42 (Swift Creek) to 95 (Mill Run) (Tables 1 and 2). Almost 80 percent of the streams had overall moderate to high quality habitats (score ≥ 65); whereas 20 percent of the streams had overall low to poor quality habitats (score < 65). With no exceptions, every stream that had been channelized had habitat score less than 65 (Tables 1 and 2). [Note: Hominy Swamp may have been channelized a long time ago.] In contrast, every stream that scored greater than 65 was either not channelized or might have been channelized a very long time ago, but has since reverted back to its natural channel and/or its riparian zones have been re-forested.

Table 1. Habitat evaluations at 31 basinwide fish community sites in the Coastal Plain ecoregion of the Neuse River basin, 2004 and 2005.

Subbasin	Stream	Location	County	Width (m)	Channel	Instream Habitat	Substrate	Pools	Bank Stability-L	Bank Stability-R	Shade	Riparian Zone-L	Riparian Zone-R	Total Score
030401														
	Knap of Reeds Cr[1]	off SR 1117	Granville	6	15	15	8	10	2	2	10	5	5	72
030402														
	Marks Cr[1]	SR 1714	Johnston	7	15	15	7	10	9	9	3	5	5	78
030403														
	Middle Cr[1]	SR 1375	Wake	9	15	15	10	10	4	4	8	4	4	74
030405														
	Stoney Cr	SR 1920	Wayne	5	15	15	13	8	8	8	10	5	4	86
	Bear Cr	SR 1311	Lenoir	10	15	17	7	10	8	8	9	5	5	84
	Falling Cr	SR 1340	Lenoir	9	15	19	13	10	9	9	9	5	5	94
	Moseley Cr	SR 1475	Craven	11	10	10	13	6	4	9	3	4	5	64
030406														
	Little R[1]	SR 2224	Wake	7	15	15	7	9	9	9	4	5	5	78
	Buffalo Cr[1]	SR 1941	Johnston	6	15	15	13	9	7	7	7	5	5	83
	Little Buffalo Cr	SR 2143	Johnston	6	15	17	14	4	9	9	9	5	5	87
030407														
	Turkey Cr[1]	SR 1109	Nash	9	15	16	13	9	9	9	10	5	5	91
	Hominy Swp	SR 1606	Wilson	6	10	7	5	6	5	3	3	5	2	46
	Toisnot Swp	US 264	Wilson	10	15	16	13	10	9	9	7	5	5	89
	Toisnot Swp	NC 222	Wilson	10	15	18	10	10	9	9	7	5	5	88
	Watery Br	NC 58	Greene	4	15	15	4	9	7	7	10	5	5	77
	Nahunta Swp	SR 1537	Wayne	6	15	15	7	6	7	7	9	5	5	76
	The Slough	SR 1535	Wayne	7	15	12	7	9	8	8	10	5	5	79
	Appletree Swp	SR 1216	Greene	4	15	17	7	8	9	9	10	4	3	81
	Fort Run	NC 58	Greene	4	15	18	7	10	7	7	1	5	5	75
	Rainbow Cr	SR 1091	Greene	5	15	15	13	9	8	8	9	5	5	87
	Little Contentnea Cr	SR 2107	Pitt	8	12	15	8	9	8	8	10	5	5	80
030409														
	Swift Cr	SR 1753	Pitt	13	5	10	7	4	4	2	3	5	2	42
	Indian Well Swp	SR 1753	Pitt	4	5	16	7	4	5	5	2	4	5	53
030411														
	Trent R	SR 1130	Jones	7	15	18	13	10	9	9	7	5	5	91
	Tuckahoe Swp	SR 1142	Jones	8	15	18	8	10	9	9	9	5	5	88
	Little Chinquapin Br	SR 1131	Jones	5	15	18	8	8	9	9	10	5	5	87
	Big Chinquapin Br	SR 1129	Jones	7	8	6	6	6	2	4	2	4	5	43
	Beaver Cr	SR 1316	Jones	9	14	18	4	10	9	8	9	4	4	80
	Mill Run	NC 58	Jones	7	15	18	13	9	10	10	10	5	5	95
	Island Cr	SR 1004	Jones	5	15	18	8	9	10	10	10	5	5	90
030412														
	Beaverdam Cr	SR 1007	Wayne	7	15	17	4	10	9	9	7	5	4	80

[1]also evaluated with Piedmont habitat criteria (Appendix F-7.)

Table 2. Rankings of 26 waterbodies in the Coastal Plain region of the Neuse River basin according to the total habitat scores, 2005.

Subbasin	Waterbody	Location	County	Score
		Moderate to high quality habitats		
11	Mill Run	NC 58	Jones	95
5	Falling Cr	SR 1340	Lenoir	94
7	Turkey Cr	SR 1109	Nash	91
11	Trent R	SR 1130	Jones	91
11	Island Cr	SR 1004	Jones	90
7	Toisnot Swp	US 264	Wilson	89
7	Toisnot Swp	NC 222	Wilson	88
11	Tuckahoe Swp	SR 1142	Jones	88
6	Little Buffalo Cr	SR 2143	Johnston	87
7	Rainbow Cr	SR 1091	Greene	87
11	Little Chinquapin Br	SR 1131	Jones	87
5	Stoney Cr	SR 1920	Wayne	86
5	Bear Cr	SR 1311	Lenoir	84
7	Appletree Swp	SR 1216	Greene	81
12	Beaverdam Cr	SR 1007	Wayne	80
7	Little Contentnea Cr	SR 2107	Pitt	80
11	Beaver Cr	SR 1316	Jones	80
7	The Slough	SR 1535	Wayne	79
7	Watery Br	NC 58	Greene	77
7	Nahunta Swp	SR 1537	Wayne	76
7	Fort Run	NC 58	Greene	75
		Low to poor quality habitats		
5	Moseley Cr	SR 1475	Craven	64
9	Indian Well Swp	SR 1753	Pitt	53
7	Hominy Swp	SR 1606	Wilson	46
11	Big Chinquapin Br	SR 1129	Jones	43
9	Swift Cr	SR 1753	Pitt	42

Table 3. Mean habitat scores for 26 fish community sites in the Coastal Plain region of the Neuse River basin, 2005.

Habitat characteristics	Low - Poor Quality Habitat (channelized)	Moderate - High Quality Habitat (natural channel)	Maximum score
Channel Modification	7.6	14.8	15
Instream habitat	9.8	16.7	20
Pools	5.2	8.9	10
Bank stability (right and left)	8.6	17.1	20
Shade	2.6	8.7	10

Habitat manipulation through channelization has had a profound effect on the other habitat characteristics of the stream (Tables 1 and 3). Characteristics of natural channel streams are (Figures 1 and 2):

- Natural channel streams have greater sinuosity than channelized streams.
- Natural channel streams have diverse instream habitats including coarse woody debris, undercut banks and root mats, macrophytes and leaf packs.
- Natural channel streams have frequent pools of varied depths.
- Natural channel streams have stable vegetated banks which provides shade.
- Natural channel streams may have more stable flows than channelized streams during periods of low precipitation.

Unexpectedly, the width of the riparian zones in this data set did not seem to differ much between the two channel types (Table 1). Riparian zones scores were only slightly greater for the natural channel streams than for the channelized streams. Substrate scores also did not differ appreciably between the two stream types.

Figure 1. **Two natural channel streams showing dense canopy, stable banks, submerged coarse woody debris, and macrophytes. Picture A = Falls Creek at SR 1340, Lenoir County and Picture B = Tuckahoe Swamp at SR 1142, Jones County.**

Figure 2. **Two natural channel streams showing coarse woody debris, dense canopy, forested and stable banks. Picture A = Mill Run at NC 58, Jones County and Picture B = Little Chinquapin Branch, SR 1131, Jones County.**

Characteristics of channelized streams are (Figures 3 and 4):

- Channelized streams have less diverse instream habitats and have the pools of uniform depths.
- Channelized streams have banks may be unstable and sparsely vegetated.
- Channelized streams have a more open canopy than natural channel streams which ultimately provides more light to reach the stream. An open canopy provides light for abundant growths of macrophytes, benthic and planktonic algae, and increase the temperature of the water.
- Channelized streams may have larger diurnal fluctuations in temperature and dissolved oxygen than in natural channel streams
- Channelized streams usually have one or both of the riparian zones cleared of trees and shrubs to provide access to the stream for dredging and channel clearing equipment.
- Channelized streams are, by design, deeply entrenched and detached from their floodplains, except during extreme high water (i.e., tropical storm- and hurricane-induced flooding).
- Channelized streams may also have flows that fluctuate dramatically due to storm events. However, the flows may also be more permanent because the streams are usually entrenched below the level of the water table.

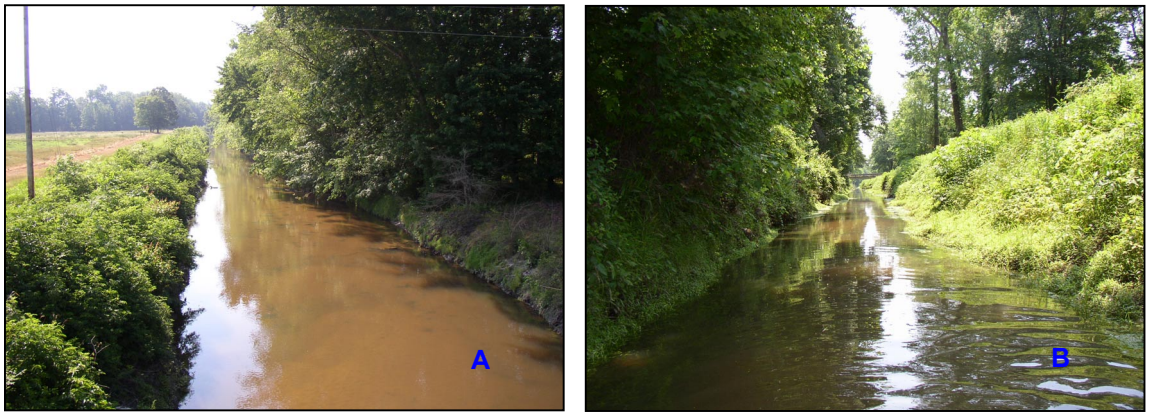


Figure 3. **Two channelized streams showing a lack of sinuosity, open canopy, entrenchment, and narrow riparian zone along one edge of the stream. Picture A = Swift Creek, SR 1753, Pitt County and Picture B = Indian Well Swamp at SR 1753, Pitt County.**

Figure 4. **Two channelized streams showing entrenchment, open canopy, sinuosity but a lack of instream habitats (Picture A), macrophytes along the edges (Picture B), and a narrow riparian zone along one edge of the stream for channel maintenance. Picture A = Big Chinquapin Branch Creek, SR 1129, Jones County and Picture B = Indian Well Swamp at SR 1753, Pitt County.**

Eleven sites had habitat data from two or three different collection periods (Figure 5). Except for Little Contentnea Creek, the habitat scores varied by no more than ± 11 points. The reason for the large difference in the scores at Little Contentnea Creek (26 points) was attributed to the different versions of the assessment criteria and the weighting of the criteria that were in use in 1995 and 2005.

Even though there was a wide range in habitat qualities among the sites (Figure 5), from a low of 53 to a high of 95, overall, the habitats at these sites were stable. The scoring and assessment method are reproducible with small variability among trained staff.

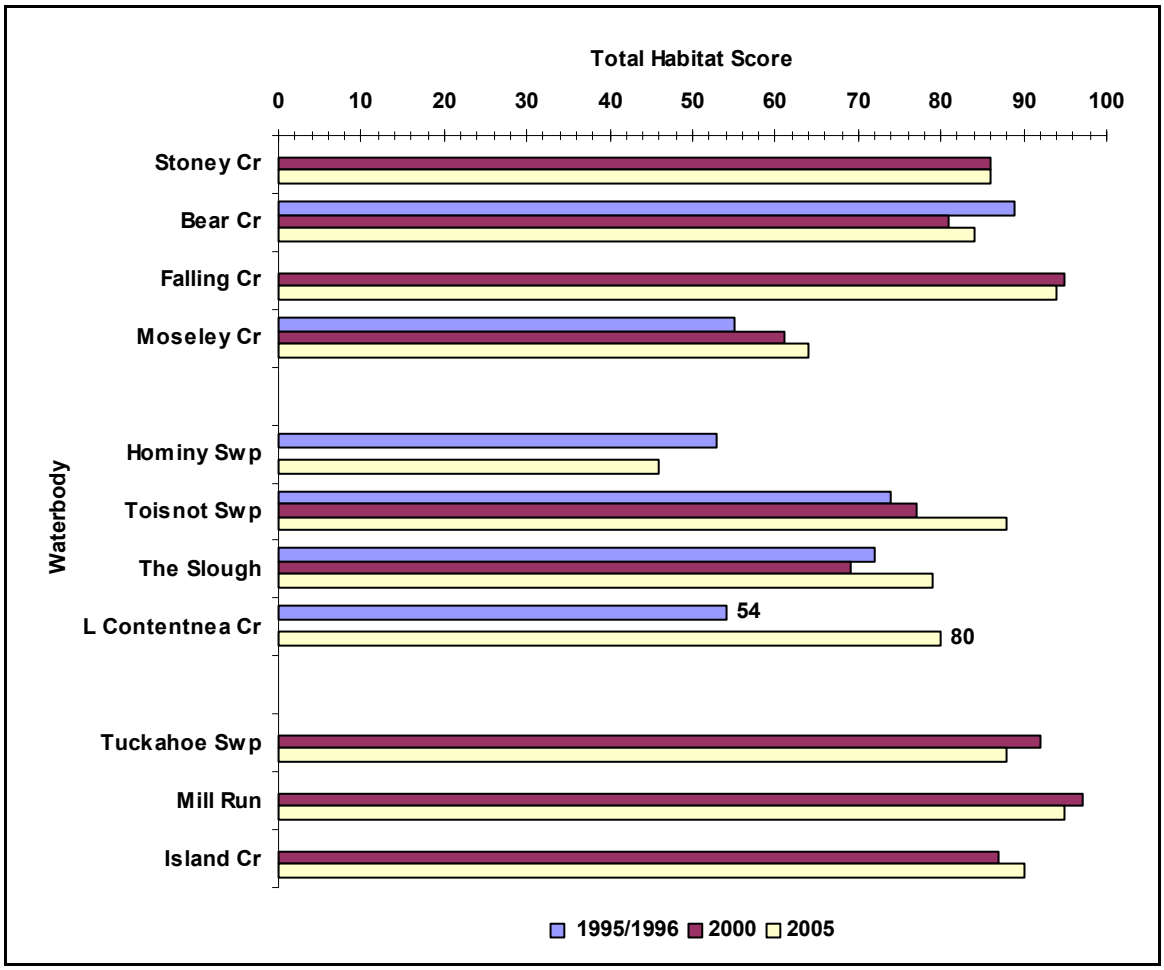


Figure 5. Total habitat scores at 11 fish community sites in the Coastal Plain region of the Neuse River basin, 1995/1996, 2000, and 2005.

REFERENCES

NCDENR. 2001a. Standard operating procedures for benthic macroinvertebrates. Biological Assessment Unit. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Water Quality Section. Environmental Sciences Branch. Raleigh, NC.

Appendix F-9. Water quality at fish community sites in the Piedmont region of the Neuse River basin, 2004 and 2005.

In 2004 and 2005, water quality parameters were collected at all fish community assessment sites in the Piedmont ecoregion (Table 1). All dissolved oxygen concentrations were greater than the water quality standard of 5 mg/L (with a minimum instantaneous value of not less than 4.0 mg/L) (NCAC 2004), except for the measurement at Knap of Reeds Creek. At the time of sampling, the Knap of Reeds Creek site was experiencing low flow conditions. Dissolved oxygen saturation ranged from 31.6 percent at Knap of Reeds Creek to 100.9 percent at Newlight Creek.

Conductivity measurements ranged from 27 to 391 µmhos/cm at Moccasin and Crabtree Creeks, respectively (Figure 1). In general, conductivity measurements were the greatest below wastewater treatment facilities (e.g., Crabtree and Middle Creeks) or in streams draining urban areas (e.g. Ellerbe Creek) and the lowest in streams draining least impacted watersheds (North Flat River and Deep Creek).

All pH measurements were within the water quality standard for non-swamp waters (6.0 – 9.0 s.u; NCAC 2004) and ranged from 6.0 s.u. at Yates Branch to 7.0 s.u. at Marsh Creek, respectively. pH measurements were not recorded for North Flat River, South Flat River, and Deep Creek because of a malfunctioning pH meter.

Table 1. Water quality measurements at 26 fish community sites in the Piedmont region of the Neuse River basin, 2004 and 2005.

Subbasin/ Waterbody	Location	County	Date	Temperature (˚C)	Dissolved oxygen (mg/L)	Saturation (%)	Specific conductance (µmhos/cm)	pH (s.u.)
030401								
Eno R	SR 1336	Orange	04/07/05	15.5	8.1	81.2	73	6.3
S Fk Little R	SR 1461	Durham	04/07/05	17.1	9.4	97.5	83	6.8
N Fk Little R	SR 1461	Durham	04/07/05	17.8	9.4	98.9	77	6.9
N Flat R	SR 1715	Person	04/06/05	15.5	9.8	98.3	56	---[1]
S Flat R	NC 157	Person	04/06/05	18.0	9.0	95.1	83	---[1]
Deep Cr	SR 1734	Person	04/06/05	14.0	9.4	91.2	63	---[1]
Knap of Reeds Cr	off SR 1117	Granville	07/19/04	23.2	2.7	31.6	184	6.2
Ellerbe Cr	SR 1709	Durham	04/14/05	14.8	5.6	55.3	167	6.7
Smith Cr	SR 1710	Granville	04/04/05	11.7	10.6	97.7	67	6.8
Newlight Cr	SR 1911	Wake	04/04/05	14.0	10.4	100.9	72	6.8
Upper Barton Cr	NC 50	Wake	04/04/05	10.8	9.8	88.5	95	6.7
Lower Barton Cr	SR 1844	Wake	07/19/04	21.6	6.3	71.5	104	6.2
Horse Cr	SR 1923	Wake	06/10/04	23.8	7.9	93.5	64	6.4
030402								
Richland Cr	US 1	Wake	04/04/05	17.8	9.0	94.7	89	6.9
Smith Cr	SR 2045	Wake	04/05/05	11.8	9.4	86.9	92	6.4
Crabtree Cr	off SR 1650	Wake	06/11/04	26.9	5.4	67.7	391	6.7
Crabtree Cr	SR 1664	Wake	05/13/05	21.1	6.9	77.6	190	6.7
Marsh Cr	SR 2277	Wake	04/05/05	14.5	9.0	88.3	115	7.0
Walnut Cr	SR 2544	Wake	04/05/05	15.3	8.5	84.9	144	6.8
Marks Cr	SR 1714	Johnston	04/08/05	18.2	7.9	83.8	65	6.5
Yates Br	US 401	Wake	07/20/04	23.5	6.8	80.0	81	6.0
Little Cr	SR 1562	Johnston	04/18/05	12.5	8.3	77.9	82	6.4
030403								
Middle Cr	SR 1375	Wake	07/20/04	24.6	5.9	70.9	283	6.6
030406								
Little R	SR 2224	Wake	06/11/04	26.8	5.3	66.3	73	6.3
Buffalo Cr	SR 1941	Johnston	04/18/05	15.2	8.0	79.7	53	6.5
030407								
Moccasin Cr	NC 231	Johnston	05/02/05	15.0	7.5	74.4	27	6.7

[1]data missing, meter malfunction.

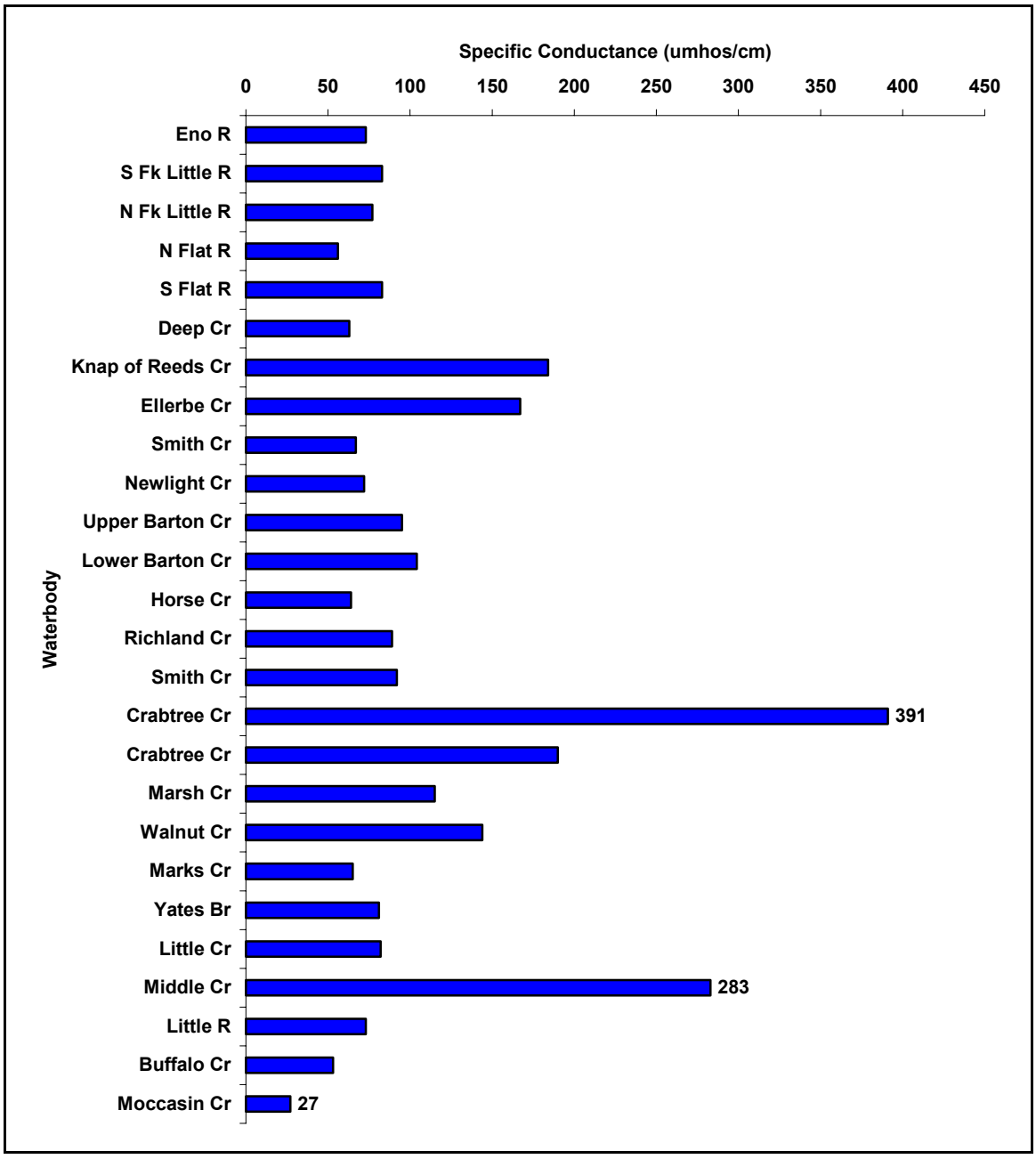


Figure 1. Specific conductance (µmhos/cm) at 26 fish community sites in the Piedmont region of the Neuse River basin, 2004/2005.

Since 1991, 102 fish community samples have been collected from the Piedmont portion of the basin; of these samples, 93 have associated conductivity measurements. This data set showed that median conductivity was not substantially different among the NCIBI ratings, except for sites rated Poor (Figure 2). Median conductivity measurements for Excellent, Good, Good-Fair, Fair, and Poor sites were 89, 75, 107, 92, and 155 µmhos/cm, respectively. The range in conductivities at sites rated Good or Fair was much smaller than the range at sites rated Poor Good-Fair or Excellent. [Note: the high conductivity outliers seen in the Poor and Excellent data sets (Ellerbe Creek at SR 1636, Durham County, 1995, Eno River at SR 1569, Orange County, 1998; Eno River at SR 1003, Durham County, 1998; and Crabtree Creek off SR 1650, Wake

County, 2004) are sites located below WWTPs]. The high conductivity measurement seen in the Good-Fair data set was a result of nonpoint urban runoff into Rocky Branch.

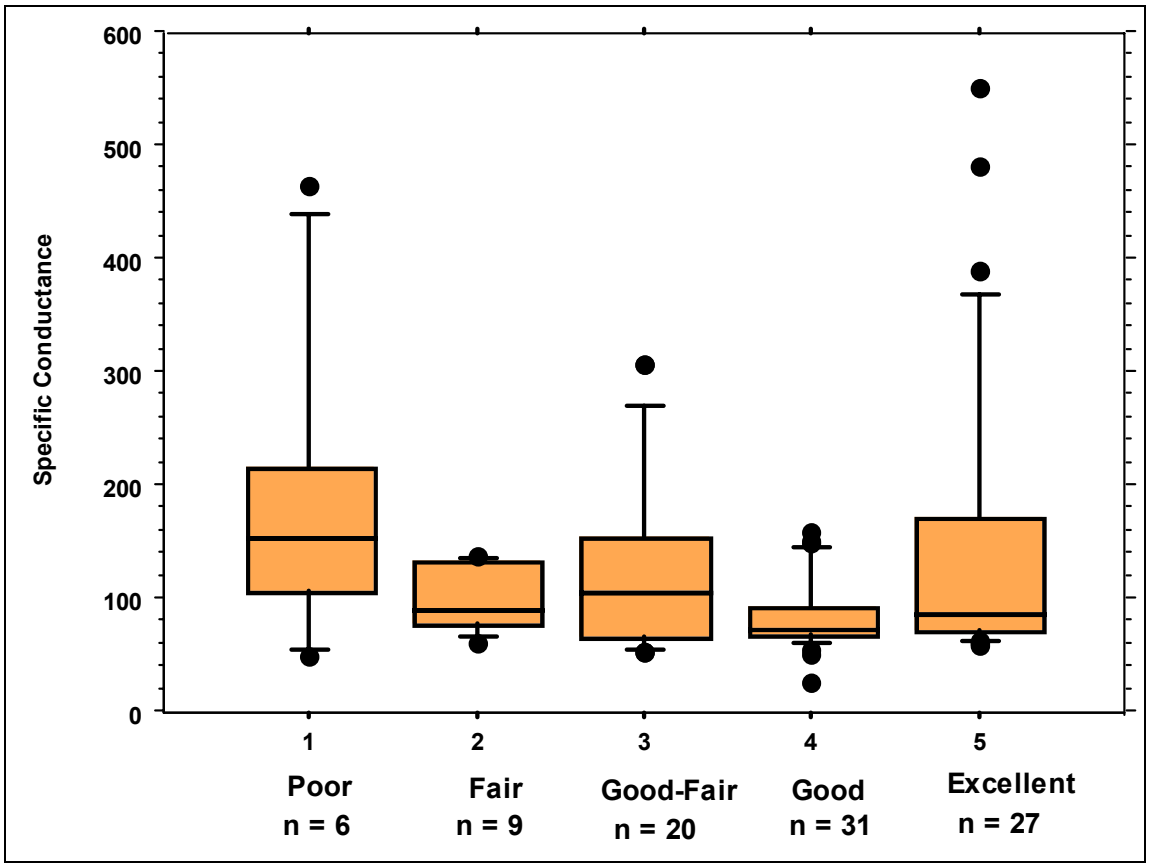


Figure 2. Relationships between specific conductance (µmhos/cm) and NCIBI ratings in the Neuse River basin, 1990 - 2005.

REFERENCES

NCAC. 2004. North Carolina administrative code. Effective August 1, 2004. Environmental Management Commission. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Raleigh, NC.

Appendix F-10. Water quality at fish community sites in the Coastal Plain region of the Neuse River basin, 2005.

In 2005 water quality data were collected at every Coastal Plain site during fish community assessments (Table 1). All dissolved oxygen concentrations were greater than the water quality standard of 5 mg/L (with a minimum instantaneous value of not less than 4.0 mg/L), except for measurements at Hominy and Tuckahoe Swamps. Except for Stoney, Little Buffalo, Turkey, and Beaverdam Creeks, which are classified either as C or WS-IV, all other waterbodies are classified as Swamp Waters (SW). Even though the concentrations were less than the standard at Hominy and Tuckahoe Swamps, concentrations may be lower in swamp waters if caused by natural conditions (NCAC 2004). Hominy Swamp drains the City of Wilson where runoff from the urbanized watershed may also be partially responsible for the depressed concentrations. However, the Tuckahoe Swamp watershed is undeveloped and rural in character and thus the low concentration was in fact natural. Dissolved oxygen saturation ranged from 38 percent at Hominy Swamp to 91 percent at Big Chinquapin Branch and Beaverdam Creek.

Table 1. Water quality measurements at 26 fish community sites in the Coastal Plain region of the Neuse River Basin, 2005.

Subbasin/ Waterbody	Location	County	Date	Temperature (˚C)	Dissolved oxygen (mg/L)	Saturation (%)	Specific conductance (µmhos/cm)	pH (s.u.)
030405								
Stoney Cr	SR 1920	Wayne	04/20/05	18.1	6.4	68	97	6.4
Bear Cr	SR 1311	Lenoir	05/04/05	14.6	8.9	88	103	6.5
Falling Cr	SR 1340	Lenoir	05/04/05	16.1	8.5	86	97	7.0
Moseley Cr	SR 1475	Craven	05/17/05	21.9	6.3	72	154	6.5
030406								
Little Buffalo Cr	SR 2143	Johnston	04/19/05	15.3	7.3	73	65	6.4
030407								
Turkey Cr	SR 1109	Nash	05/02/05	15.3	6.5	65	65	6.5
Hominy Swp	SR 1606	Wilson	05/02/05	16.8	3.7	38	196	6.9
Toisnot Swp	US 264	Wilson	05/03/05	16.3	7.3	74	86	6.5
Toisnot Swp	NC 222	Wilson	05/03/05	16.0	6.9	70	85	7.1
Watery Br	NC 58	Greene	04/21/05	18.0	6.8	72	99	5.5
Nahunta Swp	SR 1537	Wayne	04/20/05	17.0	6.9	71	96	6.3
The Slough	SR 1535	Wayne	04/20/05	19.6	6.1	67	97	6.2
Appletree Swp	SR 1216	Greene	04/22/05	18.0	6.8	72	82	6.5
Fort Run	NC 58	Greene	04/21/05	22.0	7.8	89	82	6.0
Rainbow Cr	SR 1091	Greene	05/05/05	15.7	7.8	79	78	6.4
Little Contentnea Cr	SR 2107	Pitt	05/18/05	19.6	5.2	57	95	6.3
030409								
Swift Cr	SR 1753	Pitt	05/18/05	18.5	7.6	81	142	6.5
Indian Well Swp	SR 1753	Pitt	05/18/05	18.1	8.1	86	147	6.7
030411								
Trent R	SR 1130	Jones	05/05/05	17.4	6.2	65	106	6.4
Tuckahoe Swp	SR 1142	Jones	05/16/05	21.2	4.0	45	103	6.3
Little Chinquapin Br	SR 1131	Jones	05/16/05	19.5	6.6	72	182	6.4
Big Chinquapin Br	SR 1129	Jones	05/16/05	23.2	7.8	91	381	7.2
Beaver Cr	SR 1316	Jones	05/05/05	17.0	6.7	69	260	6.4
Mill Run	NC 58	Jones	05/17/05	19.3	6.2	67	169	6.5
Island Cr	SR 1004	Jones	05/17/05	19.3	5.6	61	99	6.7
030412								
Beaverdam Cr	SR 1007	Wayne	05/03/05	17.9	8.6	91	98	7.1

Conductivity (specific conductance) ranged from 65 µmhos/cm at Little Buffalo and Turkey Creeks to 381 µmhos/cm at Big Chinquapin Creek (Table 1 and Figure 1). Conductivity was also elevated at Hominy Swamp and at several streams in Craven, Pitt, and Jones counties. Nonpoint source runoff from upstream landuses (agricultural uses or urbanization) seemed to be affecting the water quality in Big Chinquapin Branch, Beaver Creek, and Hominy Swamp based upon their elevated conductivities.

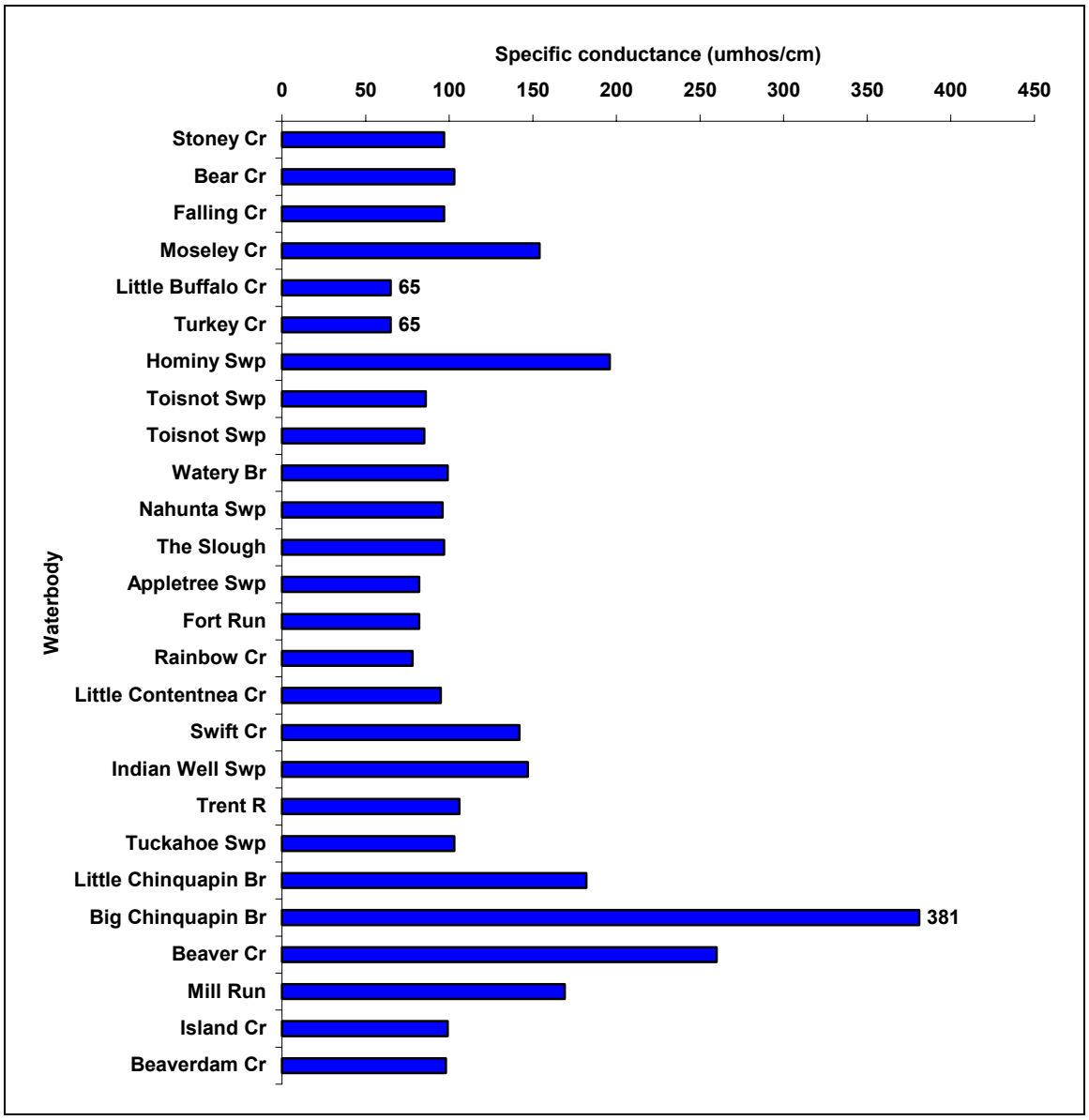


Figure 1. Specific conductance (µmhos/cm) at 26 fish community sites in the Coastal Plain region of the Neuse River basin, 2005.

A pH measurement from swamp waters may also be less than the water quality standard of 6.0 s.u. if it is the result of natural conditions (NCAC 2004). All pH measurements were within the water quality standard and ranged from 5.5 s.u. at Watery Branch (classified as SW) to 7.2 at Big Chinquapin Branch. Streams in the Trent River watershed (Subbasin 11, Jones County) have greater than expected pH due to the underlying and exposed limestone outcrops that can be found in many of the streams.

Coastal Plain streams are naturally tannin stained and are commonly called “blackwater” streams. Water clarity at the fish community sites ranged from clear, tannin stained (n =13), slightly turbid, tannin stained (n = 9), darkly stained, blackwater (n = 3), to turbid (n = 1). The darkest water was found in Fort Run, Appletree Swamp, and Island Creek. The only turbid stream was Hominy Swamp.

REFERENCES

NCAC. 2004. North Carolina administrative code. Effective August 1, 2004. Environmental Management Commission. North Carolina Department of Environment and Natural Resources. Division of Water Quality. Raleigh, NC.

Appendix F-11.Flow measurement and flow conditions in the Neuse River basin.

Even before the last basinwide monitoring cycle was completed in 2000, the Neuse River basin had been experiencing a prolonged drought which started in 1998 and continued through 2002 (Figures 1 - 6). In the eastern Piedmont and Coastal Plain, drought conditions generally were less widespread through about mid 2000 (Weaver 2005). Late summer tropical storms prevented the continuous, widespread drought conditions in the eastern part unlike the western part of the state. Beginning in late 2000, however, widespread drought conditions began to spread across much of the state (Weaver 2005). The drought was abruptly halted by above normal precipitation in late 2002 and into 2003. During fish community sampling in early April until mid May 2005 flows were at or above median daily at nearby USGS gauge sites.

The drought was most severe during summer 2002, especially in the upper part of the basin (Subbasin 01). For example, the lowest 7-day average discharge flow ever recorded at the Flat River at Bahama occurred on June 19, 2002 (0.24 cfs, cubic feet per second). Daily mean discharges of 0 cfs occurred at the Little River near Princeton (Subbasin 06) on August 12, 2002 and repeatedly during the 1998-2002 drought at Sevenmile Creek near Efland and the Little River near Orange Factory (Subbasin 01). Lower in the basin in Subbasin 05, record low flows of 10 cfs occurred at Bear Creek at Mays Store on August 06, 2002 (Weaver 2005). Many of the streams draining smaller watersheds in the upper basin undoubtedly went completely dry or became a series of isolated pools with subsurface flows.

Towards the end of the five year basinwide monitoring cycle in mid-late 2005, another drought had begun in the upper part of the basin. The drought however was much more isolated and seemed to be confined primarily to Subbasin 01 (i.e., streams draining into Falls Reservoir such as the Eno, Flat, and Little Rivers).

REFERENCES

Weaver, J. C. 2005. The drought of 1998 – 2002 in North Carolina – precipitation and hydrologic conditions. U. S. Geological Survey. Scientific Investigations Report 2005-5053.

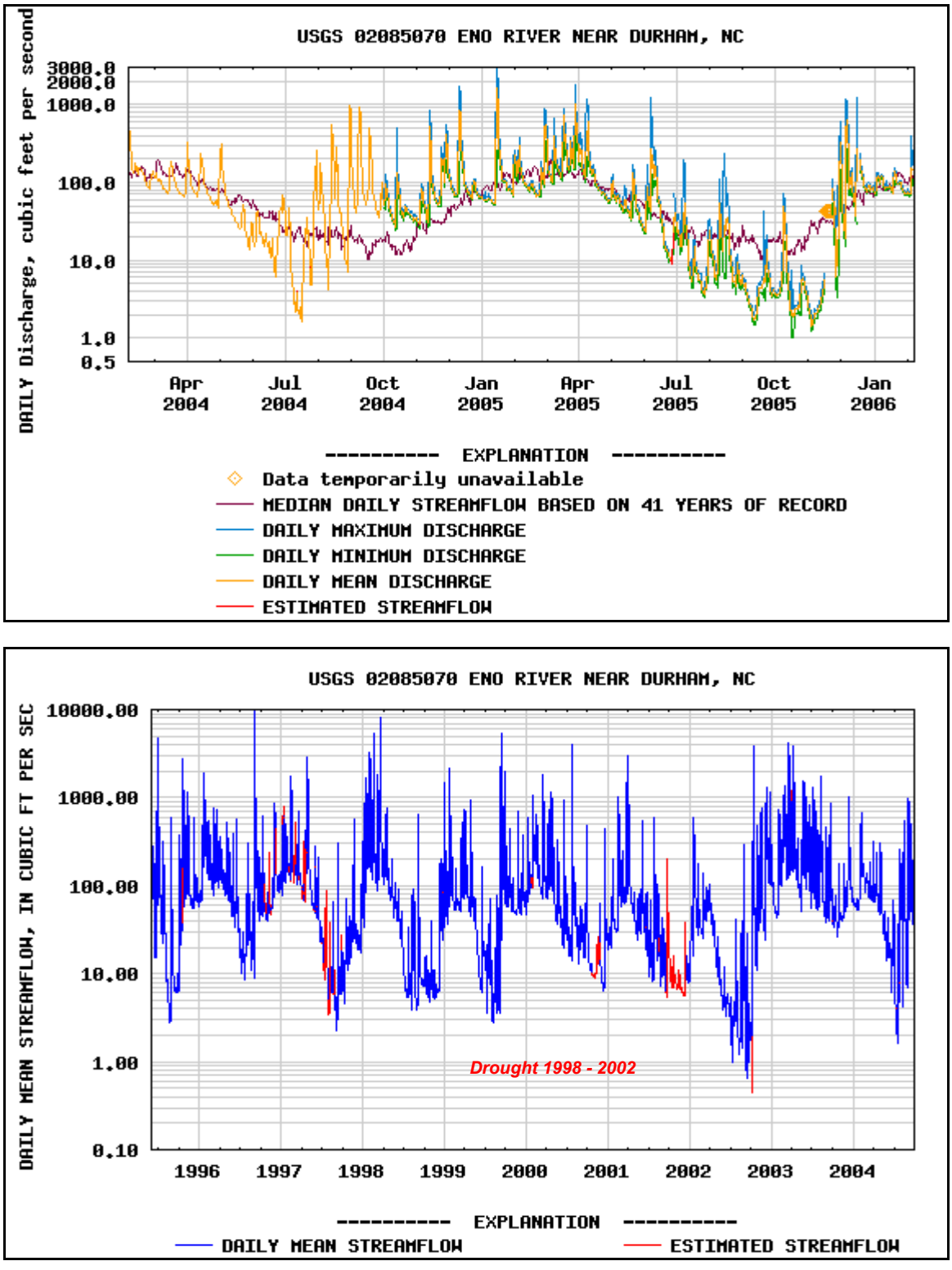


Figure 1. **Flows in the Eno River near Durham, March 2004 – February 2006 (top) and June 01, 1995 – September 30, 2004 (bottom).**

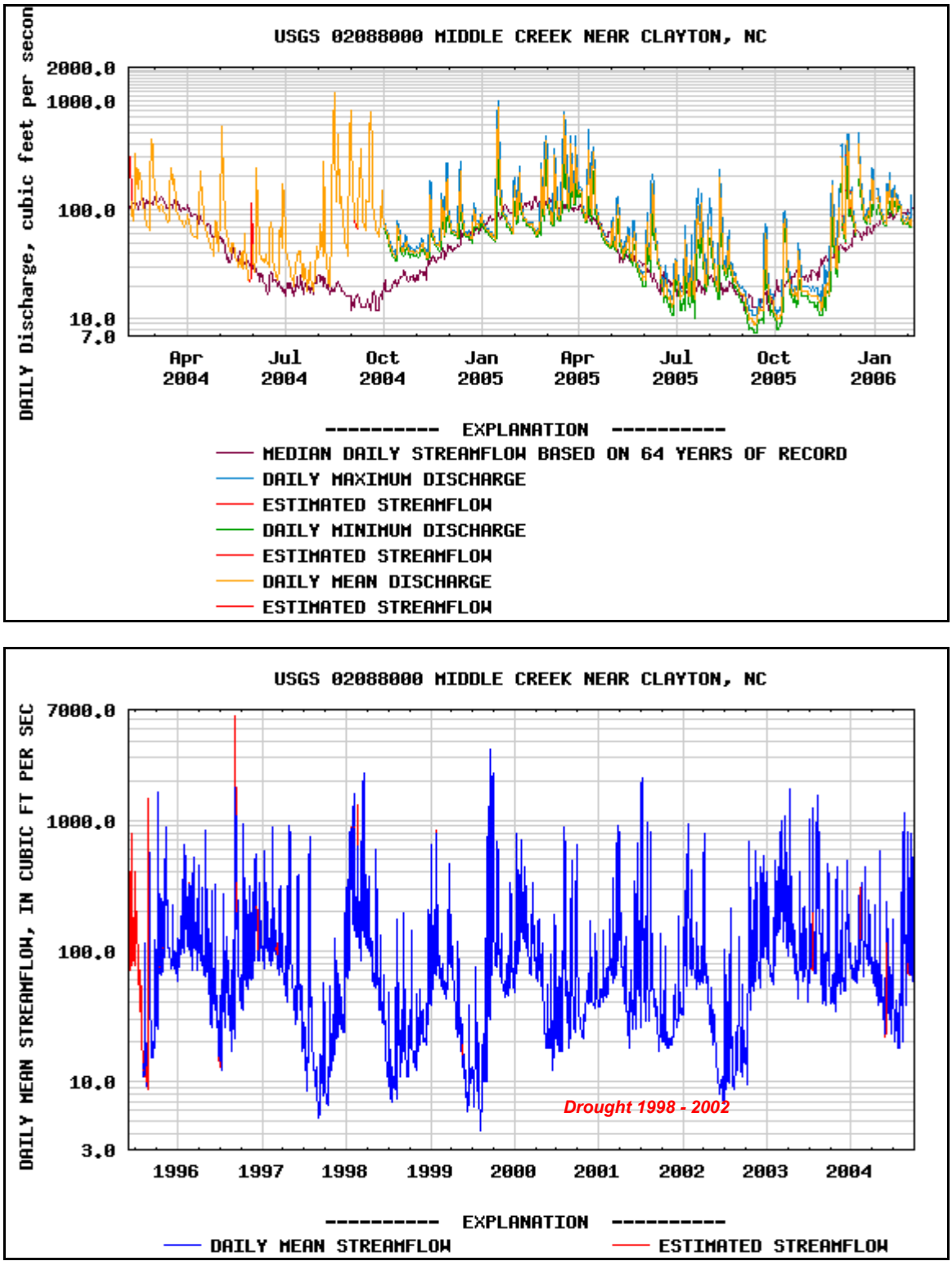


Figure 2. **Flows in Middle Creek near Clayton, March 2004 – February 2006 (top) and June 01, 1995 – September 30, 2004 (bottom).**

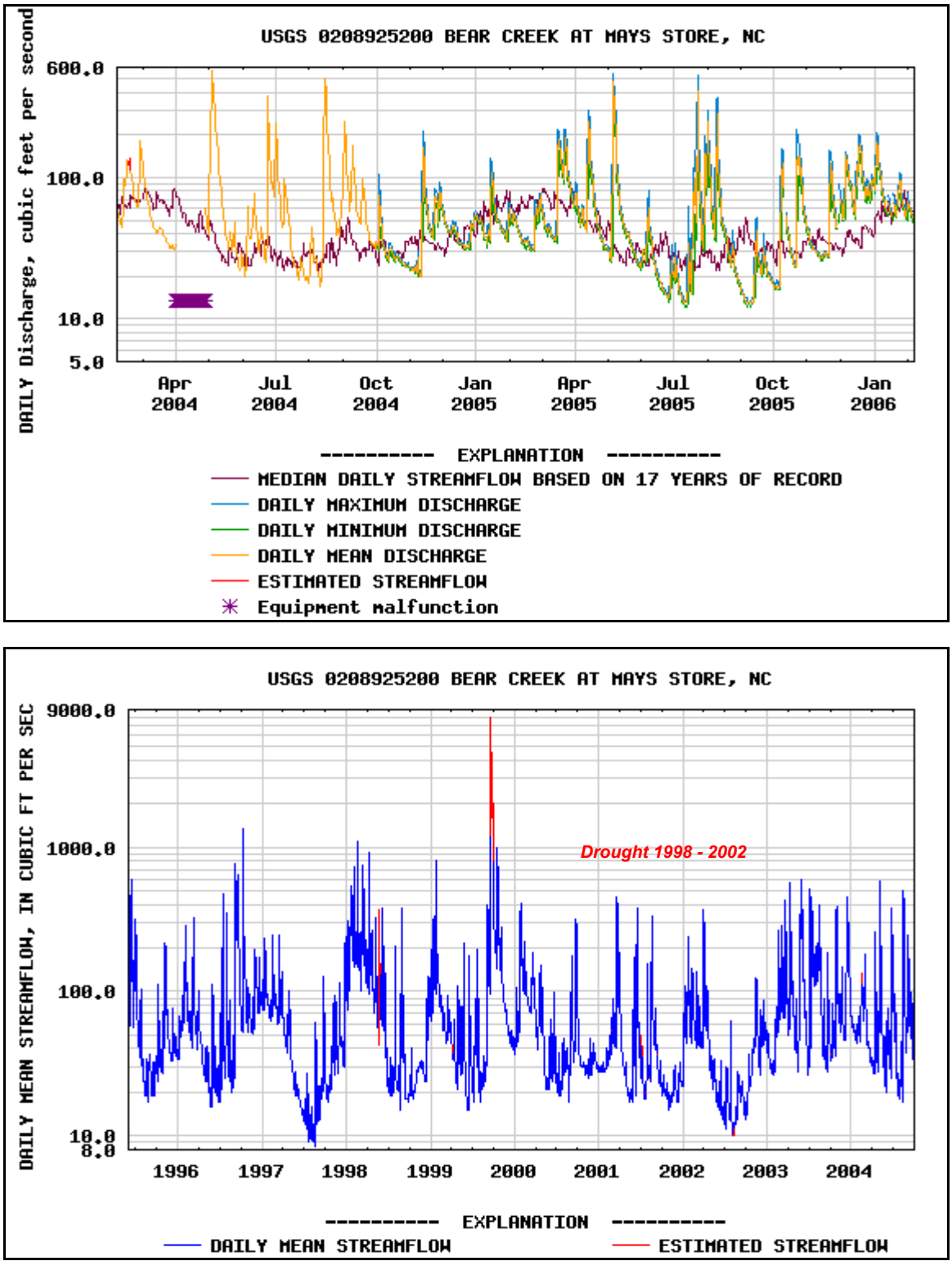


Figure 3. **Flows in Bear Creek at Mays Store, March 2004 – February 2006 (top) and June 01, 1995 – September 30, 2004 (bottom).**

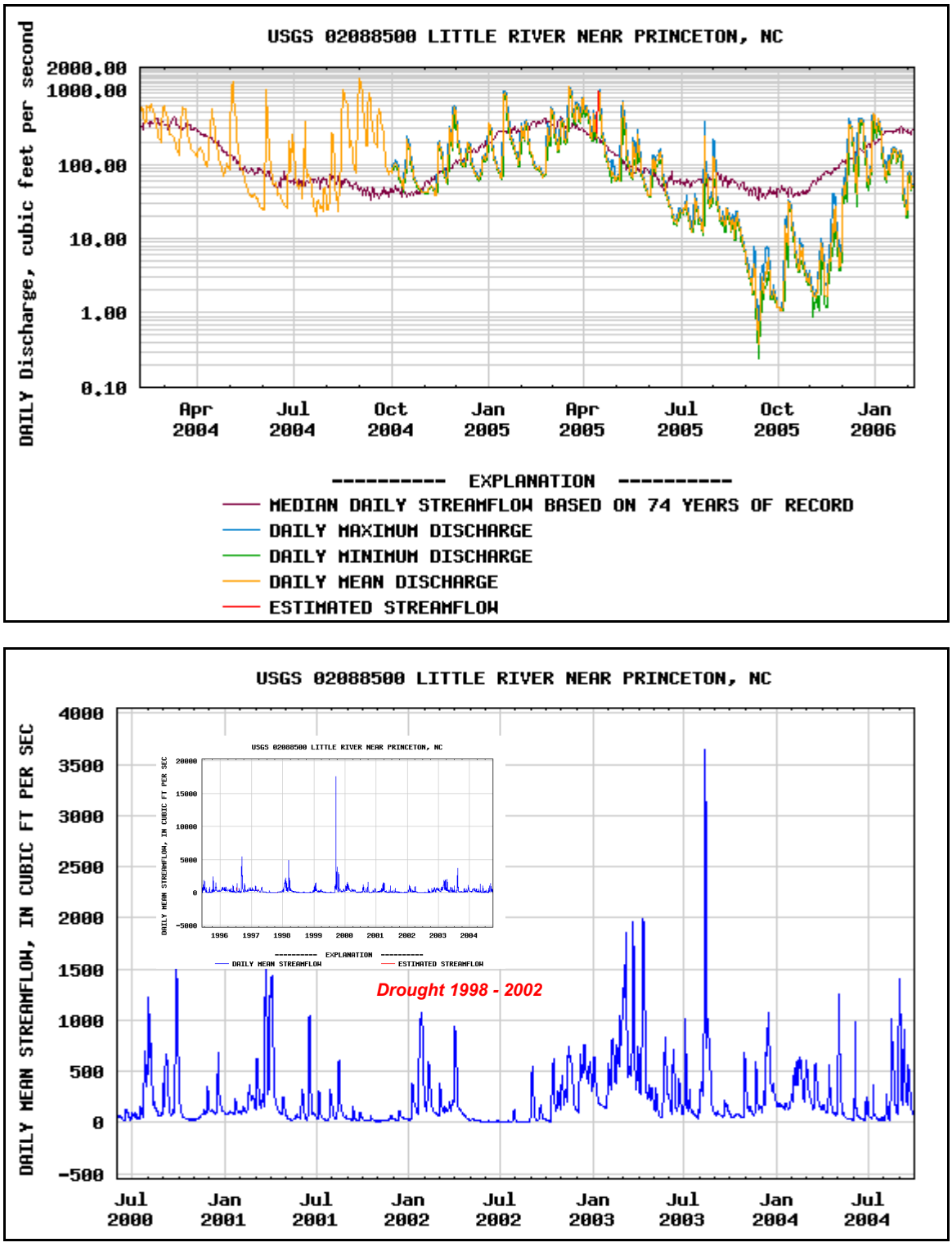


Figure 4. **Flows in the Little River near Princeton, March 2004 – February 2006 (top) and June 01, 2000 – September 30, 2004 (bottom). The insert shows the extreme flows from Hurricane Floyd (September 19990 that masks the long-term trends.**

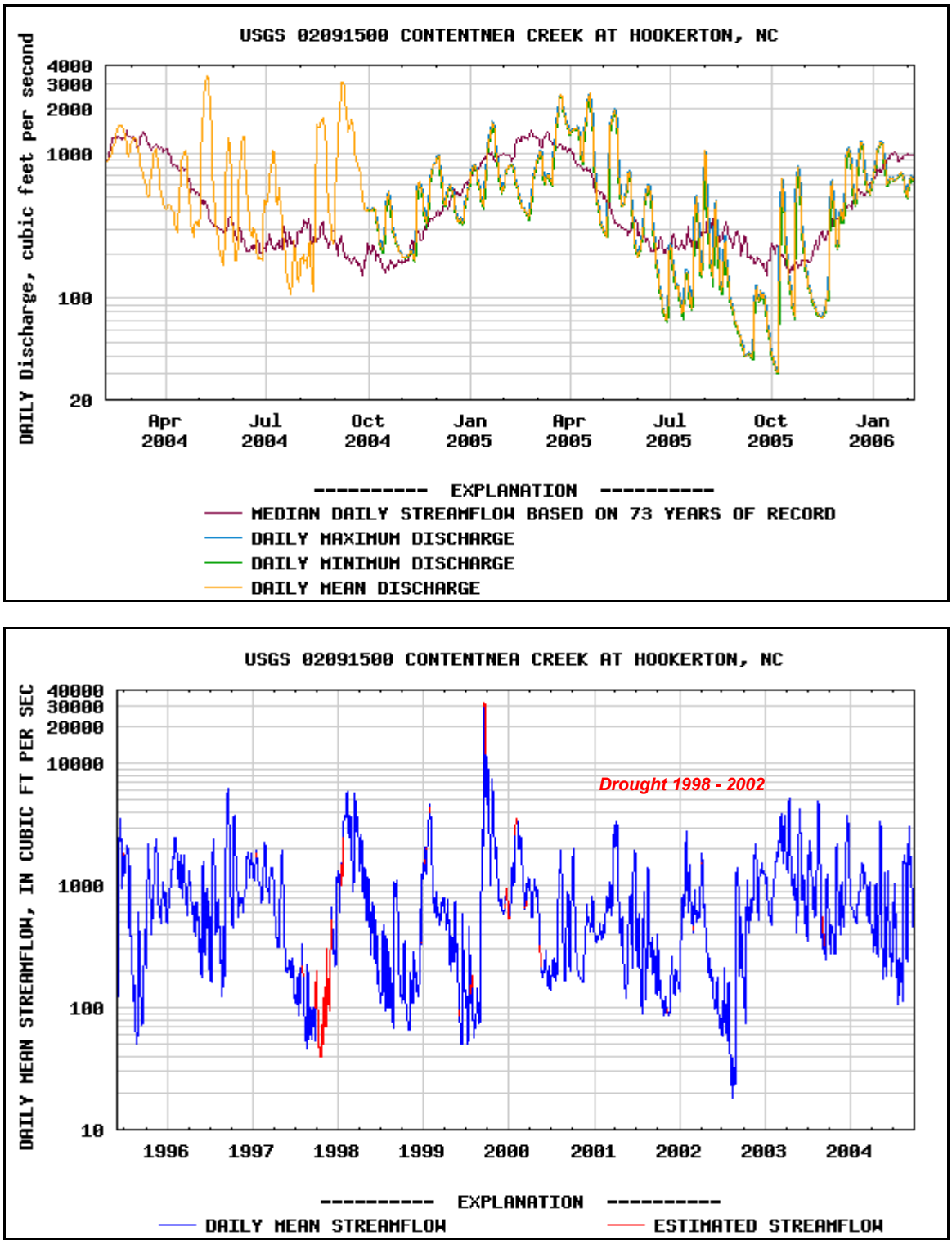


Figure 5. **Flows in Contentnea Creek at Hookerton, March 2004 – February 2006 (top) and June 01, 1995 – September 30, 2004 (bottom).**

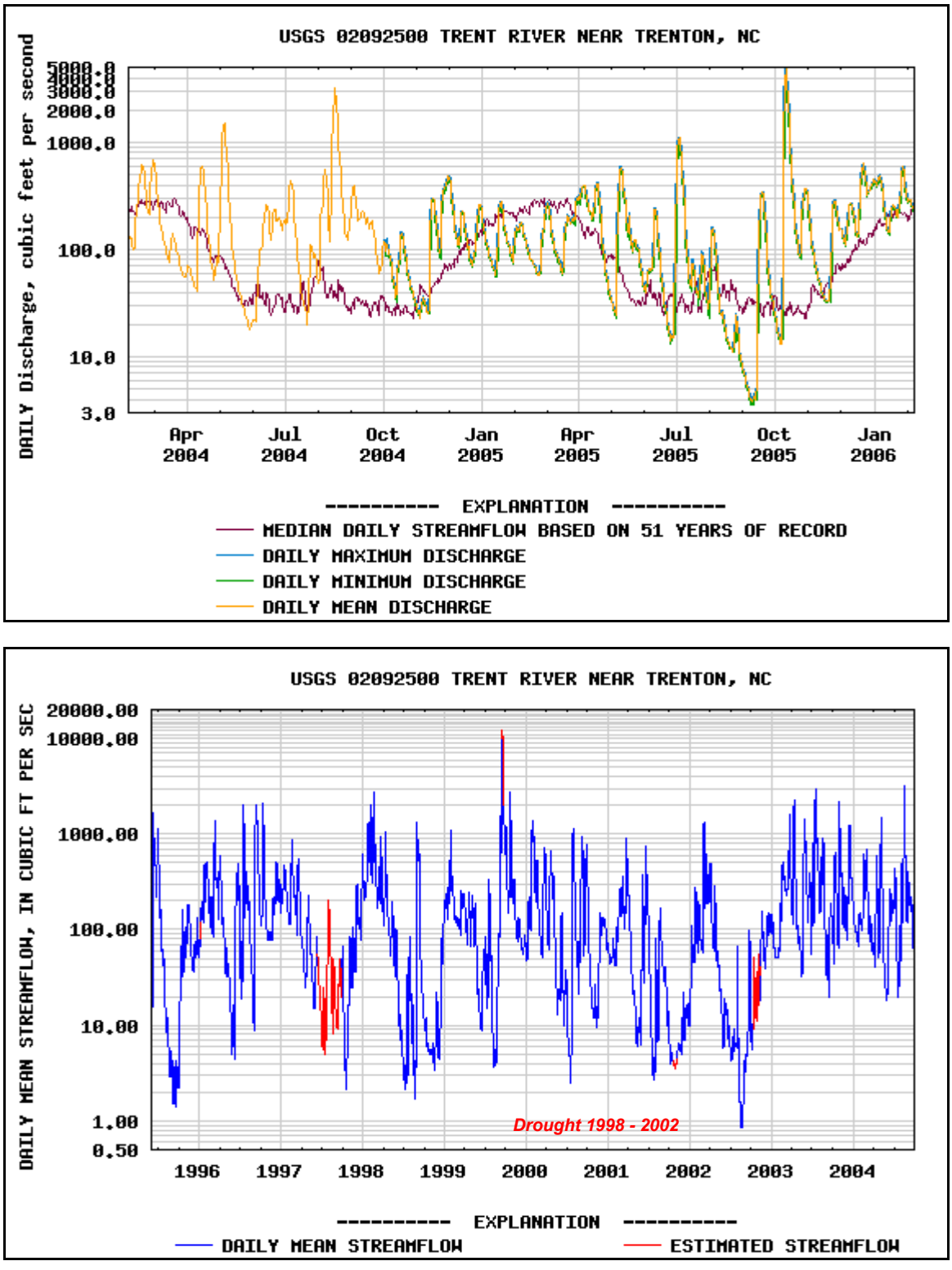


Figure 6. **Flows in the Trent River near Trenton, March 2004 – February 2006 (top) and June 01, 1995 – September 30, 2004 (bottom).**

Appendix F-12 Fish Tissue Monitoring.

The Division conducted fish tissue surveys at four stations within the Neuse River Basin from 1999 to 2004. These surveys were conducted as part of the mercury contaminant assessments in the eastern part of the state and during statewide pesticide assessments.

Tissue samples collected from the Neuse River at Goldsboro contained organic contaminants at undetectable levels or at levels less than the US EPA, US FDA, and State of North Carolina criteria. The Goldsboro samples consisted of composites of largemouth bass.

Elevated mercury concentrations (greater than the EPA and NC level of 0.4 ppm) were detected in fish samples collected from all four stations within the Neuse Basin. These included the Eno River near Durham, Neuse River at Goldsboro, Neuse River at Kinston, and Contentnea Creek at Snow Hill. Elevated levels were most often detected in largemouth bass, a species at the top of the food chain and most often associated with mercury bioaccumulation in North Carolina. Presently, there are no site-specific fish consumption advisories for mercury in the Neuse River basin; however, an advisory for the consumption of largemouth bass, bowfin, and chain pickerel east of Interstate 85 was issued by NCDHHS in 2002.

Because fish spend their entire lives in the aquatic environment, they incorporate chemicals from this environment into their body tissues. Contamination of aquatic resources has been documented for heavy metals, pesticides, and other complex organic compounds. Once these contaminants reach surface waters, they may be available for bioaccumulation, either directly or through aquatic food webs, and may accumulate in fish and shellfish tissues. Results from fish tissue monitoring can serve as an important indicator of further contamination of sediments and surface water.

Since 1991, fish tissue surveys have been conducted as part of the Basinwide Assessment Program. Fish tissues were sampled for metals and organic contaminants throughout the year's scheduled basins with the intent of assessing as many waterbodies as possible. While this included efforts to assess suspected "trouble spots" in a basin, significant time and resources were spent in gathering data from areas where few fish tissue contaminants were historically detected. Review of data after the first round of basin assessments were completed revealed that, except for mercury, there were no widespread fish contaminant issues in the state that warranted basinwide-style investigations.

In 1999, the scope of fish tissue surveys were revised and shifted from basinwide assessments to areas where contaminants exist or are suspected. This shift has resulted in less basinwide coverage, but has focused resources on known contaminant issues within a basin.

In evaluating fish tissue analysis results, several criteria are used. Human health concerns related to fish consumption are screened by comparing results with federal Food and Drug Administration (FDA) action levels (USFDA 1980), Environmental Protection Agency (EPA) recommended screening values, and criteria adopted by the state Health Director (Table 1). Results which seem to be of potential human health concern are evaluated by the N.C. Division of Occupational and Environmental Epidemiology by request from the DWQ.

The FDA levels were developed to protect people from the chronic effects of toxic substances consumed in foodstuffs and thus employ a "safe level" approach to fish consumption. Presently, the FDA has developed metals criteria only for mercury.

The EPA has recommended screening values for target analytes formulated from a risk assessment procedure (USEPA 1995). These are the concentrations of analytes in edible fish tissue that are of potential public health concern. The DWQ compares fish tissue results with EPA screening values to evaluate the need for further intensive site specific monitoring.

The North Carolina State Health Director has adopted a selenium limit of 5 µg/g and a mercury limit of 0.4 µg/g for issuing an advisory. Although the EPA has suggested a screening value of 0.7 ppt (pg/g) for dioxins, the North Carolina currently uses a value of 4.0 ppt in issuing an advisory.

Table 1. Fish tissue criteria. All wet weight concentrations are reported in parts per million (ppm, µg/g).

Contaminant	FDA Action Levels	US EPA Screening Values Recreational Fishermen	US EPA Screening Values Subsistence Fishermen	NC Health Director
Metals				
Arsenic (Inorganic)		0.026	0.00327	
Cadmium		4.0	0.491	
Mercury	1.0	0.4	0.049	0.4
Selenium		20	2.457	5.0
Tributyltin		1.2	0.147	
Organics				
Aldrin	0.3			
Chlorpyrifos		1.2	0.147	
Total chlordane		0.114	0.014	
Cis-chlordane	0.3			
Trans-chlordane	0.3			
Total DDT[1]		0.117	0.0144	
o, p DDD	5.0			
p, p DDD	5.0			
o, p DDE	5.0			
p, p DDE	5.0			
o, p DDT	5.0			
p, p DDT	5.0			
Diazinon		2.8	0.344	
Dicofol		1.6	0.196	
Dieldrin		0.0025	3.07×10^{-4}	
Dioxins (total)		2.56×10^{-7}	3.15×10^{-8}	4.0 (ppt)
Disulfoton		0.16	0.019	
Endosulfan (I and II)		24	2.949	
Endrin	0.3	1.2	0.147	
Ethion		2.0	0.245	
Heptachlorepoxide		0.00439	5.40×10^{-4}	
Hexachlorobenzene		0.025	0.00307	
Lindane		0.0307	0.00378	
Mirex		0.8	0.098	
Oxyfluorfen		0.546	0.0671	
Total PCBs		0.02	0.00245	0.05
PCB-1254	2.0			
Terbufos		0.08	0.009	
Toxaphene		0.0363	0.00446	

[1] Total DDT includes the sum of all its isomers and metabolites (i.e. p, p DDT, o, p DDT, DDE, and DDD).
[2] Total chlordane includes the sum of cis-and trans- isomers as well as nonachlor and oxychlordane.

Table 2. Wet weight concentrations of mercury (Hg), arsenic (As), total chromium (Crt),cadmium (Cd), copper (Cu), nickel (Ni), lead (Pb) and zinc (Zn) in fish tissue from the Neuse River basin, 2000, 2003[1]

LOCATION/SPECIES	DATE	LENGTH (cm)	WEIGHT (g)	Hg (ug/g)	As (ug/g)	Crt (ug/g)	Cu (ug/g)	Ni (ug/g)	Pb (ug/g)
Eno River near Durham									
BLUEGILL SUNFISH	22-Jul-03	14.4	68.6	0.17	--	--	--	--	--
BLUEGILL SUNFISH	22-Jul-03	14.3	64.3	0.20	--	--	--	--	--
BLUEGILL SUNFISH	21-Jul-03	15.4	85	0.11	--	--	--	--	--
BLUEGILL SUNFISH	21-Jul-03	17.2	118	0.19	--	--	--	--	--
CHANNEL CATFISH	21-Jul-03	34.2	368	0.14	--	--	--	--	--
CHANNEL CATFISH	21-Jul-03	29.4	228	0.12	--	--	--	--	--
CHANNEL CATFISH	21-Jul-03	29.5	220.5	0.13	--	--	--	--	--
CHANNEL CATFISH	21-Jul-03	30.5	243	0.12	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	43.8	1229	1.30	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	47.1	1720	1.20	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	31.3	527	0.58	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	40.2	994	0.93	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	35.2	674	0.58	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	33.3	637	0.62	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	31.3	467	0.53	--	--	--	--	--
LARGEMOUTH BASS	21-Jul-03	30.8	433	0.50	--	--	--	--	--
Neuse River at Goldsboro									
BLUE CATFISH	02-May-00	55	1953	0.28	<0.10	0.12	0.19	<0.10	<0.10
BLUE CATFISH	03-May-00	34	1517	0.23	<0.10	0.12	0.44	<0.10	<0.10
BLUE CATFISH	02-May-00	44.5	979	0.14	<0.10	0.14	0.49	<0.10	<0.10
BLUE CATFISH	02-May-00	44.3	814	0.14	0.11	0.15	0.13	<0.10	<0.10
BLUEGILL SUNFISH	02-May-00	20.6	217.5	0.25	<0.10	0.2	2.1	<0.10	<0.10
BLUEGILL SUNFISH	02-May-00	17.8	130.6	0.20	<0.10	0.17	0.45	0.1	<0.10
BLUEGILL SUNFISH	02-May-00	19.2	161.5	0.21	<0.10	0.19	4.9	<0.10	<0.10
CHANNEL CATFISH	02-May-00	43.5	831	0.10	<0.10	0.13	0.13	<0.10	<0.10
CHANNEL CATFISH	02-May-00	42	782	0.11	<0.10	0.36	0.42	0.12	<0.10
LARGEMOUTH BASS	02-May-00	30.5	475	0.52	<0.10	0.15	0.17	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	31.8	469	0.48	<0.10	0.16	0.25	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	24.2	209	0.39	<1.0	0.19	0.13	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	30	373	0.40	<1.0	0.1	<0.10	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	31.1	454	0.47	<0.10	0.16	0.36	<0.10	<0.10
REDEAR SUNFISH	02-May-00	22.1	224	0.15	<0.10	0.19	0.78	0.13	<0.10
REDEAR SUNFISH	02-May-00	22.7	259.5	0.23	<0.10	0.18	0.38	<0.10	<0.10
REDEAR SUNFISH	02-May-00	24.25	337.5	0.27	0.12	0.14	0.26	<0.10	<0.10
REDEAR SUNFISH	02-May-00	19.5	161.3	0.16	<0.10	0.14	0.31	<0.10	<0.10
STRIPED BASS	02-May-00	46	1055	0.21	0.52	0.23	0.35	<0.10	<0.10
STRIPED BASS	02-May-00	41.5	764	0.22	0.3	0.11	0.29	<0.10	<0.10
STRIPED BASS	02-May-00	41.1	753	0.50	3.3	0.51	0.31	<0.10	0.33

Table 2 (continued).

LOCATION/SPECIES	DATE	LENGTH (cm)	WEIGHT (g)	Hg (ug/g)	As (ug/g)	Crt (ug/g)	Cu (ug/g)	Ni (ug/g)	Pb (ug/g)
Neuse River at Kinston									
BLUEGILL SUNFISH	02-May-00	18.5	135	0.21	<0.10	0.17	0.23	<0.10	<0.10
BLUEGILL SUNFISH	03-May-00	19.2	158.5	0.39	<0.10	0.16	0.25	<0.10	<0.10
BLUEGILL SUNFISH	02-May-00	22.5	310	0.23	0.11	0.23	0.24	<0.10	<0.10
CHANNEL CATFISH	02-May-00	60	2698	0.11	0.13	0.3	0.6	0.37	0.19
LARGEMOUTH BASS	02-May-00	48.1	1720	0.71	<0.10	0.14	0.14	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	41.5	1108	1.40	<0.10	0.35	0.17	0.14	<0.10
LARGEMOUTH BASS	02-May-00	37.1	752	0.62	<0.10	0.15	0.13	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	33.8	619	0.63	<0.10	0.19	0.2	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	31.1	448	0.47	<1.0	0.14	0.16	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	26	273	0.48	<1.0	0.18	0.26	<0.10	<0.10
LARGEMOUTH BASS	02-May-00	37	745	0.55	<0.10	0.17	0.3	0.11	<0.10
REDBREAST SUNFISH	02-May-00	19.5	185.5	0.20	<0.10	0.12	0.23	0.12	<0.10
REDBREAST SUNFISH	02-May-00	18.8	164	0.22	<0.10	0.16	0.41	0.33	<0.10
REDEAR SUNFISH	02-May-00	26.5	481	0.37	<0.10	0.21	0.2	<0.10	<0.10
REDEAR SUNFISH	02-May-00	26.2	406	0.27	<0.10	0.17	56	<0.10	<0.10
REDEAR SUNFISH	02-May-00	26.2	485	0.38	0.52	0.48	0.58	0.56	<0.10
REDEAR SUNFISH	02-May-00	22.3	267.5	0.29	<0.10	0.17	0.18	<0.10	<0.10
STRIPED BASS	02-May-00	56	1849	0.31	0.38	0.14	0.41	<0.10	<0.10
Contentnea Creek at Snow Hill									
CHANNEL CATFISH	17-Jul-03	41.8	790	0.18	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	39.5	948	0.86	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	26.2	299	0.55	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	33.4	547	0.75	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	32.7	540	0.82	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	27.5	327	0.41	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	35.6	721	0.96	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	27.9	352	0.40	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	31	431	0.60	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	32.7	492	0.76	--	--	--	--	--
LARGEMOUTH BASS	17-Jul-03	34	572	0.52	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	22.1	241	0.45	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	22.5	302	0.29	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	23.5	300	0.31	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	25.9	367	0.68	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	26.1	430	0.70	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	19.1	145	0.16	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	17.2	128	0.13	--	--	--	--	--
REDEAR SUNFISH	17-Jul-03	17.5	129	0.16	--	--	--	--	--
NOTCHLIP REDHORSE	17-Jul-03	35.1	531	0.17	--	--	--	--	--
NOTCHLIP REDHORSE	17-Jul-03	41.8	816	0.57	--	--	--	--	--
NOTCHLIP REDHORSE	17-Jul-03	44.2	938	0.76	--	--	--	--	--
WHITE CATFISH	17-Jul-03	37.5	664	0.41	--	--	--	--	--
WHITE CATFISH	17-Jul-03	43	1206	0.23	--	--	--	--	--

[1] Cadmium and lead were non-detectable in all samples.
"<" = non detect at stated detection level

Table 3. Wet weight concentrations of organic contaminants in fish tissue from the Neuse River basin, 2003

STATION:	02089000	COUNTY:	Wayne	LATITUDE:	352033
DESCRIPTION:	Neuse River at Goldsboro	BASIN:	030405	LONGITUDE:	780134

DATE SAMPLED: **10/16/2003**	SPECIES **LARGEMOUTH BASS**	LENGTH(cm) **28.9**	WEIGHT(g): **366.3**
ALDRIN (mg/kg): <0.015	o,p DDT (ug/g): <0.016	alpha-BHC (ug/g): <0.015	Heptachlor (ug/g): <0.010
DIELDRIN (mg/Kg): <0.020	p,p DDT (ug/g): <0.020	beta-BHC (ug/g): <0.020	Toxaphene (ug/g):
Mirex (mg/Kg): <0.012	cis-CHLDRANE (ug/g): <0.006	gamma-BHC (ug/g): <0.010	Endosulfan I (mg/Kg): <0.020
Chlorpyrifos (mg/Kg): <0.011	trans-CHLDRA <0.005	delta-BHC (ug/g): <0.020	Endosulfan II (mg/Kg): <0.015
o,p DDD (ug/g): <0.019	cis-N CHLOR (ug/g):	ENDRIN (mg/kg): <0.010	Endosulfan Sulfate (mg/Kg): <0.010
p,p DDD (ug/g): <0.010	trans-N CHLOR (ug/g): <0.007	Endrin Aldehyde (mg/Kg): <0.010	2,4,5-T (ug/Kg):
o,p DDE (ug/g): <0.013	METHOXYCHLR (ug/kg): <0.029	Endrin Ketone (mg/Kg): <0.013	SILVEX (ug/Kg):
p,p DDE (ug/g): **0.002**	HXCHLBENZENE (mg/k <0.018	PCB (mg/kg):	2,4-D (ug/Kg):
Total DDT (ug/g):	PCP (ug/g):	Heptachlor epoxide (ug/g): <0.015	

DATE SAMPLED: **10/16/2003**	SPECIES **LARGEMOUTH BASS**	LENGTH(cm) **45.2**	WEIGHT(g): **1496.5**
ALDRIN (mg/kg): <0.015	o,p DDT (ug/g): <0.016	alpha-BHC (ug/g): <0.015	Heptachlor (ug/g): <0.010
DIELDRIN (mg/Kg): **0.003**	p,p DDT (ug/g): <0.020	beta-BHC (ug/g): <0.020	Toxaphene (ug/g):
Mirex (mg/Kg): <0.012	cis-CHLDRANE (ug/g): <0.006	gamma-BHC (ug/g): <0.010	Endosulfan I (mg/Kg): <0.020
Chlorpyrifos (mg/Kg): <0.011	trans-CHLDRA <0.005	delta-BHC (ug/g): <0.020	Endosulfan II (mg/Kg): <0.015
o,p DDD (ug/g): <0.019	cis-N CHLOR (ug/g):	ENDRIN (mg/kg): <0.010	Endosulfan Sulfate (mg/Kg): <0.010
p,p DDD (ug/g): <0.010	trans-N CHLOR (ug/g): <0.007	Endrin Aldehyde (mg/Kg): <0.010	2,4,5-T (ug/Kg):
o,p DDE (ug/g): <0.013	METHOXYCHLR (ug/kg): <0.029	Endrin Ketone (mg/Kg): <0.013	SILVEX (ug/Kg):
p,p DDE (ug/g): **0.004**	HXCHLBENZENE (mg/k <0.018	PCB (mg/kg):	2,4-D (ug/Kg):
Total DDT (ug/g):	PCP (ug/g):	Heptachlor epoxide (ug/g): <0.015	

"<" = non detect at stated detection level

Table 4. Wet weight concentrations of PCB and PBDE contaminants in fish tissue from the Neuse River basin, 2003

STATION:	02089000	COUNTY:	Wayne	LATITUDE:	352033
DESCRIPTION:	Neuse River at Goldsboro	BASIN:	030405	LONGITUDE:	780134

DATE SAMPLED: **10/16/2003**	Common Name: **LARGE MOUTH BASS**			LENGTH: **28.9**	WEIGHT: **366.3**
Congener 1 (ug/g): <70.0	Congener 101 (ug/g): <0.040		Congener 183 (ug/g): <0.040		
Congener 5 (ug/g): <0.040	Congener 110 (ug/g): <50.0		Congener 187 (ug/g): <0.050		
Congener 18 (ug/g): <0.040	Congener 138 (ug/g): <0.040		Congener 206 (ug/g): <0.050		
Congener 31 (ug/g): <0.050	Congener 141 (ug/g): <0.040				
Congener 44 (ug/g): <0.040	Congener 151 (ug/g): <0.050		Tetrabromodiphenyl ether (ug/g):	<0.010	
Congener 52 (ug/g): <0.050	Congener 153 (ug/g): <0.040		Pentabromodiphenyl ether (ug/g):	<0.020	
Congener 66 (ug/g): <0.040	Congener 170 (ug/g): <0.050		Hexabromodiphenyl ether (ug/g):	<0.010	
Congener 87 (ug/g): <0.050	Congener 180 (ug/g): <0.040				
DATE SAMPLED: **10/16/2003**	Common Name: **LARGE MOUTH BASS**			LENGTH: **45.2**	WEIGHT: **1496.5**
Congener 1 (ug/g): <70.0	Congener 101 (ug/g): <0.040		Congener 183 (ug/g): <0.040		
Congener 5 (ug/g): <0.040	Congener 110 (ug/g): <50.0		Congener 187 (ug/g): <0.050		
Congener 18 (ug/g): <0.040	Congener 138 (ug/g): <0.040		Congener 206 (ug/g): <0.050		
Congener 31 (ug/g): <0.050	Congener 141 (ug/g): <0.040				
Congener 44 (ug/g): <0.040	Congener 151 (ug/g): <0.050		Tetrabromodiphenyl ether (ug/g):	<0.010	
Congener 52 (ug/g): <0.050	Congener 153 (ug/g): <0.040		Pentabromodiphenyl ether (ug/g):	<0.020	
Congener 66 (ug/g): <0.040	Congener 170 (ug/g): <0.050		Hexabromodiphenyl ether (ug/g):	<0.010	
Congener 87 (ug/g): <0.050	Congener 180 (ug/g): <0.040				

"<" = non-detect at stated detection level

Appendix F-13.Web links.

NC Administrative Code (Effective August 1, 2004)
(http://h2o.enr.state.nc.us/admin/rules/documents/rb080104.pdf)

NC Division of Water Quality (fish community sampling methods)
http://h2o.enr.state.nc.us/esb/BAUwww/IBI%20Methods%202001.pdf

NC Division of Water Quality (fish community data)
http://h2o.enr.state.nc.us/esb/NCIBI.htm

NC Division of Water Quality (native and exotic freshwater fish in North Carolina)
http://www.esb.enr.state.nc.us/www.esb.enr.state.nc.us/Native and Introduced Freshwater Fish in North Carolina.2-1.htm

US Geological Survey (real-time streamflow data for North Carolina)
http://waterdata.usgs.gov/nc/nwis/current?type=flow

LAKE & RESERVOIR ASSESSMENTS – NEUSE RIVER BASIN

Buckhorn Reservoir

Intensive Survey Unit
Environmental Sciences Section
Division of Water Quality
April 1, 2006

Overview

The Neuse River Basin covers 16,000 square kilometers in the lower piedmont and coastal plain of North Carolina. It is the third largest basin in the state. The upper boundary of the basin begins northeast of Durham and drains the region that includes the tributaries of Falls of the Neuse Reservoir. The basin follows the Neuse River down to Kinston and includes the tributaries to the Neuse in this region. Below Kinston, the Neuse River becomes estuarine. The basin continues to the coast and includes portions of Pamlico and Carteret Counties.

In December 1983, the EMC designated the portion of the Neuse River basin upstream of the Falls of the Neuse Reservoir dam as nutrient sensitive waters (NSW). Severe nutrient enrichment observed in the headwaters of the reservoir appeared to be aggravated by ongoing, rapid urban growth in the watershed. The lower section of the Neuse River basin water was subsequently classified as NSW in January 1988 due to nuisance algal growth, sporadic blooms of undesirable blue-green algae, and fish kills.

As a result of the NSW classification, nutrient management strategies were developed for the entire Neuse River basin. These strategies address point and nonpoint sources through permitting, land use restrictions, stormwater controls and a variety of other actions.

Seven lakes were sampled in the Neuse River Basin between 1 October 2001 and 31 September 2005. The West Fork Eno River Reservoir was sampled for the first time as it was only created in 1999. Falls of the Neuse Reservoir and Buckhorn Reservoir are the only reservoirs that were rated as impaired. Falls of the Neuse is based on turbidity; however, chlorophyll-a concentrations were above the standard of 40 ug/L in 1 out of 4 samples. Buckhorn Reservoir was designated impaired in 1998 as part of Contentnea Creek. Contentnea Creek was listed due to low dissolved oxygen and degraded biological integrity. While sampling in 2005 did not document low dissolved oxygen in Buckhorn Reservoir, elevated nutrients and severe algal blooms support leaving Buckhorn Reservoir on the list.

Following the description of the assessment methodology used for the Neuse River Basin, there are individual summaries for each of the lakes and a two-paged matrix that distills the information used to make the lakes use support assessments. For further background information on a particular lake (including sampling data), please go to http://www.esb.enr.state.nc.us/.

Assessment Methodology

For this report, data from October 1, 2001 through September 30, 2005 were reviewed. All lakes except Falls of the Neuse Reservoir were only sampled during the summer of 2005 in May through August. The Falls of the Neuse Reservoir was sampled March through September of 2006. The extended sampling period was due to a special study being conducted to better document current conditions in the reservoir and support development of a nutrient model for the watershed. Data were assessed for excursions of the state's class C water quality standards for chlorophyll-a, pH, dissolved oxygen, water temperature, turbidity, and surface metals. All of the reservoirs sampled in the

Neuse River Basin are classified as water supplies and, therefore, additional parameters were sampled relating to water supply protection. The water supply standards sampled and evaluated were total suspended solids (TSS), nickel, manganese, chlorides and total hardness.

Other parameters discussed in this report include Secchi depth and percent dissolved oxygen saturation. Secchi depth provides a measure of water clarity and is used in calculating the trophic or nutrient enriched status of a lake. Percent dissolved oxygen saturation gives information on the amount of dissolved oxygen in the water column and may be increased by photosynthesis.

On lakes without obvious segmentation or differences in hydrology and morphology between stations, all samples taken on a particular sampling date regardless of station are treated as replicates and the average concentration is used to determine if the standards are being met. Readings of pH are the only exception as it is inappropriate to average pH values. For a lake such as Falls of the Neuse Reservoir, which has very definite differences between portions of the lake and has been given different assessment units based on hydrology and morphology, results are averaged within the assessment unit. See the matrix at the end of this report for how the stations are grouped.

A water quality standard is exceeded (denoted by CE in matrix) if data values are do not meet the state's water quality standard for more than 10% of the samples where the sample size consists of ten or more observations for the basinwide assessment period. Ideally, ten observations are needed to provide enough data to reasonably interpret water quality conditions within the lake or reservoir. Fewer observations increase the possibility of misinterpreting random unusual conditions as representative of ongoing water quality trends. If the water quality standard is exceeded, either in less than 10% of the data collected during the assessment period or if the sample observation size is less than ten for the basinwide assessment period, then the water quality standard for that parameter is designated exceeded (E in the matrix).

Additional data considered as part of the use support assessment includes historic DWQ water quality data, documented algal blooms and/or fish kills, problematic aquatic macrophytes, or listing on the EPA's 303(d) List of Impaired Waters.

Lakes receive an overall rating of Supporting or Impaired when ten or more samples per water quality criteria are collected for evaluation within the basinwide assessment period. Otherwise, the lake is considered as Not Rated. The exception is for a lake listed on the 303(d) List of Impaired Waters or where additional data indicates water quality problems not captured during sampling. These lakes are listed as Impaired along with the reason for the impairment.

For a more complete discussion of lake ecology and assessment, please go to http://www.esb.enr.state.nc.us/. The 1990 North Carolina Lake Assessment Report (downloadable from this website) contains a detailed chapter on ecological concepts that clarifies how the parameters discussed in this review related to water quality and reservoir health.

Assessments by Subbasin

Subbasin 030401

West Fork Eno River Reservoir

West Fork of the Eno River Reservoir is a water supply reservoir for the Town of Hillsborough. Public access is prohibited to the reservoir. Construction of the reservoir began in 1999 and was completed in 2000. The drainage area surrounding this lake consists of forested and rural areas with agricultural fields, pastureland and residences. Figure 1 depicts the sampling locations on this reservoir.

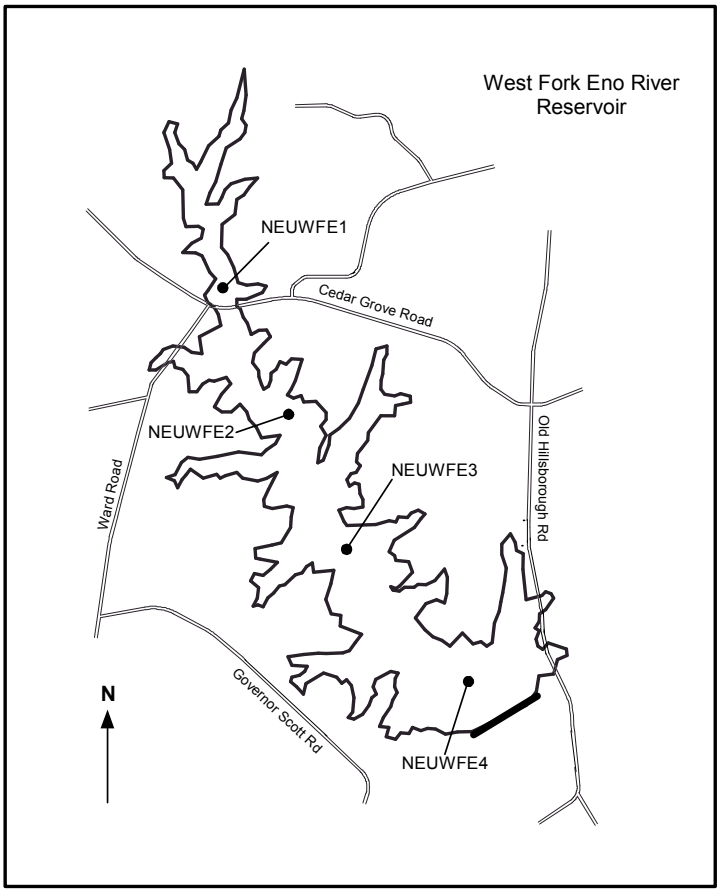
West Fork Eno River Reservoir was sampled for the first time by DWQ from May through September in 2005 for a total of eight sampling trips. There are four sampling sites located on this lake arranged from upstream to downstream near the mid-channel (Figure 1). Dissolved oxygen, pH and water temperature measurements were within state water quality standards during the sampling period. Secchi depths ranged from 0.5 to 2.0 meters with the lowest measurements observed on June 16, 2005 (0.5 to 0.8 meter), indicating fair to good water clarity.

Nutrient concentrations were within the usual range for a Piedmont reservoir. Total phosphorus generally ranged from <0.02 mg/L to 0.03 mg/L except for two elevated values observed at sampling site downstream of Cedar Grove Road (NEUWFE2) on May 9th (0.06 mg/L) and at the sampling site between NEUWFE2 and the dam (NEUWFE3) on August 22, 2005 (also 0.06 mg/L). Ammonia and nitrite plus nitrate were usually below the practical quantitation level (<0.02 mg/L) while total organic nitrogen ranged from moderate to very elevated (0.39 mg/L to 0.99 mg/L). Due to a problem with laboratory analysis of chlorophyll-a in 2005, the trophic state of the lake could not be determined.

Surface metals in West Fork Eno River Reservoir were within applicable state water quality standards with the exception of manganese. Manganese was found to be greater than the state water quality standard of 200 mg/L for lakes designated as water supplies on June 16 (330 mg/L) and July 25, 2005 (620 mg/L). Also on June 16th, Secchi depths were the lowest observed during sampling period in 2005, and hypoxic conditions occurred at a depth of three meters and continued down to the bottom of the lake. Because some oxygen was present in the bottom waters and Secchi depths were

low, suspension of manganese-rich sediments in the water column by a recent rain event was most likely the source of this metal. On July 25th, hypoxic conditions also occurred at a depth of three meters from the surface but continued to drop to near anoxic conditions (0.2 mg/L) at a depth of seven meters and continued down to the bottom (9.9 meters). The exceptionally low dissolved oxygen content of the water may have contributed to the solubilization of manganese from the bottom sediment into the water column.

Figure 1. West Fork of the Eno Reservoir Sampling Stations



Analysis of phytoplankton samples indicated the presence of mild to moderate algal blooms throughout the summer. The algal assemblages of these blooms were dominated by the colonial golden-brown algae (chrysophytes), *Dinbryon* and *Ochromonas.* Chrysophytes are generally an indicator of low nutrient waters and are commonly found in tannin-stained waters. At high bloom densities, *Dinobryon* may produce taste and odor problems in drinking water. No reports of such problems were made to DWQ.

Macrophytes (aquatic weeds) were observed along the shoreline of West Fork Eno River Reservoir but the abundance of these plants comprised less than 25% of the total surface area. Among these plants were coontail (*Ceratophyllum demersum*) and

southern naiad (*Najas guadalupensis*). Stonewort (*Chara sp*.) a macroscopic alga was also seen along the shoreline. Stonewort, which is usually found in hard or alkaline waters, has a characteristic garlic-like musky odor. For this reason it is also commonly referred to as skunkweed or muskweed. While known to form mats that may hamper boating and swimming, stonewort is beneficial in providing habitat for aquatic life.

West Fork Eno River Reservoir appears to be supporting its designated use at this time although insufficient data is available to rate it. This young reservoir will continue to be monitored for potential changes related to increased productivity in the future.

Falls of the Neuse Reservoir

Falls of the Neuse Reservoir is a multi-purpose impoundment of the Neuse River located in the Upper Neuse River basin. The reservoir is the primary water supply source for the City of Raleigh and surrounding towns in Wake County. The various uses authorized for the reservoir include: water supply, flood control, recreation, wildlife enhancement, and augmentation of low flows for purposes of pollution abatement and water quality control in the Neuse River basin.

The Falls of the Neuse Reservoir dam was constructed and filled by 1983 and is currently operated by the United States Army Corps of Engineers (USACOE). The reservoir extends 28 miles up the Neuse River to just above the confluence of the Eno and Flat Rivers. At normal pool elevation, the lake has a surface area of 11,310 acres. It drains a watershed area of 494,600 acres or approximately 770 square miles including parts or all of 6 counties (Person, Orange, Franklin, Durham, Wake and Granville). As noted in the Overview, the entire Falls of the Neuse Reservoir watershed is classified NSW[1].

Falls of the Neuse Reservoir was monitored by DWQ a total of 13 times in March through September of 2005. This lake has been previously monitored by DWQ numerous times since 1983; however, no samples were taken between 1 October 1997 and 31 September 2001.

Percent dissolved oxygen saturation values were elevated (>120%). These high percent dissolved oxygen saturation values indicated biological productivity due to algal photosynthesis. The high dissolved oxygen saturation values were especially prevalent

[1] For more information on the NSW management strategies associated with this reservoir go to: http://h2o.enr.state.nc.us/nps/Neuse_NSW_Rules.htm.

in the most upstream section of the reservoir, near Interstate 85. High phytoplankton populations were found in this location also.

Three ambient monitoring stations, one on the upper end, one in the middle and one in the lower end, were assessed for phytoplankton. Phytoplankton sampling occurred during March, July and October of 2005. Mild blooms of cryptomonads and the green alga *Ankistrodesmus* were found in March. Cryptomonads and green algae commonly dominate spring flora. *Ankistrodesmus* is a unicellular green alga frequently found in lakes, ponds and reservoirs throughout the state. Although these taxa can form blooms that discolor waters and may cause taste and odors in drinking waters, these algae are generally considered a good food source and pose no known environmental health risks.

The phytoplankton assemblage shifted to small filamentous blue-greens in July and October that formed moderate to severe blooms throughout the lake. Blue-green blooms may also discolor water and cause taste and odor problems. They are common indicators of eutrophication and some taxa, such as *Cylindrospermopsis*, can produce toxins. No known adverse human health effects associated with blue-green algal toxins (cyanotoxins) have been reported in North Carolina waters. Sampling being conducted by the City of Raleigh for cyanotoxins found very low concentrations during summer. These concentrations were below the World Health Organization's suggested human health criteria for cyanotoxins.

Chlorophyll-a concentrations were only available for March through mid-April. By mid-April, chlorophyll-a concentrations above the I-85 bridge exceeded the standard of 40 ug/L. However, insufficient samples are available to impair this area.

Nutrient concentrations in 2005 were generally moderate to high for total kjeldahl nitrogen, total organic nitrogen, and total phosphorus confirming a potential for high biological productivity. Total kjeldahl nitrogen ranged from 0.37 mg/L to 1.5 mg/L, total organic nitrogen from 0.36 mg/L to 1.49 mg/L, and total phosphorus from <0.02 mg/L to 0.23 mg/L. Additionally, 2005 nitrite + nitrate values were high until approximately the end of April, when they dropped to low levels for the rest of the basinwide reporting period ending in September of 2005. This phenomenon indicated uptake of this nutrient by algae at the start of the growing season.

With the assistance of EPA's Athens Laboratory, algal growth potential tests (AGPT) were conducted at seven stations on the reservoir. AGPT is used to determine the potential of the waterbody to grow algae and the nutrient that is controlling algal growth. In this reservoir only NEU013 above the I-85 bridge had an AGPT without nutrient additions above 10 mg/L (13.3 mg/L). This demonstrates that this location in the reservoir already has more than sufficient nutrients to support severe algal blooms.

High turbidity and corresponding low secchi depths were frequently recorded in the reservoir during 2005. Turbidity values exceeded the state standard of 25 NTU for reservoirs in 69 percent of the samples in the upper portion of the reservoir. Below the I-85 bridge there were no exceedances on any of the sampling dates; however, turbidity at the upper station (NEU013B) was above standard on occasion as a result of mixing with the more turbid upstream waters. The most likely cause of the elevated turbidity appeared to be sediment loading.

There are a variety of sampling programs being conducted on Falls of the Neuse Reservoir. They include sampling funded by the City of Raleigh focused on non-regulatory source water characterization to meet the EPA Interim Enhanced Surface Water Treatment Rule, sampling by researchers at the NCSU Center for Applied Aquatic Ecology focused on cyanotoxins and water quality (funded by the Department of Health and Human Services), and sampling being conducted by the USGS for the Upper Neuse River Basin to document surface water supply quality[2]. Sampling by researchers and contractors documented similar turbidity, nutrient and chlorophyll-a concentrations to those recorded by DWQ.

Based on sampling data, Falls of the Neuse Reservoir appears impaired for its designated uses in the upstream section above the I-85 bridge and, although it shows reason for concern for possible future impairment in the downstream section, it is rated supporting below the I-85 bridge.

Beaverdam Reservoir

Beaverdam Lake is located in Granville and Wake Counties just north of the City of Raleigh and flows directly into Falls of the Neuse Reservoir. The lake is used as a back-up water supply by the City of Raleigh and for recreation. No gas motors are allowed in the lake. Beaverdam and Swift Creeks are the main tributaries to the lake. The watershed is composed primarily of urban and forested areas with a state park surrounding much of the reservoir. Beaverdam Reservoir was monitored by DWQ 13 times in March through September of 2005. This lake was previously monitored by DWQ in 1983. There is only one monitoring station on the reservoir.

Nutrient concentrations in 2005 were generally high for total phosphorus (range of 0.04 mg/L to 0.08 mg/L), total kjeldahl nitrogen (range of 0.47 mg/L to 0.92 mg/L), and total organic nitrogen (range of 0.46 mg/L to 0.91 mg/L) indicating a potential for biological productivity.

[2] For more information on the EPA rule go to www.epa.gov/safewater/mdbp/ieswtr.html. For information on North Carolina's Public Drinking Water Supply program go to www.deh.enr.state.nc.us/pws/index.htm. USGS information is available at http://waterdata.usgs.gov/nc/nwis/qw.

Analyses of phytoplankton samples collected in March, July, and October of 2005 indicated low assemblages of diatoms in March. Diatoms are adapted to cooler waters and low light and are generally considered beneficial. Blue-green algae blooms were found in July and October. The blue-green algae blooms were most severe in July and consisted of the blue-green alga *Cylindrospermopsis*. Blue-green algae can discolor water and cause taste and odor problems and are common indicators of eutrophication. Some taxa, including *Cylindrospermopsis* may produce toxins, although there have been no known adverse effects associated with blue-green algal toxins reported in these waters. An increase in euglenoids was also found in October that indicates organic enrichment and stagnant conditions due to the low flow conditions present in the fall of 2005. No chlorophyll-a data was available to determine if the standard had been violated.

One turbidity value found in 2005 (31 NTU) was above the state standard of 25 NTU for this parameter in reservoirs.

Beaverdam Reservoir continues to support its designated uses.

Subbasin 030402

Lake Benson

Lake Benson is located in Wake County near the City of Garner. The lake is leased from the City of Raleigh by the City of Garner and used for recreation. Swift Creek is the main tributary to the lake. The watershed is composed primarily of urban areas associated with the City of Garner with some houses located along the shoreline. A golf course is also present just upstream. Lake Benson was monitored by DWQ in May, June, July, and August of 2005 for a total of seven sampling trips. This lake has been previously monitored by DWQ ten times since 1981.

Nutrient concentrations in 2005 were generally moderate to high for total phosphorus, total kjeldahl nitrogen and total organic nitrogen indicating a potential for high biological productivity. Total phosphorus concentrations ranged from 0.03 mg/L to 0.06 mg/L, total kjeldahl nitrogen from 0.43 mg/L to 0.85 mg/L and total organic nitrogen from 0.42 mg/L to 0.82 mg/L. Phytoplankton analyses of samples collected at the most downstream station in the lake indicated mild to severe blooms of blue-green algae

during all four months of sampling, unfortunately chlorophyll-a data for this time period are not available. The most severe blooms were found in late July and into early August. Blue-green algae blooms may discolor water, cause taste and odor problems and are indicators of eutrophication. Some of the species found in Lake Benson may also produce toxins although there has been no reported adverse health effects associated with blue-green algal toxins in North Carolina waters.

Surface metals analyses of samples collected at the most downstream station in 2005 indicated two manganese values above the state standard of 200 *u*g/L for this parameter in water supplies. These values were 420 *u*g/L and 440 *u*g/L. Manganese is typically high in local soil types and the high values found are probably due to natural sources and are not a cause for concern.

Aquatic weeds were observed and collected in a small area near the dock at the park area at Lake Benson. These plants were identified as Parrot Feather (*Mariophyllum aquaticum*) and Creeping Primrose (*Ludwigia palustris*). These invasive plants can become quite dense and completely colonize small ponds and impede flow. Parrot Feather can also out compete and replace native species that are of more value to fish and wildlife (http://el.erdc.usace.army.mil/aqua/apis). In addition, the City of Raleigh has identified *Lyngbya woolei*, a filamentous blue-green algae that forms thick mats, in the lake. The City of Raleigh is taking measures (chemical treatments) to control these weeds and the *Lyngbya*.

Data collected for Lake Benson are insufficient to determine if the lake supported its designated uses and therefore the lake is not rated.

Subbasin 030407

Buckhorn Reservoir

Buckhorn Reservoir was built by the City of Wilson for use as a water supply and for recreational use. The reservoir was originally impounded in 1976 and expanded in 1999. Turkey Creek and Moccasin Creek are the main tributaries to the reservoir. The land surrounding this lake is mainly rural with agricultural and residential development. Buckhorn Reservoir was monitored by DWQ in May, June, July, and August of 2005 for

a total of seven sampling trips. This lake has been previously monitored by DWQ three times since 1988.

Nutrient concentrations of total kjeldahl nitrogen and total organic nitrogen in 2005 were generally moderate to high indicating a potential for high biological productivity. Total kjeldahl nitrogen values ranged from 0.41 mg/L to 0.76 mg/L and total organic nitrogen values ranged from 0.40 mg/L to 0.74 mg/L. Phytoplankton analyses of samples collected a station located in the upstream section of the reservoir indicated mild to severe blue-green blooms during June, July, and August of 2005 with the most severe blooms found in early August. Blue-green algae blooms may discolor water, cause taste and odor problems and are indicators of eutrophication. Some of the algae species found in Buckhorn Reservoir may produce toxins although there have been no reports of adverse human health effects associated with blue-green toxins in North Carolina.

Surface metals analyses of samples collected at the station near the dam in 2005 indicated two iron values and a manganese value equal to or above the state standards for these parameters in water supplies. The iron values found were 1300 ug/L and 1500 ug/L, above the standard of 1000 ug/L, while the manganese value found was 200 ug/L, equal to the standard of 200 ug/L. These metals are typically high in local soil types and the high values found are probably due to natural conditions and are not a cause for concern.

The section of Contentnea Creek that includes Buckhorn Reservoir was listed on the 303(d) list as impaired in 1998. The reasons for impairment were listed as biological integrity and low dissolved oxygen. No surface dissolved oxygen values below the surface water quality standard of 4 mg/L (as an instantaneous value) were found in Buckhorn Reservoir during the 2005 sampling events. There is currently no method established in North Carolina for determining the status of biological integrity in lakes. Buckhorn Reservoir should remain on the impaired waters list and nutrients should be addressed as part of any management strategies developed to address the entire watershed.

Wiggins Mill Reservoir

Wiggins Mill Reservoir is located near the City of Wilson and is used as a water supply reservoir and for recreational fishing. The lake was originally built in 1915 and Contentnea Creek is the main tributary. The watershed of this lake consists of a mixture of urban and

agricultural areas along with some swampland and forested area. Wiggins Mill Reservoir was sampled from May through September in 2005 for a total of seven sampling trips. DWQ staff previously monitored this reservoir six times since 1988.

Wiggins Mill Reservoir continued to have a low Secchi depth in 2005 (less than one meter) with the exception of measurements taken in May, which ranged from 1.1 to 1.4 meters. These were the highest Secchi depths observed for this lake by DWQ staff. Surface water temperature exceeded the state water quality standard for a coastal or piedmont lake of 32°C on July 21, 2005 (32.9°C). Conductivity and pH values in 2005 were similar to those previously observed and indicate little change for these parameters over time. The values for pH did not violate the state water quality standards for this parameter in 2005.

In general, nutrient concentrations were consistent with previous observations. Total phosphorus values in 2005 (range = 0.05 to 0.08 mg/L) was similar to those observed since 1988. Ammonia values in 2005 (range = <0.01 mg/L to 0.03 mg/L) were lower and total Kjeldahl nitrogen values (range = 0.51 to 0.70 mg/L) were slightly higher than those previously observed. Surface metals were within applicable state water quality standards with the exception of iron in May, June and July when values were greater than the water quality action level of 1000 µg/L (range = 1300 to 1600 µg/L). Iron concentrations, however, were lower in 2005 as compared with previous years. The naturally high iron content of the soils in the Wiggins Mill Reservoir watershed may have contributed to the iron levels observed in the water.

Insufficient samples are available to determine if Wiggins Mill Reservoir is currently meeting its designed uses and therefore it is not rated.

Lake Wilson

Lake Wilson is located near the north side of the City of Wilson and was constructed in 1962 for use as a water supply reservoir and for recreation. The land surrounding this lake is composed of agricultural areas and residential development with significant new construction of residences near the lake's shoreline. The major inflow to the lake is Toisnot Swamp. Lake Wilson was monitored by DWQ in May, June, July, and August of 2005 for a total of seven sampling trips. This lake has been previously monitored by DWQ five times since 1991.

Lake Wilson appeared brown colored (tannic) in appearance in all months in 2005. Two water temperature values measured in 2005 (32.9 ºC and 33.9 ºC) were above the state standard of 32 ºC for water temperature although these high values were due to natural climatic conditions. These temperatures were recorded between 11:20 AM and 12:45 PM.

Nutrient concentrations in 2005 were high for total phosphorus (range 0.06 mg/L to 0.09 mg/L), total kjeldahl nitrogen (range 0.62 mg/L to 0.95 mg/L), and total organic nitrogen (range 0.56 mg/L to 0.94 mg/L) indicating a potential for high algal activity. Algal analyses indicated that taxa diversity increased through mid-summer, but none of the samples appeared to be algal blooms. The dominant species was a euglenoid, *Trachelomonas*. This genus is often associated with elevated chlorophyll-a concentrations and may be indicative of organic enrichment and eutrophic conditions.

Surface metals analyses of samples collected in 2005 indicated one manganese value and all but one iron value above the state standards of 200 *u*g/L and 1000 *u*g/L respectively for these parameters in water supplies. The manganese value found was 980 *u*g/L and the iron values above the standard ranged from 1100 *u*g/L to 13,000 *u*g/L. These metals are typically high in local soil types and the high values found are probably due to natural processes and are not a cause for concern.

Some aquatic weeds and filamentous algae were found in a small area near the shoreline in the upstream end of the reservoir in May of 2005. The weeds were identified as water primrose (*Ludwigia hexapetala*) while the algae was identified as black mat algae (*Lyngbya wollei*). Water primrose is considered invasive and more information can be found at http://plants.ifas.ufl.edu/ludhex.html. *Lyngbya wollei* is a noxious blue-green algae and is known to form thick, foul smelling mats that choke coves and cover shorelines. These mats may hamper recreational use and there are reports of *L. wollei* causing skin irritation. According to staff of the City of Wilson, copper sulfate was used to treat the weeds and algae in June of 2005 and they were less prevalent after that date.

Data collected for Lake Wilson were insufficient to determine if it supported its designated uses and therefore it is Not Rated.

Neuse River Basin Ambient Lakes Use Support Matrix for 10/1/2001 – 9/31/2005

Subbasin		*030401*			
Lakes Ambient Program Name		**West Fork Eno River Reservoir**	**Falls of the Neuse Reservoir**		**Beaverdam Reservoir**
Trophic Status (NC TSI)		Eutrophic	Eutrophic		Eutrophic
Mean Depth (meters)			16.4		
Volume ($10^6 m^3$)		3.0	176.6		
Watershed Area (mi^2)		9.5	769.9		50
Assessment Unit Name (Gray = changes to AU description)			**Neuse River (Falls Lake below normal pool elevation) From source to I-85 bridge**	**Neuse River (Falls Lake below normal pool elevation) From I-85 bridge to dam**	**Beaverdam Creek (Beaverdam Creek Reservoir below normal pool elevation)**
Classification		WS-II HQW NSW CA	WS-IV NSW CA	WS-IV & B NSW CA	WS-IV & B NSW CA
Assessment Unit			27-(1)	27-(5.5)	27-12-(0.7)
Stations in Assessment Unit		NEUWF1, NEUWF2, NEUWF3, NEUWF4	NEU010, NEU013	NEU013B, NEU0171B, NEU018E, NEU019E, NEU019L, NEU019P, NEU020D	NEU019C
Number of Sampling Trips (n)		8	13	13	13
Water Quality Standards					
Chlorophyll *a*	>40 ug/L	ND	E (25% n=4)	NCE	ND
Dissolved Oxygen	<4.0 mg/L	NCE	**CE (8%)**	**CE (1%)**	NCE
pH	<6 s.u. or > 9 s.u.	NCE	NCE	NCE	NCE
Turbidity	>25 mg/L	NCE	**CE (69%)**	NCE	**CE (8%)**
Temperature	>32°C Lower Piedmont & Coastal Plain	NCE	NCE	**CE (7%)**	**CE (8%)**
Water Supply Related Parameters	TSS – 500 mg/L; Ni – 25 ug/L; Mn – 200 ug/L, Chloride – 250 mg/L; Total Hardnes – 100 mg/L	E (Mn - 25%) All others = NCE	TSS - NCE All others - ND	TSS - NCE All others - ND	TSS - NCE All others - ND
Metals (excluding copper, iron & zinc)	15A NCAC 2B .0211	ND	ND	ND	ND
Other Data					
% Saturation DO	>120%	N	Y (8%)	Y (8%)	Y (8%)
Algae	Documented blooms during 2 or more sampling events in 1 year with historic blooms	N	Y	Y	N
Fish	Kills related to eutrophication	N	N	N	N
Chemically/Biologi-cally Treated	For algal or macrophyte control - either chemicals or biologically by fish, etc.	N	N	N	N
Aesthetics complaints	Documented sheens, discoloration, etc. - written complaint and follow-up by a state	N	N	N	N
TSI	Increase of 2 trophic levels from one 5-yr period to next	N	N	N	N
Historic DWQ Data	Conclusions from other reports (link to other reports)	N	Y	Y	N
303(d)	Listed on 303(d) [year listed]	N	N	N	N
AGPT	Algal Growth Potential Test 5-9 mg/L = concern 10 mg/L or more = problematic	NR	Y (13.3 mg/L at NEU013)	N	N
Macrophytes	Limiting access to public ramps, docks, swimming areas; reducing access by fish and other aquatic life to habitat	N	N	N	N
Taste and Odor	Public complaints or taste and odor causing algal species are dominant	N	N	N	N
Sediments	Clogging intakes – dredging program necessary; Frequent public/agency complaints - visual observation	N	N	N	N
Rating:		**NR**	**I**	**S**	**S**

RATING KEY:

S =Supporting
I = Impaired
NR = Not Rated

Key

CE = Sample size (n) is >10 and Criteria is exceeded
E = Criteria exceeded but sample size is <10
NCE = Critieria not exceeded
ND = No Data – sample not taken for this parameter
Y = in Other Data portion, indicates that the parameter has exceeded target or
N = in Other Data portion, indicates that the parameter is within target per available data

Neuse River Basin Ambient Lakes Use Support Matrix for 10/1/2001 – 9/31/2005

		Subbasin	030402	030407		
		Lakes Ambient Program Name	**Lake Benson**	**Lake Wilson**	**Wiggins Mill Reservoir**	**Buckhorn Reservoir**
		Trophic Status (NC TSI)	Eutrophic	Eutrophic	Eutrophic	Eutrophic
		Mean Depth (meters)	3.0	4.9	1.6	7.0
		Volume ($10^6 m^3$)	3.6	0.7	0.6	3.8
		Watershed Area (mi^2)	64.9	40.2	237.1	154.8
		Assessment Unit Name (Gray = changes to AU description)	**Swift Creek (Lake Benson**	**Toisnot Swamp (Silver Lake, Lake Wilson)**	**Contentnea Creek (Wiggins Mill Reservoir)**	**Contentnea Creek (Buckhorn Reservoir)**
		Classification	WS-III NSW CA	WS-III NSW	WS-IV NSW CA	WS-V NSW
		Assessment Unit	27-43-(5.5)b	27-86-11-(1)	27-86-(5.8)	27-86-(1)
		Stations in Assessment Unit	NEU055A3, NEU055A4	NEU096B4	NEU084D, NEU084F	NEUBRI, NEUBR2, NEU084B, NEU084C
		Number of Sampling Trips (n)	7	7	7	7
Water Quality Standards						
Chlorophyll *a*	>40 ug/L		ND	ND	ND	ND
Dissolved Oxygen	<4.0 mg/L		NCE	NCE	NCE	NCE
pH	<6 s.u. or > 9 s.u.		NCE	NCE	NCE	NCE
Turbidity	>25 mg/L		NCE	NCE	NCE	NCE
Temperature	>32°C Lower Piedmont & Coastal Plain		NCE	E (29%)	E (14%)	NCE
Water Supply Related Parameters	TSS – 500 mg/L; Ni – 25 ug/L; Mn – 200 ug/L, Chloride – 250 mg/L; Total Hardnes – 100 mg/L		E (Mn - 29%) All others = NCE	E (Mn - 14%) All others - NCE	NCE	NCE
Metals (excluding copper, iron & zinc)	15A NCAC 2B .0211		E (Mn-29%)	E (Fe - 86%)	E (Fe - 43%)	E (Fe - 29%)
Other Data						
% Saturation DO	>120%		N	N	N	N
Algae	Documented blooms during 2 or more sampling events in 1 year with historic blooms		N	N	N	N
Fish	Kills related to eutrophication		N	N	N	N
Chemically/Biologi-cally Treated	For algal or macrophyte control - either chemicals or biologically by fish, etc.		N	N	N	N
Aesthetics complaints	Documented sheens, discoloration, etc. - written complaint and follow-up by a state		N	N	N	N
TSI	Increase of 2 trophic levels from one 5-yr period to next		N	N	N	N
Historic DWQ Data	Conclusions from other reports (link to other reports)		N	N	N	N
303(d)	Listed on 303(d) [year listed]		N	N	N	Y (1998 - Low DO, degraded biological integrity in Contentnea Creek)
AGPT	Algal Growth Potential Test 5-9 mg/L = concern 10 mg/L or more = problematic		NR	NR	NR	NR
Macrophytes	Limiting access to public ramps, docks, swimming areas; reducing access by fish and other aquatic life to habitat		N	N	N	N
Taste and Odor	Public complaints or taste and odor causing algal species are dominant		N	N	N	N
Sediments	Clogging intakes – dredging program necessary; Frequent public/agency complaints - visual observation		N	N	N	N
		Rating:	**NR**	**NR**	**NR**	**I**

RATING KEY:

S =Supporting
I = Impaired
NR = Not Rated

Key

CE = Sample size (n) is >10 and Criteria is exceeded
E = Criteria exceeded but sample size is <10
NCE = Critieria not exceeded
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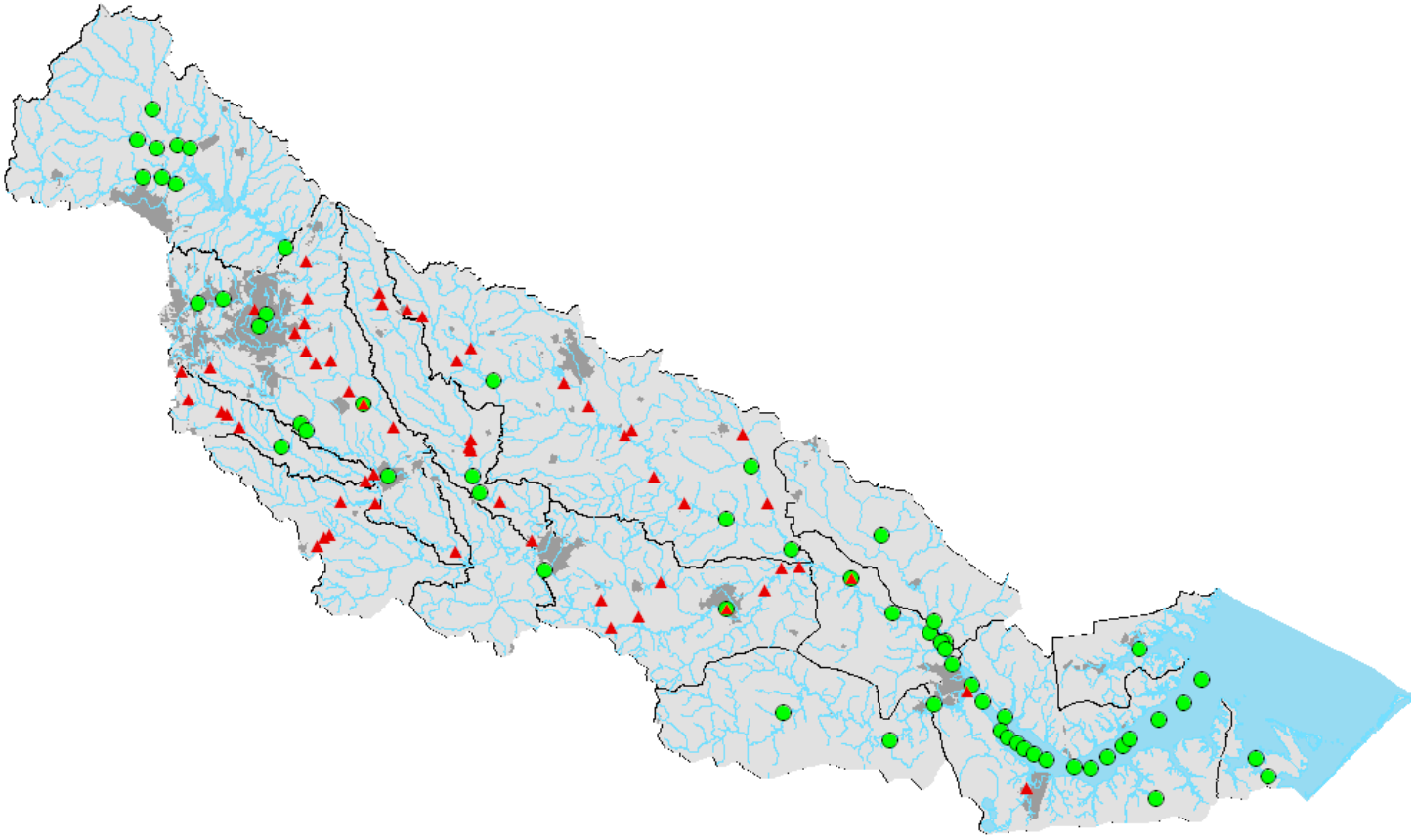
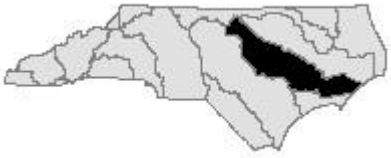


Neuse River Basin
Ambient Monitoring System Report

September 1, 2000 through August 31, 2005



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Evaluation Levels

In order to assist the reader in developing a rapid understanding of the summary statistics provided throughout this data review, concentrations of water quality variables may be compared to an Evaluation Level (EL). Evaluation levels may be a water quality standard, an action level, an ecological threshold, or simply an arbitrary threshold that facilitates a rapid data review. Evaluation levels are further evaluated for frequency to determine if they have been exceeded in more than 10 percent of the observed samples. This summary approach facilitates a rapid and straightforward presentation of the data but may not be appropriate for making specific use support decisions necessary for identification of impaired waters under the Clean Water Act's requirements for 303(d) listings. The reader is advised to review the states 303(d) listing methodology for this purpose. (see http://h2o.enr.state.nc.us/tmdl/General_303d.htm).

TABLES

FIGURES

APPENDIXES

SUMMARY

A general understanding of human activities and natural forces that affect pollution loads and their potential impacts on water quality can be obtained through routine sampling from fixed water quality monitoring stations. During this assessment period (September 1, 2000 through August 31, 2005) chemical and physical measurements were obtained by DWQ from 57 stations located throughout the Neuse River Basin. Lower Neuse Basin Association (LNBA) collected chemical and physical measurements from 55 stations. Three stations are monitored by both DWQ and the LNBA. An additional 12 locations (241 statewide) are monitored for bacterial issues by the N.C. Recreational Water Quality Program. Information on the program can be found here: http://www.deh.enr.state.nc.us/shellfish/Water_Monitoring/RWQweb/home.htm. The program meets all the requirements of the EPA national bacteria rule.

In order to evaluate acceptable water quality criteria at least 10 observations are desired. If at least 10 results were collected for a given site for a given parameter, the results are then compared to water quality evaluation levels. The water quality evaluation level may be an ecological evaluation level, a narrative or numeric standard, or an action level as specified in 15A NCAC 2B .0200 (Table 3). If less then 10 results were collected, then no comparison to evaluation levels was made. When more than 10 percent of the results exceeded the evaluation level, a binomial statistical test was employed to determine if there was sufficient statistical confidence (95% confidence) to conclude that the results statistically exceed the 10% criteria. When that is found to be true, it is termed a *statistically significant exceedance* (SSE). This criterion was applied to all parameters with an evaluation level, except for fecal coliform bacteria. The criteria for fecal coliform varied based on the classification of the water body. See the Parameters section for an explanation of fecal coliform methods. The results of the data analysis are displayed in tables, box plots, scatter plots, and maps. For complete summaries on each station, reference the AMS Station Summary Sheets located in Appendix A.

All data were collected between September 1, 2000 and August 31, 2005. Stations with SSEs were found for dissolved oxygen (nine sites), pH (two sites), chlorophyll a (one site), total copper (six sites), total iron (32 sites), total manganese (five sites), total zinc (three sites), and fecal coliform (three sites). For all parameters, 37 additional 10 percent violations that were not SSEs also occurred.

The following table gives a summary of the problem areas using these criteria in the basin. While reading the table please note the following: The majority of the parameters listed are compared directly to their standards, and those are highlighted in blue. There are two exceptions, however. The fecal coliform standard requires that 5 samples be taken in the span of 30 days, which was not done for this data. Therefore any fecal coliform violations should be taken as a recommendation to collect the data required by the standard. The second exception is the dissolved oxygen (< 5 mg/l) standard. For fresh waters, the 5 mg/l standard is a daily average only. The 4 mg/l standard is considered the critical standard.

The dissolved oxygen measurements being evaluated here are all surface or near-surface samples. The standard states that lake and estuary bottom samples can be lower then the standard if due to natural conditions. Determining whether low dissolved oxygen concentrations are a result of natural conditions requires a more in-depth study then is presented here. Dissolved oxygen depth profiles of the Neuse River Estuary are available at http://www.esb.enr.state.nc.us/NeuFolder/NeuDo.htm.

Table 1. Violations and Areas of Concern in the Neuse River Basin (1 of 5)

Subbasin / Agency / Station ID	Location	Class	Parameter / Evaluation Level	% Exceed	% Conf
1	**Falls Lake Watershed**				
DWQ J0770000	Eno Riv At Us 501 Nr Durham	WS-IV NSW	Total Iron (>1000)	10.5%	70.5%
DWQ J0810000	Eno Riv At Sr 1004 Nr Durham	WS-IV NSW	Total Iron (>1000)	16.7%	90.2%
			Total Manganese (>200)	16.7%	90.2%
DWQ J0820000	Little Riv At Sr 1461 Nr Orange Factory	WS-II NSW CA	Total Iron (>1000)	15.8%	88.5%
			Total Manganese (>200)	10.5%	70.5%
DWQ J0840000	Little Riv Res At Sr 1628 At Orange Factory	WS-II NSW CA	Dissolved Oxygen (<5)**	12.5%	78.9%
			Total Manganese (>200)	20.0%	91.9%
DWQ J1070000	Flat Riv At Sr 1614 Nr Quail Roost	WS-III NSW	Total Iron (>1000)	27.8%	99.4%
DWQ J1100000	Flat Riv At Sr 1004 Nr Willardsville	WS-IV NSW	Dissolved Oxygen (<4)	23.4%	100.0%
			Dissolved Oxygen (<5)**	35.9%	100.0%
			Total Iron (>1000)	22.2%	97.2%
			Total Manganese (>200)	50.0%	100.0%
DWQ J1210000	Knap Of Reeds Crk At Wwtp Outfall Nr Butner	WS-IV NSW CA	Total Copper (>7)	11.1%	73.4%
			Total Iron (>1000)	22.2%	97.2%
			Total Manganese (>200)	33.3%	99.9%
			Total Zinc (>50)	27.8%	99.4%
DWQ J1330000	Ellerbe Crk At Sr 1636 Nr Durham	WS-IV NSW CA	Fecal Coliform* (>20%>400)	24.6%	84.8%
			Total Zinc (>50)	27.8%	99.4%
2	**Neuse River, Swift Creek, and Crabtree Creek**				
DWQ J1890000	Neuse Riv At Sr 2000 Nr Falls	WS-IV NSW	Total Manganese (>200)	25.0%	94.8%
LNBA J2230000	Smith Crk At Sr 2045 Burlington Mill Rd Nr Wake Forest	C NSW	Total Iron (>1000)	62.2%	100.0%
LNBA J2330000	Neuse Riv At Sr 2215 Buffalo Rd Nr Neuse	C NSW	Total Iron (>1000)	100.0%	100.0%
LNBA J2360000	Neuse Riv At Milburnie Dam Nr Raleigh	C NSW	Dissolved Oxygen (<5)**	19.2%	98.7%
DWQ J2850000	Crabtree Crk At Sr 1795 Nr Umstead State Park	B NSW	Total Iron (>1000)	55.6%	100.0%
			Total Zinc (>50)	11.1%	73.4%
DWQ J3000000	Crabtree Crk At Sr 1649 Nr Raleigh	B NSW	Total Iron (>1000)	50.0%	100.0%
			Total Zinc (>50)	16.7%	90.2%
			Turbidity (>50)	10.9%	69.0%
LNBA J3210000	Crabtree Crk At Lassiter Mill Dam At Raleigh	C NSW	Dissolved Oxygen (<5)**	19.6%	98.9%
			Total Iron (>1000)	51.3%	100.0%

Blue entries indicate violations of standards. Black entries indicate violations of evaluation levels.

* The percentages, geomeans, and medians given are for the 5-year monitoring period, which does not meet the requirements of the fecal coliform standard. We recommend that intensive sampling be done for these sites in order to evaluate whether the standard has been violated.

** Applies to saltwater (class SA, SB, and SC) primarily, and to freshwater (class B, C, and WS) as a daily average. Not considered critical (therefore not blue for violations) in freshwater areas.

Table 1 (Continued). Violations and Areas of Concern in the Neuse River Basin (2 of 5)

Subbasin / Agency / Station ID	Location	Class	Parameter / Evaluation Level	% Exceed	% Conf
2	**Neuse River, Swift Creek, and Crabtree Creek**				
DWQ J3251000	Crabtree Crk At Sr 2000 Old Wake Forest Rd At Raleigh	C NSW	Fecal Coliform* (>20%>400)	25.9%	89.3%
			Fecal Coliform* (Geomean: >200)	239	
			Total Iron (>1000)	61.1%	100.0%
			Total Zinc (>50)	11.1%	73.4%
DWQ J3300000	Pigeon House Branch At Dortch St At Raleigh	C NSW	Fecal Coliform* (>20%>400)	75.9%	100.0%
			Fecal Coliform* (Geomean: >200)	1093	
			Total Copper (>7)	66.7%	100.0%
			Total Iron (>1000)	11.1%	73.4%
			Total Zinc (>50)	27.8%	99.4%
LNBA J3470000	Crabtree Crk At Sr 2036 New Hope Rd Nr Wilders Grove	C NSW	Dissolved Oxygen (<5)**	13.0%	80.7%
			Fecal Coliform* (>20%>400)	29.3%	94.8%
			Fecal Coliform* (Geomean: >200)	203	
			Total Copper (>7)	10.5%	67.0%
			Total Iron (>1000)	36.8%	100.0%
LNBA J3970000	Walnut Crk At Sr 2551 Barwell Rd Nr Raleigh	C NSW	Total Copper (>7)	10.3%	64.0%
			Total Iron (>1000)	84.5%	100.0%
LNBA J4050000	Neuse Riv At Sr 2555 Auburn Knightdale Rd Nr Raleigh	C NSW	Total Copper (>7)	15.8%	88.5%
			Total Iron (>1000)	57.9%	100.0%
LNBA J4130000	Neuse Riv At Sr 1700 Covered Bridge Rd Nr Archers Lodge	WS-V NSW	Total Iron (>1000)	42.1%	100.0%
			Total Manganese (>200)	15.8%	88.5%
			Total Zinc (>50)	10.5%	70.5%
DWQ J4170000	Neuse Riv At Nc 42 Nr Clayton	WS-IV NSW	Total Copper (>7)	10.5%	70.5%
			Total Iron (>1000)	42.1%	100.0%
			Total Manganese (>200)	26.3%	99.1%
			Turbidity (>50)	12.1%	78.0%
LNBA J4170000	Neuse Riv At Nc 42 Nr Clayton	WS-IV NSW	Total Iron (>1000)	39.7%	100.0%
			Total Manganese (>200)	13.8%	87.9%
DWQ J4370000	Neuse Riv At Us 70 At Smithfield	WS-V NSW	Total Copper (>7)	11.1%	73.4%
			Total Iron (>1000)	55.6%	100.0%
			Total Manganese (>200)	22.2%	97.2%
			Turbidity (>50)	10.5%	65.7%
LNBA J4414000	Swift Crk At Sr 1152 Holly Springs Rd Nr Macedonia	WS-III NSW	Dissolved Oxygen (<5)**	11.8%	75.5%

Blue entries indicate violations of standards. Black entries indicate violations of evaluation levels.

* The percentages, geomeans, and medians given are for the 5-year monitoring period, which does not meet the requirements of the fecal coliform standard. We recommend that intensive sampling be done for these sites in order to evaluate whether the standard has been violated.

** Applies to saltwater (class SA, SB, and SC) primarily, and to freshwater (class B, C, and WS) as a daily average. Not considered critical (therefore not blue for violations) in freshwater areas.

Table 1 (Continued). Violations and Areas of Concern in the Neuse River Basin (3 of 5)

Subbasin / Agency / Station ID	Location	Class	Parameter / Evaluation Level	% Exceed	% Conf
2	**Neuse River, Swift Creek, and Crabtree Creek**				
DWQ J4510000	Swift Crk At Nc 42 Nr Clayton	C NSW	Total Iron (>1000)	94.7%	100.0%
LNBA J5250000	Neuse Riv At Sr 1201 Richardson Bridge Rd Nr Cox Mill	WS-IV NSW	Total Iron (>1000)	63.8%	100.0%
			Total Manganese (>200)	13.8%	87.9%
3	**Middle Creek**				
LNBA J4620000	Middle Crk At Pristine Water Rd Nr Apex	C NSW	Dissolved Oxygen (<5)**	11.8%	75.5%
			Fecal Coliform* (>20%>400)	33.3%	99.5%
LNBA J4690000	Middle Crk At Sr 1152 Holly Springs Rd Nr Holly Springs	C NSW	Fecal Coliform* (>20%>400)	25.0%	86.9%
LNBA J4870000	Middle Crk At Us 401 Nr Banks	C NSW	Fecal Coliform* (>20%>400)	20.7%	62.7%
			Total Iron (>1000)	71.4%	100.0%
DWQ J5000000	Middle Crk At Nc 50 Nr Clayton	C NSW	Total Iron (>1000)	89.5%	100.0%
4	**Neuse River, Black Creek, and Mill Creek**				
LNBA J5170000	Black Crk At Sr 1162 Black Creek Rd Nr Four Oaks	C NSW	Dissolved Oxygen (<4)	23.1%	96.6%
			Dissolved Oxygen (<5)**	38.5%	99.9%
LNBA J5390000	Hannah Crk At Sr 1158 Allen Crossroads Rd Nr Benson	C NSW	Dissolved Oxygen (<5)**	21.4%	98.2%
LNBA J5390800	Hannah Crk At Sr 1227 Ivey Rd Nr Benson	C NSW	Dissolved Oxygen (<4)	39.3%	100.0%
			Dissolved Oxygen (<5)**	39.3%	100.0%
LNBA J5400000	Hannah Crk At I95 Nr Benson	C NSW	Dissolved Oxygen (<4)	21.7%	97.7%
			Dissolved Oxygen (<5)**	30.4%	99.9%
5	**Neusre River & Tributaries - Goldsboro to Craven County**				
DWQ J5970000	Neuse Riv At Sr 1915 Nr Goldsboro	C NSW	Total Iron (>1000)	78.9%	100.0%
LNBA J6010950	Walnut Crk At Sr 1730 Saint Johns Church Rd Nr Walnut Creek	C NSW	Dissolved Oxygen (<5)**	17.6%	97.2%
LNBA J6024000	Neuse Riv At Sr 1731 Nr Seven Springs	C NSW	Dissolved Oxygen (<5)**	13.7%	86.7%
LNBA J6150000	Neuse Riv At Nc 11 Bypass At Kinston	C NSW	Dissolved Oxygen (<5)**	11.8%	75.5%
DWQ J6150000	Neuse Riv At Nc 11 Bypass At Kinston	C NSW	Total Iron (>1000)	85.0%	100.0%
			Total Zinc (>50)	15.0%	86.7%
LNBA J6250000	Neuse Riv At Nc 55 Nr Graingers	C NSW	Dissolved Oxygen (<5)**	19.6%	98.9%
LNBA J6340000	Neuse Riv Nr Sr 1802 Braxtons Rd Nr Tick Bite	C NSW	Dissolved Oxygen (<4)	17.4%	96.4%
			Dissolved Oxygen (<5)**	30.4%	100.0%
			Total Iron (>1000)	87.5%	100.0%
LNBA J6370000	Neuse Riv Nr Sr 1803 Nr Tick Bite	C NSW	Total Iron (>1000)	65.2%	100.0%

Blue entries indicate violations of standards. Black entries indicate violations of evaluation levels.

* The percentages, geomeans, and medians given are for the 5-year monitoring period, which does not meet the requirements of the fecal coliform standard. We recommend that intensive sampling be done for these sites in order to evaluate whether the standard has been violated.

** Applies to saltwater (class SA, SB, and SC) primarily, and to freshwater (class B, C, and WS) as a daily average. Not considered critical (therefore not blue for violations) in freshwater areas.

Table 1 (Continued). Violations and Areas of Concern in the Neuse River Basin (4 of 5)

Subbasin / Agency / Station ID	Location	Class	Parameter / Evaluation Level	% Exceed	% Conf
6	**Little River**				
LNBA J5620000	Little Riv At Sr 2333 Smithfield Rd Nr Zebulon	WS-II HQW NSW	Dissolved Oxygen (<4)	29.4%	100.0%
			Dissolved Oxygen (<5)**	37.3%	100.0%
LNBA J5630000	Little Riv At Sr 2320 Riley Hill Rd Nr Zebulon	WS-II HQW NSW	Dissolved Oxygen (<4)	80.0%	100.0%
			Dissolved Oxygen (<5)**	90.0%	100.0%
LNBA J5690000	Little Riv At Us 301 Nr Kenly	WS-V NSW	Dissolved Oxygen (<5)**	13.7%	86.7%
LNBA J5730000	Little Riv At I95 Nr Lowell Mill	WS-V NSW	pH (<6)	20.0%	91.9%
LNBA J5730300	Little Riv Nr Sr 2339 At Lowell Mill	WS-V NSW	Dissolved Oxygen (<5)**	27.8%	99.4%
DWQ J5850000	Little Riv At Sr 2320 Nr Princeton	WS-V NSW	Total Iron (>1000)	88.9%	100.0%
			Total Manganese (>200)	11.1%	73.4%
7	**Contentnea Creek**				
LNBA J6410000	Little Crk At Nc 97 At Zebulon	C NSW	Dissolved Oxygen (<5)**	10.0%	64.7%
LNBA J6450000	Little Crk At Nc 39 At Zebulon	C NSW	Dissolved Oxygen (<4)	10.0%	62.9%
			Dissolved Oxygen (<5)**	35.0%	100.0%
LNBA J6500000	Moccasin Crk At Sr 1131 Antioc Church Rd Nr Conner	C NSW	Dissolved Oxygen (<4)	11.8%	75.5%
			Dissolved Oxygen (<5)**	23.5%	99.9%
LNBA J6680000	Turkey Crk At Sr 1101 Claude Lewis Rd Nr Middlesex	C NSW	Dissolved Oxygen (<4)	31.4%	100.0%
			Dissolved Oxygen (<5)**	45.1%	100.0%
DWQ J6740000	Contentnea Crk At Nc 581 Nr Lucama	WS-5 NSW	Dissolved Oxygen (<5)**	10.3%	64.0%
			Total Iron (>1000)	78.9%	100.0%
			Total Manganese (>200)	36.8%	100.0%
DWQ J7450000	Contentnea Crk At Nc 123 At Hookerton	C Sw NSW	Total Iron (>1000)	90.0%	100.0%
LNBA J7690000	Little Contentnea Crk At Sr 1218 Chinquapin Rd Nr Farmville	C Sw NSW	Fecal Coliform* (>20%>400)	20.0%	57.6%
DWQ J7739550	Little Contentnea Crk At Sr 1125 Nr Ballards Crossroads	C Sw NSW	Total Iron (>1000)	90.0%	100.0%
DWQ J7810000	Contentnea Crk Nr Sr 1800 At Grifton	C Sw NSW	Total Iron (>1000)	100.0%	100.0%
8	**Neuse River & Tributaries, Craven County**				
DWQ J7850000	Neuse Riv At Sr 1470 Nr Fort Barnwell	C Sw NSW	Total Iron (>1000)	80.0%	100.0%
DWQ J7860000	Neuse Riv At Lane Landing Nr Perfection	C Sw NSW	Total Iron (>1000)	70.0%	100.0%
DWQ J7930000	Neuse Riv At Sr 1400 At Streets Ferry	C Sw NSW	Total Iron (>1000)	68.4%	100.0%
DWQ J8250000	Neuse Riv At Cm 68 Below Swift Crk Nr Askin	SC Sw NSW	Total Copper (>3)	10.0%	67.7%
DWQ J8290000	Neuse Riv At Cm 52 At Mouth Of Narrows Nr Washington Forks	SC Sw NSW	Total Copper (>3)	15.0%	86.7%

Blue entries indicate violations of standards. Black entries indicate violations of evaluation levels.

* The percentages, geomeans, and medians given are for the 5-year monitoring period, which does not meet the requirements of the fecal coliform standard. We recommend that intensive sampling be done for these sites in order to evaluate whether the standard has been violated.

** Applies to saltwater (class SA, SB, and SC) primarily, and to freshwater (class B, C, and WS) as a daily average. Not considered critical (therefore not blue for violations) in freshwater areas.

Table 1 (Continued). Violations and Areas of Concern in the Neuse River Basin (5 of 5)

Subbasin / Agency / Station ID	Location	Class	Parameter / Evaluation Level	% Exceed	% Conf
9	**Swift Creek**				
DWQ J8150000	Creeping Swamp At Nc 43 Nr Vanceboro	C Sw NSW	Total Iron (>1000)	63.2%	100.0%
DWQ J8210000	Swift Crk At Mouth Nr Askin	SC Sw NSW	Total Copper (>3)	15.0%	86.7%
10	**Neuse River Estuary - New Bern to Pamlico Sound**				
DWQ J8570000	Neuse Riv .5 Mi Ups Union Point At New Bern	SC Sw NSW	Chlorophyll A (>40)	14.5%	90.6%
			Total Copper (>3)	35.0%	100.0%
DWQ J8900800	Neuse Riv At Cm 22 Nr Fairfield Harbour	SC Sw NSW	Total Copper (>3)	15.0%	86.7%
DWQ J8902500	Neuse Riv At Cm 2 At Mouth Of Broad Crk Nr Thurman	SB Sw NSW	Chlorophyll A (>40)	16.4%	95.6%
			Total Copper (>3)	15.0%	86.7%
DWQ J8903500	Neuse Riv At Cm 17 Nr Thurman	SW Sw NSW	Chlorophyll A (>40)	33.3%	97.2%
			pH (>8.5)	16.7%	96.6%
DWQ J8903600	Neuse Riv At Cm 15 Nr Riverdale	SB Sw NSW	Chlorophyll A (>40)	100.0%	100.0%
			pH (>8.5)	13.1%	84.8%
DWQ J8910000	Neuse Riv At Cm 11 Nr Riverdale	SB Sw NSW	Chlorophyll A (>40)	14.3%	89.7%
			pH (>8.5)	15.9%	95.3%
			Total Copper (>3)	23.8%	98.6%
DWQ J9530000	Neuse Riv At Cm 9 Nr Minnesott Beach	SA NSW	Chlorophyll A (>40)	10.9%	69.0%
			Total Copper (>3)	20.0%	95.7%
DWQ J9540000	Neuse Riv Nr Pierce	SA NSW	Chlorophyll A (>40)	100.0%	100.0%
DWQ J9590000	Neuse Riv Nr Janeiro	SA NSW	pH (>8.5)	10.0%	60.6%
DWQ J9690000	Back Crk At Sr 1300 Nr Merrimon	SA HQW NSW	Dissolved Oxygen (<5)**	20.7%	99.6%
			Fecal Coliform* (>10%>43)	75.0%	100.0%
			Fecal Coliform* (Median:>14)	125	
			pH (<6.8)	22.8%	99.9%
			Total Copper (>3)	21.1%	96.5%
DWQ J9810000	Neuse Riv At Cm 7 Nr Oriental	SA NSW	Chlorophyll A (>40)	11.3%	72.3%
			Total Copper (>3)	15.8%	88.5%
11	**Trent River**				
DWQ J8690000	Trent Riv At Sr 1129 Nr Trenton	C Sw NSW	Total Iron (>1000)	10.5%	70.5%
14	**West Bay**				
DWQ J9940000	Thorofare Canal At Nc 12 Nr Atlantic	SA NSW	Total Nickel (>8.3)	16.7%	88.6%

Blue entries indicate violations of standards. Black entries indicate violations of evaluation levels.

* The percentages, geomeans, and medians given are for the 5-year monitoring period, which does not meet the requirements of the fecal coliform standard. We recommend that intensive sampling be done for these sites in order to evaluate whether the standard has been violated.

** Applies to saltwater (class SA, SB, and SC) primarily, and to freshwater (class B, C, and WS) as a daily average. Not considered critical (therefore not blue for violations) in freshwater areas.

INTRODUCTION

The DWQ's Ambient Monitoring System is a network of stream, lake, and estuarine stations strategically located for the collection of physical and chemical water quality data. The stations are located at convenient access points (e.g. bridge crossings) that are sampled on a monthly basis. These locations were chosen to characterize the effects of point source dischargers and nonpoint sources such as agriculture, animal operations, and urbanization within watersheds. Currently the DWQ does not conduct probabilistic (random) monitoring.

The data are used to identify long term trends within watersheds, to develop Total Maximum Daily Loads (TMDLs) and to compare measured values with water quality standards to identify possible areas of impairment. Parametric coverage is determined by freshwater or saltwater waterbody classification and corresponding water quality standards. Under this arrangement, core parameters are based on Class C waters with additional parameters added when justified (Table 2).

Within this document, an analysis of how monitoring results compare with water quality standards and evaluation levels is presented. A conceptual overview of water quality standards is provided at: http://www.epa.gov/waterscience/standards. Specific information on North Carolina water quality standards is provided at: http://h2o.enr.state.nc.us/csu/swstdsfaq.html.

Water quality data are evaluated in five year periods. Some stations have little or no data for several parameters over the period. However, for the purpose of standardization, data summaries for each station are included in this report. DWQ monitored water quality and collected samples at 57 stations throughout the basin.

THE LOWER NEUSE BASIN ASSOCIATION

Also within the Neuse River basin are monitoring stations maintained by the Lower Neuse Basin Association (LNBA). The LNBA is an organization of municipalities and industries that release treated wastewater into the Neuse River. Since its inception in 1994, the LNBA has taken an active role in monitoring water quality along the Neuse. As an alternative to typical state and federally required in-stream National Pollutant Discharge Elimination System (NPDES) permit monitoring requirements, the members of LNBA collect water samples from 55 monitoring stations throughout the basin, under agreement with DWQ. Three of the stations monitored by LNBA are also monitored by DWQ.

Table 2. Parametric coverage for the Ambient Monitoring System.[1]

Parameter	All Waters	Water Supply
Dissolved oxygen (s)	✔	✔
pH (s)	✔	✔
Specific conductance	✔	✔
Temperature (s)	✔	✔
Total phosphorus[2]	✔	✔
Ammonia as N[2]	✔	✔
Total Kjeldahl as N[2]	✔	✔
Nitrate+nitrite as N[2] (s)	✔	✔
Total suspended solids	✔	✔
Turbidity (s)	✔	✔
Fecal coliform bacteria (s)	✔	✔
Aluminum	✔	✔
Arsenic (s)	✔	✔
Cadmium (s)	✔	✔
Chromium, total (s)	✔	✔
Copper, total (s)	✔	✔
Iron (s)	✔	✔
Lead (s)	✔	✔
Mercury (s)	✔	✔
Nickel (s)	✔	✔
Zinc (s)	✔	✔
Manganese (s)	---	✔
Chlorophyll *a*[2] (s)	✔	✔

[1]A check (✔) indicates the parameter is collected. 's' indicates the parameter has a standard.
[2]Chlorophyll *a* is collected in Nutrient Sensitive Waters (NSW) and some coastal areas. Since 2001, nutrient sampling likewise is only done in areas of concern, such as NSW, estuaries, and areas with known enrichment issues.

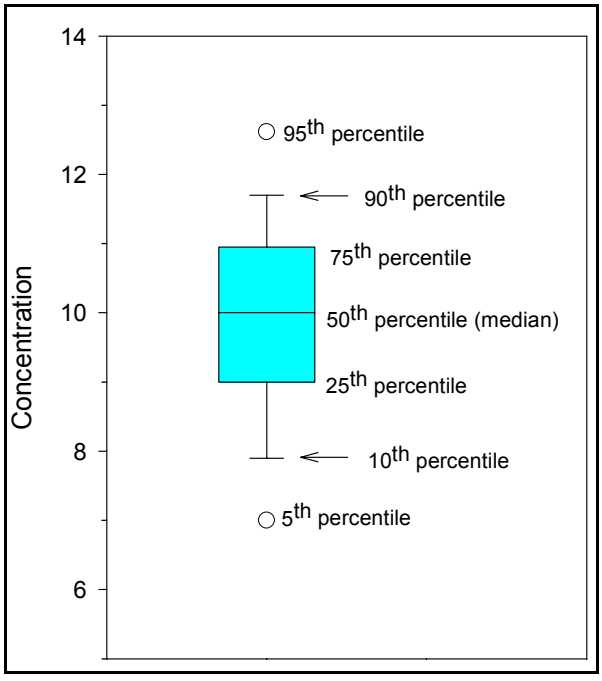

Figure 1. Explanation of box plots.

Table 3. Selected water quality standards for parameters sampled as part of the Ambient Monitoring System.[1]

	Standards for All Freshwater			Standards to Support Additional Uses		
Parameter (µg/L, unless noted)	Aquatic Life	Human Health	Water Supply Classifications	Trout Water	HQW	Swamp Waters
Arsenic		10				
Cadmium	2.0			0.4		
Chloride (mg/l)	230		250			
Chlorophyll *a* (corrected)	40[2]			15[2]		
Chromium, total	50					
Coliform, total (MFTCC/100 ml)[3]			50[2] (WS-I only)			
Coliform, fecal (MFFCC/100 ml)[4]		200[2]				
Copper, total	7					
Dissolved oxygen (mg/L)	4.0[5,6]			6.0		2, 6
Hardness, total (mg/L)			100			
Iron	1,000					
Lead	25[2]					
Manganese			200			
Mercury	0.012					
Nickel	88		25			
Nitrate nitrogen			10,000			
pH (units)	6.0 - 9.0[2, 6]					2, 6
Solids, total suspended (mg/L)					10 Trout, 20 other[7]	
Turbidity (NTU)	50, 25[2]			10[2]		
Zinc	50					

[1]Standards apply to all classifications. For the protection of water supply and supplemental classifications, standards listed under Standards to Support Additional Uses should be used unless standards for aquatic life or human health are listed and are more stringent. Standards are the same for all water supply classifications (Administrative Code 15A NCAC 2B 0200, eff. August 1, 2004).
[2]Refer to 2B.0211 for narrative description of limits.
[3]Membrane filter total coliform count per 100 ml of sample.
[4]Membrane filter fecal coliform count per 100 ml of sample.
[5]An instantaneous reading may be as low as 4.0 mg/L, but the daily average must be 5.0 mg/L or more.
[6]Designated swamp waters may have a dissolved oxygen less than 5.0 mg/L and a pH as low as 4.3, if due to natural conditions.
[7]For effluent limits only, refer to 2B.0224(1)(b)(ii).

	Standards for All Saltwater			Standards To Support Additional Uses	
Parameter (µg/L, unless noted)	Aquatic Life	Human Health[1]	Class SA[2]	HQW	Swamp Waters
Arsenic		10			
Cadmium	5.0				
Chlorophyll *a* (corrected)	40[3]				
Chromium, total	20				
Coliform, fecal (MFFCC/100ml)[4]		200[3]	14[3]		
Copper, total	3				
Dissolved oxygen (mg/L)	5.0[8]			6.0	3, 5
Lead	25[3]				
Mercury	0.025				
Nickel	8.3				
PH (units)	6.8 - 8.5[5]				3, 5
Selenium	71				
Silver	0.1				
Solids, total suspended (mg/L)				10 PNA[6], 20 other[7]	
Turbidity (NTU)	25[3]				
Zinc	86				

[1]Standards are based on consumption of fish only unless dermal contact studies are available, see 2B.0208 for equation.
[2]Class SA = shellfishing waters, see 2B.0101 for description.
[3]See 2B.0220 for narrative description of limits.
[4]MFFCC/100ml means membrane filter fecal coliform count per 100 ml of sample.
[5]Designated swamp waters may have a dissolved oxygen less than 5.0 mg/L and a pH as low as 4.3 s.u., if due to natural conditions.
[6]PNA = Primary Nursery Areas.
[7]For effluent limits only, see 2B.0224.
[8]Swamp waters, poorly flushed tidally influenced streams, or embayments, or estuarine bottom waters may have lower values if caused by natural conditions.

Figure 2. DWQ's Ambient Monitoring System and the LNBA monitoring system in the Neuse River Basin.

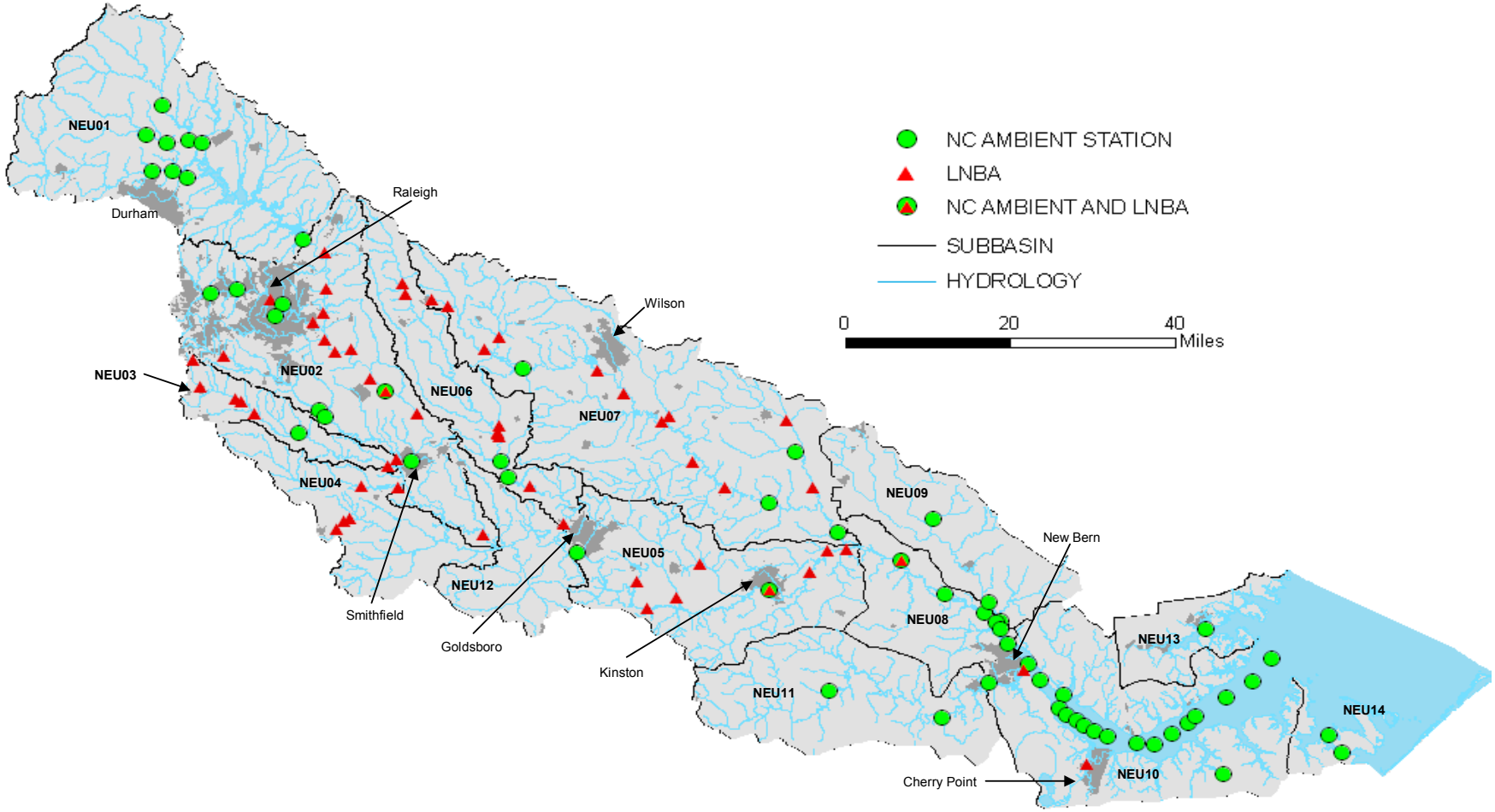

Table 4. DWQ Monitoring stations in the Neuse River Basin, 2000 - 2005. (1 of 2)

Subbasin/ Station ID	Location	Class	Lat.	Long.
1	**Falls Lake Watershed**			
J0770000	Eno River at US 501 near Durham	WS-IV NSW	36.07197	-78.90864
J0810000	Eno River at SR 1004 near Durham	WS-IV NSW	36.07254	-78.86270
J0820000	Little River at SR 1461 near Orange Factory	WS-II NSW CA	36.14159	-78.91930
J0840000[1]	Little River Reservior at SR 1628 at Orange Factory	WS-II NSW CA	36.12721	-78.87471
J1070000	Flat River at SR 1614 near Quail Roost	WS-III NSW	36.20021	-78.88651
J1100000	Flat River at SR 1004 near Willardsville	WS-IV NSW	36.13186	-78.82784
J1210000	Knap of Reeds Creek at WWTP Outfall near Butner	WS-IV NSW CA	36.12797	-78.79852
J1330000	Ellerbe Creek at SR 1636 near Durham	WS-IV NSW CA	36.05949	-78.83224
2	**Neuse River, Swift Creek, and Crabtree Creek**			
J1890000	Neuse River at SR 2000 near Falls	WS-IV NSW	35.94077	-78.58010
J2850000	Crabtree Creek at SR 1795 near Umstead State Park	B NSW	35.83770	-78.78084
J3000000	Crabtree Creek at SR 1649 near Raleigh	B NSW	35.84545	-78.72444
J3251000	Crabtree Creek at SR 2000 Old Wake Forest Rd at Raleigh	C NSW	35.81584	-78.62568
J3300000	Pigeon House Branch at Dortch St at Raleigh	C NSW	35.79387	-78.64262
J4170000	*Neuse River at NC 42 near Clayton*	*WS-IV NSW*	*35.64732*	*-78.40567*
J4370000	Neuse River at US 70 at Smithfield	WS-V NSW	35.51283	-78.34988
J4510000	Swift Creek at NC 42 near Clayton	C NSW	35.61314	-78.54863
3	**Middle Creek**			
J5000000	Middle Creek at NC 50 near Clayton	C NSW	35.56894	-78.59230
5	**Neuse River & Tributaries - Goldsboro to Craven County**			
J5970000	Neuse River at SR 1915 near Goldsboro	C NSW	35.33712	-77.99734
J6150000	*Neuse River at NC 11 Bypass at Kinston*	*C NSW*	*35.25879*	*-77.58353*
6	**Little River**			
J5850000	Little River at SR 2320 near Princeton	WS-V NSW	35.51252	-78.15883
7	**Contentnea Creek**			
J6740000	Contentnea Creek at NC 581 near Lucama	WS-V NSW	35.69142	-78.10928
J7450000	Contentnea Creek at NC 123 at Hookerton	C Sw NSW	35.42864	-77.58265
J7739550	Contentnea Creek at SR 1125 near Ballards Crossroads	C Sw NSW	35.52490	-77.52271
J7810000	Contentnea Creek near SR 1800 at Grifton	C Sw NSW	35.36842	-77.43395
8	**Neuse River & Tributaries - Craven County**			
J7850000	*Neuse River at SR 1470 near Fort Barnwell*	*C Sw NSW*	*35.31245*	*-77.30221*
J7860000	Neuse River at Lane Landing near Perfection	C Sw NSW	35.24790	-77.20820
J7930000	Neuse River at SR 1400 at Streets Ferry	C Sw NSW	35.21060	-77.12220
J8250000	Neuse River at CM 68 below Swift Creek near Askin	SC Sw NSW	35.19234	-77.09974
J8270000	Neuse River at CM 64 near Bellair	SC Sw NSW	35.17801	-77.09004
J8290000	Neuse River at CM 52 at Mouth of Narrows near Washington Forks	SC Sw NSW	35.15010	-77.07493
9	**Swift Creek**			
J8150000	Creeping Swamp at NC 43 near Vanceboro	C Sw NSW	35.39164	-77.23134
J8210000	Swift Creek at Mouth near Askin	SC Sw NSW	35.19278	-77.08984
J8230000	Swift Creek at NC 43 near Streets Ferry	SC Sw NSW	35.23104	-77.11388

Table 4 (Continued). DWQ Monitoring stations in the Neuse River Basin, 2000 - 2005. (2 of 2)

Subbasin/ Station ID	Location	Class	Lat.	Long.
10	**Neuse River Estuary - New Bern to Pamlico Sound**			
J8570000	Neuse River 0.5 Miles Upstream of Union Point at New Bern	SC Sw NSW	35.10972	-77.03174
J8900800	Neuse River at CM 22 near Fairfield Harbour	SC Sw NSW	35.07989	-77.00607
J8902500	Neuse River at CM 2 at Mouth of Broad Creek near Thurman	SB Sw NSW	35.04898	-76.95687
J8903500	Neuse River at CM 17 near Thurman	SB Sw NSW	35.02335	-76.96950
J8903600	Neuse River at CM 15 near Riverdale	SB Sw NSW	35.00961	-76.95292
J8910000	Neuse River at CM 11 near Riverdale	SB Sw NSW	35.00040	-76.93166
J8920000	Neuse River near Kennel Beach	SB Sw NSW	34.99060	-76.91598
J8925000	Neuse River near Arapahoe	SB Sw NSW	34.97922	-76.89479
J9431500	Neuse River near Cherry Point Marine Corp Air Station	SB Sw NSW	34.96872	-76.86743
J9530000	Neuse River at CM 9 near Minnesott Beach	SA NSW	34.95301	-76.80301
J9540000	Neuse River near Pierce	SA NSW	34.95065	-76.76591
J9590000	Neuse River near Janeiro	SA NSW	34.96947	-76.72910
J9685000	Neuse River near Merrimon	SA NSW	34.99015	-76.69366
J9690000	Black Creek at SR 1300 near Merrimon	SA HQW NSW	34.89201	-76.62200
J9810000	Neuse River at CM 7 near Oriental	SA NSW	35.00209	-76.67847
J9860000	Neuse River near Cockle Point	SA NSW	35.03700	-76.60925
J9900000	Neuse River near Piney Point	SA NSW	35.06793	-76.55219
11	**Trent River**			
J8690000	Trent River at SR 1129 near Trenton	C Sw NSW	35.06364	-77.46107
J8730000	Trent River at US 17 at Pollocksville	C Sw NSW	35.00993	-77.21891
J8770000	Trent River at CM 14 Above Reedy Bridge near Rhems	SB Sw NSW	35.07502	-77.11627
13	**Bay River**			
J9950000	Bay River at CM 5 near Vandemere	SA NSW	35.17057	-76.65155
14	**West Bay**			
J9930000	Neuse River at CM NR at Mouth near Pamlico	SA NSW	35.11214	-76.51117
J9938000[2]	W Thorofare Bay at CM 10WB near Atlantic	SA NSW	34.96101	-76.39201
J9940000[2]	Thorofare Canal at NC 12 near Atlantic	SA NSW	34.92658	-76.36443

Stations in *Italics* are also sampled by the Lower Neuse Basin Association.

[1]Station J0840000 ceased sample collection on 5/13/2002.

[2]Stations J9938000 and J9940000 ceased sample collection on 6/5/2002.

Table 5. LNBA Monitoring stations in the Neuse River Basin, 2000 - 2005. (1 of 2)

Subbasin/ Station ID	Location	Class	Lat.	Long.
2	**Neuse River, Swift Creek, and Crabtree Creek**			
J2230000	Smith Creek at SR 2045 Burlington Mill Rd near Wake Forest	C NSW	35.91820	-78.53480
J2330000	Neuse River at SR 2215 Buffalo Rd near Neuse	C NSW	35.84790	-78.53020
J2360000	Neuse River at Milburnie Dam near Raleigh	C NSW	35.80222	-78.53861
J3210000	Crabtree Creek at Lassiter Mill Dam at Raleigh	C NSW	35.82722	-78.65083
J3470000[1]	Crabtree Creek at SR 2036 New Hope Rd near Wilders Grove	C NSW	35.78250	-78.56139
J3970000	Walnut Creek at SR 2551 Barwell Rd near Raleigh	C NSW	35.74930	-78.53450
J4050000	Neuse River at SR 2555 Auburn Knightdale Rd near Raleigh	C NSW	35.72660	-78.51390
J4080000	Poplar Creek at SR 2049 Bethlehem Rd near Knightdale	C NSW	35.73090	-78.47760
J4130000	Neuse River at SR 1700 Covered Bridge Rd near Archers Lodge	WS-V NSW	35.67490	-78.43640
J4170000	*Neuse River at NC 42 near Clayton*	*WS-IV NSW*	*35.64732*	*-78.40567*
J4190000	Neuse River at SR 1908 Fire Dept Rd near Wilson Mills	WS-IV NSW	35.60670	-78.33740
J4414000	Swift Creek at SR 1152 Holly Springd Rd near Macedonia	WS-III NSW	35.71877	-78.75270
J5250000	Neuse River at SR 1201 Richardson Bridge Rd near Cox Mill	WS-IV NSW	35.37410	-78.19620
3	**Middle Creek**			
J4590000	Swift Creek at NC 210 near Smithfield	C NSW	35.51860	-78.38190
J4620000	Middle Creek at Pristine Water Rd near Apex	C NSW	35.71058	-78.83592
J4690000	Middle Creek at SR 1152 Holly Springs Rd near Holly Springs	C NSW	35.66090	-78.80420
J4870000	Middle Creek at US 401 near Banks	C NSW	35.63180	-78.71600
J4980000	Middle Creek at SR 1006 Old Stage Rd near Willow Springs	C NSW	35.60910	-78.68660
J5010000	Middle Creek at NC 210 near Smithfield	C NSW	35.50750	-78.40139
J5185000[3]	Black Creek at I 95 near Smithfield	C NSW	35.46639	-78.38056
4	**Neuse River, Black Creek, and Mill Creek**			
J5170000[2]	Black Creek at SR 1162 Black Creek Rd near Four Oaks	C NSW	35.46925	-78.45681
J5390000[4]	Hannah Creek at SR 1158 Allen Crossroads Rd near Benson	C NSW	35.38677	-78.51096
J5390800[4]	Hannah Creek at SR 1227 Ivey Rd near Benson	C NSW	35.40245	-78.49520
J5400000[5]	Hannah Creek at I95 near Benson	C NSW	35.40720	-78.48320
5	**Neuse River & Tributaries - Goldsboro to Craven County**			
J6010950	Walnut Creek at SR 1730 Saint Johns Church Rd near Walnut Creek	C NSW	35.28170	-77.86860
J6024000	Neuse River at SR 1731 near Seven Springs	C NSW	35.22900	-77.84600
J6044500	Bear Creek at SR 1311 Bear Creek Rd near Kinston	WS-IV Sw NSW	35.24890	-77.78430
J6055000	Mosley Creek at SR 1327 Willey Measley Rd near LaGrange	C Sw NSW	35.31194	-77.73139
J6150000	*Neuse River at NC 11 Bypass at Kinston*	*C NSW*	*35.25879*	*-77.58353*
J6250000	Neuse River at NC 55 near Graingers	C NSW	35.29570	-77.49620
J6340000[10]	Neuse River near SR 1802 Braxtons Rd near Tick Bite	C NSW	35.33527	-77.45702
J6370000[11]	Neuse River near SR 1803 near Tick Bite	C NSW	35.33660	-77.41760
6	**Little River**			
J5620000	Little River at SR 2333 Smithfield Rd near Zebulon	WS-II HQW NSW	35.85770	-78.36650
J5630000[6]	Little River at SR 2320 Riley Hill Rd near Zebulon	WS-II HQW NSW	35.83734	-78.36024
J5690000	Little River at US 301 near Kenly	WS-V NSW	35.58290	-78.15930
J5730000[7]	Little River at I95 near Lowell Mill	WS-V NSW	35.56990	-78.16260
J5730300[8]	Little River near SR 2339 at Lowell Mill	WS-V NSW	35.56780	-78.16252
J5750000[9]	Little River at SR 2339 Bagley Road near Lowell Mill	WS-V NSW	35.56128	-78.15935
J5900000	Little River at SR 1234 Capps Bridge Rd near Crossroads	WS-IV NSW	35.46620	-78.09420
J5930000	Little River at US 581 at Asylum	WS-IV NSW	35.39300	-78.02500

Table 5 (Continued). LNBA Monitoring stations in the Neuse River Basin, 2000 - 2005. (2 of 2)

Subbasin/ Station ID	Location	Class	Lat.	Long.
7	**Contentnea Creek**			
J6410000	Little Creek at NC 97 at Zebulon	C NSW	35.82500	-78.30420
J6450000	Little Creek at NC 39 at Zebulon	C NSW	35.81250	-78.26810
J6500000	Moccasin Creek at SR 1131 Antioc Church Rd near Conner	C NSW	35.73010	-78.18950
J6680000	Turkey Creek at SR 1101 Claude Lewis Rd near Middlesex	C NSW	35.75190	-78.15970
J6764000	Contentnea Creek at US 301 Ward Blvd near Dixie	C Sw NSW	35.68790	-77.94770
J6890000	Contentnea Creek at SR 1622 Evansdale Rd near Wilson	C Sw NSW	35.64290	-77.89020
J7210000	Contentnea Creek at NC 58 near Stantonsburg	C Sw NSW	35.58610	-77.81110
J7240000	Toisnot Swamp at SR 1539 Sand Pit Rd near Stantonburg	C Sw NSW	35.59760	-77.79470
J7325000	Nahunta Swamp at NC 58 near Contentnea	C Sw NSW	35.50810	-77.74550
J7330000	Contentnea Creek at US 13 at Snow Hill	C Sw NSW	35.45850	-77.67530
J7690000	Little Contentnea Creek at SR 1218 Chinquapin Rd near Farmville	C Sw NSW	35.58810	-77.54160
J7740000	Little Contentnea Creek at SR 1110 at Scuffleton	C Sw NSW	35.45670	-77.48540
8	**Neuse River & Tributaries - Craven County**			
J7850000	*Neuse River at SR 1470 near Fort Barnwell*	*C Sw NSW*	*35.31245*	*-77.30221*
10	**Neuse River Estuary - New Bern to Pamlico Sound**			
J8870000	Trent River at Hancock St Railroad Bridge at New Bern	SB Sw NSW	35.10090	-77.04190
J9330000	Slocum Creek at Slocum Rd at Cherry Point	SC Sw NSW	34.91770	-76.91150

Stations in *Italics* are also sampled by the DWQ Ambient Monitoring Program.

[1]Station J3470000 ceased sample collection on 2/4/2004.

[2]Station J5170000 began sample collection on 12/8/2004.

[3]Station J5185000 ceased sample collection on 11/10/2004.

[4]Stations J5390000 and J5390800 began sample collection on 2/25/2004.

[5]Station J5400000 ceased sample collection on 1/29/2004.

[6]Station J5630000 began sample collection on 5/4/2003 and ceased sampling on 9/23/2003.

[7]Station J5730000 ceased sample collection on 12/13/2002.

[8]Station J5730300 began sample collection on 1/30/2003 and ceased sampling on 1/30/2004.

[9]Station J5750000 began sample collection on 2/23/2004.

[10]Station J6340000 began sample collection on 1/30/2003.

[11]Station J6370000 ceased sample collection on 12/12/2002.

DATA ASSESSMENT AND INTERPRETATION

Monitoring and sampling results considered in this report represent samples collected or measurements taken at less than one-meter depth.

Percentile statistics were calculated for most of the data using JMP statistical software (version 5.01; SAS Institute, Cary, NC). Values less than the minimum reporting level (non-detects) were evaluated as equal to the reporting level. Box and whisker plots (constructed using SigmaPlot version 8.02) and maps are presented for most water quality parameters collected at each monitoring station. Significant trends in water quality parameters (constructed using Microsoft Excel) are illustrated as scatterplots. Significant trends are found by assessing the probability that the linear model explains the data no better then chance. If that chance is 5% or less (an observed significance probability of 0.05 or less) then that is considered evidence of a regression effect in this document. The strength of the regression effect is given as an r^2 value, the portion of the data that is explained by the linear model. There are many other types of modeling (non-linear) that can be used to explore trends, but they were not used in this document.

Analytical Considerations

Three issues were noted by the DWQ Laboratory Section as part of the analytical processes during this assessment period:

1) Between February and April 2001, improved analytical techniques and protocols for nutrient samples were implemented. No nutrient samples were processed during the period when the techniques and protocols were being implemented.
2) In early 2001 the Laboratory Section reviewed their internal QA/QC programs and some of the analytical methods. This effort resulted in a temporary increase in reporting levels for certain parameters. New analytical equipment and methods were subsequently acquired to establish more accurate reporting levels and rigorous quality assurance. Because of the improvements, the reporting levels quickly declined back down to or near the previous reporting levels. Nutrients were especially affected by these changes (Table 5).

Table 6. Changes in the Laboratory Section's reporting levels for nutrients.

	Reporting Level By Date (mg/l)			
Parameter	**Pre-2001**	**3/13/2001 to 3/29/2001**	**3/30/2001 to 7/24/2001**	**7/25/2001 to present**
NH_3	0.01	0.5	0.2	0.01
TKN	0.1	1.0	0.6	0.20
NO_2+NO_3	0.01	0.5	0.15	0.01
TP	0.01	0.5	0.1	0.02

3) Chlorophyll a samples collected between 4/11/05 and 8/23/05 were incorrectly prepared for analysis, to the extent that the accuracy of the results is unknown. Therefore, the chlorophyll a results for this period were omitted from the dataset.

Providing Confidence in the Exceedances of Water Quality Standards

NC DWQ uses guidance provided by the US EPA for determining when the number of results that exceed a water quality standard indicate potential water quality issues. Historically, the US EPA has suggested that management actions be implemented when 10 percent of the results exceeded a water quality standard. This interpretation is the same whether 1 out of 10, or 5 out of 50, or 25 out of 250 results exceed a standard. Evaluating exceedances in this manner is termed the "raw-score" approach. Although this "10 percent exceedance criterion" defines a point where potential water quality issues may be present, it does not consider uncertainty. Some results are subject to chance or other factors such as calibration errors or sample mishandling. Uncertainty levels change with sample size. The smaller the sample size, the greater the uncertainty.

This document uses a nonparametric procedure (Lin *et al.* 2000) to identify when a sufficient number of exceedances have occurred that indicate a true exceedance probability of 10 percent. Calculating the minimum number of exceedances needed for a particular sample size was done using the BINOMDIST function in Microsoft Excel®. This statistical function suggests that at least three exceedances need to be observed in a sample of 10 in order to be [about] 95 percent confident that the results statistically exceed the water quality standard more than 10% of the time. For example, there is less statistical confidence associated with a 1 exceedance out of 10 (73 percent) than when there are 3 exceedances out of 10 (93 percent confidence (Table 7).

Table 7. Exceedance Confidence

Number of Samples	Number of Exceedances																
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
10	74%	93%	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**							
12	66%	89%	**97%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**					
14	58%	84%	**96%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**			
16	51%	79%	93%	**98%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	
18	45%	73%	90%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
20	39%	68%	87%	**96%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
22	34%	62%	83%	94%	**98%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
24	29%	56%	79%	91%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
26	25%	51%	74%	89%	**96%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
28	22%	46%	69%	86%	94%	**98%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
30	18%	41%	65%	82%	93%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
32	16%	37%	60%	79%	91%	**96%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
34	13%	33%	55%	75%	88%	**95%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
36	11%	29%	51%	71%	85%	94%	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
38	10%	25%	46%	67%	83%	92%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
40	8%	22%	42%	63%	79%	90%	**96%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
42	7%	20%	38%	59%	76%	88%	**95%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
44	6%	17%	35%	55%	73%	85%	93%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
46	5%	15%	31%	51%	69%	83%	92%	**96%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
48	4%	13%	28%	47%	65%	80%	90%	**95%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
50	3%	11%	25%	43%	62%	77%	88%	94%	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
52	3%	10%	22%	40%	58%	74%	86%	93%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
54	2%	8%	20%	36%	54%	71%	83%	91%	**96%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
56	2%	7%	18%	33%	51%	67%	81%	90%	**95%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
58	2%	6%	16%	30%	47%	64%	78%	88%	94%	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**	**100%**
60	1%	5%	14%	27%	44%	61%	75%	86%	93%	**97%**	**99%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**
62	1%	5%	12%	24%	40%	57%	72%	84%	91%	**96%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**
64	1%	4%	11%	22%	37%	54%	69%	81%	90%	**95%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**	**100%**
66	1%	3%	9%	20%	34%	51%	66%	79%	88%	94%	**97%**	**99%**	**99%**	**100%**	**100%**	**100%**	**100%**
68	1%	3%	8%	18%	31%	47%	63%	76%	86%	93%	**96%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**
70	1%	2%	7%	16%	29%	44%	60%	74%	84%	91%	**96%**	**98%**	**99%**	**100%**	**100%**	**100%**	**100%**
72	0%	2%	6%	14%	26%	41%	57%	71%	82%	90%	**95%**	**97%**	**99%**	**100%**	**100%**	**100%**	**100%**
74	0%	2%	5%	13%	24%	38%	54%	68%	80%	88%	94%	**97%**	**99%**	**99%**	**100%**	**100%**	**100%**
76	0%	1%	5%	11%	22%	35%	51%	65%	77%	86%	93%	**96%**	**98%**	**99%**	**100%**	**100%**	**100%**
78	0%	1%	4%	10%	20%	33%	48%	62%	75%	85%	91%	**95%**	**98%**	**99%**	**100%**	**100%**	**100%**
80	0%	1%	4%	9%	18%	30%	45%	59%	72%	83%	90%	**95%**	**97%**	**99%**	**99%**	**100%**	**100%**

Note: Bold entries indicate that there is at least 95% confidence that at least 10% of the possible samples exceed the standard/action level.

Methods Used to Summarize Results

Methods used to summarize the results in this report encompass both tabular and graphical formats. Individual summary sheets for each station provide details on station location, stream classification, along with specifics on what parameters were measured, the number of samples taken (i.e. sample size), the number of results below reporting levels, the number of results exceeding a water quality standard or evaluation level, statistical confidence that 10% of results exceeded the evaluation level, and a general overview of the distribution of the results using percentiles. These station summary sheets provide the greatest details on a station-by-station basis. They are included as an appendix to this report.

Use Support Assessment Considerations

1) The freshwater dissolved oxygen concentrations of 5.0 and 4.0 mg/L are presented as evaluation levels. Instantaneous concentrations of 4.0 mg/L or less (5.0 mg/L in salt water) are in violation of the standard unless caused by natural (e.g. swampy) conditions. The 5.0 mg/L evaluation level is based upon a freshwater standard which specifies "not less than a daily average of 5.0" (15A NCAC 2B.0200).
2) Action levels are used for copper, iron, and zinc because results include fractions that may have little effect on aquatic life. Where appropriate, follow-up toxicological work may need to be conducted.
3) The geometric mean and median statistics were calculated for fecal coliform results for each station as appropriate for stream class.

Specific information on water quality standards and action levels can be found in 15A NCAC 2B.0200 (August 1, 2004).

PARAMETERS

Dissolved Oxygen

Dissolved oxygen is one of the most important of all the chemical measurements. Dissolved oxygen provides valuable information about the ability of the water to support aquatic life and the capacity of water to assimilate point and nonpoint discharges. Water quality standards for dissolved oxygen vary depending on the classification of the body of water [see, for example: 15A NCAC 02B.0211(1)(b) and 15A NCAC 02B.0220 (1)(b)] but generally results less than 4.0 mg/L can be problematic. Consistent patterns of low concentrations of dissolved oxygen can be subject to intense management review and corrective actions, although patterns of low dissolved oxygen can occur naturally in and near swamp waters.

pH

The pH of natural waters can vary throughout the state. Low values (<< 7.0 s.u.) can be found in waters rich in dissolved organic matter, such as swamp lands, whereas high values (>> 7.0 s.u.) may be found during algal blooms. Point source dischargers can also influence the pH of a stream. The measurement of pH is relatively easy; however the accuracy of field measurements is limited by the abilities of the field equipment, which is generally accurate to within 0.2 S.U. This is due, in part, because the scale for measuring pH is logarithmic (i.e. a pH of 8 is ten times less concentrated in hydrogen ions than a pH of 7).

The water quality standards for pH in freshwaters consider values less than 6.0 s.u. or greater than 9.0 s.u. to warrant attention; whereas in salt waters pH values less than 6.8 or greater than 8.5 warrant attention.

Conductivity

In this report, conductivity is synonymous with specific conductance. It is reported in micromhos per centimeter (µmhos/cm) at 25°C. Conductivity is a measure of the ability of water to conduct an electric

current. The presence of ions and temperature are major factors in the ability of water to conduct a current. Clean freshwater has a low conductivity, whereas high conductivities may indicate polluted water or saline conditions. Measurements reported are corrected for temperature, thus the range of values reported over a period of time indicate the relative presence of ions in water. Conductivities in US fresh waters commonly vary between 50 to 1,500 µmhos/cm (APHA 1998). North Carolina freshwater streams have a natural conductance range of 17-65 µmhos/cm, however (USGS 1992).

Conductivity can be used to evaluate variations in dissolved mineral concentrations (ions) among sites with varying degrees of impact resulting from point source discharges. Generally, impacted sites show elevated and widely ranging values for conductivity. However, water bodies that contain saltwater will also have high conductivities. Therefore those wishing to use conductivity as an indicator for problems must first account for salinity.

Turbidity

Turbidity data may denote episodic high values on particular dates or within narrow time periods. These can often be the result of intense or sustained rainfall events; however elevated values can occur at other times. Tidal surges can also disturb shallow estuarine sediments and naturally increase turbidity.

Metals

A number of metals are essential micronutrients for the support of aquatic life. However, there are threshold concentrations over which metals can be toxic. Currently the DWQ monitors total (not dissolved) concentrations for aluminum, arsenic, cadmium, chromium, copper, iron, lead, mercury, manganese (Water Supply waters only), nickel, and zinc. Aluminum and iron are commonly found in soils.

Nutrients

Compounds of nitrogen and phosphorus are major components of living organisms and thus are essential to maintain life. These compounds are collectively referred to as “nutrients.” Nitrogen compounds include ammonia-nitrogen (NH_3-N), total Kjeldahl nitrogen (TKN) and nitrite+nitrate nitrogen (NO_2+NO_3-N). Phosphorus is measured as total phosphorus. When nutrients are introduced to an aquatic ecosystem from municipal and industrial treatment processes, or runoff from urban or agricultural land, the excessive growth of algae (algal blooms) and other plants may be accelerated.

In addition to the possibility of causing algal blooms, ammonia-nitrogen may combine with high pH water to form NH_4OH, a form toxic to fish and other aquatic organisms.

Fecal Coliform Bacteria

Concentrations of fecal coliform bacteria can vary greatly. The descriptive statistics used to evaluate fecal coliform bacteria data include the geometric mean and the median depending on the classification of the waterbody. For all sites in the Neuse River Basin, the standard specified in Administrative Code 15A NCAC 02B.0211 (3)(e) (August 1, 2005) is applicable:

"Organisms of the coliform group: fecal coliforms shall not exceed a geometric mean of 200/100ml (MF count) based upon at least five consecutive samples examined during any 30 day period, nor exceed 400/100ml in more than 20 percent of the samples examined during such period; violations of the fecal coliform standard are expected during rainfall events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint source pollution; all coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique shall be used as the reference method."

The application of the standard is often hindered because the monthly (*circa* 30 day) sampling frequency employed for water quality monitoring usually does not provide more than one sample per 30-day period. However, water quality problems can be discerned using monthly sampling.

Both SA class and other waters are present in the Neuse River basin. Non-SA class sites where the geometric mean was greater than 200 colonies/100ml, or where greater than 20 percent of the results exceed 400 colonies/100ml are indicated on the respective station summary sheets. Likewise, SA class sites where the median exceeds 14 colonies/100ml or where greater than 10 percent of the results exceed 43 colonies/100ml are indicated on the sheets.

In addition to sampling done in the ambient monitoring program, bacterial samples are also collected by the N.C. Recreational Water Quality Program (NCRWQP). The NCRWQP began testing coastal waters in 1997. Their mission is to protect the public health by monitoring the quality of N.C.'s coastal recreational waters and notifying the public when bacteriological standards for safe bodily contact are exceeded. The coastal waters monitored include the ocean beaches, sounds, bays and estuarine rivers.

The NCRWQP tests for enterococcus bacteria, an indicator organism found in the intestines of warm-blooded animals. While it will not cause illness itself, its presence is correlated with that of organisms that can cause illness. The program tests 241 ocean and sound-side areas, most of them on a weekly basis. Swimming season runs from April 1 to Sept. 30 - all ocean beaches and high-use sound-side beaches are tested weekly. Lower-use beaches are tested twice a month. All sites are tested twice a month in October and monthly from November through March.

In November 2004 the EPA promulgated a national rule for bacteria in recreational waters. Instead of a rule for fecal coliform as a group, they chose to specifically target Enterococci and E. coli. EPA listed geomeans for E. coli in freshwater, and for Enterococci in both fresh and saltwater. Four levels of single sample maximum allowable densities were also given for those three (freshwater Enterococci, saltwater Enterococci, and freshwater E. coli) categories. The NCRWQP fully complies with the requirements of the national bacteria rule.

Table 8. Summary of Evaluation Level Exceedances at DWQ Stations (1 of 2)

Subbasin / Station	Class	Percentage of Results that Exceeded the Evaluation Limit Stations With Less Than 10 Measurements Were Not Evaluated																	
		Dissolved Oxygen (<5)[1]	Dissolved Oxygen (<4)[2]	pH (combined)[3]	Water Temperature	Chlorophyll A	Turbidity	Nitrate	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc	Fecal Coliform
1																			
J0770000	WS-IV NSW	0%	0%	5%	0%	BT	3%	0%	0%	0%	0%	0%	**11%**	0%	0%	0%	0%	0%	18%
J0810000	WS-IV NSW	5%	2%	0%	0%	BT	7%	0%	0%	0%	0%	0%	**17%**	0%	**17%**	0%	0%	0%	16%
J0820000	WS-II NSW CA	2%	2%	3%	0%	BT	9%	0%	0%	0%	0%	0%	**16%**	0%	**11%**	0%	0%	0%	16%
J0840000[1]	WS-II NSW CA	13%	6%	0%	0%	BT	0%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	0%
J1070000	WS-III NSW	5%	2%	0%	0%	BT	5%	0%	0%	0%	0%	0%	**28%**	0%	6%	0%	0%	0%	13%
J1100000	WS-IV NSW	36%	**23%**	0%	0%	BT	0%	0%	0%	0%	0%	0%	**22%**	6%	**50%**	0%	0%	0%	0%
J1210000	WS-IV NSW CA	0%	0%	2%	0%	BT	0%	2%	0%	0%	0%	**11%**	**22%**	0%	**33%**	0%	0%	**28%**	18%
J1330000	WS-IV NSW CA	0%	0%	0%	0%	BT	9%	0%	0%	0%	0%	6%	6%	0%	6%	0%	0%	**28%**	**25%**
2																			
J1890000	WS-IV NSW	0%	0%	0%	0%	BT	0%	0%	0%	0%	0%	0%	6%	6%	BT	0%	0%	0%	0%
J2850000	B NSW	9%	6%	0%	0%	BT	9%	NA	0%	0%	0%	6%	**56%**	0%	NA	0%	0%	**11%**	6%
J3000000	B NSW	0%	0%	0%	0%	BT	**11%**	NA	0%	0%	0%	0%	**50%**	0%	NA	0%	0%	**17%**	10%
J3251000	C NSW	4%	0%	4%	0%	BT	9%	NA	0%	0%	0%	0%	**61%**	0%	NA	0%	0%	**11%**	**26%**
J3300000	C NSW	4%	2%	0%	0%	BT	7%	NA	0%	0%	0%	**67%**	**11%**	0%	NA	0%	0%	**28%**	**76%**
J4170000	*WS-IV NSW*	0%	0%	0%	0%	BT	**12%**	0%	0%	0%	0%	**11%**	**42%**	0%	**26%**	0%	0%	0%	18%
J4370000	WS-V NSW	0%	0%	0%	0%	BT	**11%**	0%	0%	0%	0%	**11%**	**56%**	0%	**22%**	0%	0%	0%	16%
J4510000	C NSW	5%	0%	2%	0%	BT	2%	NA	0%	0%	0%	0%	**95%**	0%	0%	0%	0%	0%	9%
3																			
J5000000	C NSW	2%	0%	0%	0%	BT	2%	NA	0%	0%	0%	0%	**90%**	0%	NA	0%	0%	5%	9%
5																			
J5970000	C NSW	2%	0%	3%	0%	0%	5%	NA	0%	0%	0%	0%	**79%**	0%	NA	0%	0%	0%	7%
J6150000	C NSW	3%	1%	5%	0%	2%	0%	NA	0%	0%	0%	0%	**85%**	0%	NA	0%	0%	**15%**	2%
6																			
J5850000	*WS-V NSW*	9%	4%	4%	0%	BT	4%	0%	0%	0%	0%	0%	**89%**	0%	**11%**	0%	0%	6%	9%
7																			
J6740000	WS-V NSW	10%	7%	0%	0%	BT	0%	0%	0%	0%	0%	0%	**79%**	0%	**37%**	0%	0%	0%	0%
J7450000	C Sw NSW	NA	NA	0%	0%	0%	0%	NA	0%	0%	0%	0%	**90%**	0%	NA	0%	0%	0%	3%
J7739550	C Sw NSW	NA	NA	0%	0%	2%	0%	NA	0%	0%	0%	0%	**90%**	0%	NA	0%	0%	0%	5%
J7810000	C Sw NSW	NA	NA	2%	0%	0%	0%	NA	0%	0%	0%	0%	**100%**	0%	NA	0%	0%	5%	7%
8																			
J7850000	*C Sw NSW*	NA	NA	0%	0%	0%	0%	NA	0%	0%	0%	0%	**80%**	0%	NA	0%	0%	0%	2%
J7860000	C Sw NSW	NA	NA	3%	0%	0%	2%	NA	0%	0%	0%	0%	**70%**	0%	NA	0%	0%	0%	2%
J7930000	C Sw NSW	NA	NA	2%	0%	0%	0%	NA	0%	0%	0%	0%	**68%**	0%	NA	0%	0%	0%	2%
J8250000	SC Sw NSW	NA	NA	3%	0%	0%	3%	NA	0%	0%	0%	**10%**	NA	0%	NA	0%	0%	0%	2%
J8270000	SC Sw NSW	NA	NA	3%	2%	BT	BT	NA	BT	BT	BT	BT	NA	BT	BT	BT	BT	BT	BT
J8290000	SC Sw NSW	NA	NA	3%	0%	4%	3%	NA	0%	0%	0%	**15%**	NA	0%	NA	0%	0%	0%	2%
9																			
J8150000	C Sw NSW	NA	NA	2%	0%	2%	2%	NA	5%	0%	0%	0%	**63%**	0%	NA	0%	0%	0%	14%
J8210000	SC Sw NSW	NA	NA	2%	0%	6%	3%	NA	0%	0%	0%	**15%**	NA	0%	NA	0%	0%	0%	3%
J8230000	SC Sw NSW	NA	NA	0%	0%	BT	0%	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT

Notes:

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Table 8 (Continued). Summary of Evaluation Level Exceedances at DWQ Stations (2 of 2)

Subbasin / Station	Class	Percentage of Results that Exceeded the Evaluation Limit																	
		Dissolved Oxygen (<5)[1]	Dissolved Oxygen (<4)[2]	pH (combined)[3]	Water Temperature	Chlorophyll A	Turbidity	Nitrate	Arsenic	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc	Fecal Coliform
10																			
J8570000	SC Sw NSW	NA	NA	6%	0%	**15%**	0%	NA	0%	0%	0%	**35%**	NA	0%	NA	0%	0%	0%	8%
J8900800	SC Sw NSW	NA	NA	3%	0%	0%	9%	NA	0%	0%	0%	**15%**	NA	0%	NA	0%	0%	0%	0%
J8902500	SB Sw NSW	NA	NA	3%	0%	**16%**	0%	NA	5%	0%	0%	**15%**	NA	0%	NA	0%	0%	5%	0%
J8903500	SB Sw NSW	NA	NA	**17%**	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J8903600	SB Sw NSW	NA	NA	**13%**	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J8910000	SB Sw NSW	NA	NA	**16%**	2%	**14%**	0%	NA	0%	0%	0%	**24%**	NA	0%	NA	0%	0%	0%	0%
J8920000	SB Sw NSW	NA	NA	10%	2%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J8925000	SB Sw NSW	NA	NA	10%	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9431500	SB Sw NSW	NA	NA	10%	2%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9530000	SA NSW	0%	NA	10%	0%	**11%**	0%	NA	0%	0%	0%	**20%**	NA	0%	NA	0%	0%	0%	0%
J9540000	SA NSW	0%	NA	8%	2%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9590000	SA NSW	0%	NA	**10%**	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9685000	SA NSW	0%	NA	7%	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9690000	SA HQW NSW	**21%**	NA	**23%**	2%	8%	7%	NA	0%	0%	0%	**21%**	NA	0%	NA	0%	0%	5%	**75%**
J9810000	SA NSW	0%	NA	5%	0%	**11%**	0%	NA	0%	0%	0%	**16%**	NA	0%	NA	0%	0%	5%	0%
J9860000	SA NSW	0%	NA	2%	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9900000	SA NSW	0%	NA	2%	0%	BT	BT	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
11																			
J8690000	C Sw NSW	NA	NA	0%	0%	0%	0%	NA	0%	0%	0%	0%	**11%**	0%	NA	0%	0%	0%	7%
J8730000	C Sw NSW	NA	NA	0%	0%	BT	BT	NA	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	BT
J8770000	SB Sw NSW	NA	NA	3%	2%	2%	0%	NA	0%	0%	0%	0%	0%	0%	NA	0%	0%	0%	2%
13																			
J9950000	SA NSW	0%	NA	4%	0%	2%	0%	NA	0%	0%	0%	6%	NA	0%	NA	0%	0%	0%	8%
14																			
J9930000	SA NSW	0%	NA	4%	0%	0%	0%	NA	0%	6%	0%	0%	NA	0%	NA	0%	0%	0%	0%
J9938000[2]	SA NSW	0%	NA	7%	0%	BT	0%	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	BT
J9940000[2]	SA NSW	0%	NA	0%	0%	BT	0%	NA	BT	BT	BT	BT	NA	BT	NA	BT	BT	BT	6%

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[3] If both the maximum pH (9, or 8.5 for saltwater) and the minimum pH (6, or 6.8 for saltwater) were exceeded at a site, the total of the two is displayed.

Table 9. Summary of Evaluation Level Exceedances at LNBA Stations (1 of 2)

Subbasin / Station	Class	Percentage of Results that Exceeded the Evaluation Limit Stations With Less Than 10 Measurements Were Not Evaluated															
		Dissolved Oxygen (<5)[1]	Dissolved Oxygen (<4)[2]	pH (combined)[3]	Water Temperature	Turbidity	Chlorophyll A	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc	Fecal Coliform
2																	
J2230000	C NSW	1%	0%	0%	0%	2%	BT	0%	3%	5%	**62%**	0%	NA	0%	3%	5%	20%
J2330000	C NSW	2%	0%	0%	0%	3%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	8%
J2360000	C NSW	13%	1%	0%	0%	2%	0%	BT	BT	BT	BT	BT	NA	BT	BT	BT	12%
J3210000	C NSW	12%	2%	0%	0%	3%	BT	0%	0%	3%	**51%**	0%	NA	0%	0%	3%	18%
J3470000	C NSW	5%	0%	0%	0%	0%	BT	3%	0%	**11%**	**37%**	0%	NA	0%	0%	5%	**29%**
J3970000	C NSW	2%	0%	0%	0%	8%	BT	0%	0%	**10%**	**85%**	2%	NA	0%	0%	7%	15%
J4050000	C NSW	2%	0%	0%	0%	7%	BT	0%	0%	**16%**	**58%**	0%	NA	0%	0%	0%	11%
J4080000	C NSW	0%	0%	0%	0%	3%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	18%
J4130000	WS-V NSW	0%	0%	0%	0%	6%	BT	0%	0%	5%	**42%**	0%	**16%**	0%	0%	**11%**	16%
J4170000	WS-IV NSW	2%	0%	0%	0%	3%	BT	0%	0%	5%	**40%**	0%	**14%**	0%	2%	2%	11%
J4190000	WS-IV NSW	1%	0%	0%	0%	7%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	14%
J4414000	WS-III NSW	7%	0%	0%	0%	2%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	15%
J5250000	WS-IV NSW	5%	0%	0%	0%	5%	BT	0%	0%	5%	**64%**	0%	**14%**	2%	0%	2%	12%
3																	
J4590000	C NSW	1%	0%	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	3%
J4620000	C NSW	14%	6%	2%	0%	3%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	**33%**
J4690000	C NSW	1%	0%	1%	0%	8%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	**25%**
J4870000	C NSW	5%	0%	1%	0%	3%	BT	2%	0%	5%	**71%**	0%	NA	2%	0%	9%	**21%**
J4980000	C NSW	4%	0%	1%	0%	2%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	13%
J5010000	C NSW	1%	0%	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	7%
J5185000	C NSW	11%	4%	1%	3%	2%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	8%
4																	
J5170000	C NSW	39%	**23%**	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	BT
J5390000	C NSW	21%	0%	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	16%
J5390800	C NSW	39%	**39%**	0%	0%	5%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	16%
J5400000	C NSW	47%	**37%**	9%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	10%
5																	
J6010950	C NSW	22%	7%	14%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	2%
J6024000	C NSW	8%	1%	0%	0%	2%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	8%
J6044500	WS-IV Sw NSW	NA	NA	0%	0%	3%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	12%
J6055000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	8%
J6150000	C NSW	8%	1%	0%	1%	3%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	5%
J6250000	C NSW	14%	7%	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	15%
J6340000	C NSW	30%	**17%**	0%	0%	3%	BT	0%	0%	0%	**88%**	0%	NA	0%	0%	3%	6%
J6370000	C NSW	3%	0%	0%	0%	0%	BT	0%	0%	4%	**65%**	BT	NA	BT	BT	BT	0%

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Table 9 (Continued). Summary of Evaluation Level Exceedances at LNBA Stations (2 of 2)

Subbasin / Station	Class	Percentage of Results that Exceeded the Evaluation Limit (Stations With Less Than 10 Measurements Were Not Evaluated)															
		Dissolved Oxygen (<5)[1]	Dissolved Oxygen (<4)[2]	pH (combined)[3]	Water Temperature	Turbidity	Chlorophyll A	Cadmium	Chromium	Copper	Iron	Lead	Manganese	Mercury	Nickel	Zinc	Fecal Coliform
6																	
J5620000	WS-II HQW NSW	38%	**28%**	5%	2%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	7%
J5630000	WS-II HQW NSW	90%	**80%**	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	10%
J5690000	WS-V NSW	13%	5%	1%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	7%
J5730000	WS-V NSW	3%	0%	0%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	14%
J5730300	WS-V NSW	28%	6%	0%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	8%
J5750000	WS-V NSW	7%	0%	0%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	5%
J5900000	WS-IV NSW	4%	0%	2%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	5%
J5930000	WS-IV NSW	4%	0%	1%	0%	0%	BT	BT	BT	BT	BT	BT	BT	BT	BT	BT	5%
7																	
J6410000	C NSW	6%	0%	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	**20%**
J6450000	C NSW	25%	7%	2%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	13%
J6500000	C NSW	20%	7%	1%	0%	2%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	8%
J6680000	C NSW	48%	**27%**	5%	0%	2%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	8%
J6764000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	2%
J6890000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	15%
J7210000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	**12%**
J7240000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	7%
J7325000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	7%
J7330000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	14%
J7690000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	**20%**
J7740000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	15%
8																	
J7850000	C Sw NSW	NA	NA	0%	0%	0%	BT	BT	BT	BT	BT	BT	NA	BT	BT	BT	3%
10																	
J8870000	SB Sw NSW	NA	NA	1%	1%	3%	3%	BT	BT	BT	BT	BT	NA	BT	BT	BT	12%
J9330000	SC Sw NSW	NA	NA	0%	2%	9%	4%	BT	BT	BT	BT	BT	NA	BT	BT	BT	16%

Notes:

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THE MODMON PROGRAM

The ModMon Program is a collaborative monitoring program coordinated by the UNC Institute of Marine Science and funded by DENR. It collects data in the Neuse River estuary at fifteen stations. ModMon collects data on nutrient and chlorophyll concentrations, as well as standard water quality measurements. Five of the ModMon sites are also currently monitored by DWQ. A comparison of chlorophyll data shows that ModMon data from these stations is comparable to DWQ's data. The ModMon program greatly increases the total number of observations made in the Neuse Estuary, which improves the versatility and strength of the data set in this critical area. In addition, the ModMon data provides a data set that the DWQ data set can be compared with to assure data quality.

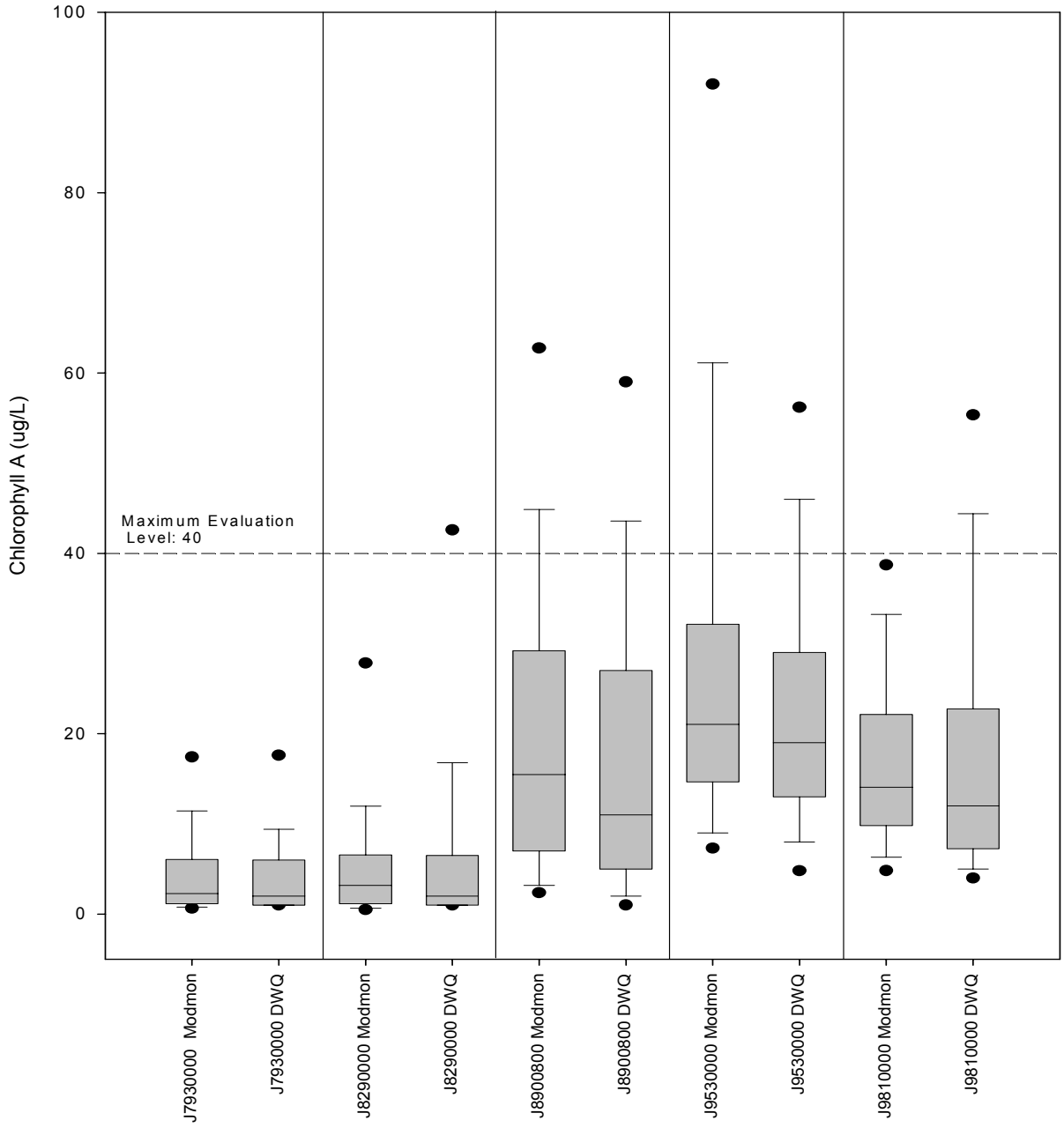
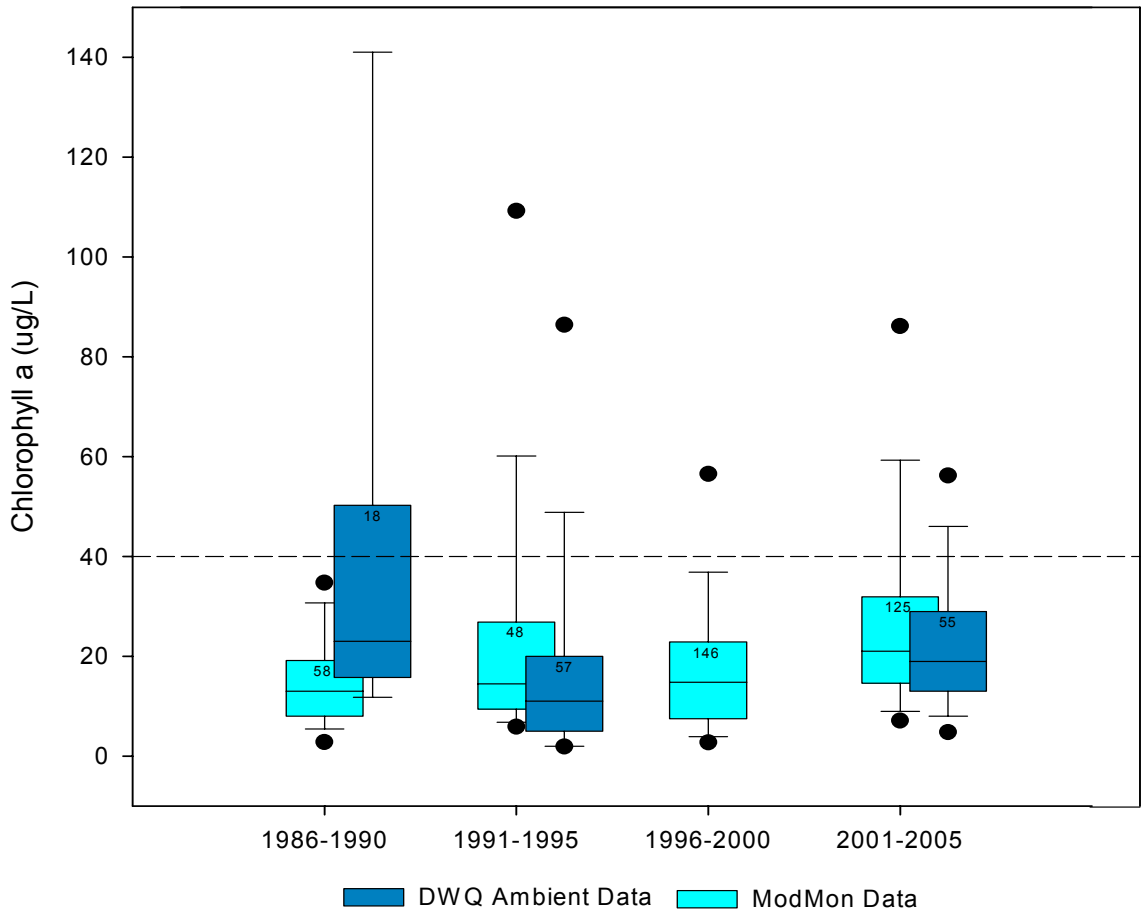


Figure 3. A Comparison of DWQ and ModMon chlorophyll a data in the Neuse River Estuary, 2000-2005.

Chlorophyll a in the Neuse River Estuary

Several high-profile fish kills took place in the Neuse Estuary in the period 1991-1995, which brought attention to such issues as nutrient loading, Pfiesteria, low dissolved oxygen levels, and algal blooms. Algal blooms and low dissolved oxygen levels can be a significant factor in the occurrence of fish kills. Consequently, chlorophyll a concentrations (as a surrogate for algal population size) are of great interest. In 1999 and 2001, the first phase and second phases of a Total Maximum Daily Load (TMDL) for total nitrogen on the Neuse River was implemented. The goal of the TMDL is to reduce chlorophyll a concentrations by way of reducing total nitrogen imputs. The target of the TMDL is to reduce total nitrogen enough that chlorophyll a concentrations no longer violate the standard.

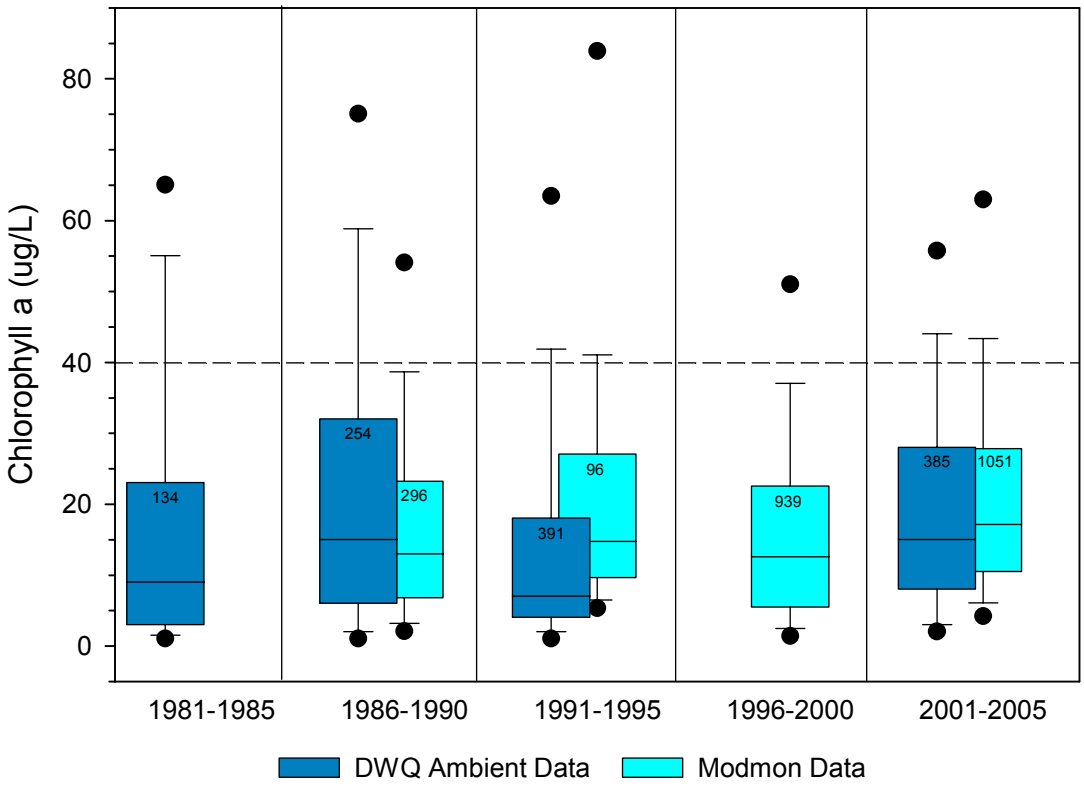
Chlorophyll a concentration data from 1981 to 2005 were analyzed to evaluate whether conditions are remaining the same, improving, or worsening. Each individual station in the Neuse River Estuary was tested for trends, as well as viewed in stepwise fashion in five-year sets. Figure 4 is an example from station J9530000.



Notes: Numbers within the box plots indicate the number of samples in each set. The DWQ data is composed of results beginning in 1989 at Station J9530000, in the Neuse Estuary near Minnesott Beach. The ModMon data is composed of results from the same location beginning in 1986. DWQ data from the period 1996-2000 was excluded due to errors in the analytical method used during that time. The ModMon samples were grabbed from approximately 0.2 meters below the surface. The DWQ samples were taken as composites of the water column from the surface to twice the secci depth.

Figure 4. A comparison of DWQ and ModMon chlorophyll at J9530000.

Of the 25 datasets collected between ModMon and DWQ, two show a decreasing trend, eight show an increasing trend, and 17 show no linear trend. Viewed as a group, no significant trend was identified. Stepwise analysis generally did not indicate large shifts. When viewed in five-year distribution periods or through linear trend analysis, chlorophyll concentrations in the Neuse Estuary do not appear to have changed significantly during in the past 25 years. Non-linear trends were not evaluated. Figure 5 summarizes the chlorophyll data collected by DWQ and ModMon over this period.



Notes: Numbers within the box plots indicate the number of samples in each set. The DWQ data is composed of results from eight stations located on the main stem of the Neuse River, downstream of the narrows (the Neuse River estuary). The ModMon data is composed of results from eleven stations also located in the Neuse River estuary. There is no ModMon data for the period 1981-1985. DWQ data from the period 1996-2000 was excluded due to errors in the analytical method used during that time.

Figure 5. A comparison of DWQ and ModMon chlorophyll a data in the Neuse River Estuary, 1981-2005.

WATER QUALITY PATTERNS IN THE NEUSE RIVER BASIN

Box and whisker plots, scatterplots, and maps were used to depict data for a variety of water quality parameters throughout the basin. While graphs portray information visually, specific and accurate details can only be conveyed in tables. Individual station summary sheets should be consulted when exact information is needed. For the box plots, stations with fewer then 10 data points for a given parameter were not included.

Box and whisker plots were generated for each station for each water quality parameter that has an evaluation level, plus specific conductance, total nitrate/nitrite, total kjeldahl nitrogen, total ammonia, and total phosphorus. Maps were also generated for parameters with the most exceedances. In addition, a series of change over time graphs were generated which divided the basin into four subregions, in order to observe basic regional differences that might be present in this large basin.

Regional Trends and Comparisons

The basin was divided into four subregions as follows: Upper Neuse: subbasins one through four, Upper Middle Neuse: subbasins five through seven, Lower Middle Neuse: subbasins eight, nine and eleven, and Lower Neuse: subbasins ten, thirteen, and fourteen. These groupings were chosen in order to create the least scatter among each group based on geography. The probability that the linear model explains the data no better then chance (Prob > F) and the percentage of variance explained by the linear model ($r^{2)}$ values are included for each subregion. If there was a significant linear trend for a subregion, that trend is shown and the Prob > F and r^2 values for that subregion is bolded.

Comparisons of the four subregions yielded the following:

- During the summer and fall, dissolved oxygen levels tended to drop much farther in stations located in the Lower Middle and Upper Middle Neuse, then in the Upper or Lower Neuse.
- pH values in the Lower Neuse stations averaged about 8, whereas in the rest of the basin they average about 7.
- Specific conductivity is much higher in the Lower Neuse stations, due to higher salinity.
- Nitrate/nitrite concentrations are trending upwards in the Lower Middle Neuse stations, whereas there are no significant trends for nitrate/nitrite in the rest of the basin's stations.
- Phosphorus concentrations are trending downward in the Lower Middle Neuse stations, whereas there are no significant trends for phosphorus in the rest of the basin's stations.
- Ammonia concentrations are trending downward in the Lower, Lower Middle, and Upper Neuse stations.
- Total kjeldahl nitrogen concentrations are trending upward in the Lower Neuse stations, whereas there are no significant trends for total kjeldahl nitrogen in the rest of the basin's stations.
- Chlorophyll a concentrations tend to be highest in the Lower Neuse stations. Chlorophyll a is trending downward in the Lower Middle Neuse stations, whereas there are no significant trends for Chlorophyll a in the rest of the basin's stations.
- Fecal coliform concentrations tend to be highest in the Upper Neuse stations, and lowest in the Lower Neuse stations.

In general, problem areas were scattered throughout the basin. 85% of stations in the Upper Neuse, 65% of stations in the Upper Middle Neuse, 67% of stations in the Lower Middle Neuse, and 52% of stations in the Lower Neuse were observed to have at least one 10% violation. In the Upper Neuse, the most common violations were for total iron, total manganese, total copper, and total zinc. In the Upper Middle Neuse, the most common violation was for dissolved oxygen. In the Lower Middle Neuse, the only violations were for total iron and total copper. In the Lower Neuse, the most common violation was for chlorophyll a.

Many significant trends ($p < 0.05$) for individual stations were identified over the monitoring period for various parameters. Scatterplots over time of stations with three or more negative trends are included in Appendix B. Among these eight stations, the most common trends are increasing nutrient concentrations, and increasing turbidity. Prob > F and r^2 values are included on the time graphs.

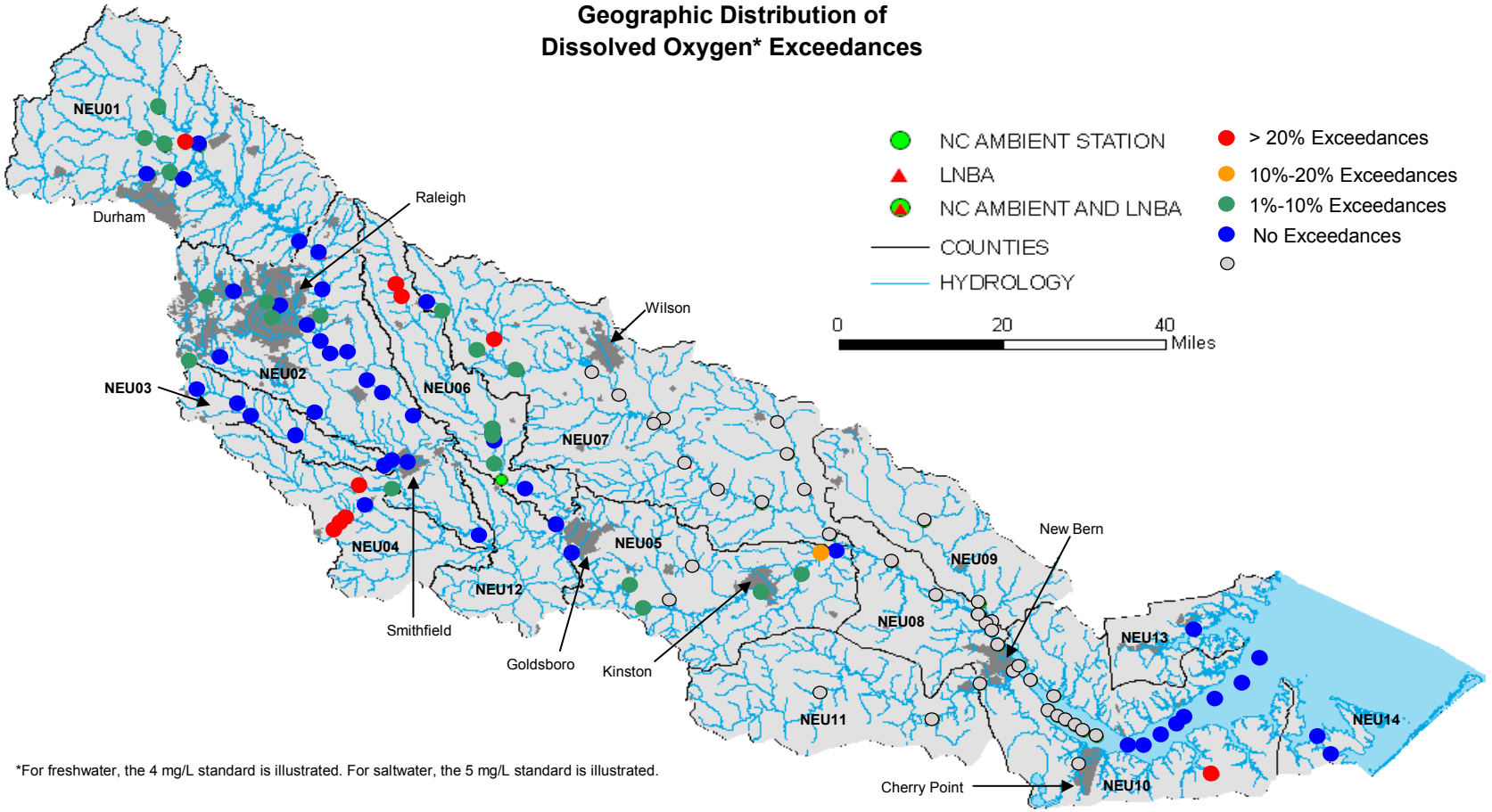


Figure 6. Dissolved Oxygen in the Neuse River Basin

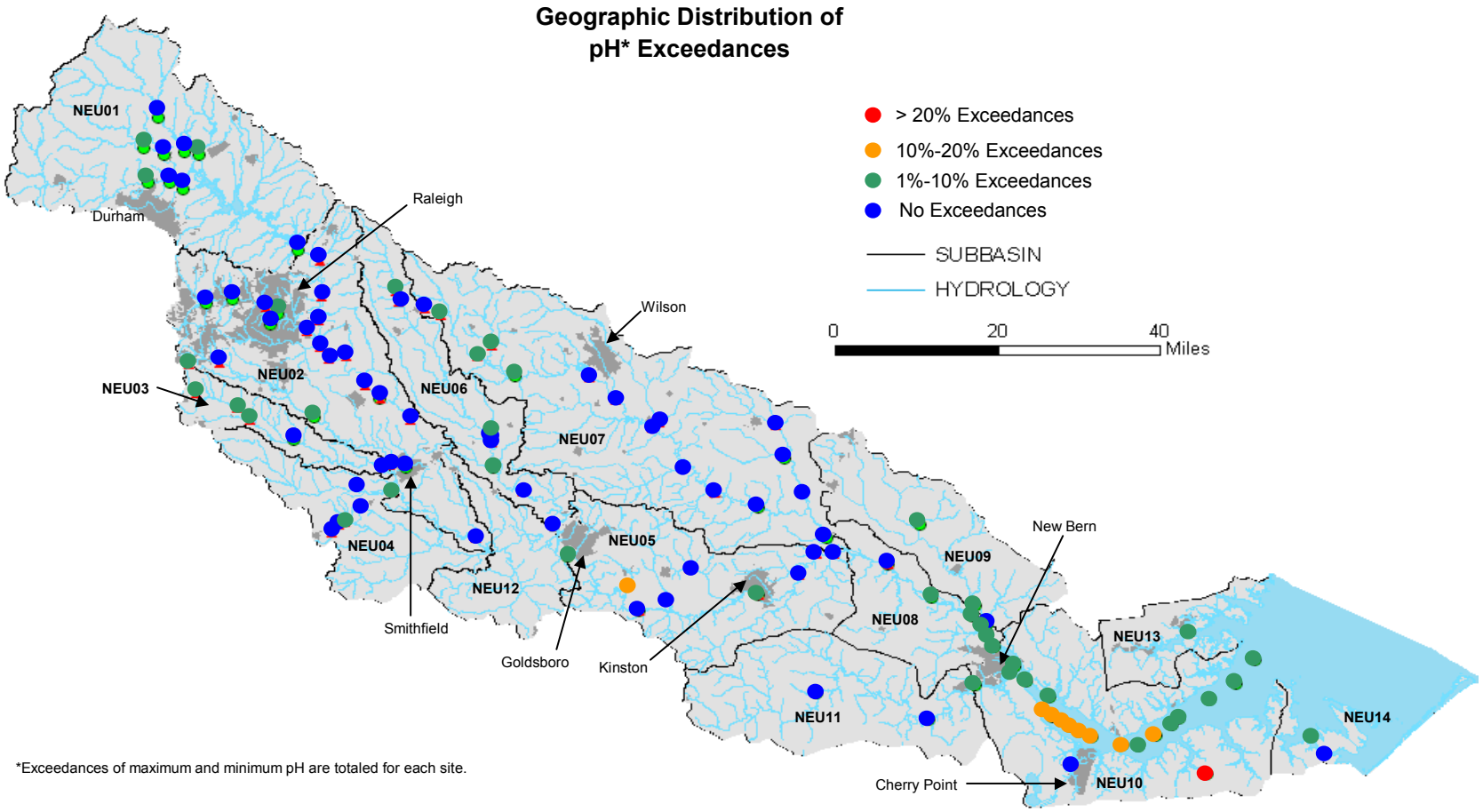


Figure 7. pH in the Neuse River Basin

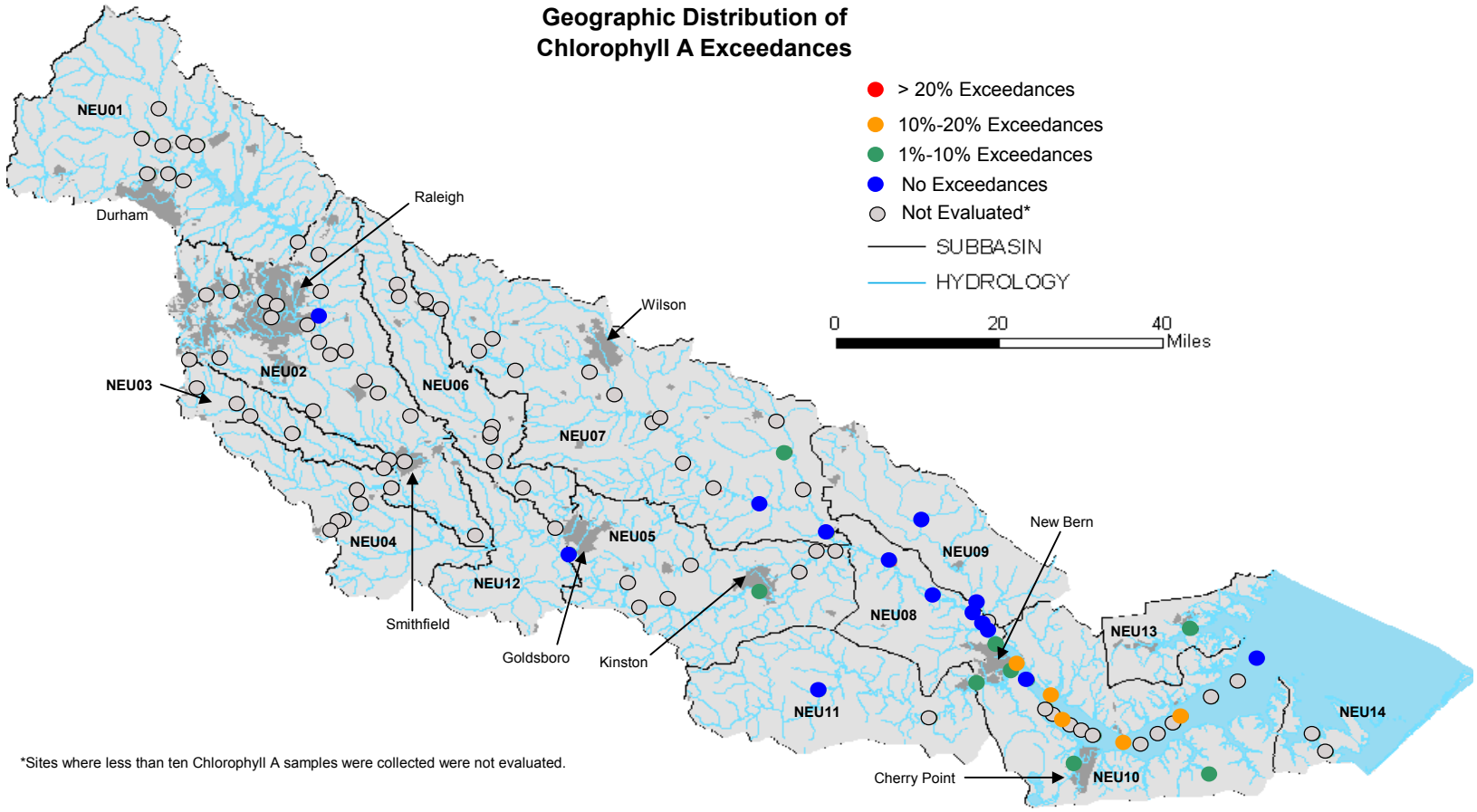


Figure 8. Chlorophyll A in the Neuse River Basin

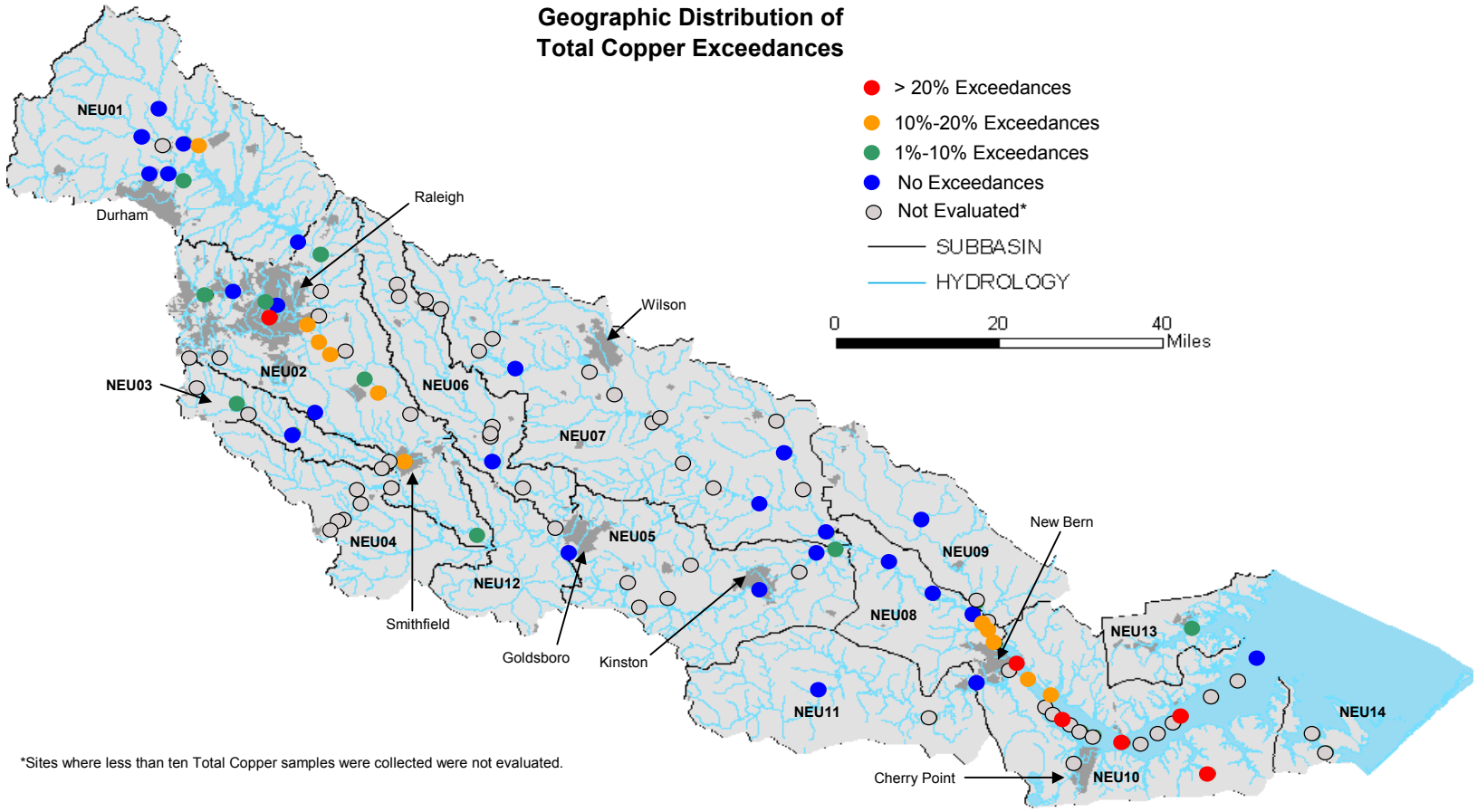


Figure 9. Total Copper in the Neuse River Basin

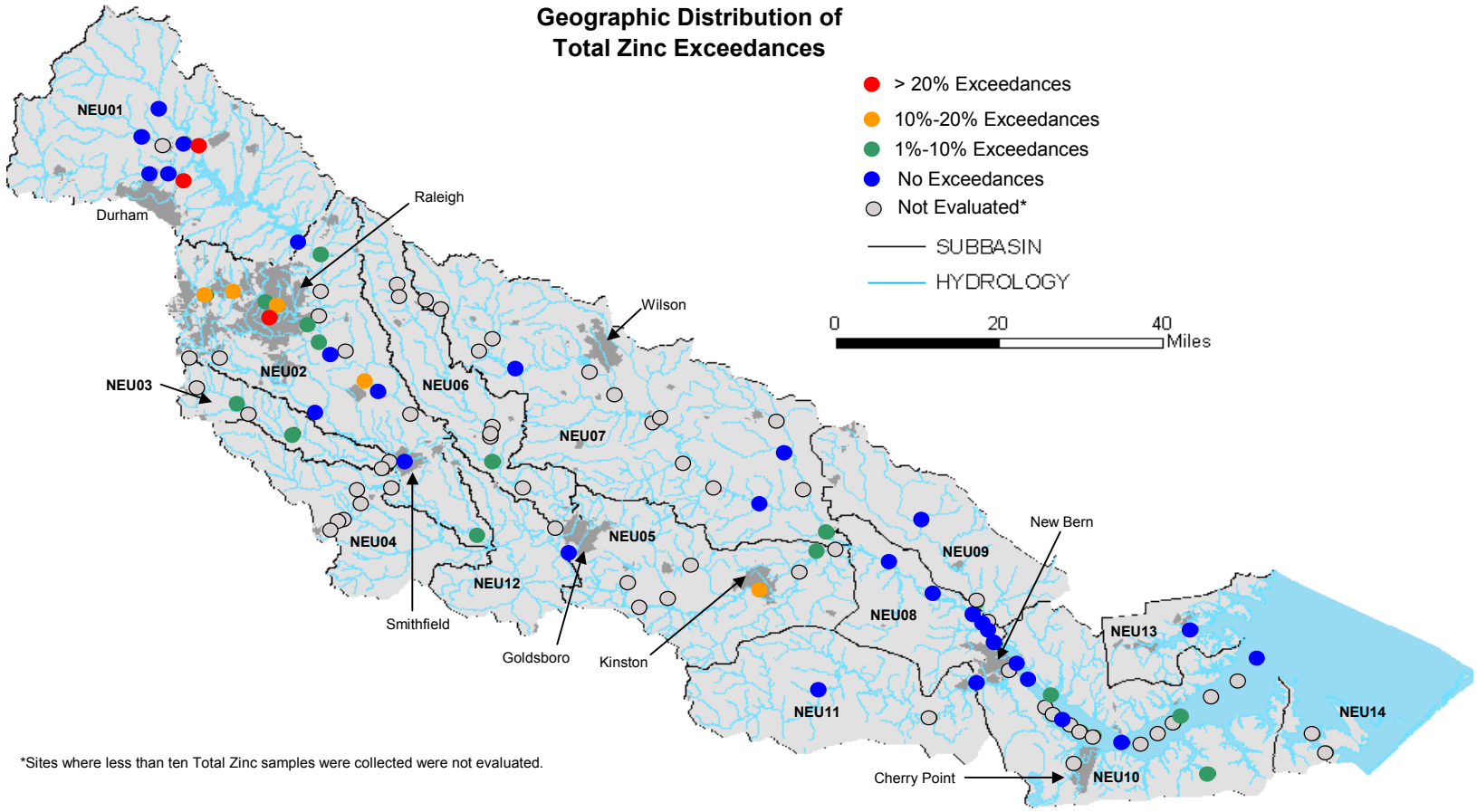


Figure 10. Total Zinc in the Neuse River Basin

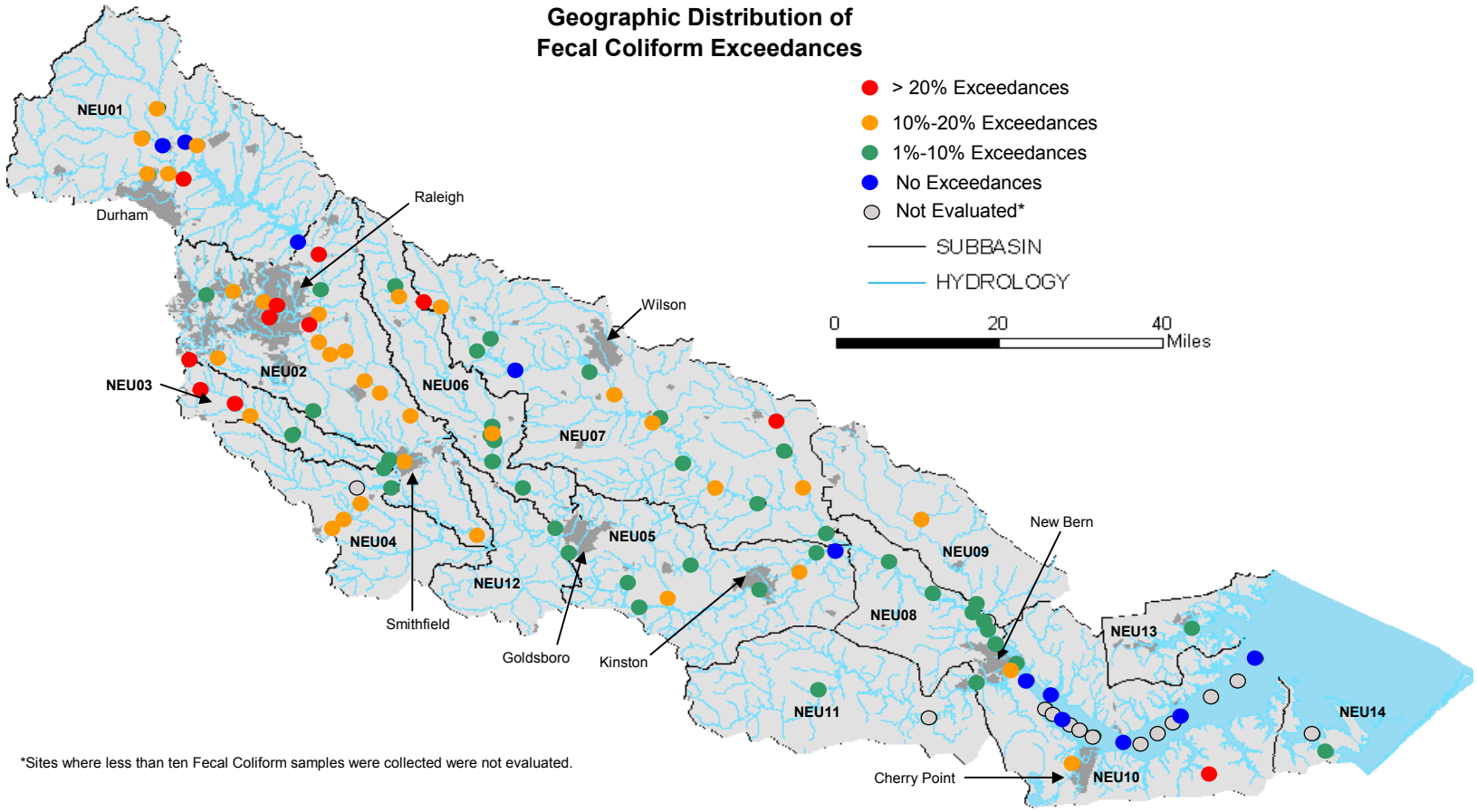
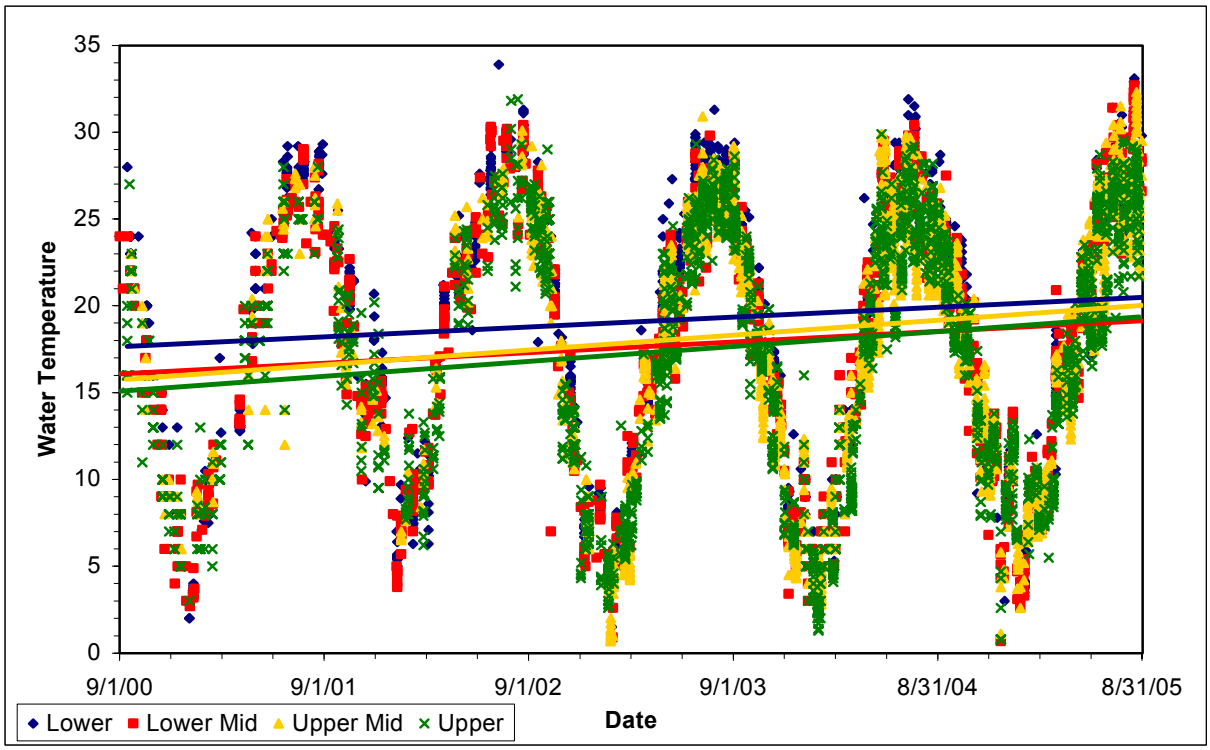
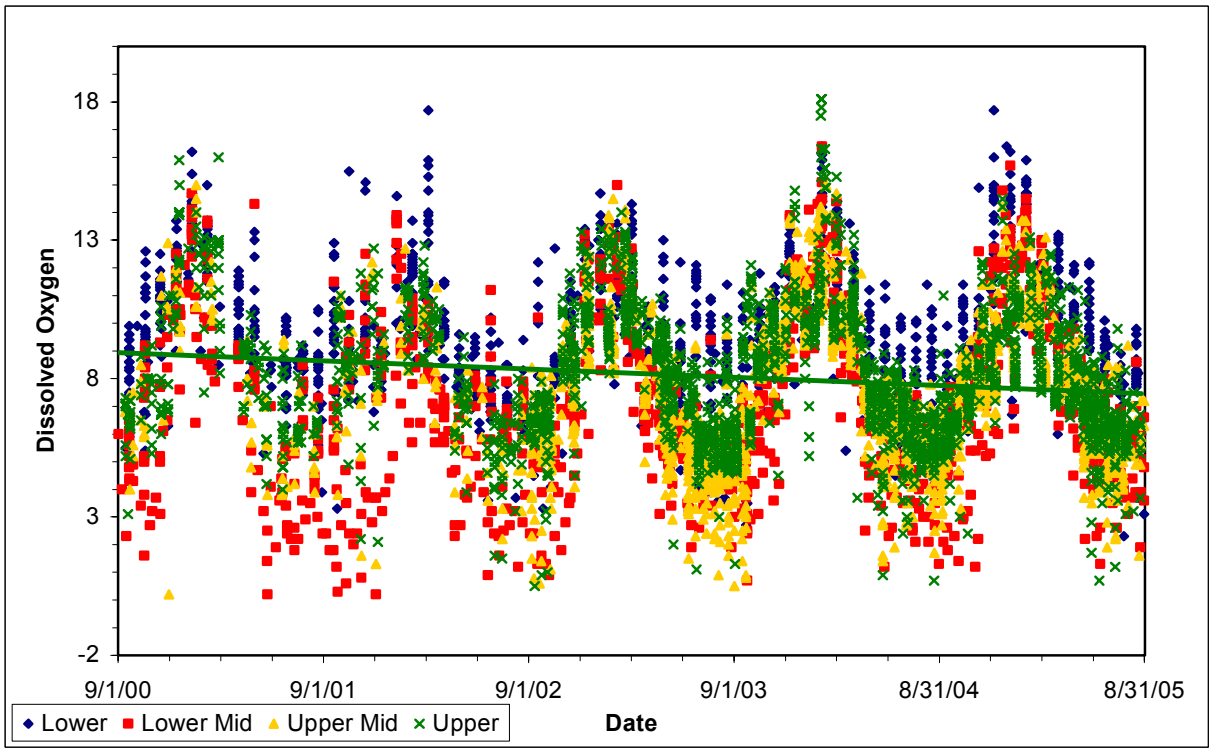


Figure 11. Fecal Coliform in the Neuse River Basin

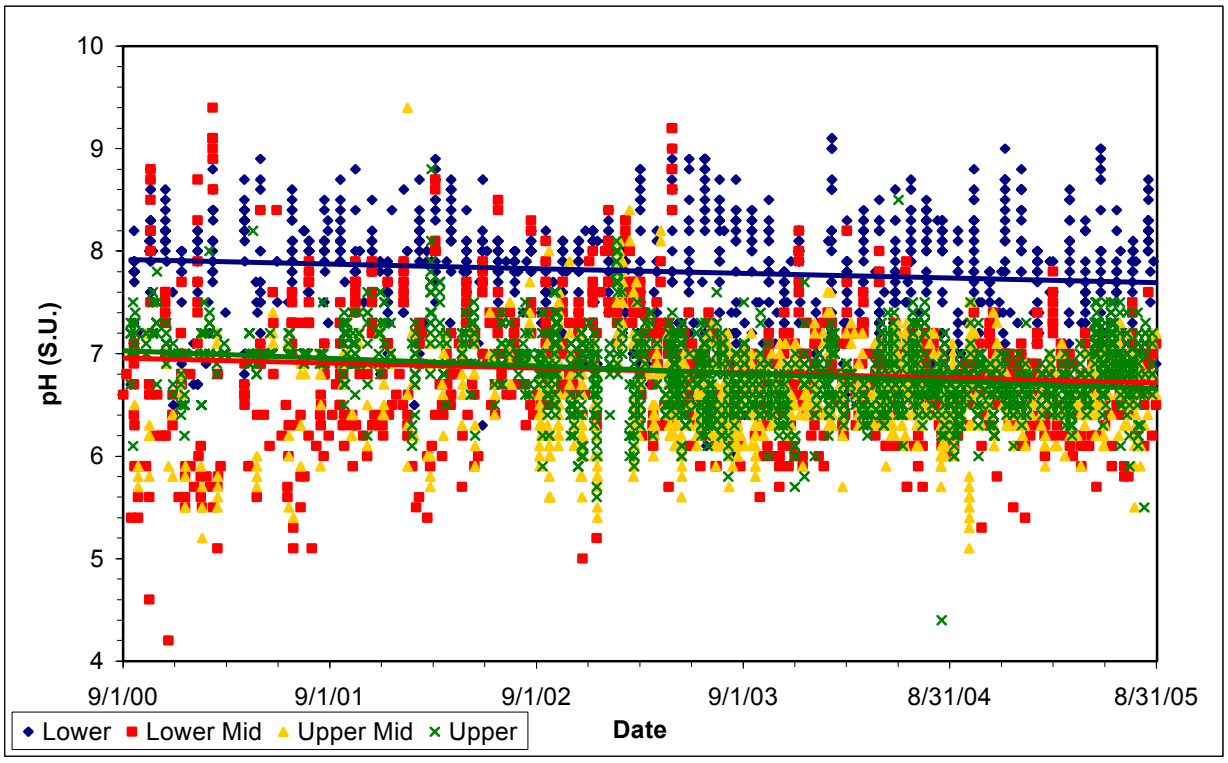


Lower	Prob > F: **0.0006**	R^2: **0.0087**		Upper Mid	Prob > F: **<0.0001**	R^2: **0.0167**	
Lower Mid	Prob > F: **0.0002**	R^2: **0.0112**		Upper	Prob > F: **<0.0001**	R^2: **0.022**	

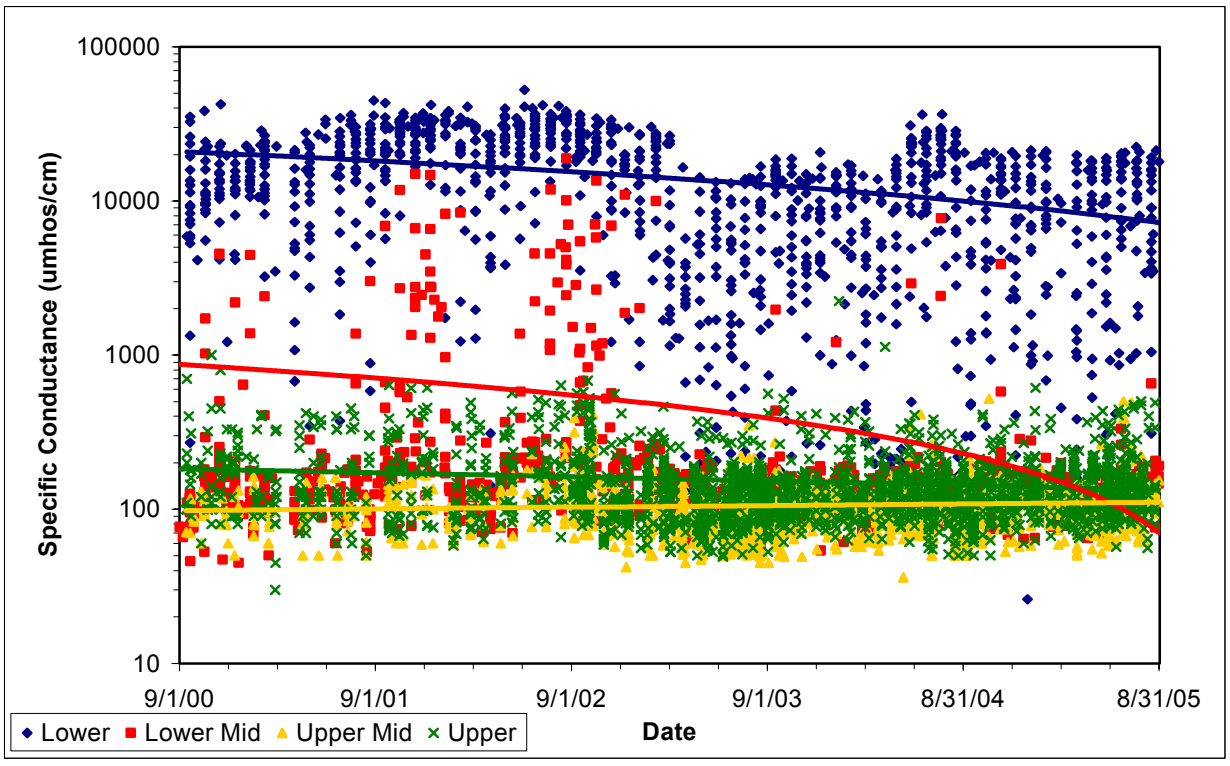


Lower	Prob > F: 0.4474	R^2: -0.0003		Upper Mid	Prob > F: 0.1564	R^2: 0.0006	
Lower Mid	Prob > F: 0.0622	R^2: 0.0022		Upper	Prob > F: **<0.0001**	R^2: **0.0230**	

Figure 12. Water Temperature and Dissolved Oxygen over time in the Neuse River Basin

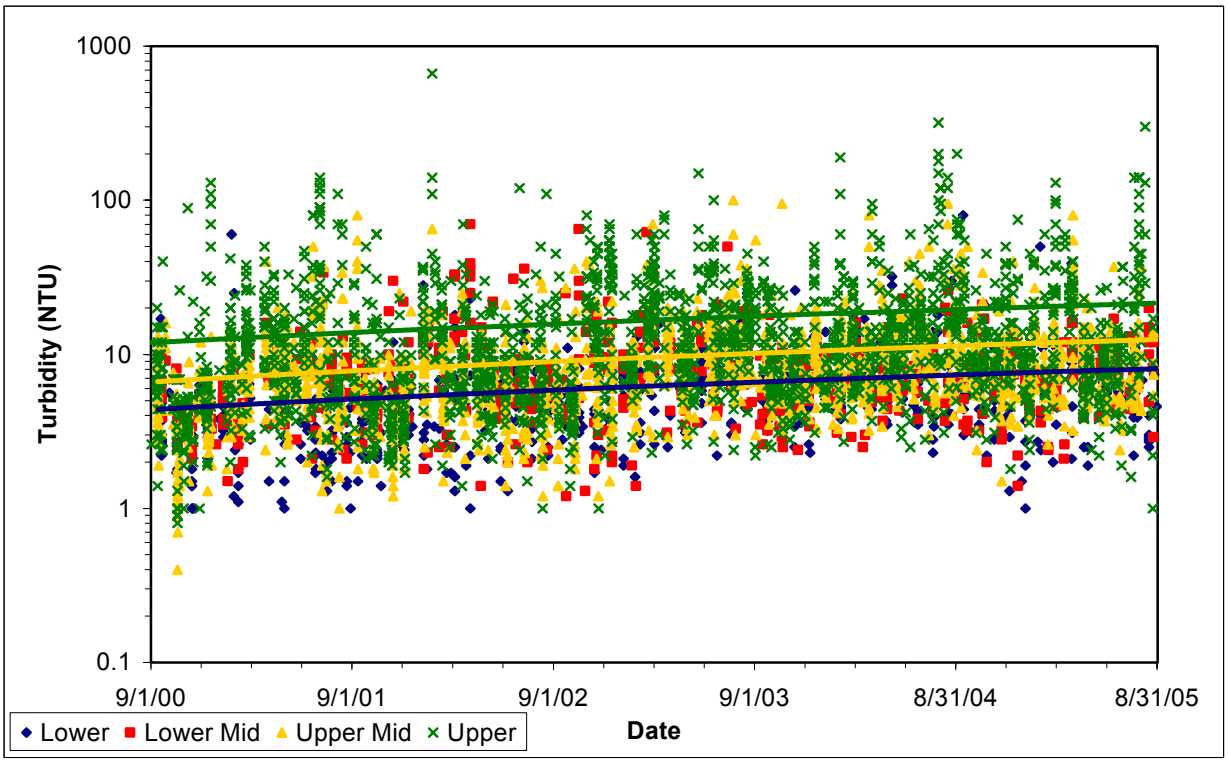


Lower	Prob > F: **<0.0001**	R^2: **0.0139**		Upper Mid	Prob > F: 0.1928	R^2: 0.0004	
Lower Mid	Prob > F: **0.0003**	R^2: **0.0103**		Upper	Prob > F: **<0.0001**	R^2: **0.0698**	

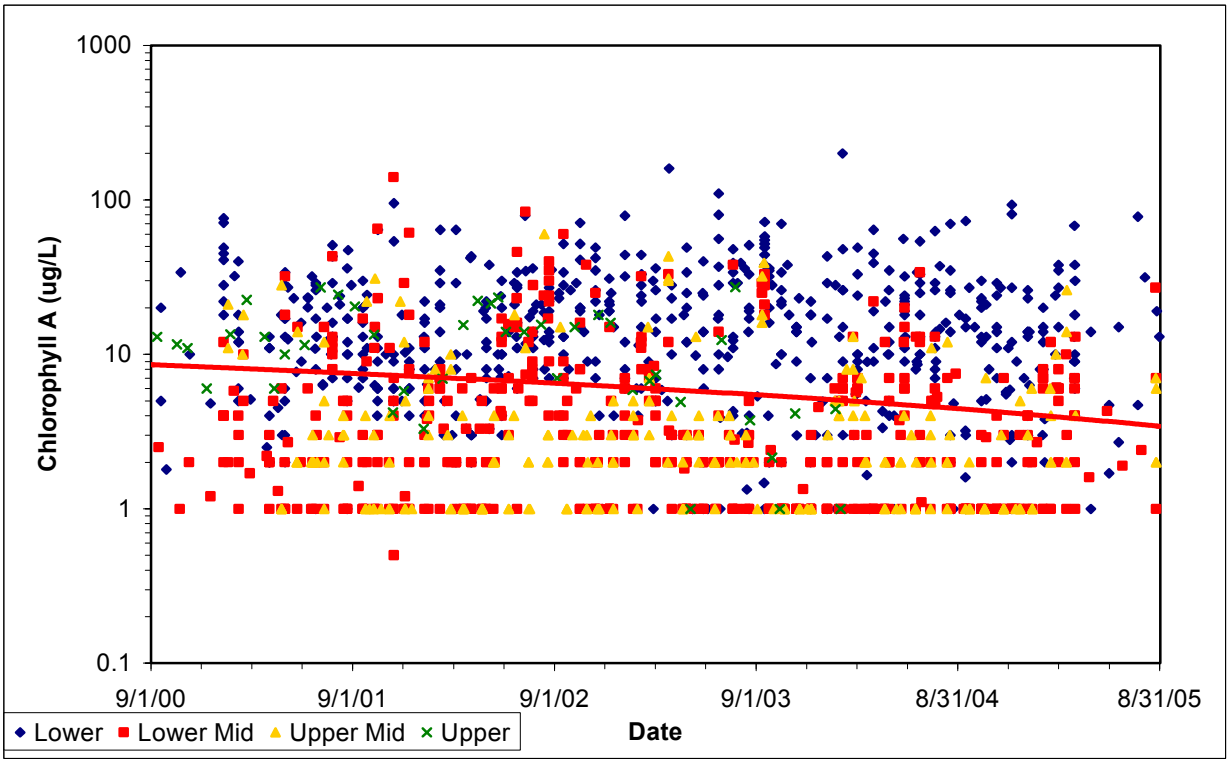


Lower	Prob > F: **<0.0001**	R^2: **0.1373**		Upper Mid	Prob > F: **0.0054**	R^2: **0.0038**	
Lower Mid	Prob > F: **<0.0001**	R^2: **0.0230**		Upper	Prob > F: **<0.0001**	R^2: **0.0141**	

Figure 13. pH and Specific Conductance over time in the Neuse River Basin

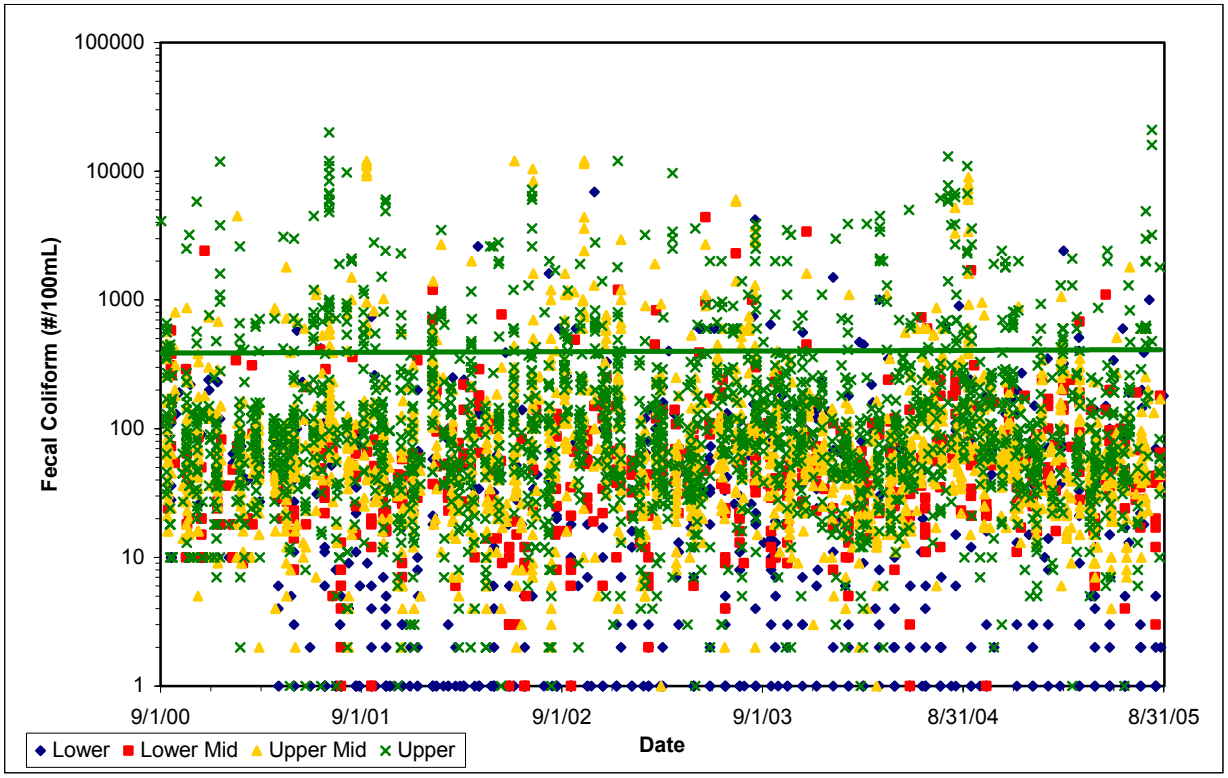


Lower	Prob > F: **<0.0001**	R^2: **0.0312**		Upper Mid	Prob > F: **<0.0001**	R^2: **0.0132**
Lower Mid	Prob > F: 0.2786	R^2: 0.0003		Upper	Prob > F: **0.0004**	R^2: **0.0068**



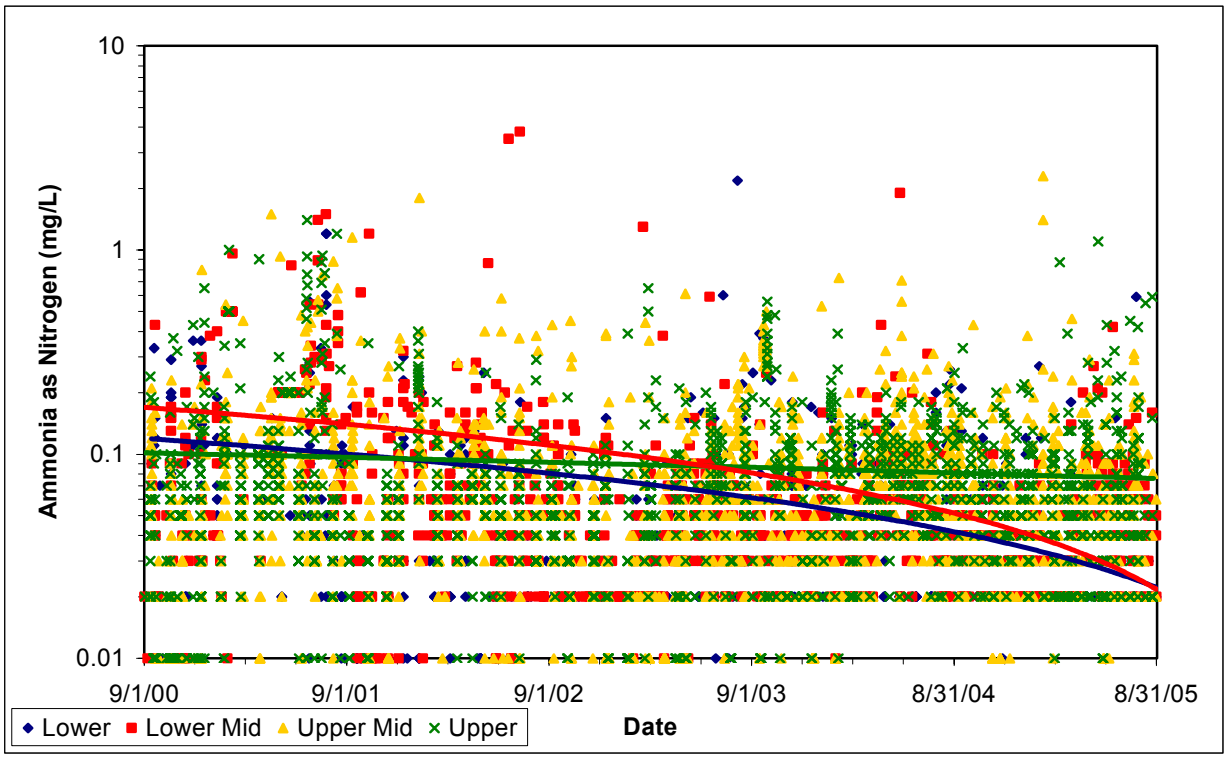
Lower	Prob > F: 0.5814	R^2: -0.0012		Upper Mid	Prob > F: 0.1551	R^2: 0.0043
Lower Mid	Prob > F: **0.0072**	R^2: **0.0118**		Upper	Prob > F: 0.0929	R^2: 0.1218

Figure 14. Turbidity and Chlorophyll A over time in the Neuse River Basin

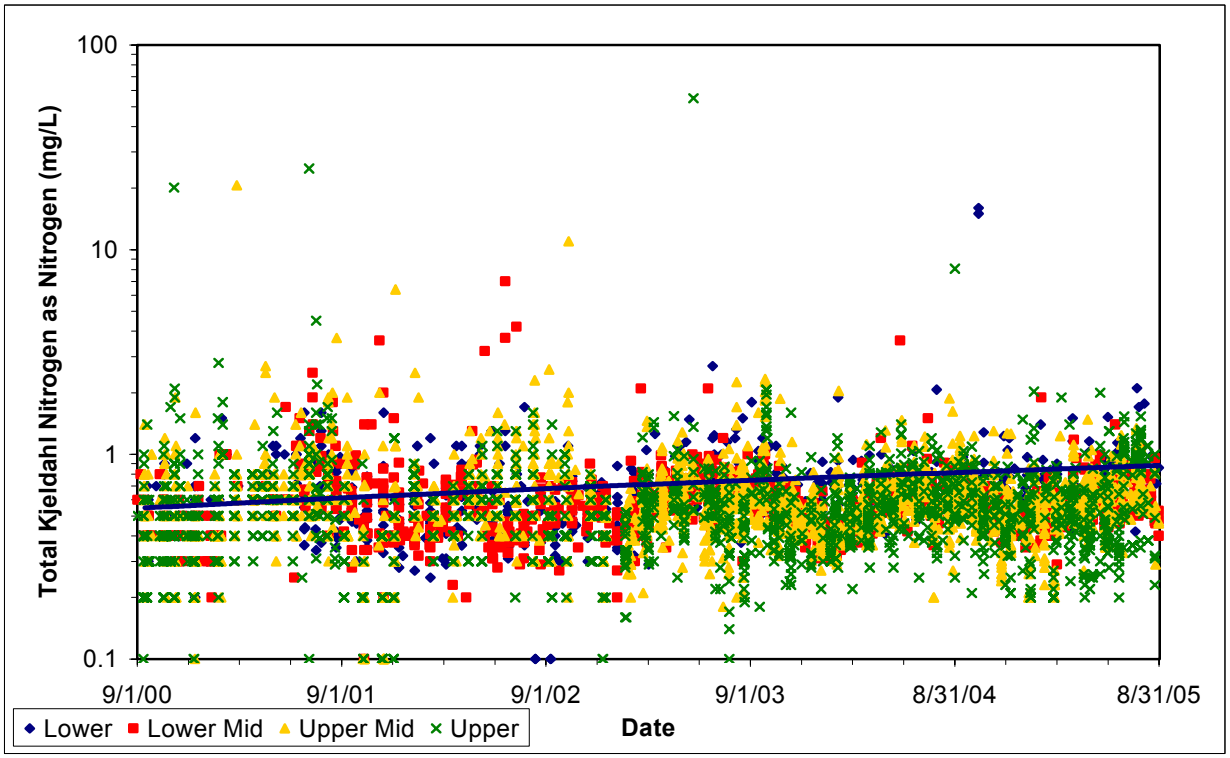


Lower	Prob > F: 0.2261	R^2: 0.0007	Upper Mid	Prob > F: 0.3819	R^2: -0.0002
Lower Mid	Prob > F: 0.7788	R^2: -0.0016	Upper	Prob > F: **0.0378**	R^2: **0.0020**

Figure 15. Fecal Coliform over time in the Neuse River Basin

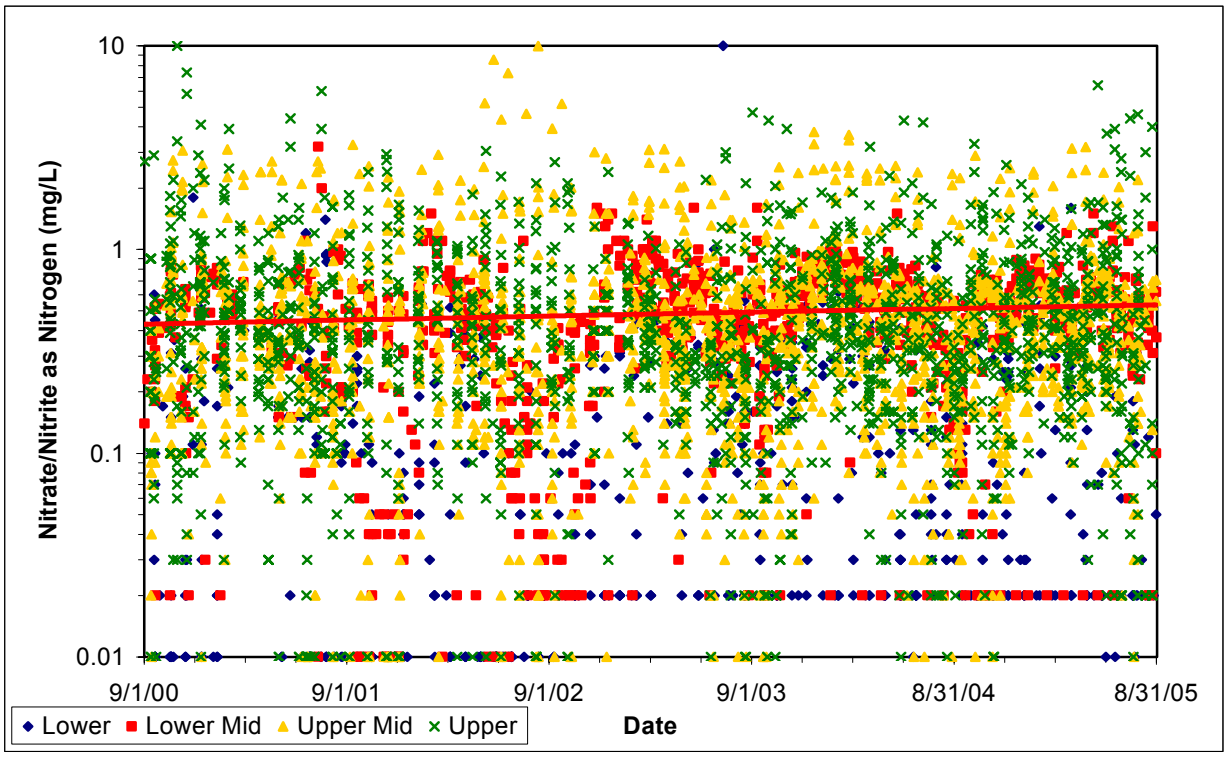


Lower	Prob > F: **<0.0001**	R^2: **0.0391**	Upper Mid	Prob > F: 0.3903	R^2: -0.0002
Lower Mid	Prob > F: **<0.0001**	R^2: **0.0375**	Upper	Prob > F: **<0.0001**	R^2: **0.0325**

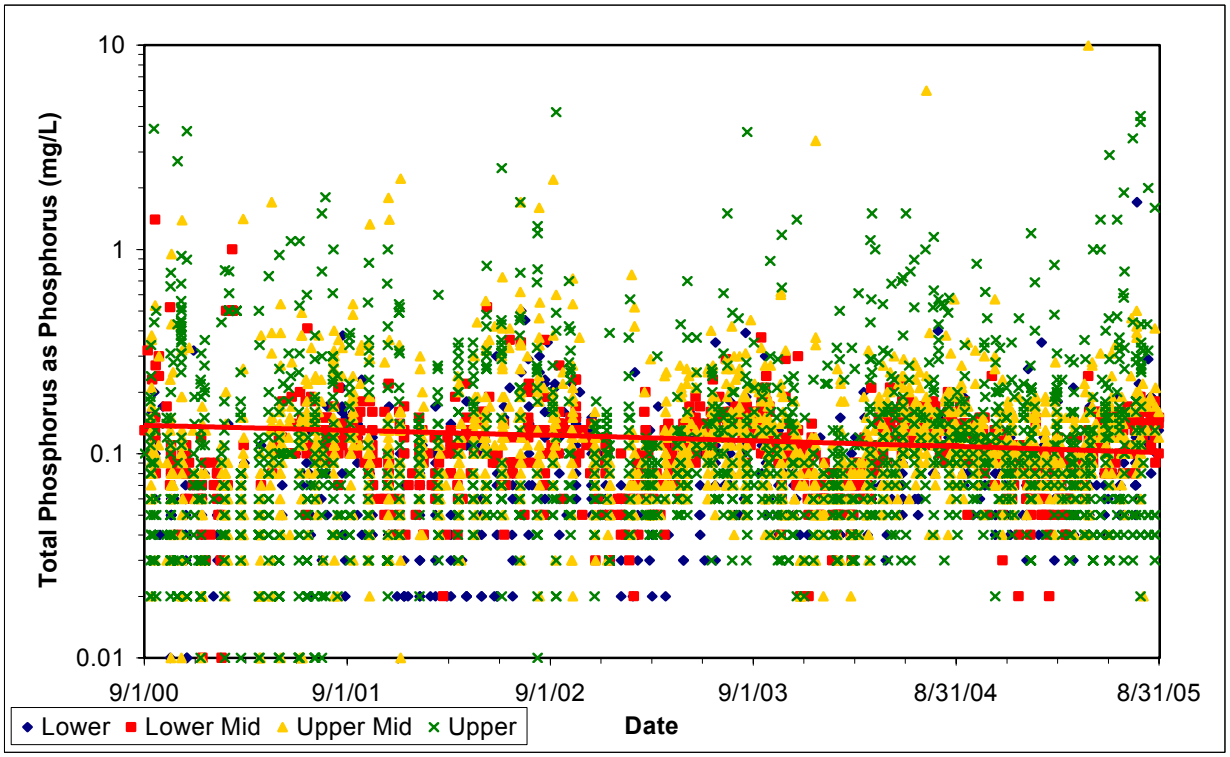


Lower	Prob > F: **0.0027**	R^2: **0.0124**	Upper Mid	Prob > F: 0.7636	R^2: -0.0007
Lower Mid	Prob > F: 0.1405	R^2: 0.0011	Upper	Prob > F: 0.8388	R^2: -0.0008

Figure 16. Ammonia and Total Kjeldahl Nitrogen over time in the Neuse River Basin

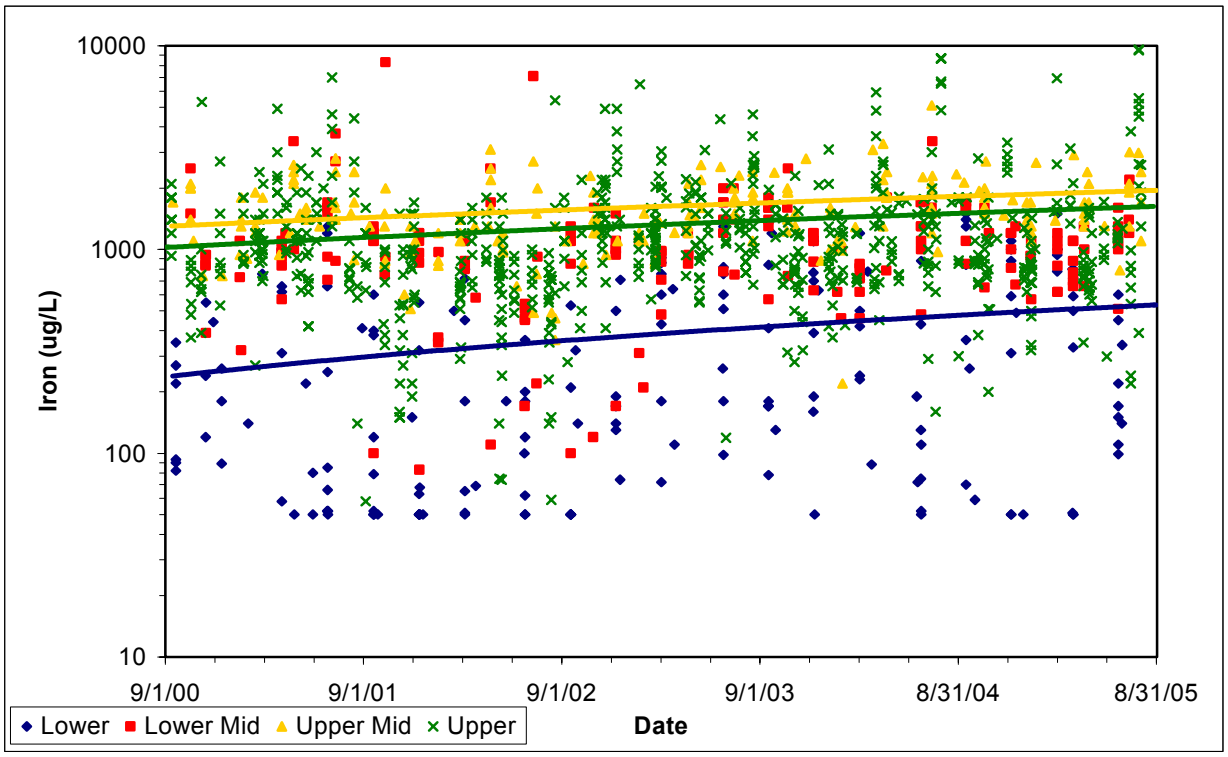


Lower	Prob > F: 0.8883	R^2: -0.0015	Upper Mid	Prob > F: 0.3315	R^2: 0
Lower Mid	Prob > F: **0.0014**	R^2: **0.0087**	Upper	Prob > F: 0.0645	R^2: 0.0021

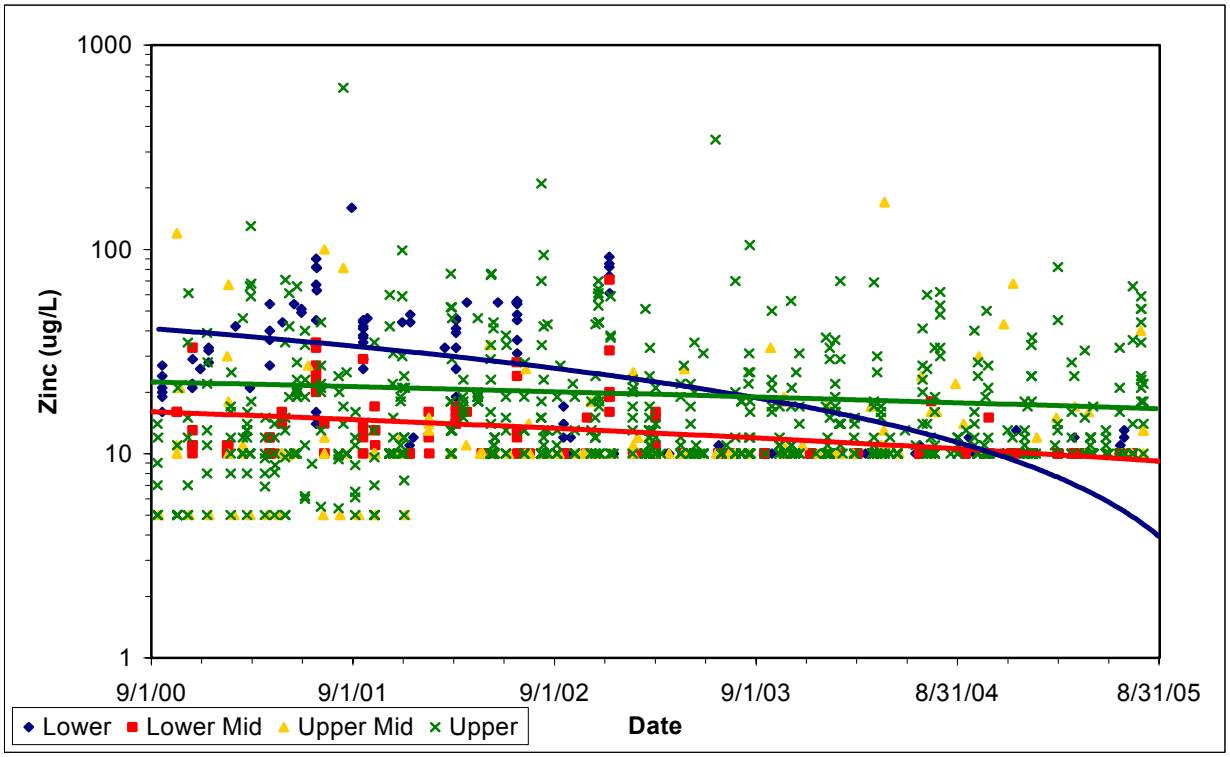


Lower	Prob > F: 0.8628	R^2: -0.0015	Upper Mid	Prob > F: 0.7847	R^2: -0.0009
Lower Mid	Prob > F: **<0.0001**	R^2: **0.0158**	Upper	Prob > F: 0.9722	R^2: -0.0007

Figure 17. Nitrate/Nitrite and Total Phosphorus over time in the Neuse River Basin



Lower	Prob > F: **0.0020**	R^2: **0.0464**		Upper Mid	Prob > F: **0.0061**	R^2: **0.0341**	
Lower Mid	Prob > F: 0.5352	R^2: -0.0035		Upper	Prob > F: **0.0002**	R^2: **0.0242**	



Lower	Prob > F: **<0.0001**	R^2: **0.2369**		Upper Mid	Prob > F: 0.5610	R^2: -0.0035	
Lower Mid	Prob > F: **<0.0001**	R^2: **0.0830**		Upper	Prob > F: **0.0128**	R^2: **0.0096**	

Figure 18. Copper and Zinc over time in the Neuse River Basin

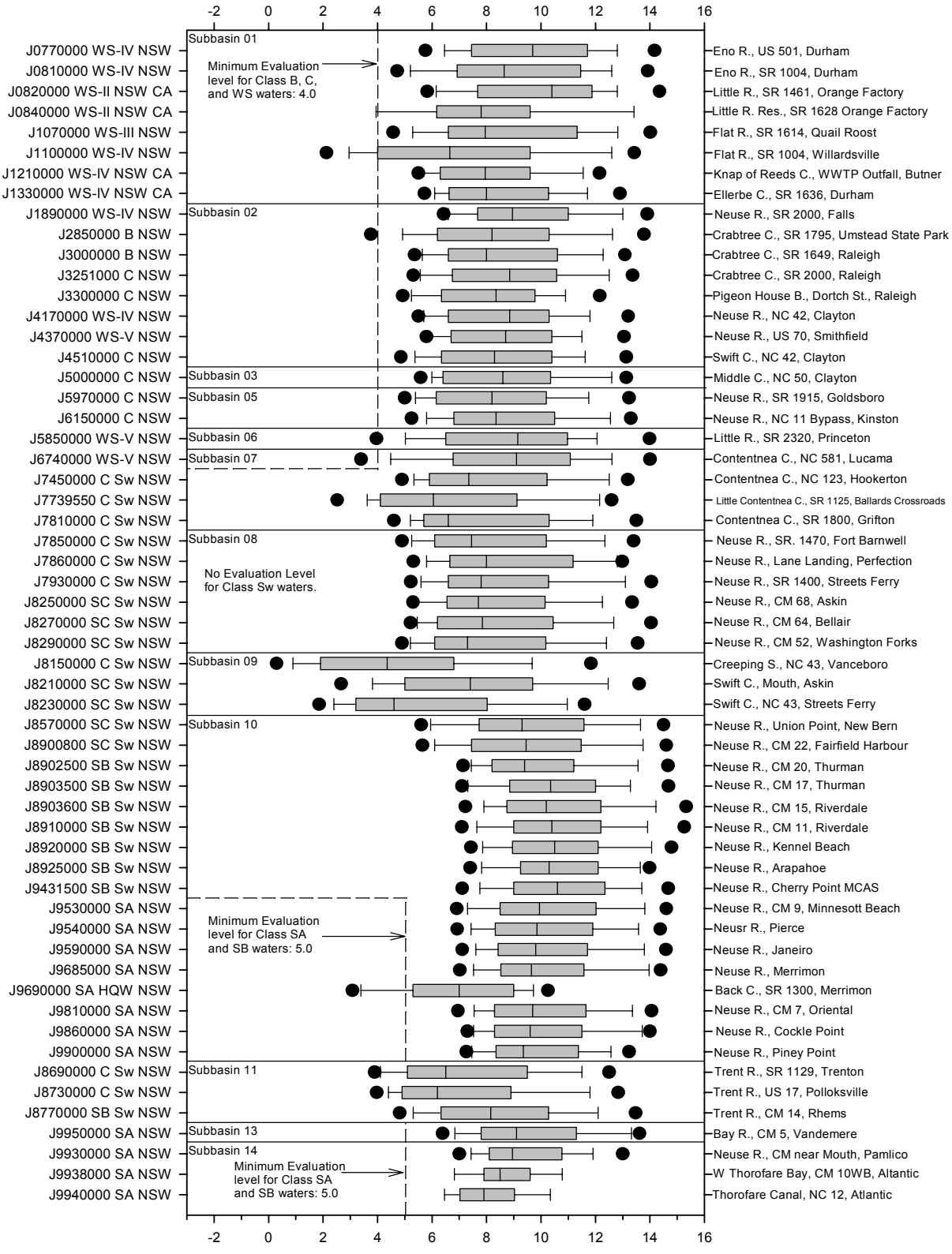


Figure 19. Box Plots of Dissolved Oxygen at DWQ Stations in the Neuse River Basin

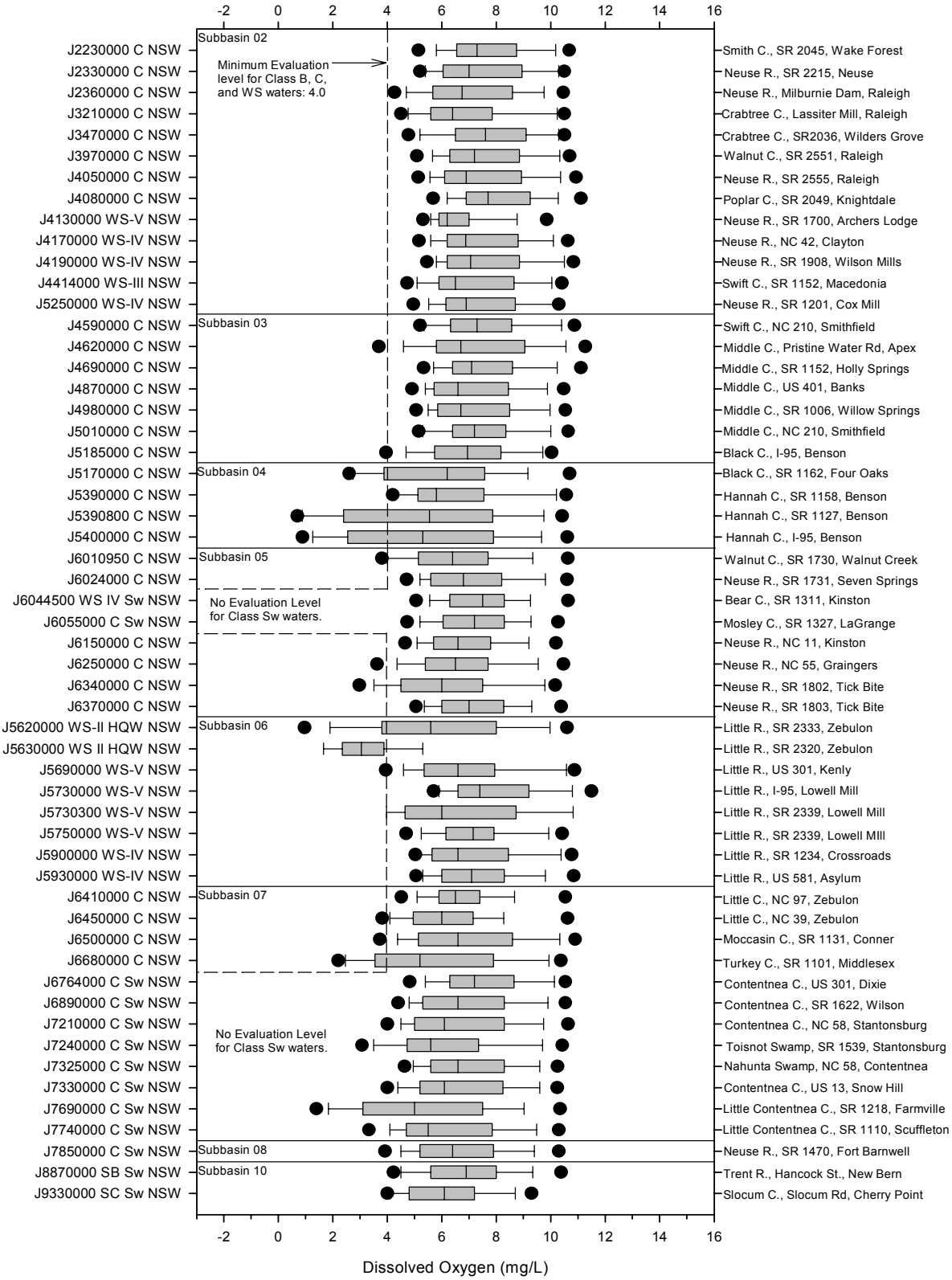


Figure 20. Box Plots of Dissolved Oxygen at LNBA Stations in the Neuse River Basin

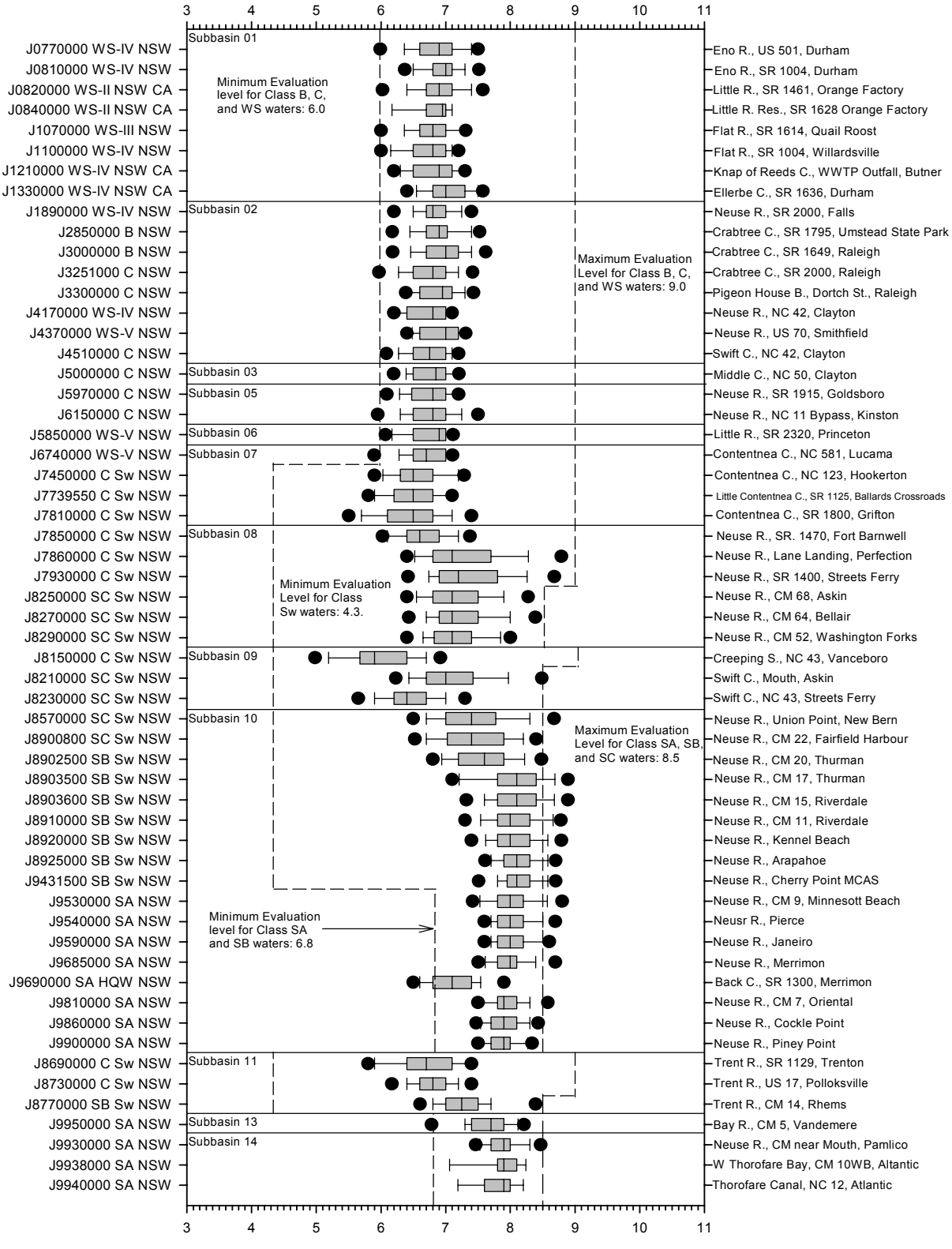


Figure 21. Box Plots of pH at DWQ Stations in the Neuse River Basin

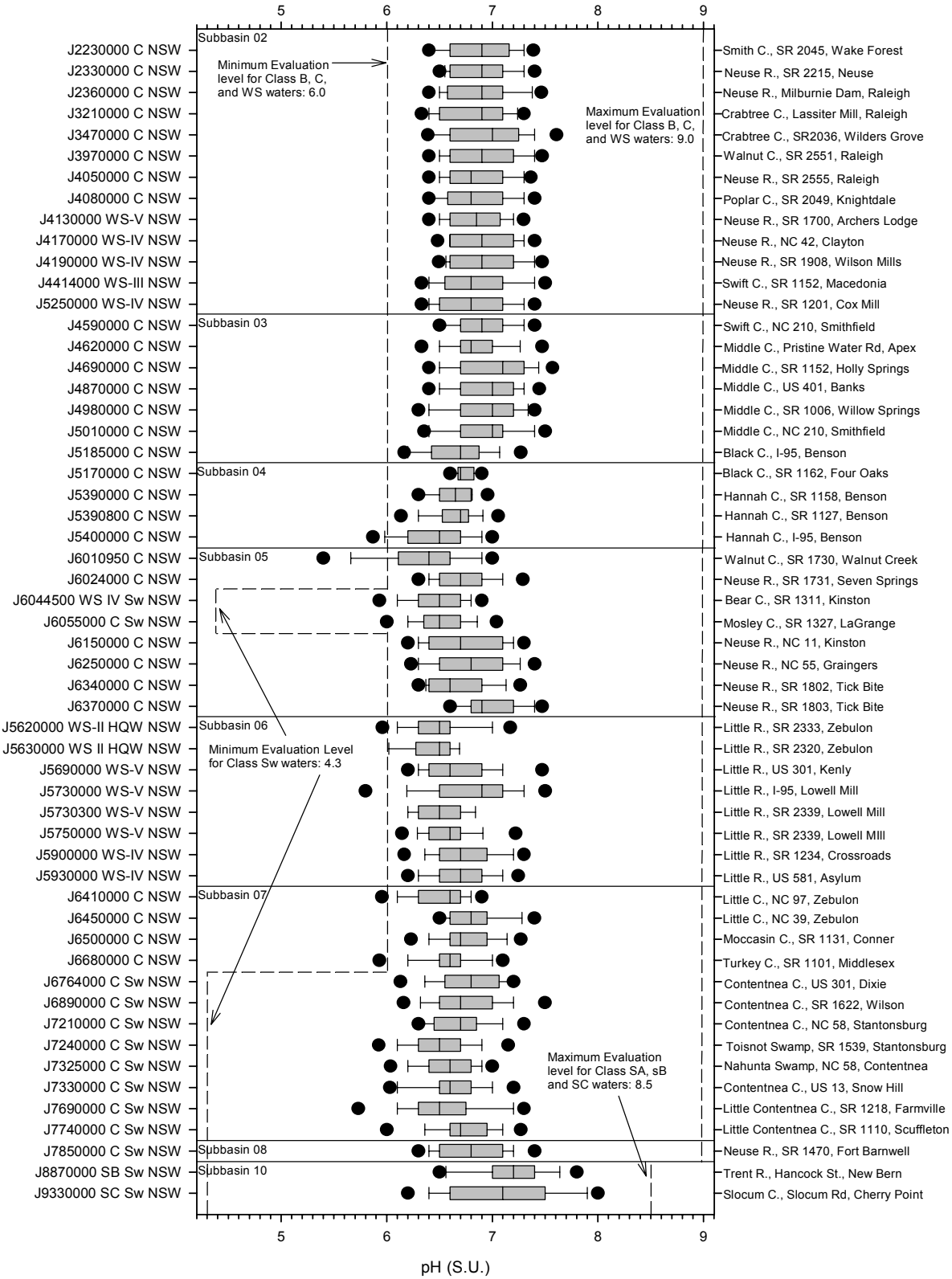


Figure 22. Box Plots of pH at LNBA Stations in the Neuse River Basin

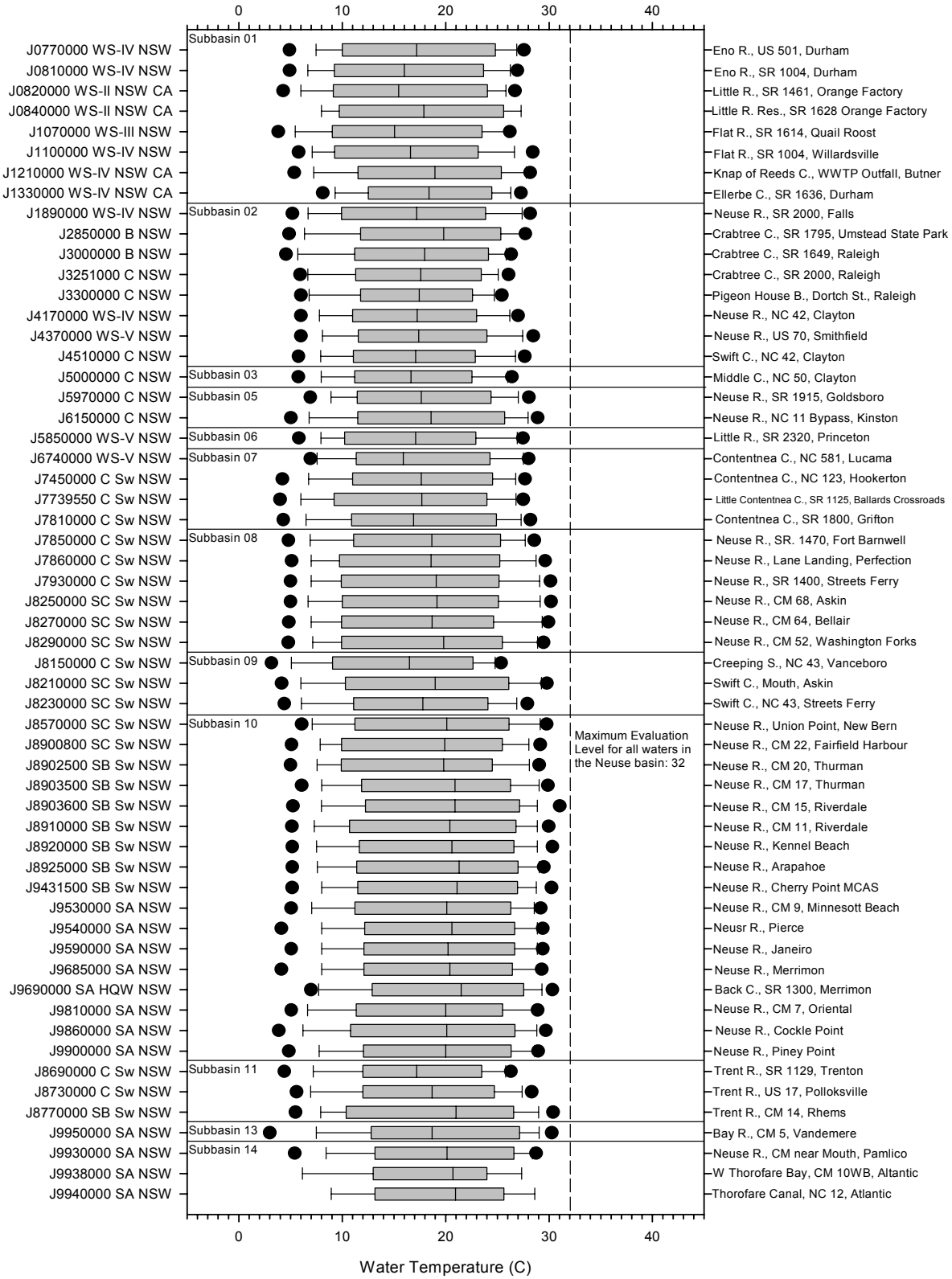


Figure 23. Box Plots of Water Temperature at DWQ Stations in the Neuse River Basin

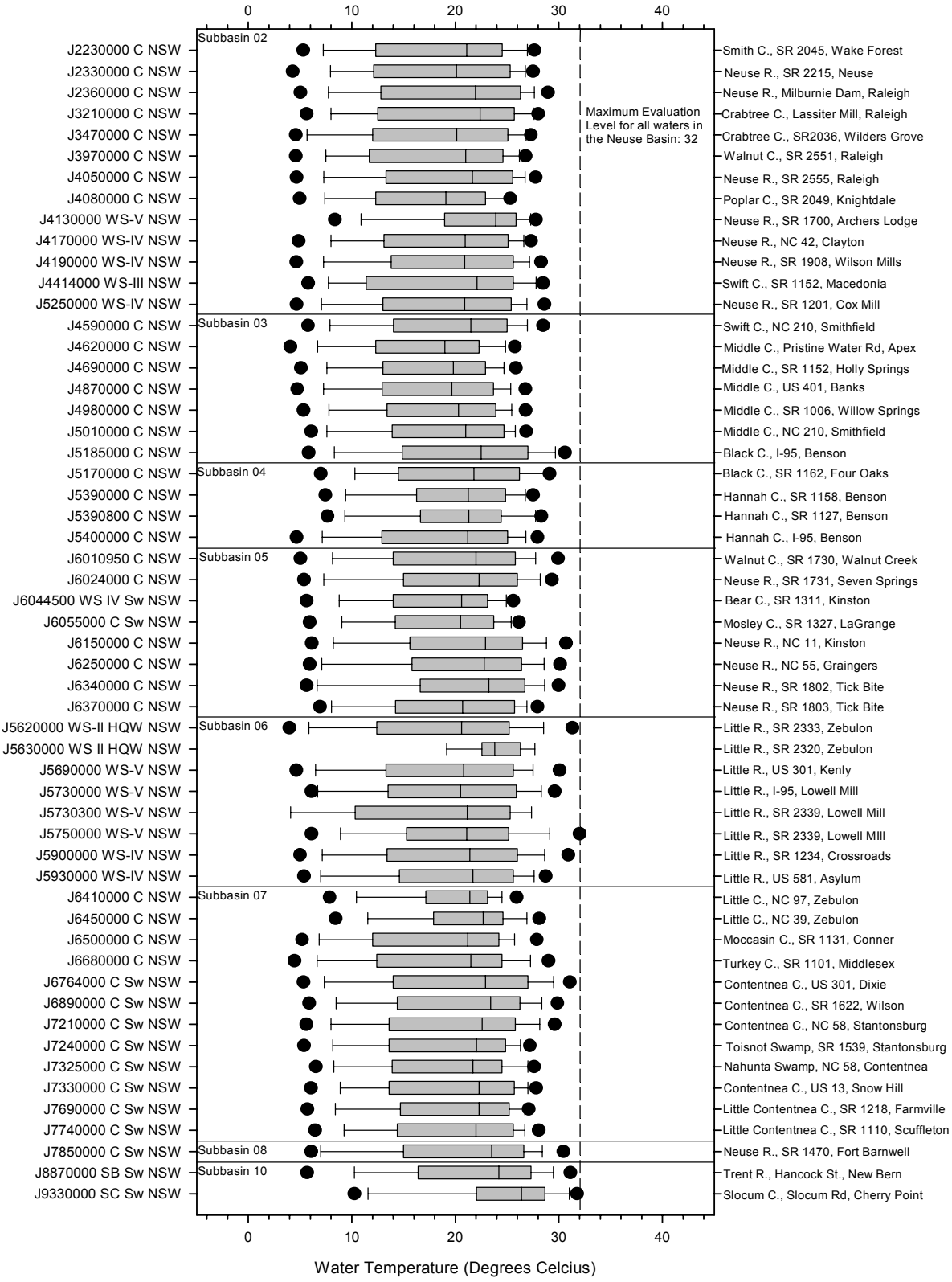


Figure 24. Box Plots of Water Temperature at LNBA Stations in the Neuse River Basin

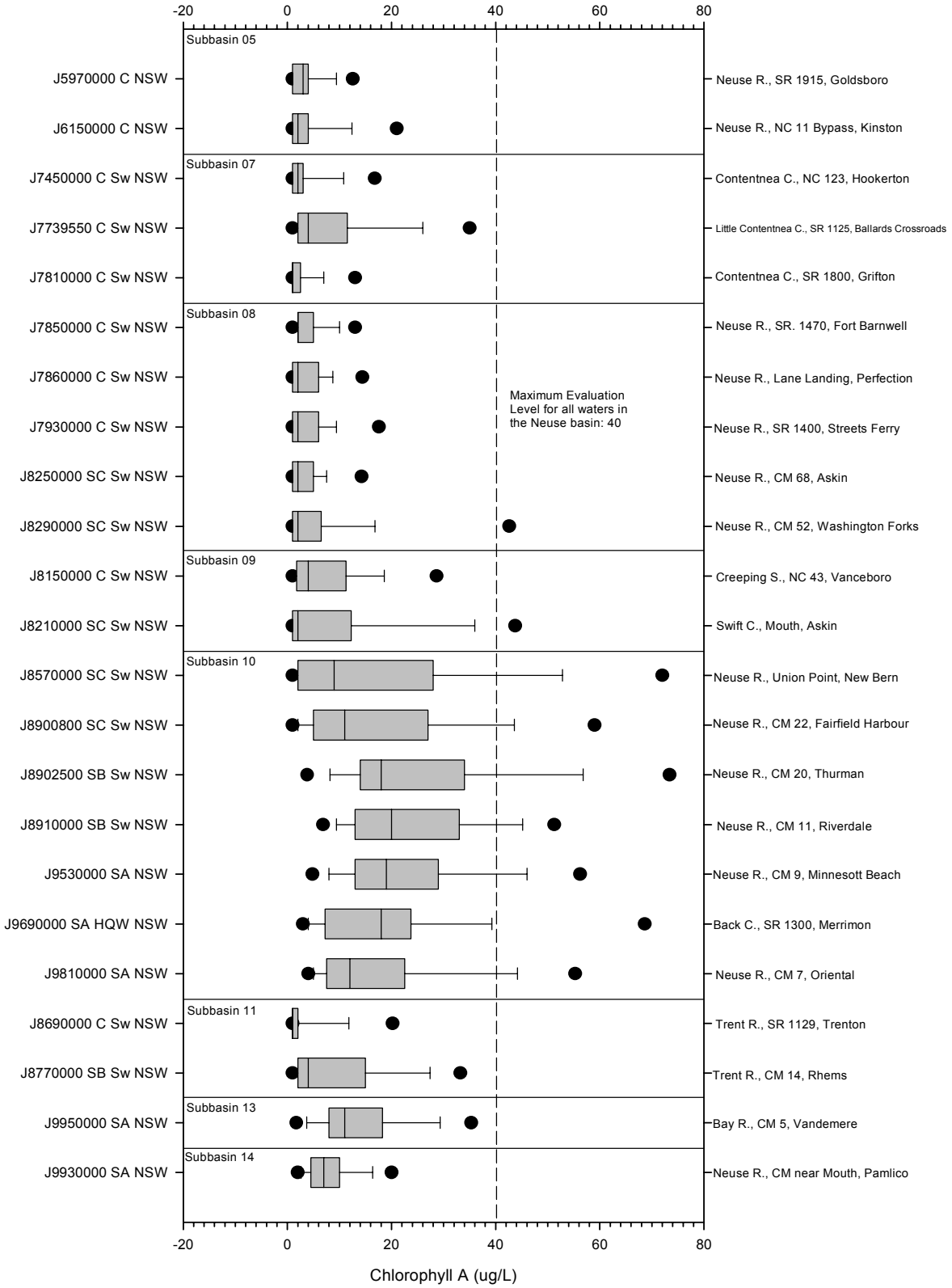


Figure 25. Box Plots of Chlorophyll *A* at DWQ Stations in the Neuse River Basin

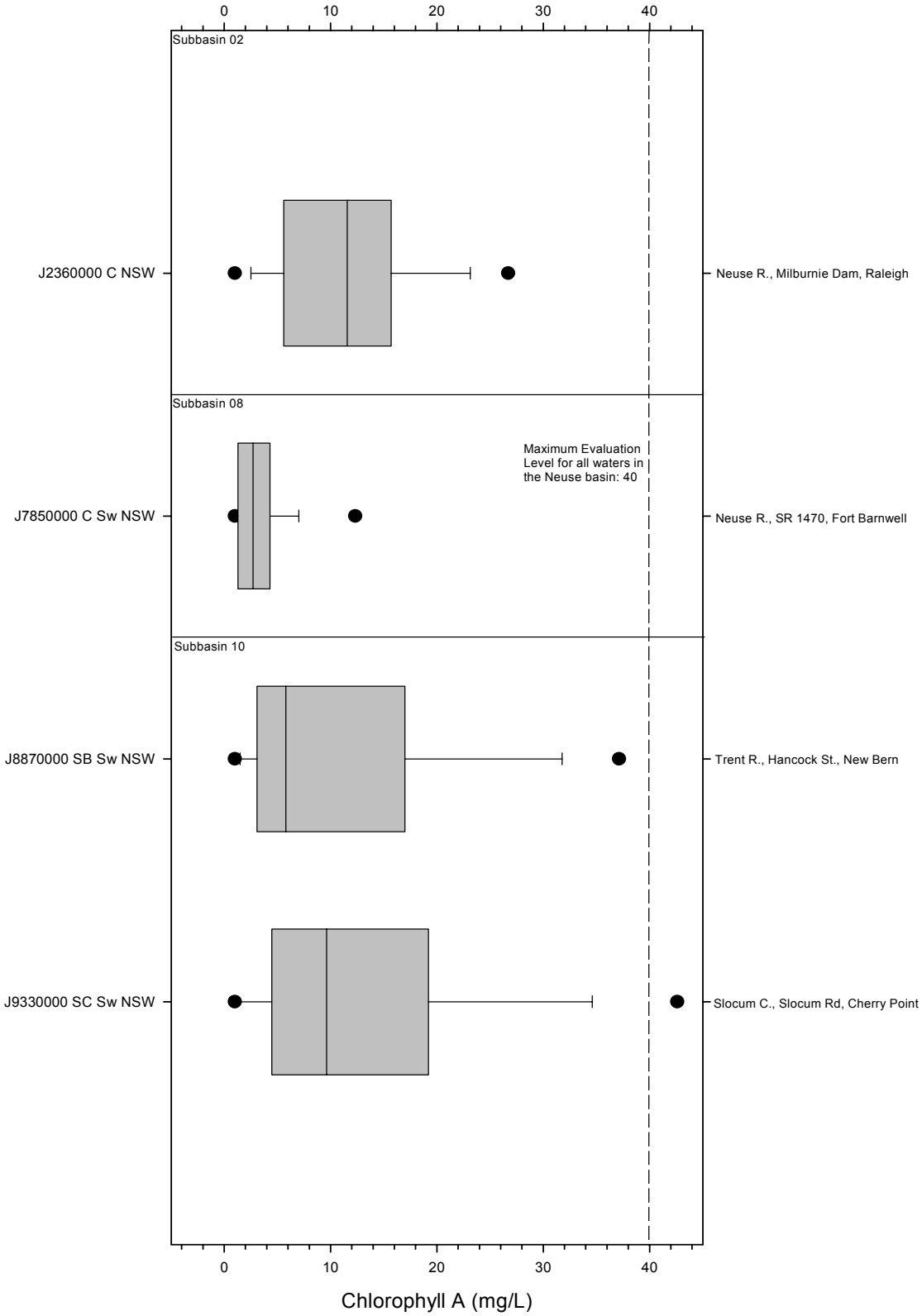


Figure 26. Box Plots of Chlorophyll *A* at LNBA Stations in the Neuse River Basin

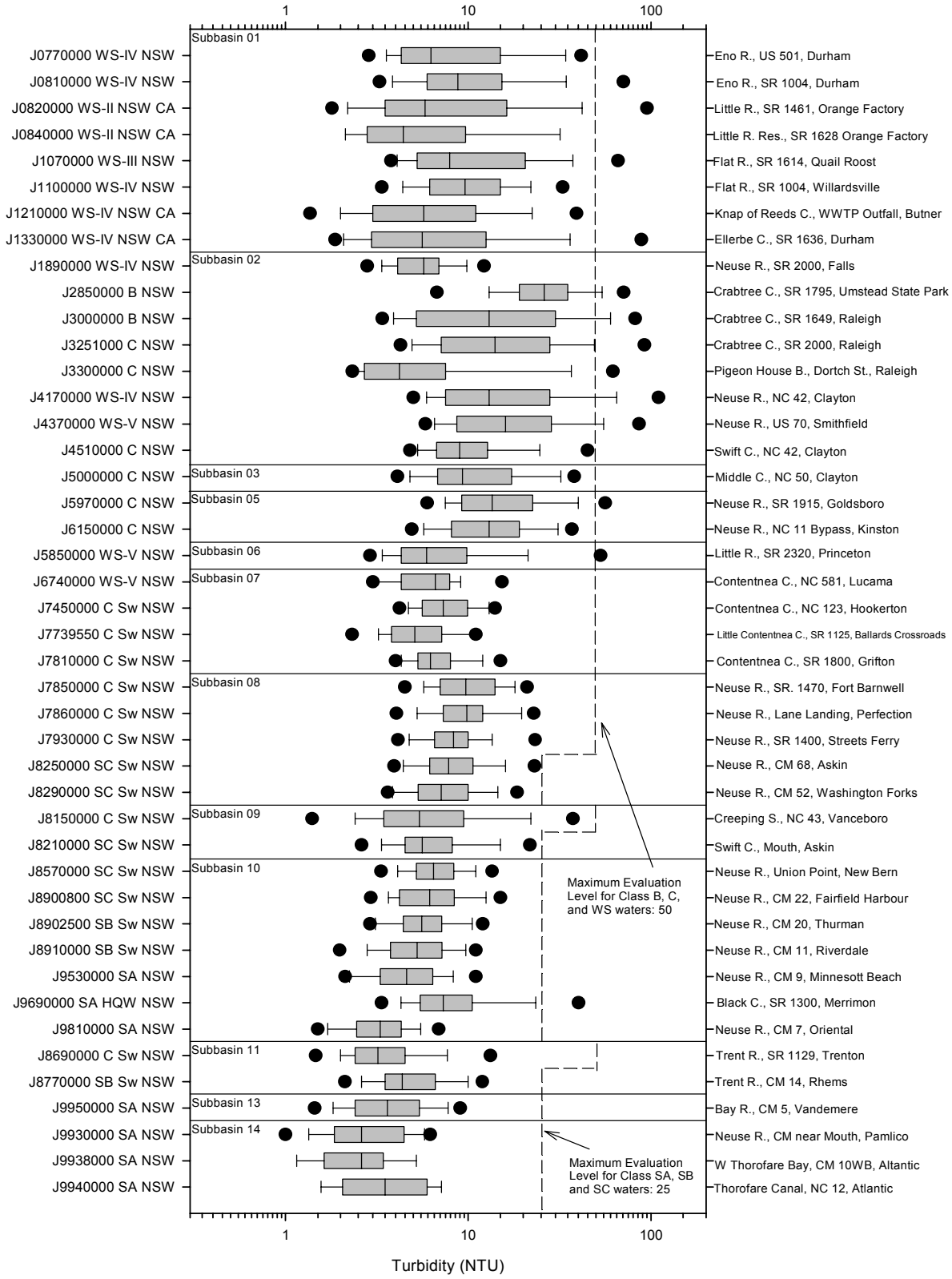


Figure 27. Box Plots of Turbidity at DWQ Stations in the Neuse River Basin

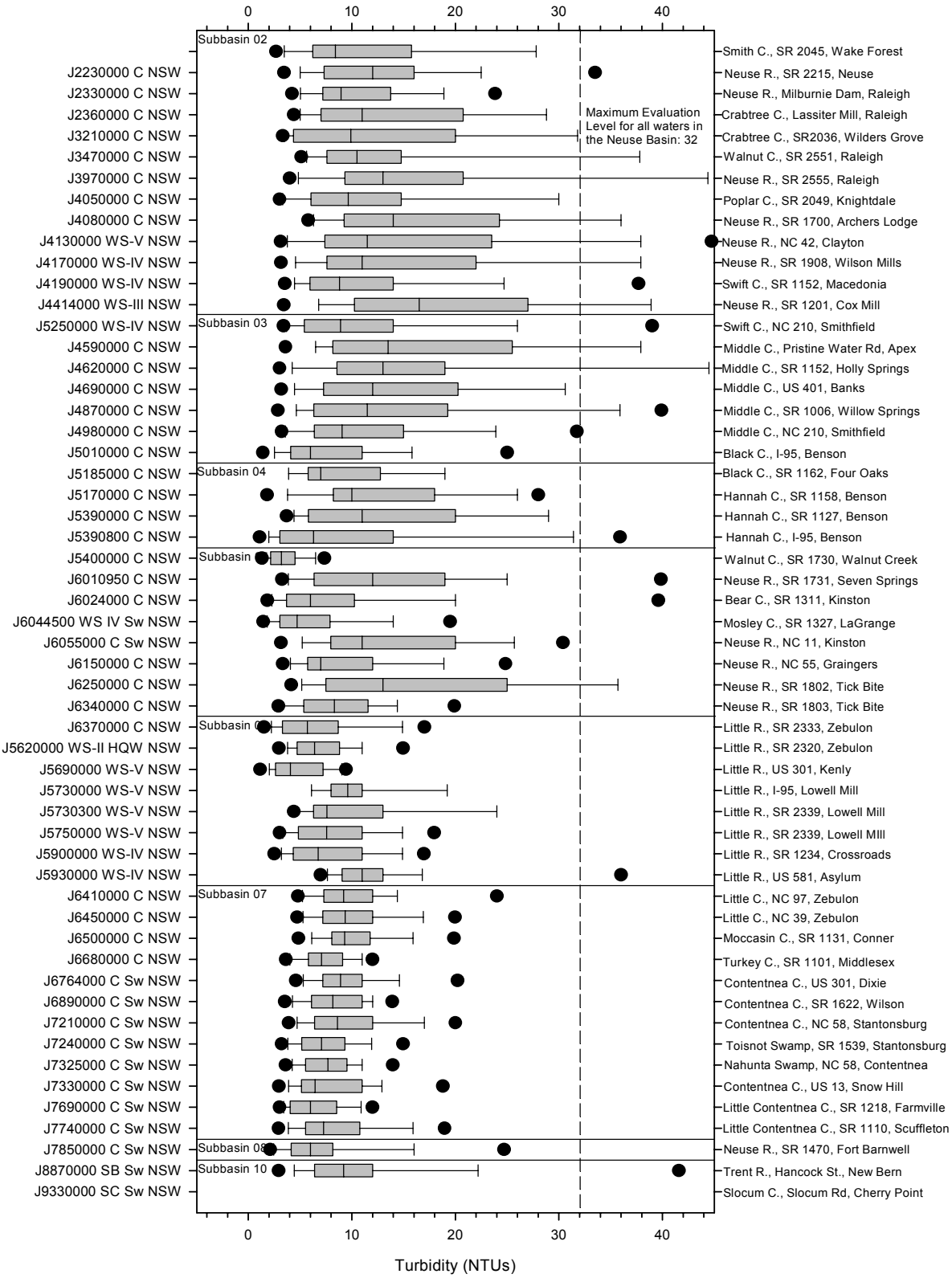


Figure 28. Box Plots of Turbidity at LNBA Stations in the Neuse River Basin

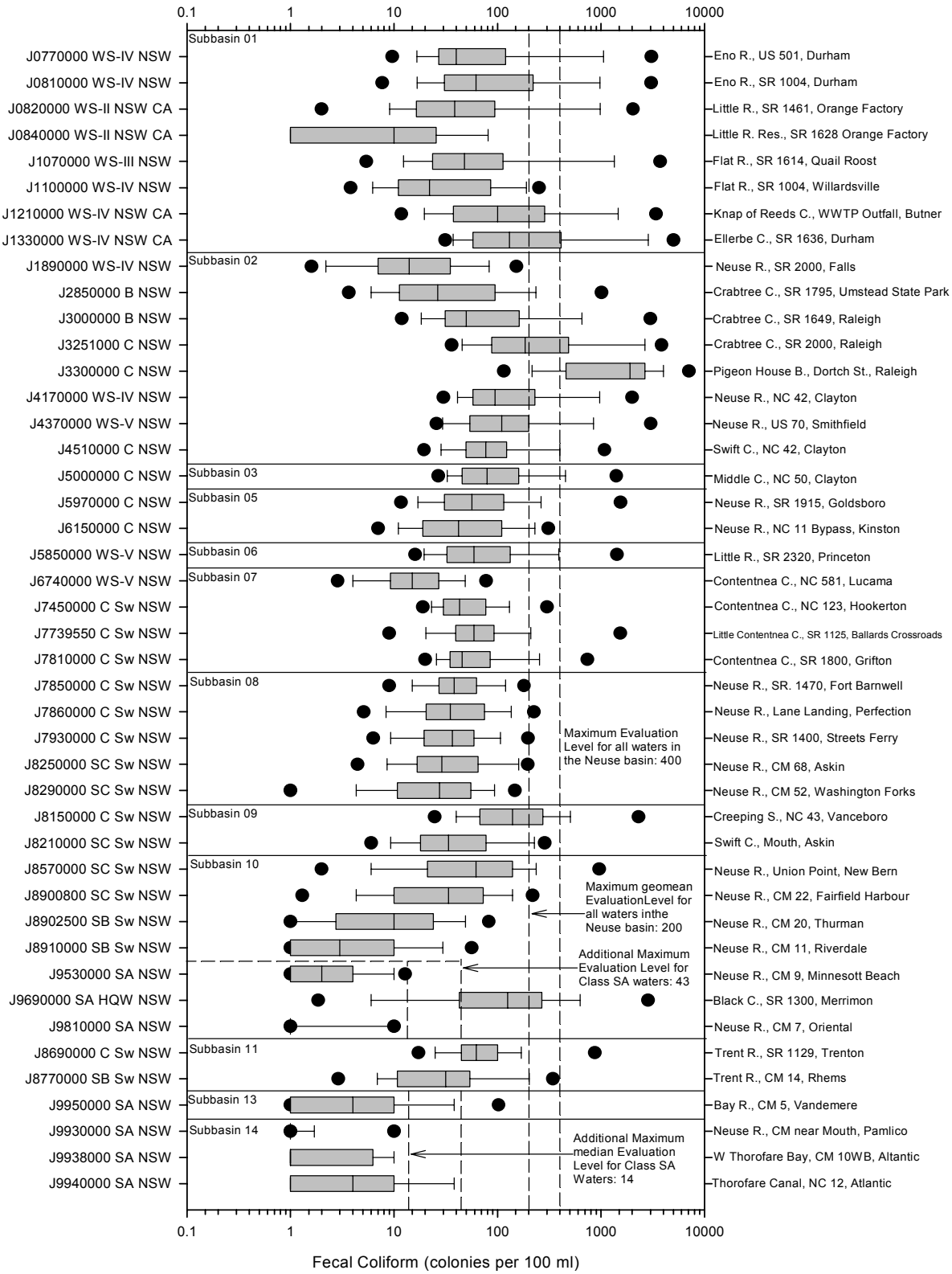


Figure 29. Box Plots of Fecal Coliform at DWQ Stations in the Neuse River Basin

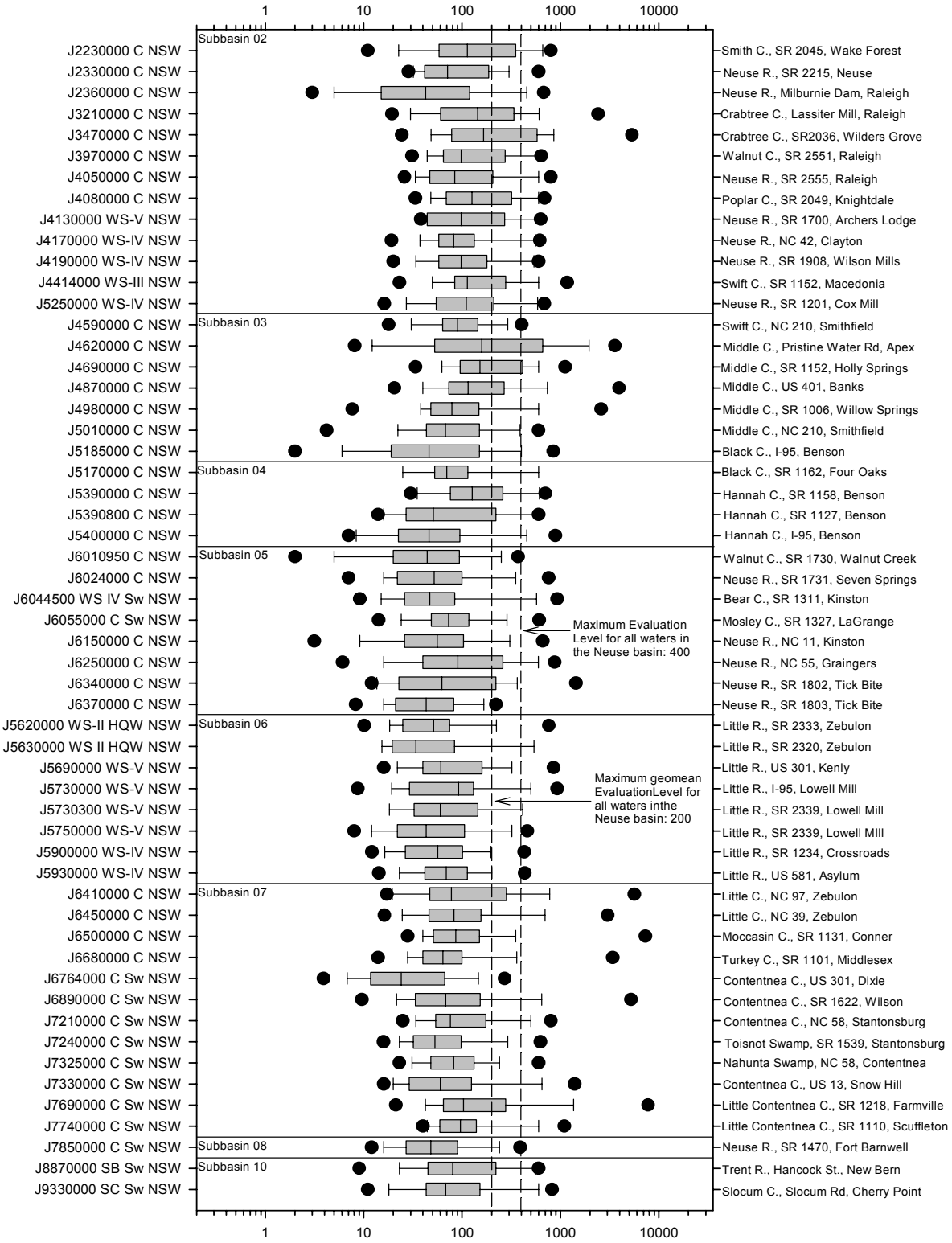


Figure 30. Box Plots of Fecal Coliform at LNBA Stations in the Neuse River Basin

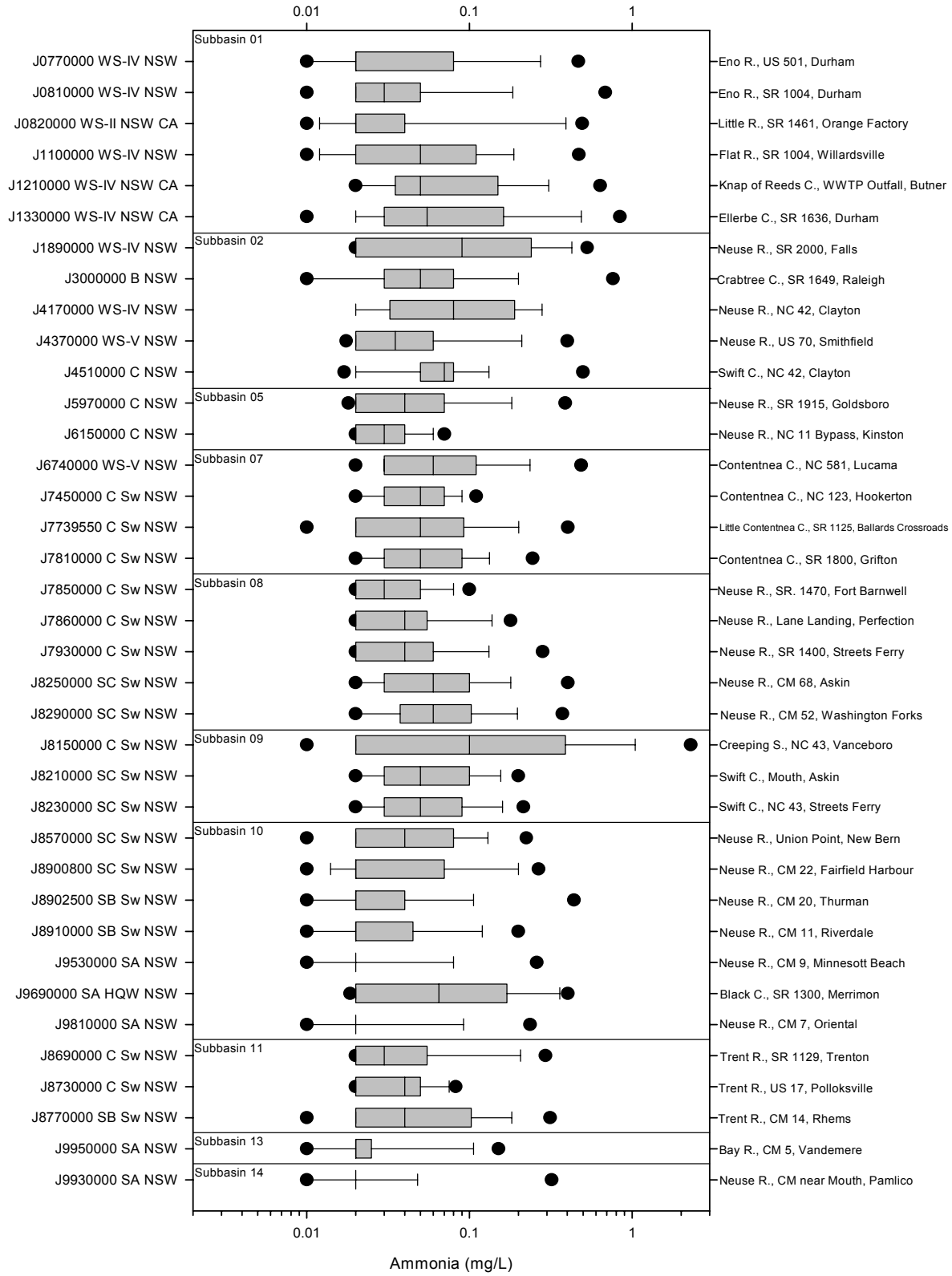


Figure 31. Box Plots of Total Ammonia at DWQ Stations in the Neuse River Basin

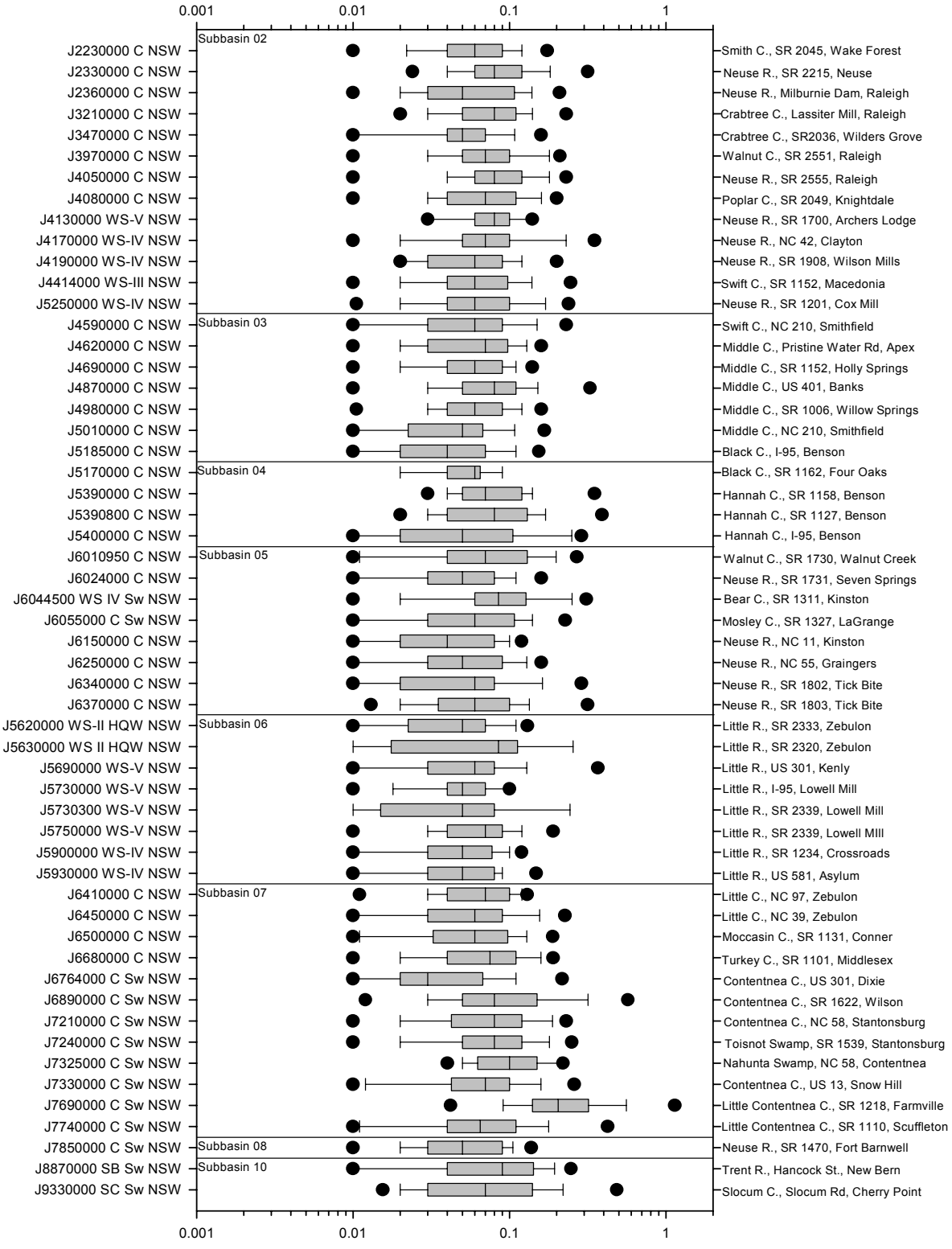


Figure 32. Box Plots of Total Ammonia at LNBA Stations in the Neuse River Basin

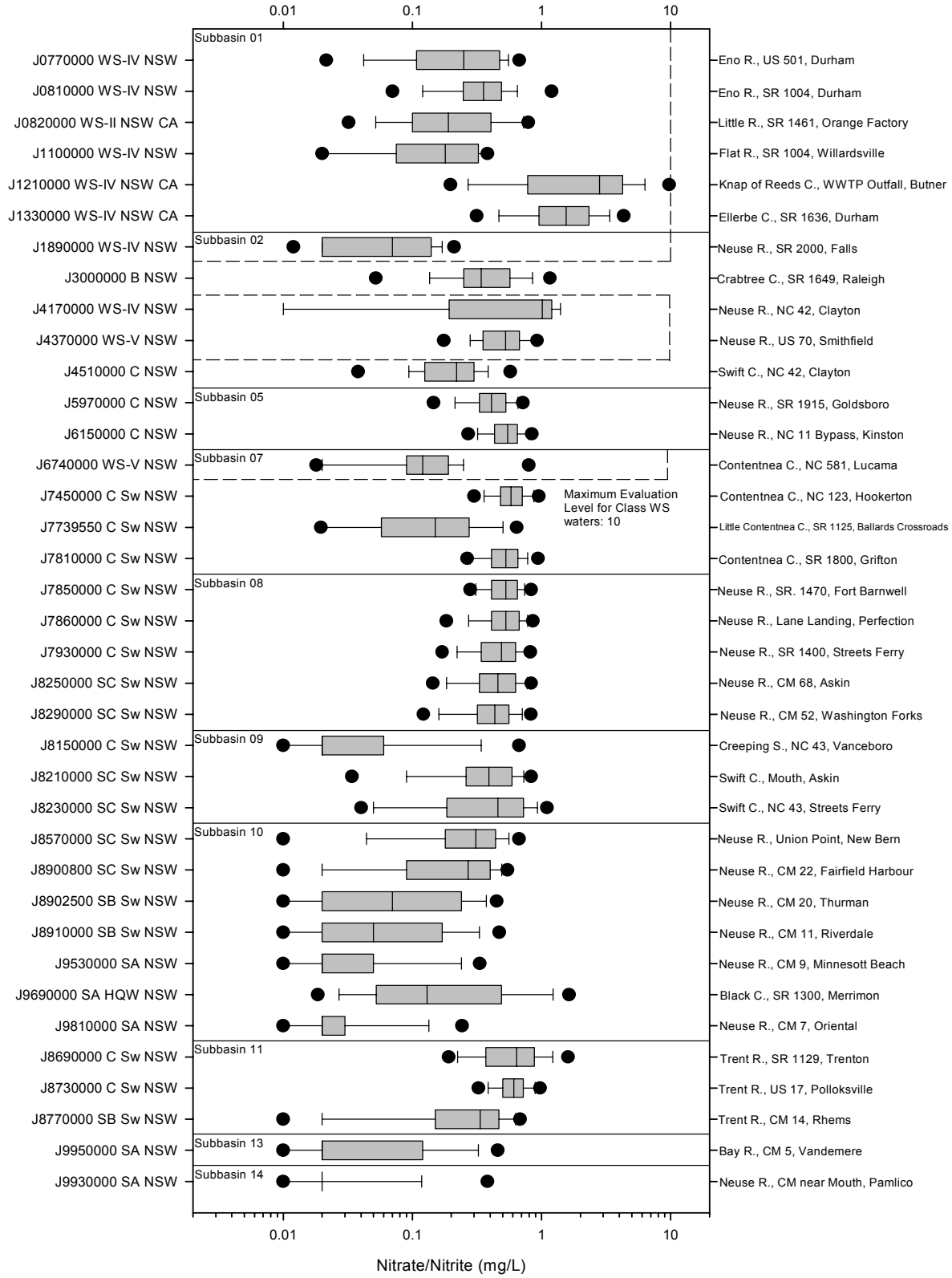


Figure 33. Box Plots of Total Nitrate/Nitrite for DWQ Stations in the Neuse River Basin

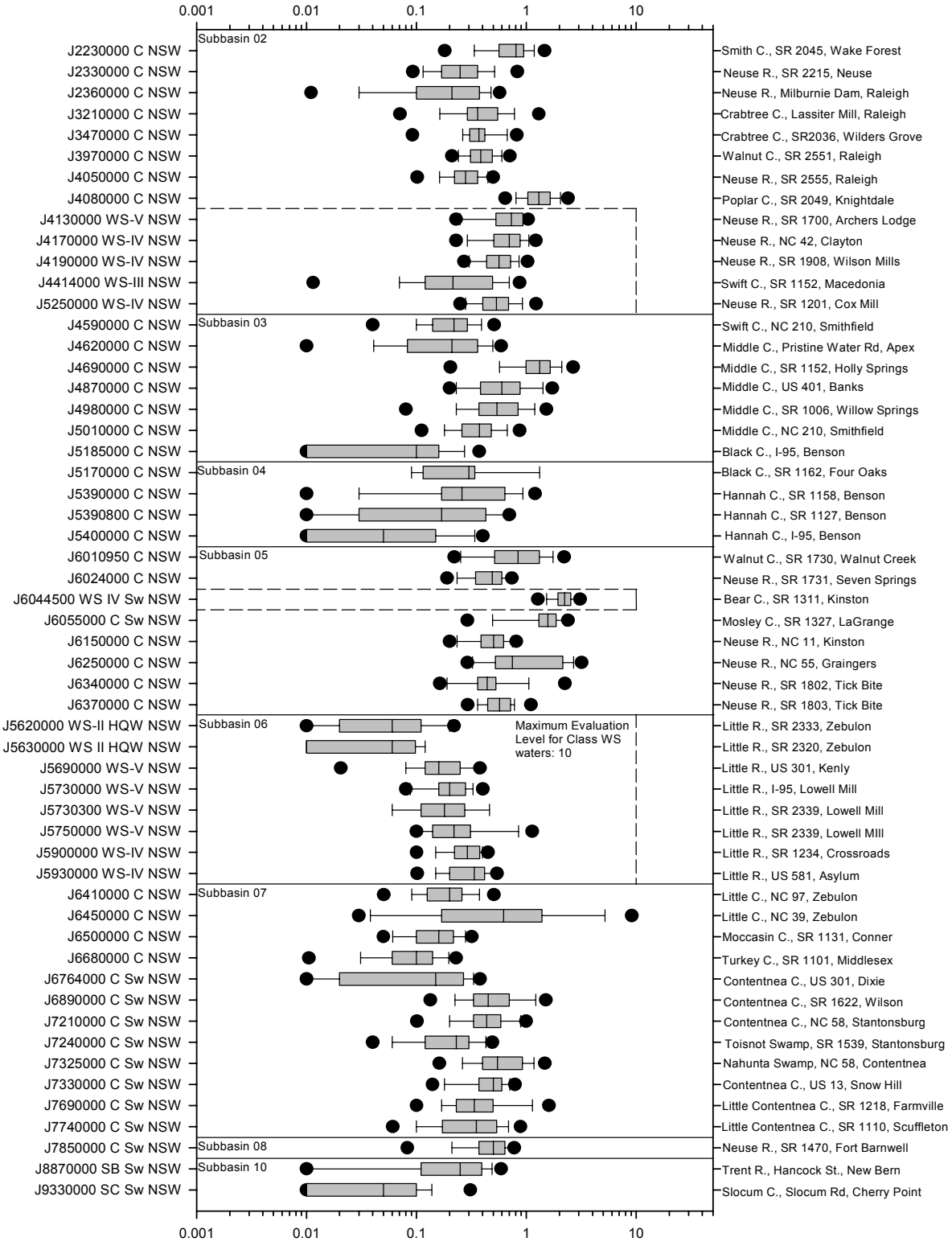


Figure 34. Box Plots of Total Nitrate/Nitrite for LNBA Stations in the Neuse River Basin

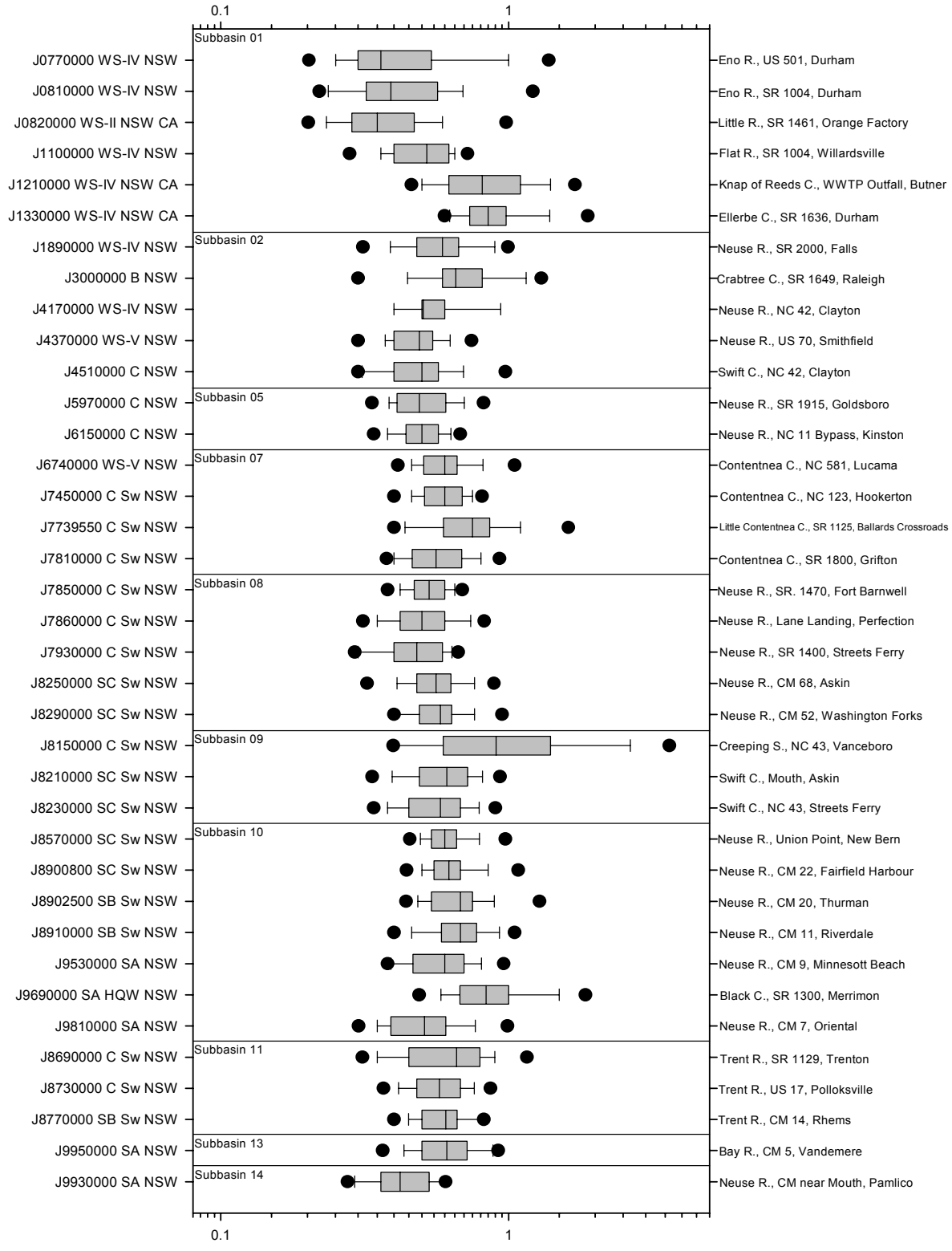


Figure 35. Box Plots of Total Kjeldahl Nitrogen at DWQ Stations in the Neuse River Basin

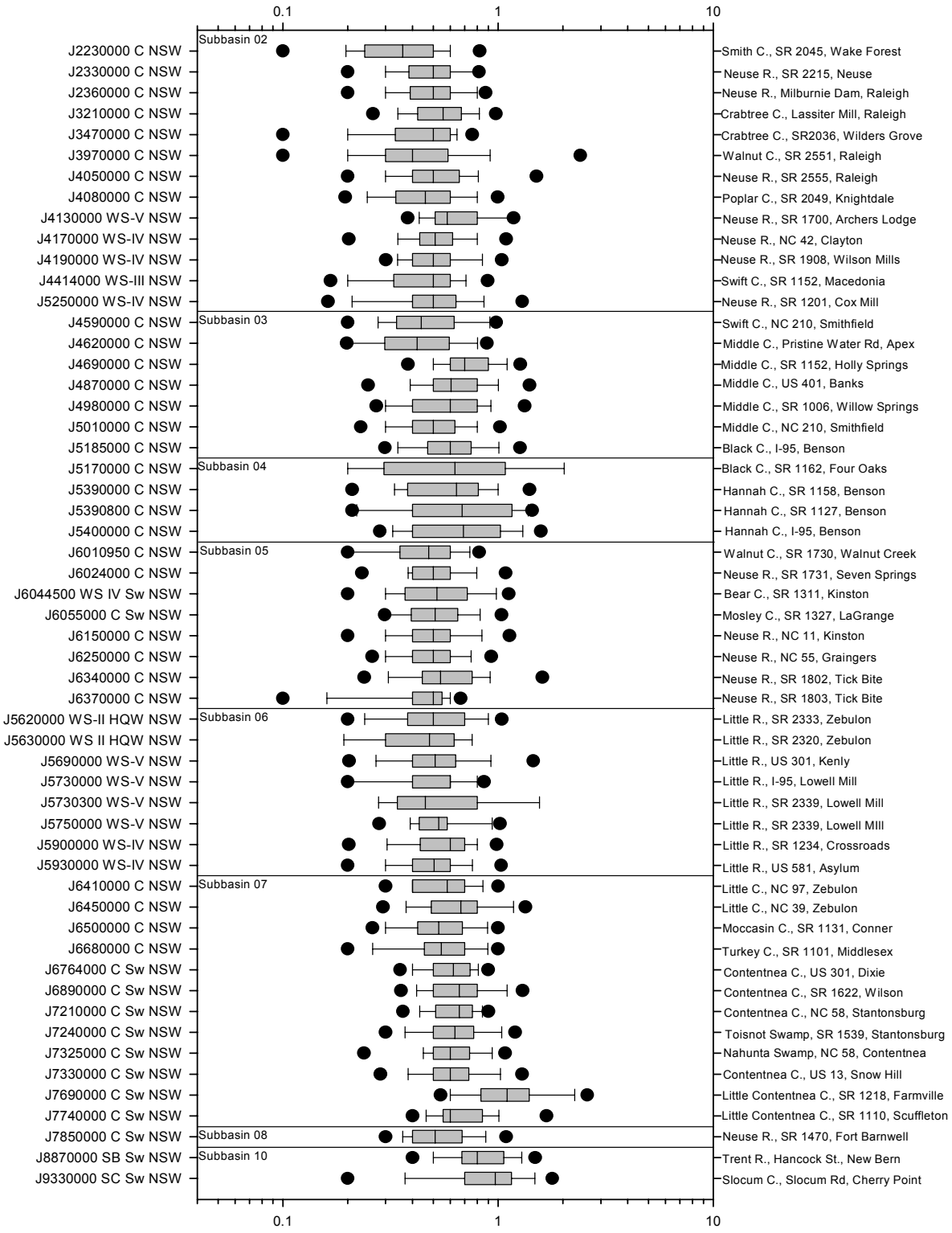


Figure 36. Box Plots of Total Kjeldahl Nitrogen at LNBA Stations in the Neuse River Basin

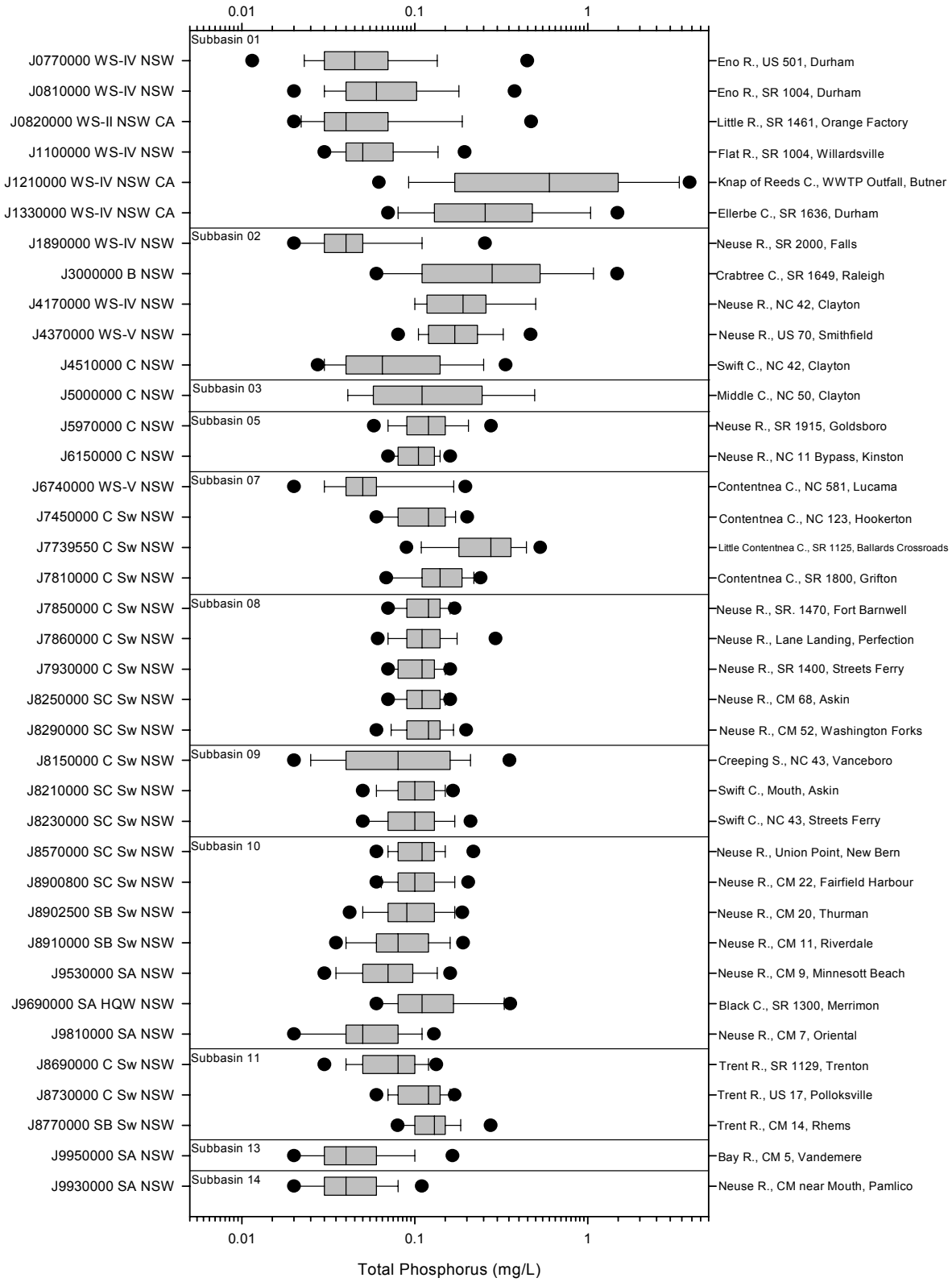


Figure 37. Box Plots of Total Phosphorus at DWQ Stations in the Neuse River Basin

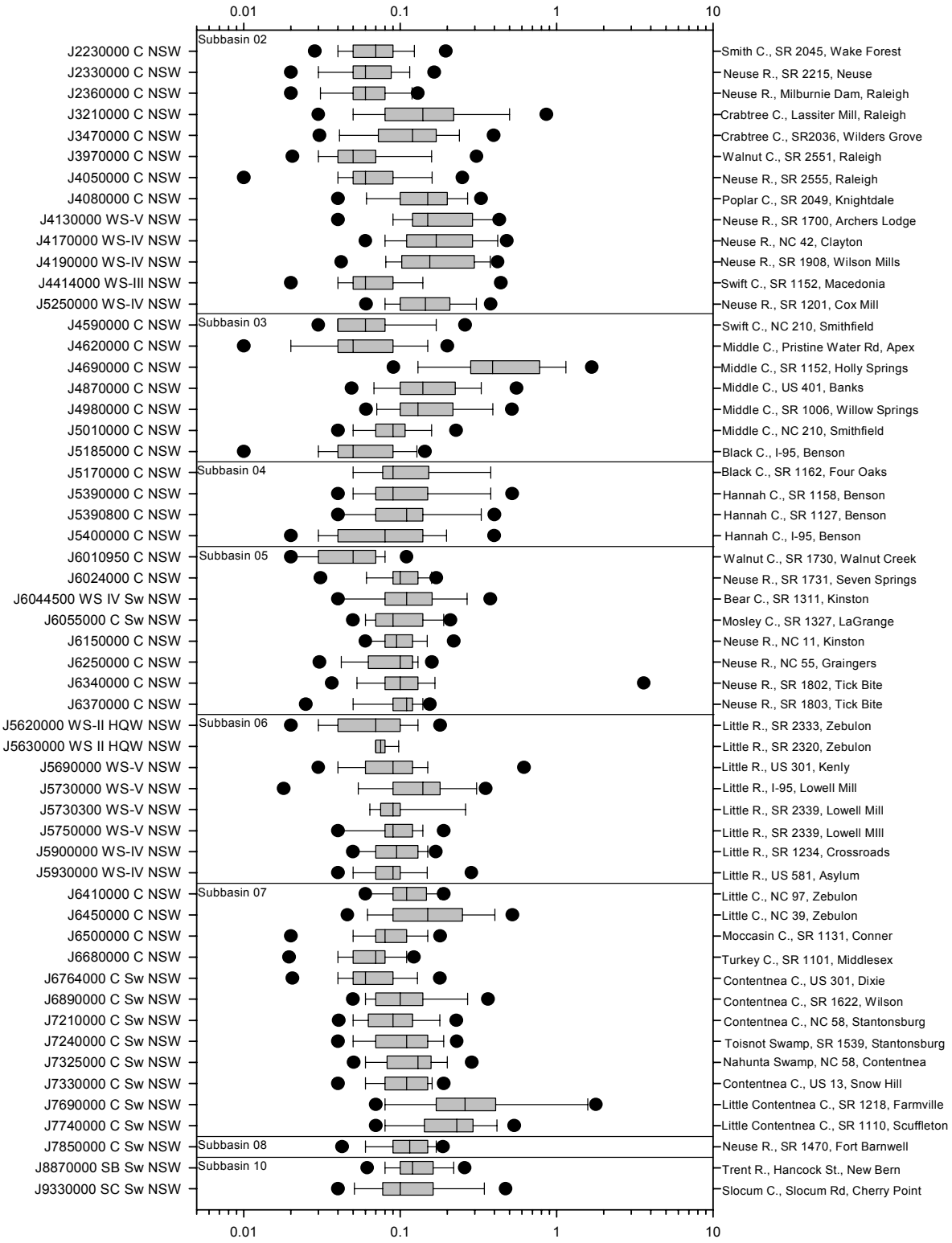


Figure 38. Box Plots of Total Phosphorus at LNBA Stations in the Neuse River Basin

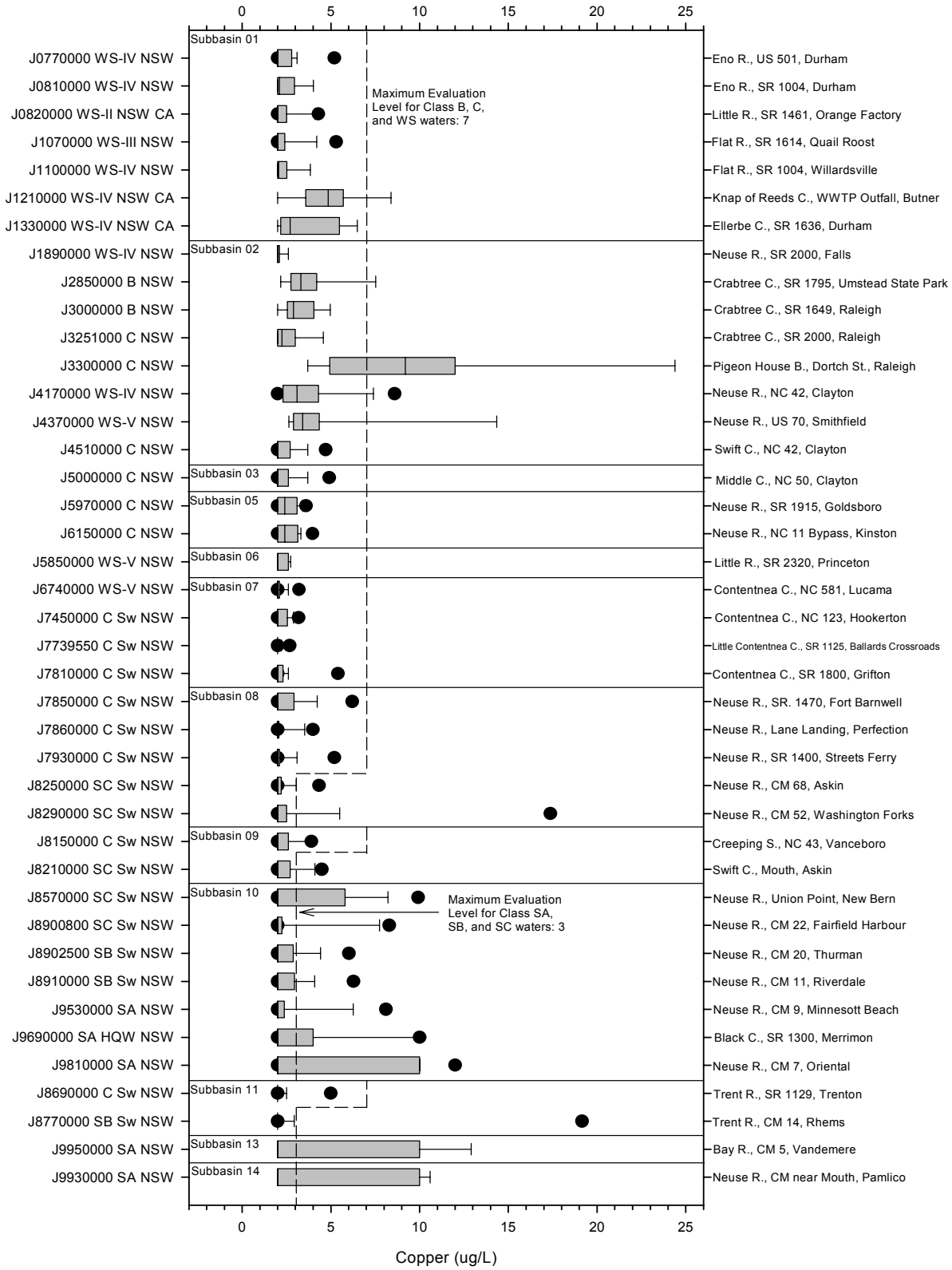


Figure 39. Box Plots of Total Copper at DWQ Stations in the Neuse River Basin

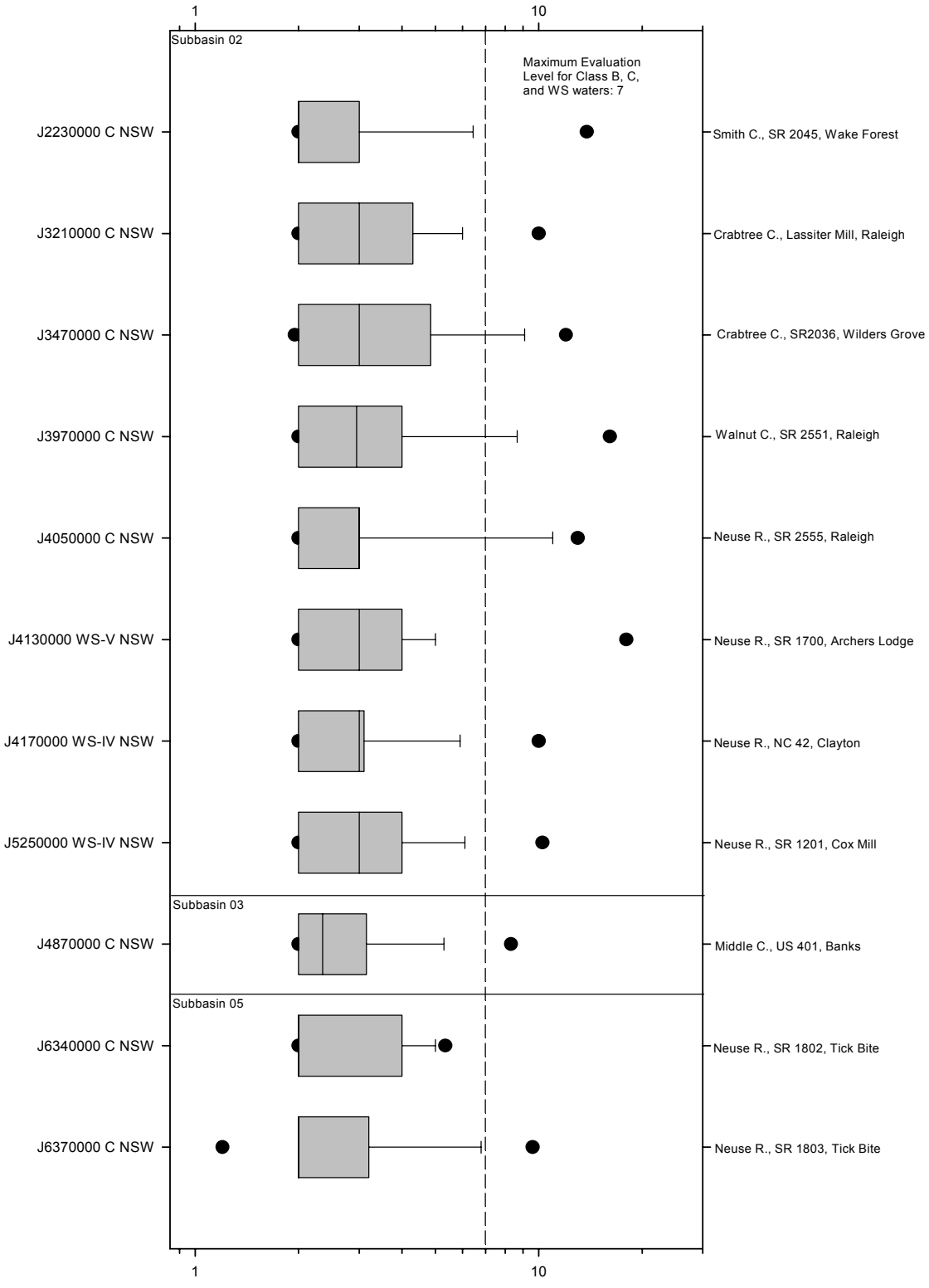


Figure 40. Box Plots of Total Copper at LNBA Stations in the Neuse River Basin

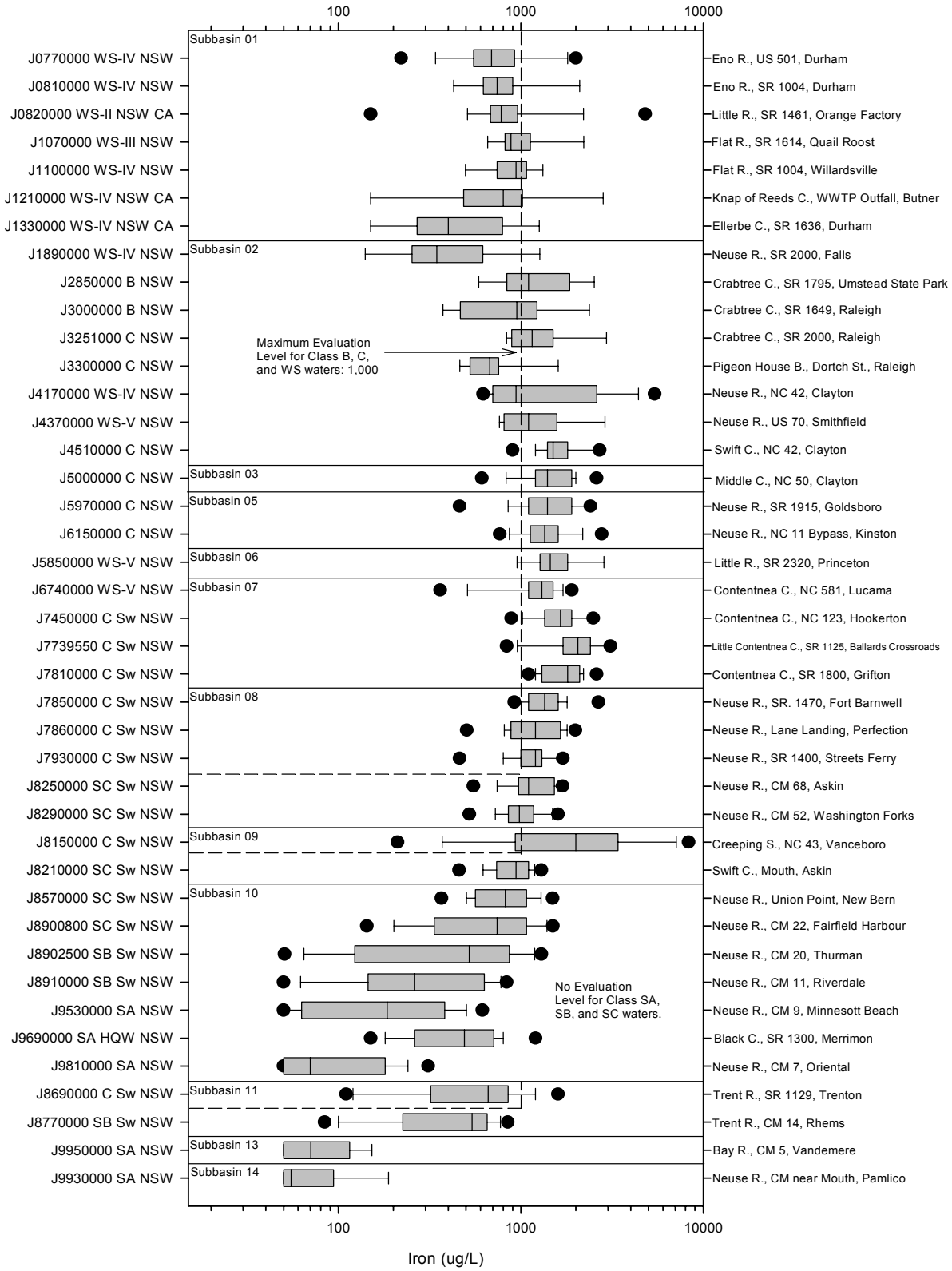


Figure 41. Box Plots of Total Iron at DWQ Stations in the Neuse River Basin

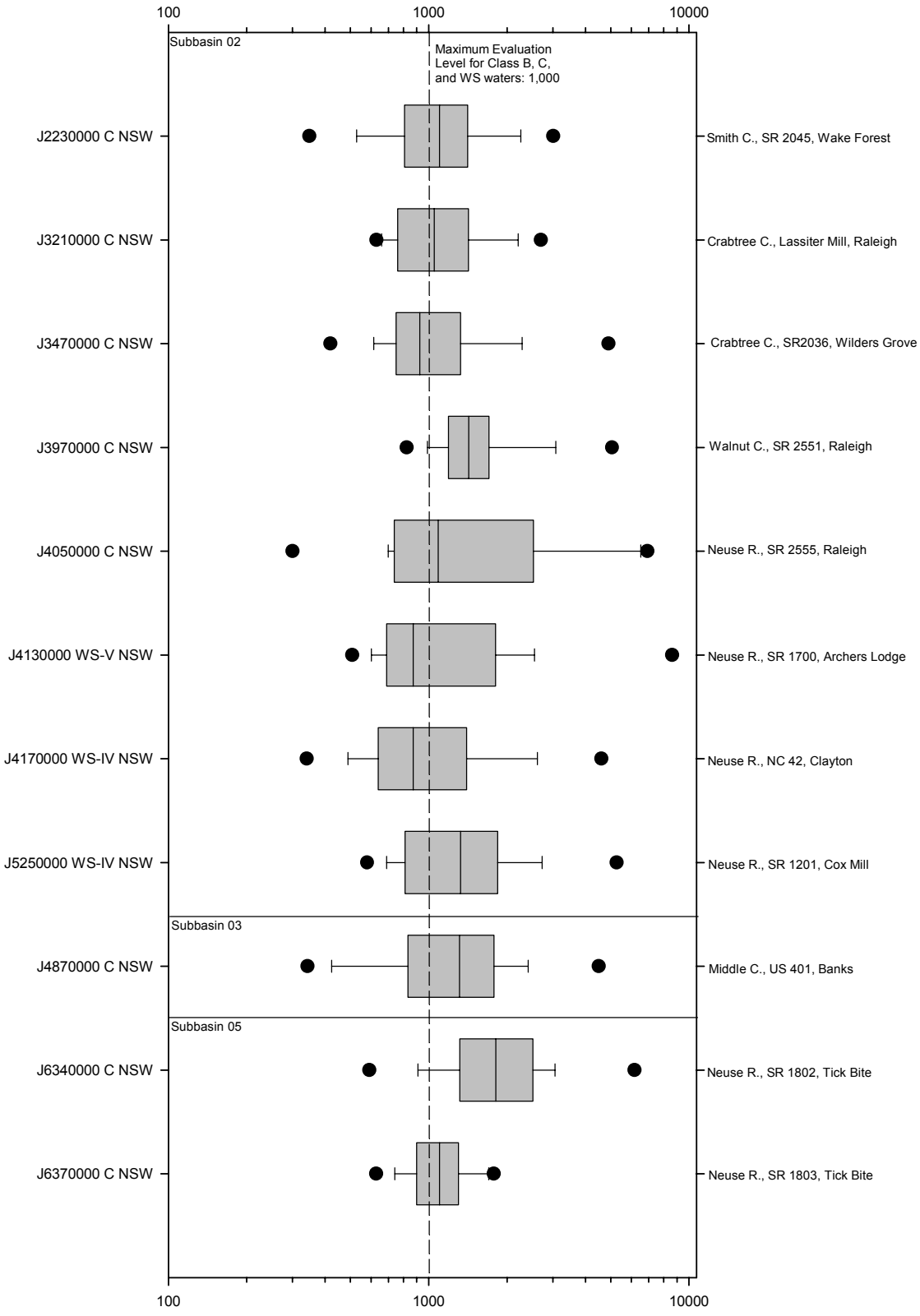


Figure 42. Box Plots of Total Iron at LNBA Stations in the Neuse River Basin

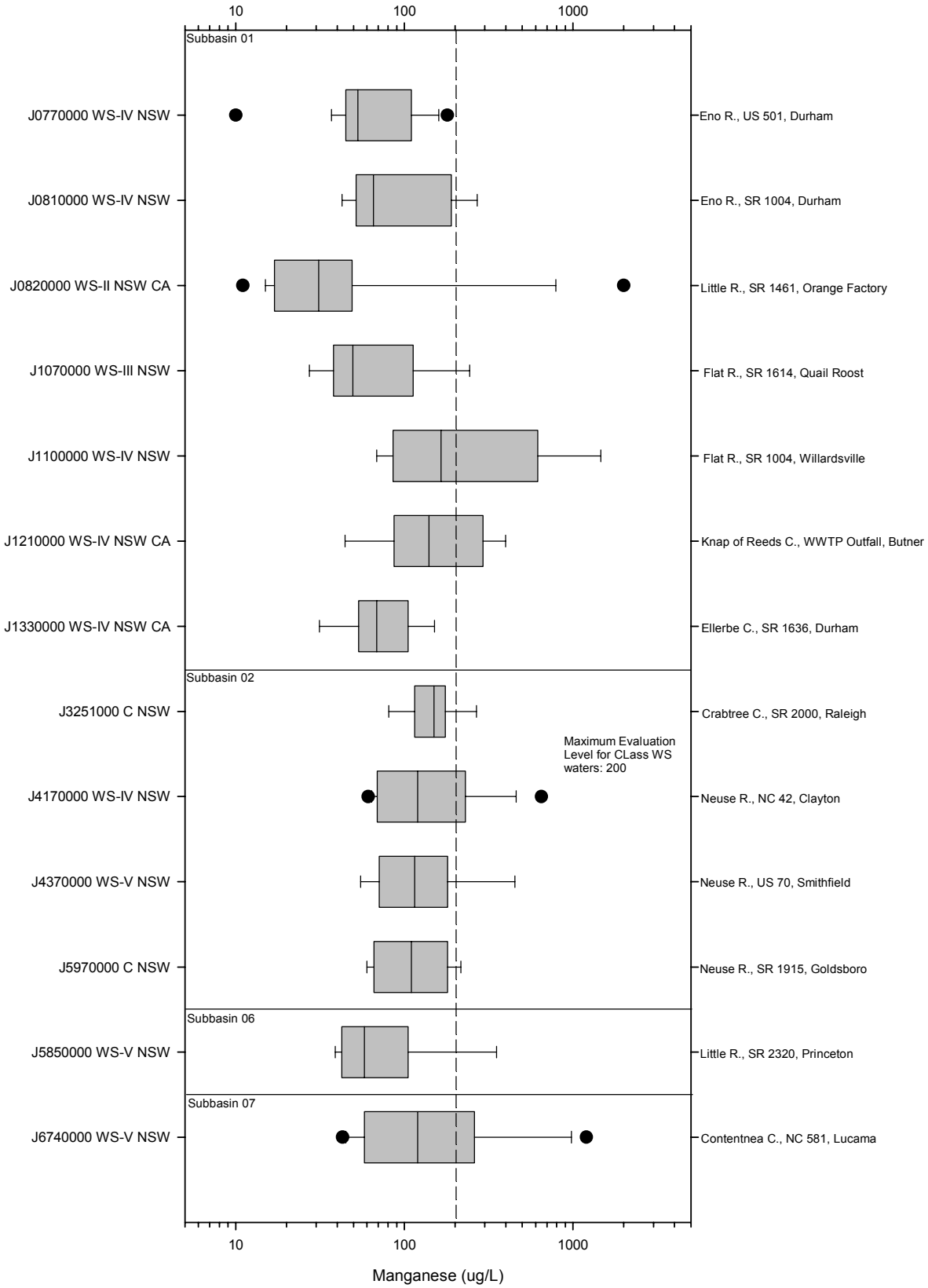


Figure 43. Box Plots of Total Manganese at DWQ Stations in the Neuse River Basin

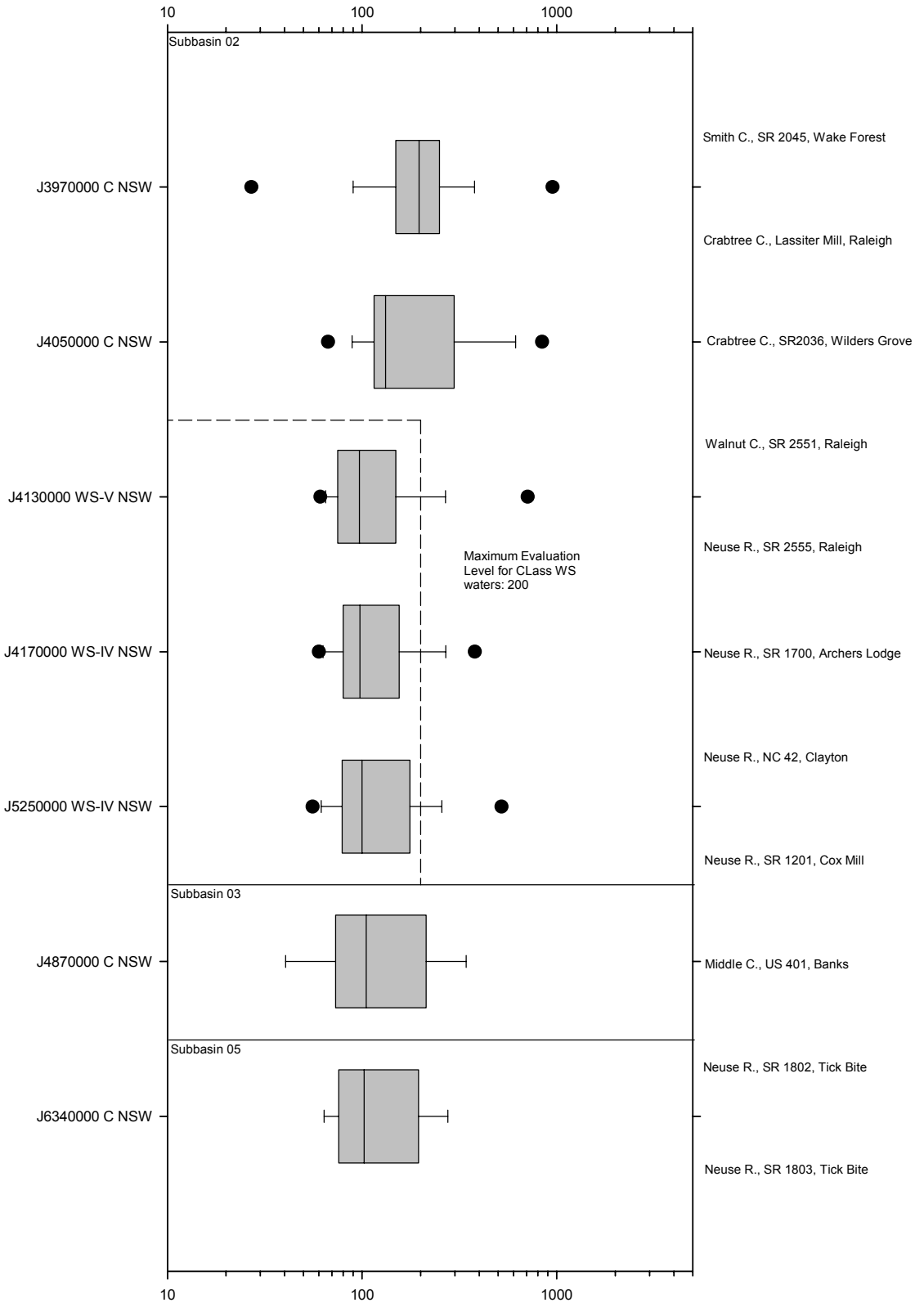


Figure 44. Box Plots of Total Manganese at LNBA Stations in the Neuse River Basin

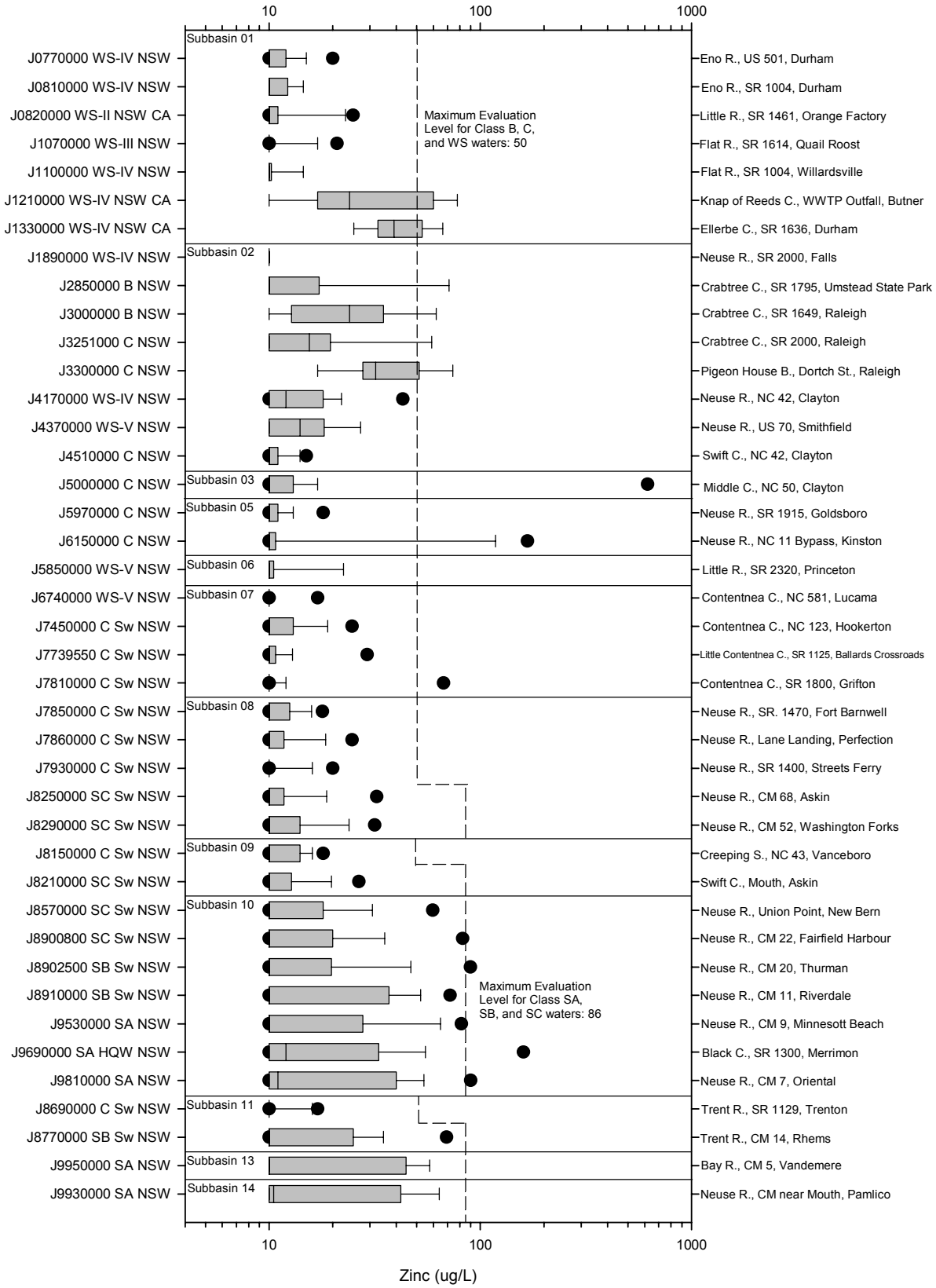


Figure 45. Box Plots of Total Zinc at DWQ Stations in the Neuse River Basin

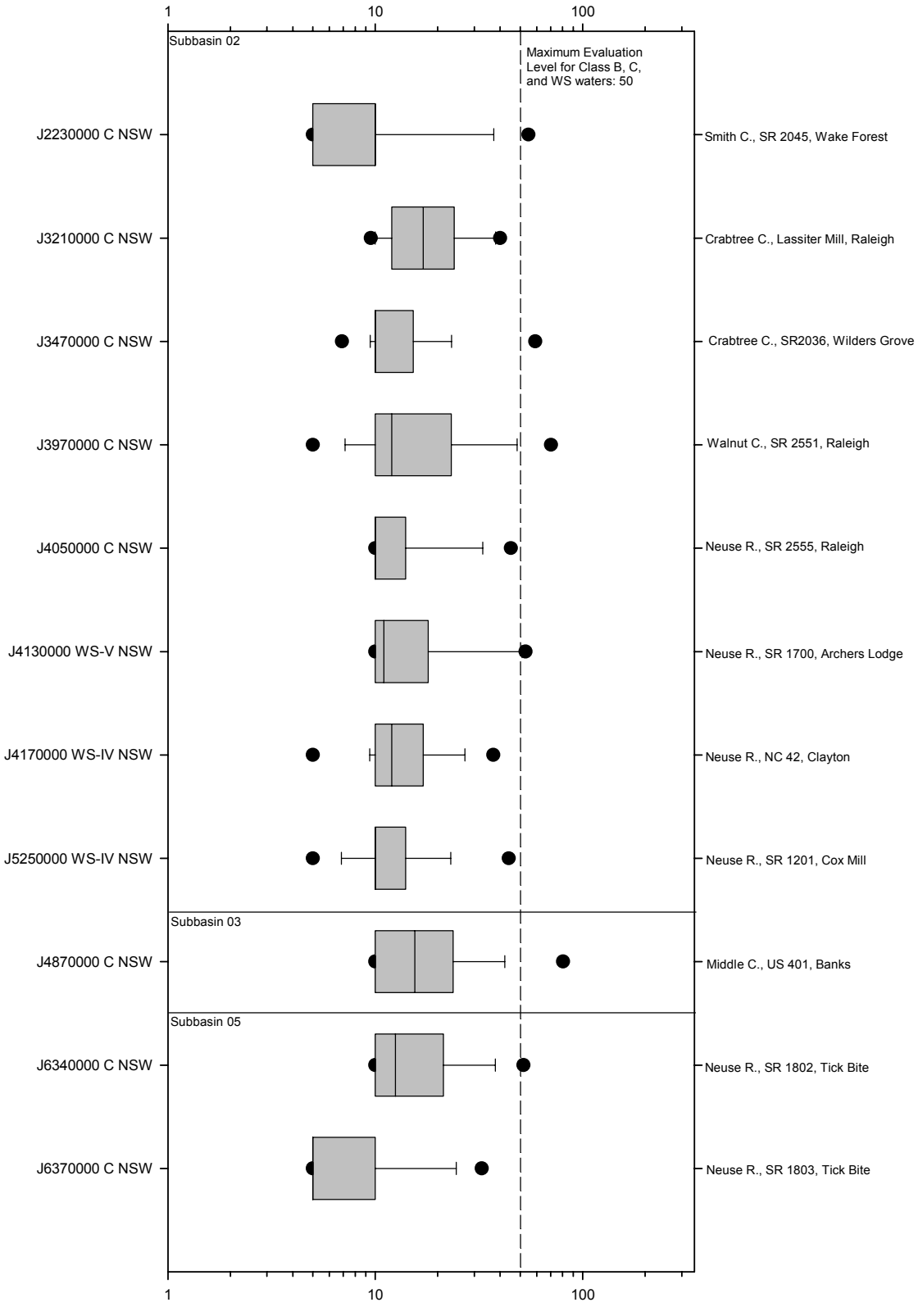


Figure 46. Box Plots of Total Zinc at LNBA Stations in the Neuse River Basin

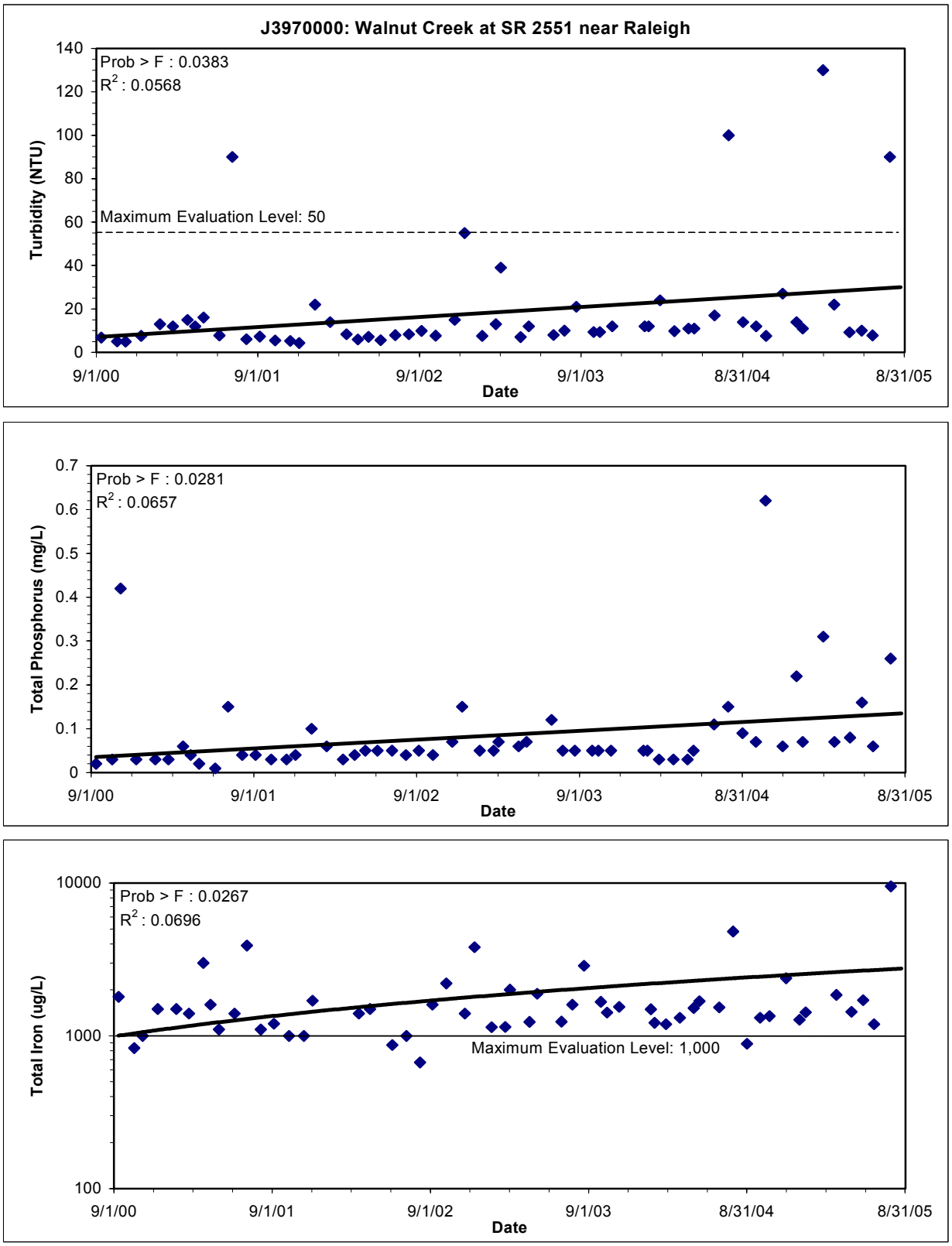
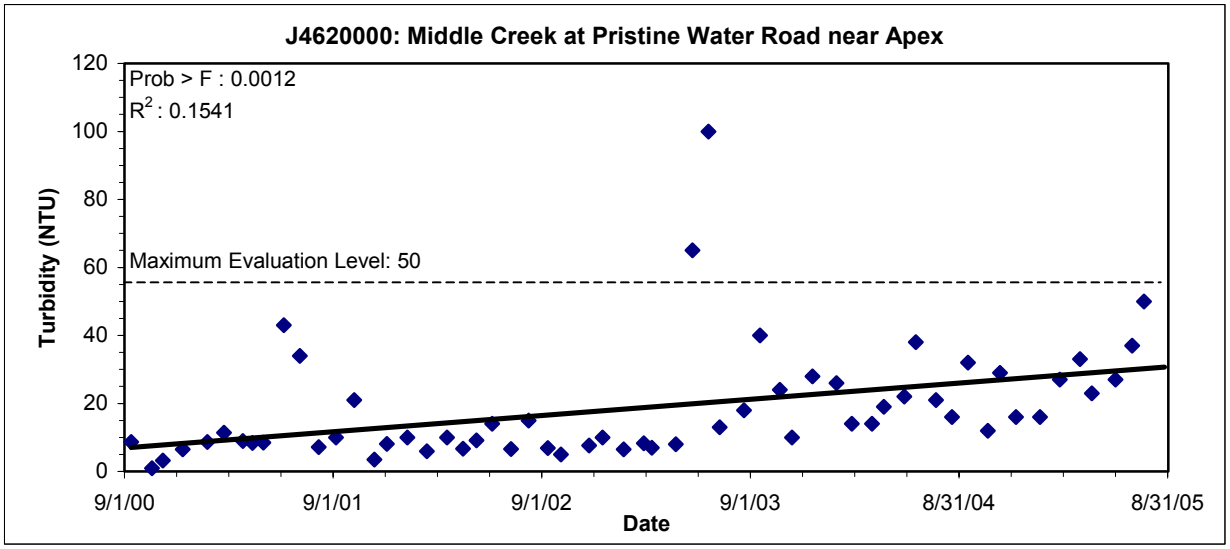
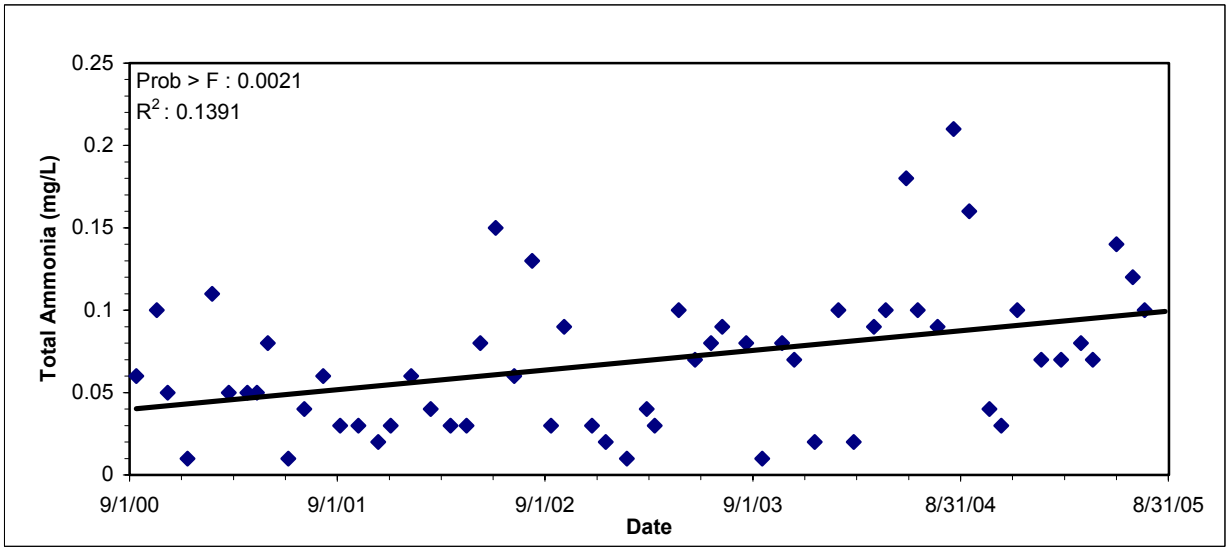


Figure 47. Trends in Selected Parameters for Station J3970000: Walnut Creek at SR 2551 near Raleigh





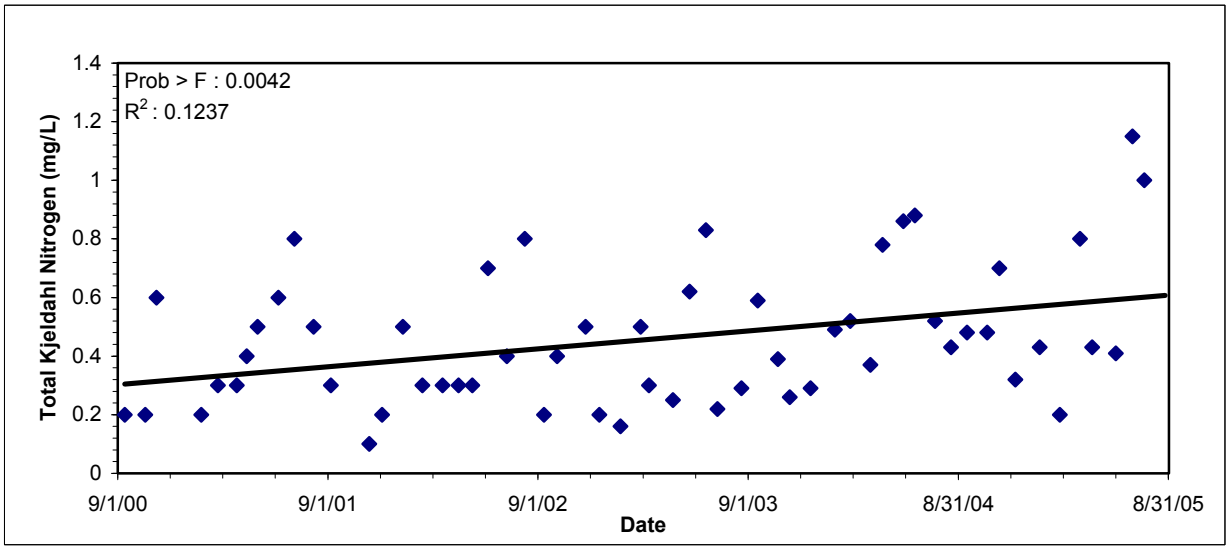
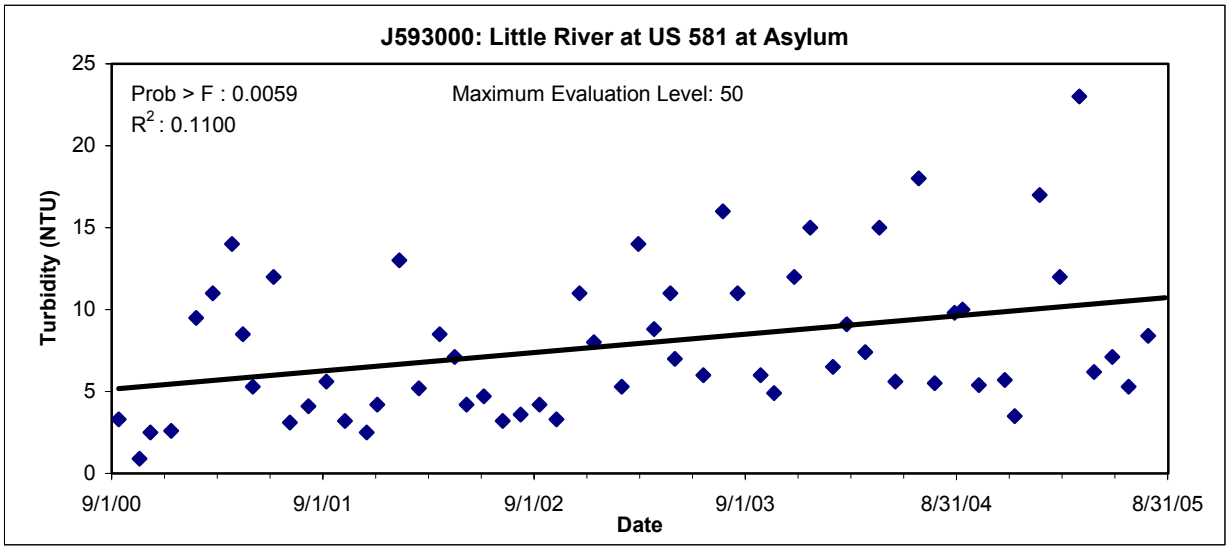
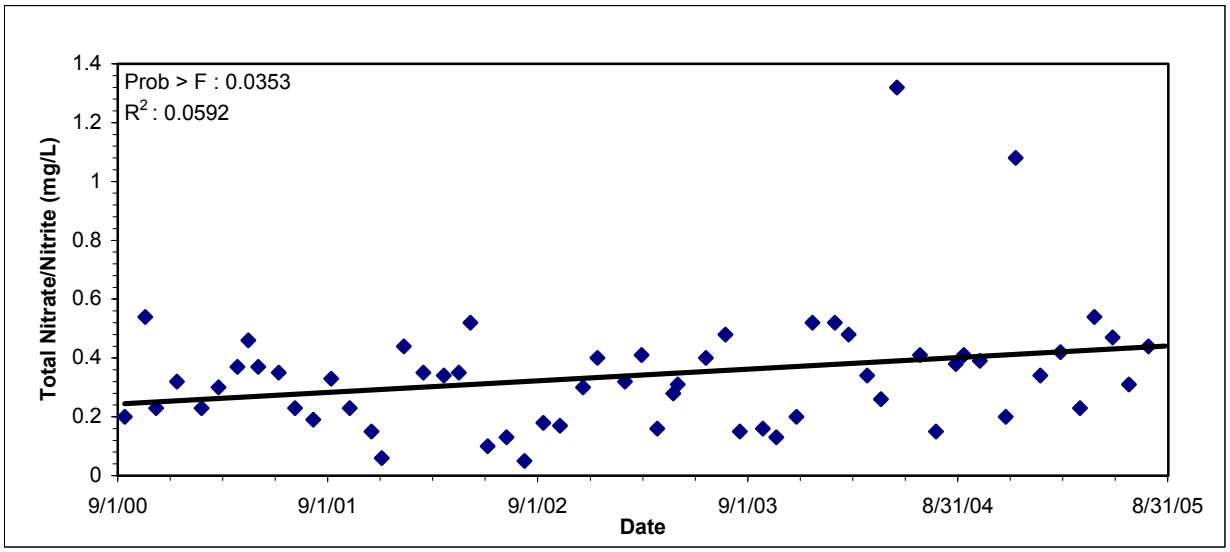


Figure 48. Trends in Selected Parameters for Station J4620000: Middle Creek at Pristine Water Road near Apex





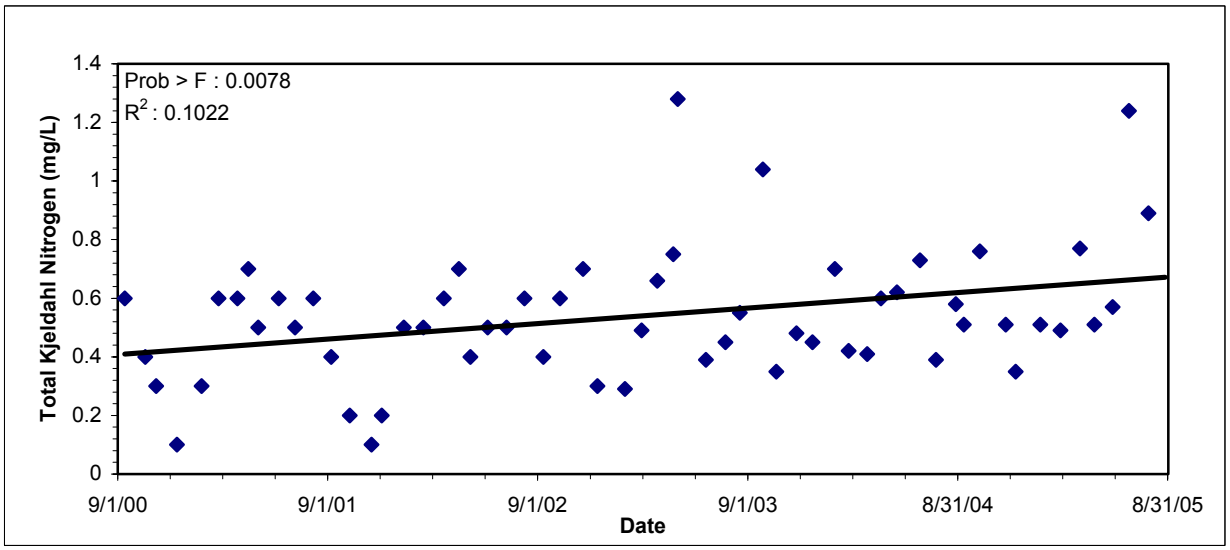
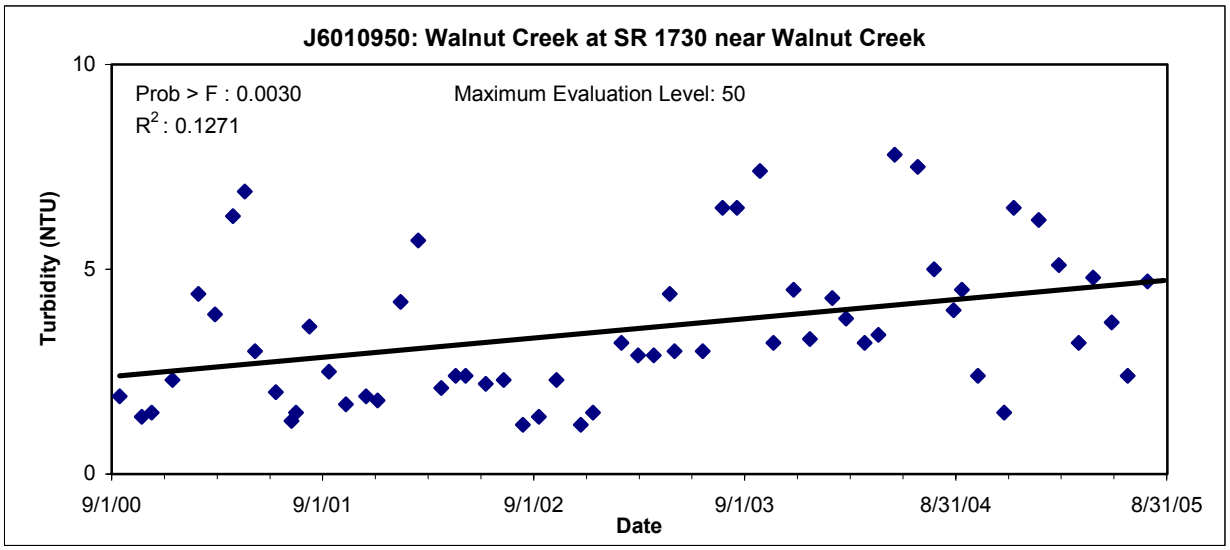
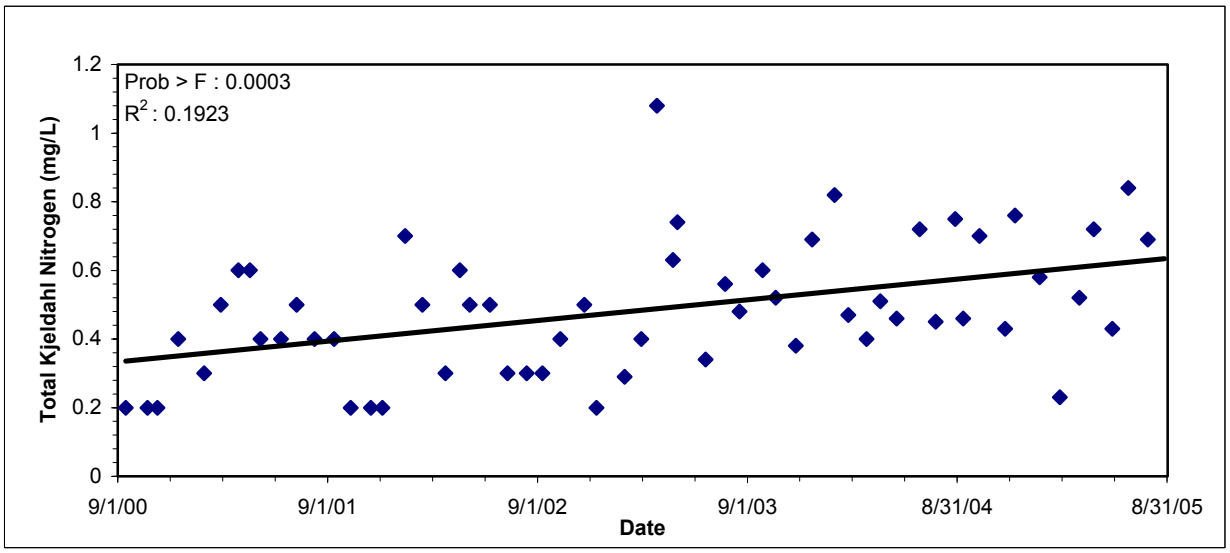


Figure 49. Trends in Selected Parameters for Station J5930000: Little River at US 581 at Asylum





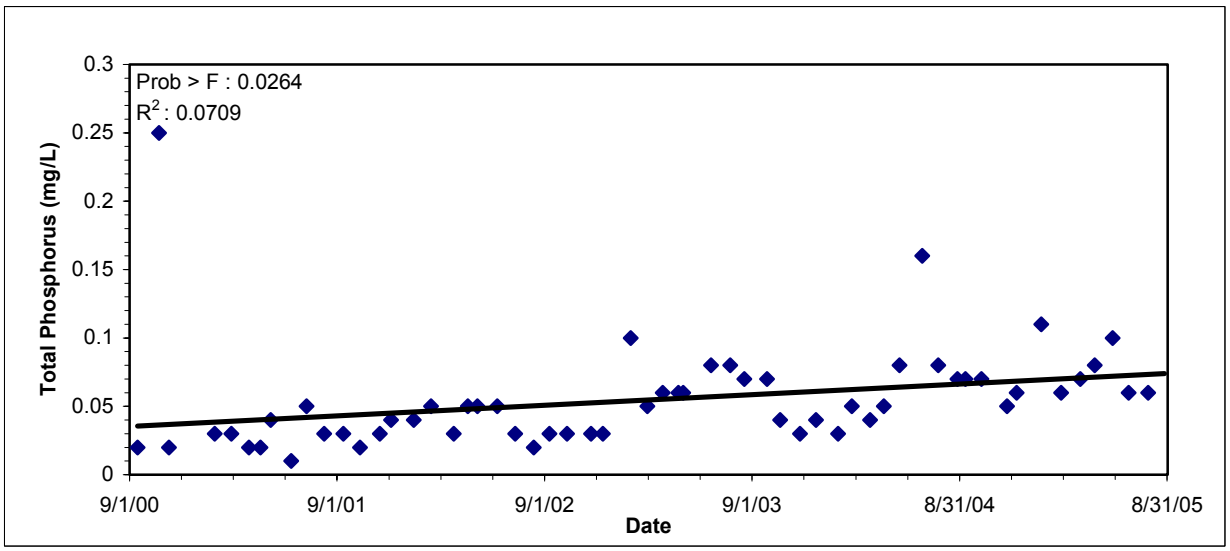
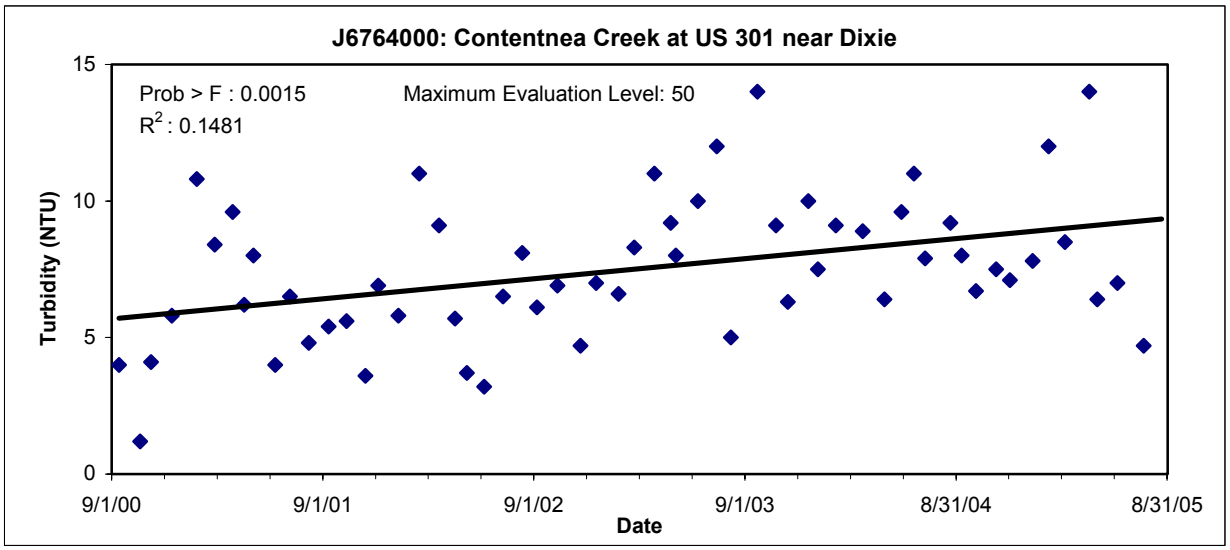
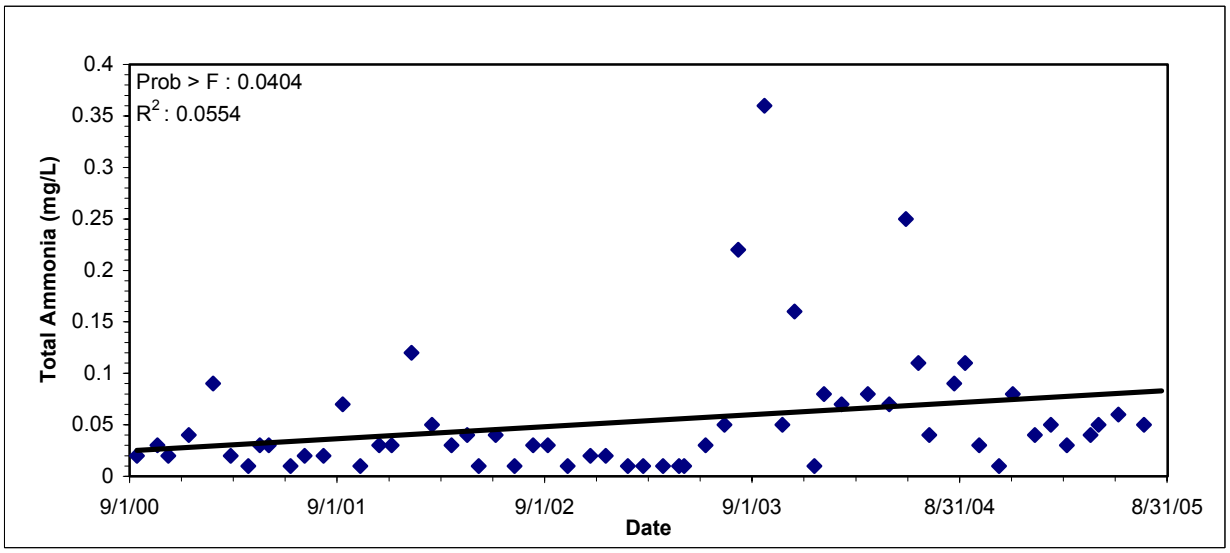


Figure 50. Trends in Selected Parameters for Station J6010950: Walnut Creek at SR 1730 near Walnut Creek





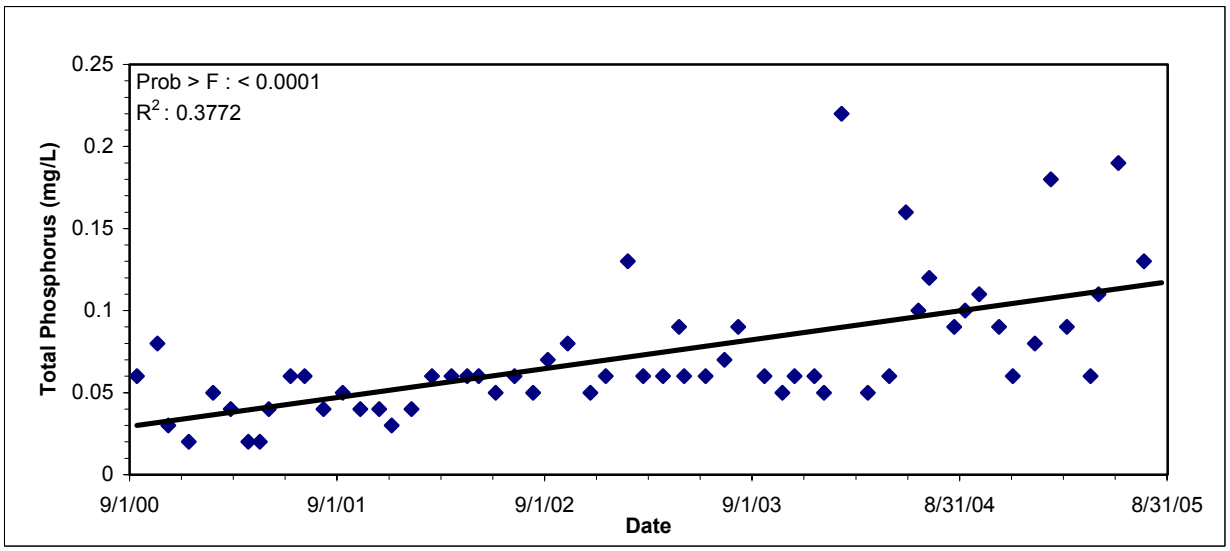
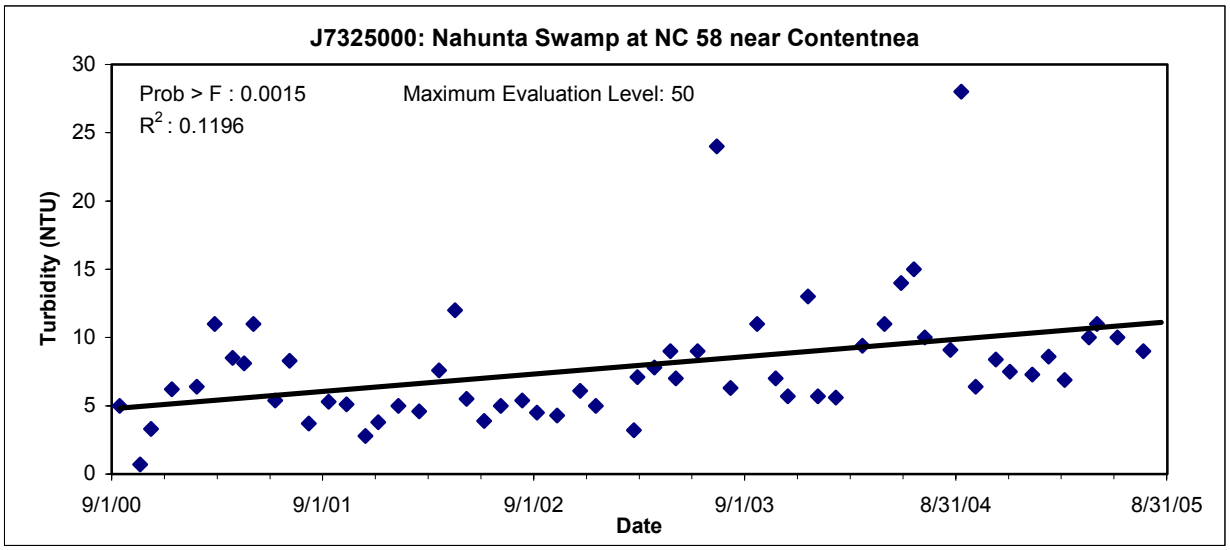
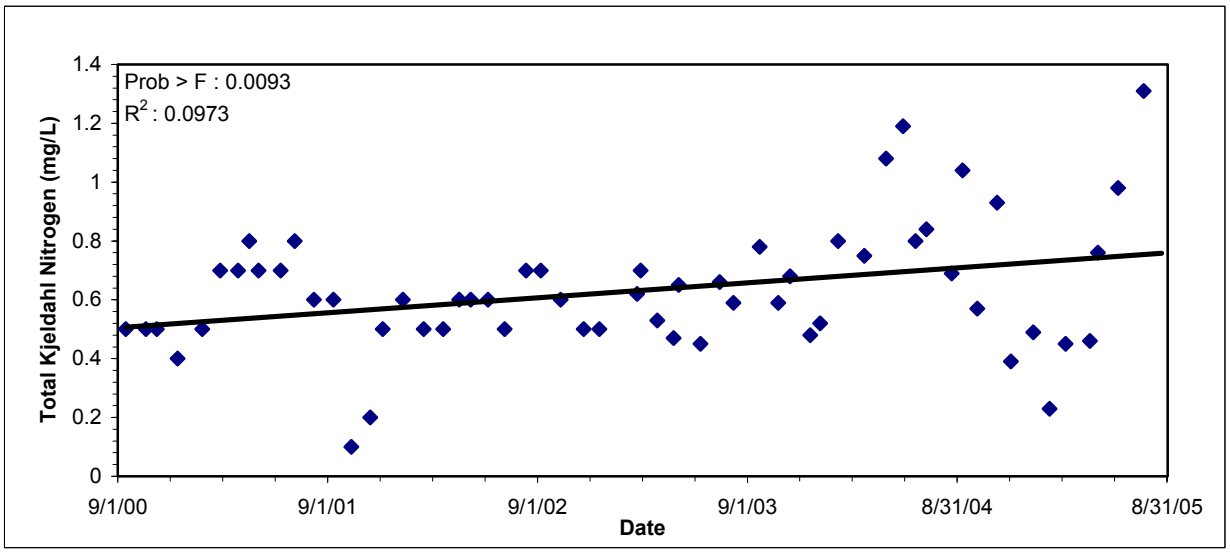


Figure 51. Trends in Selected Parameters for Station J6764000: Contentnea Creek at US 301 near Dixie





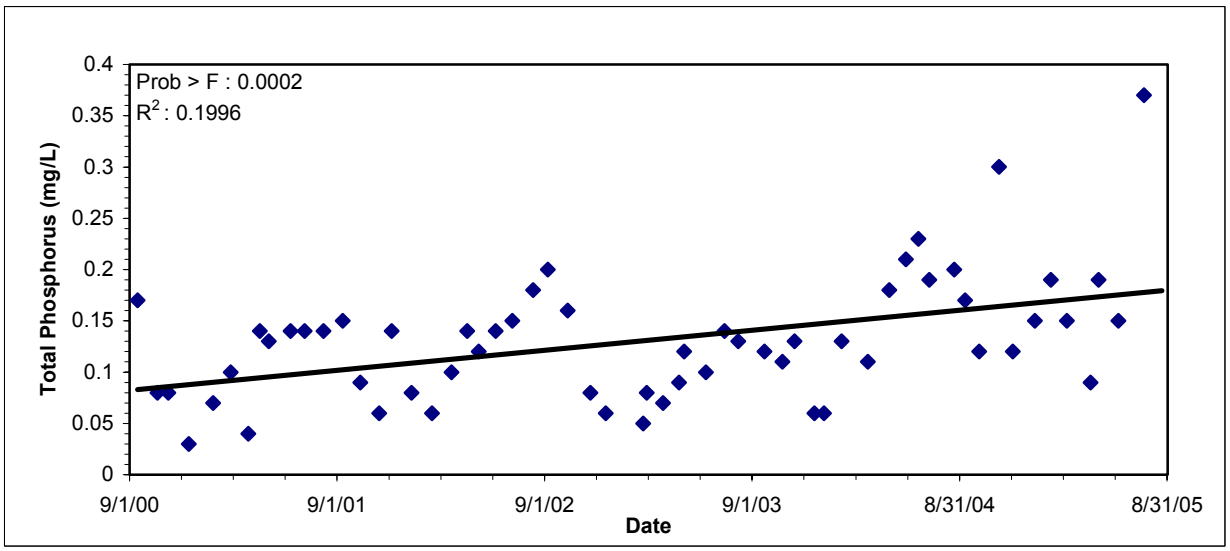
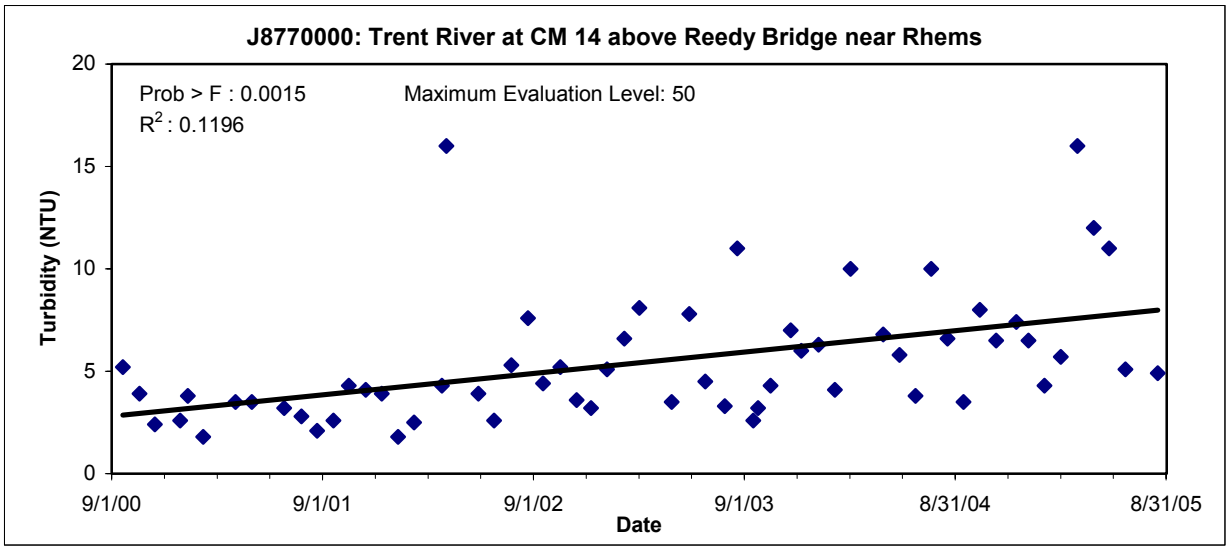
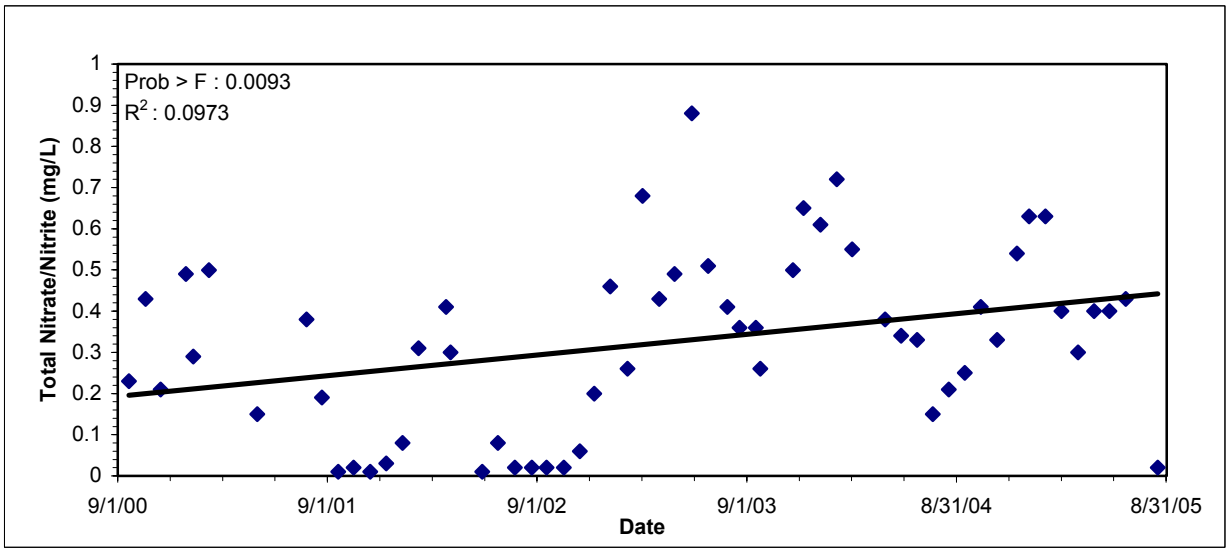


Figure 52. Trends in Selected Parameters for Station J7325000: Nahunta Swamp at NC 58 near Contentnea





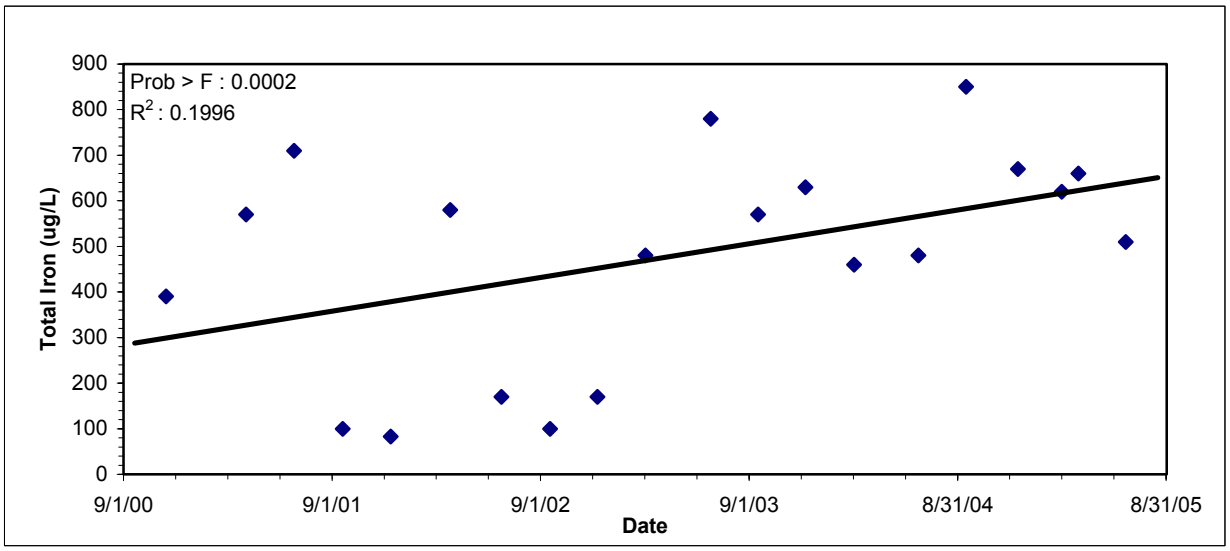
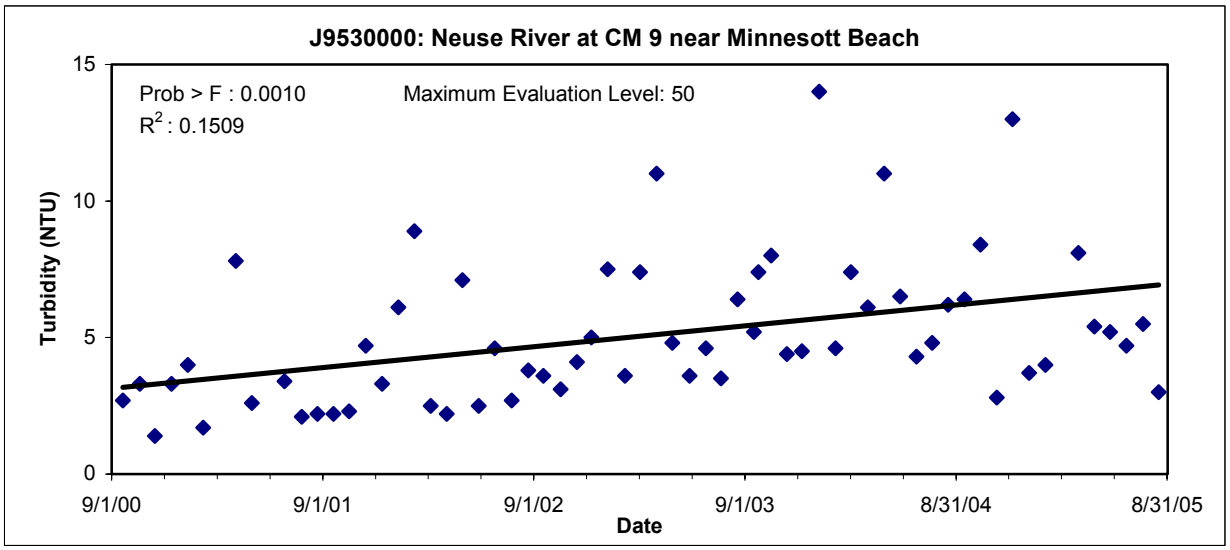
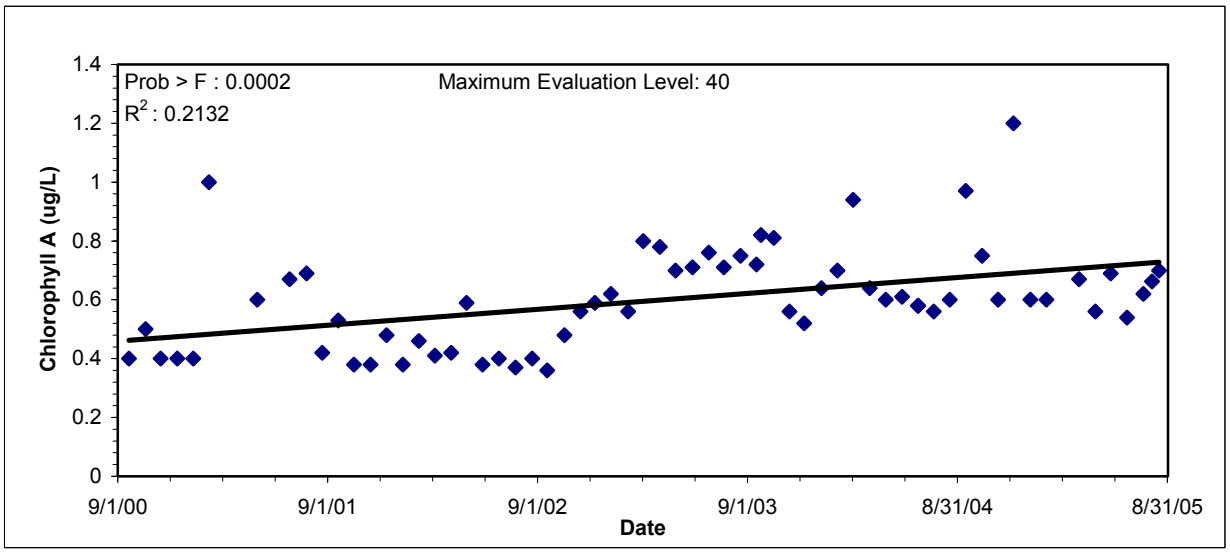


Figure 53. Trends in Selected Parameters for Station J8770000: Trent River at CM 14 above Reedy Bridge near Rhems





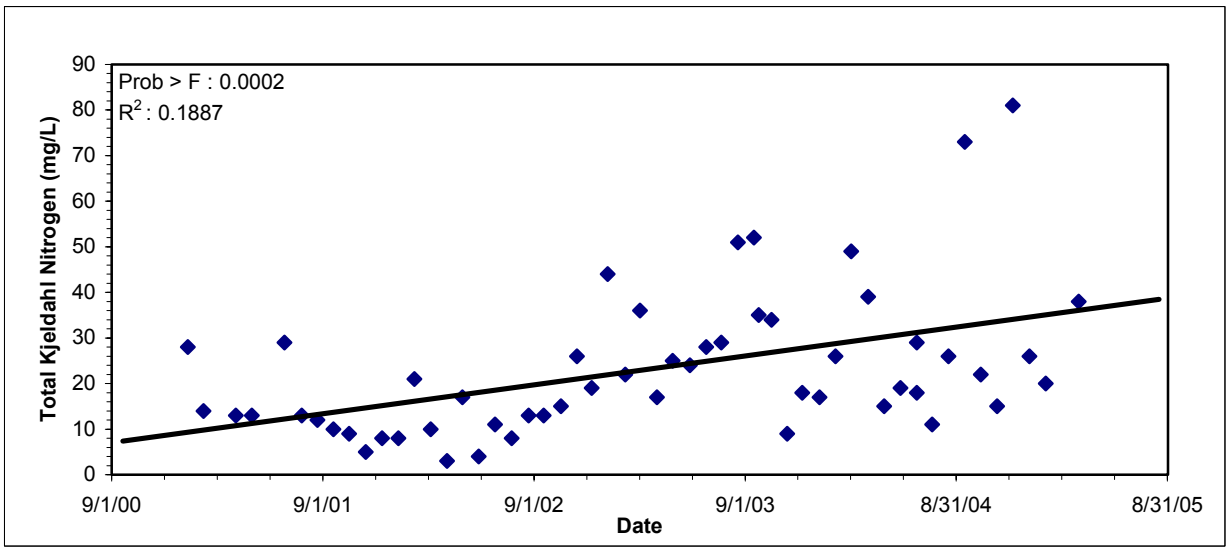
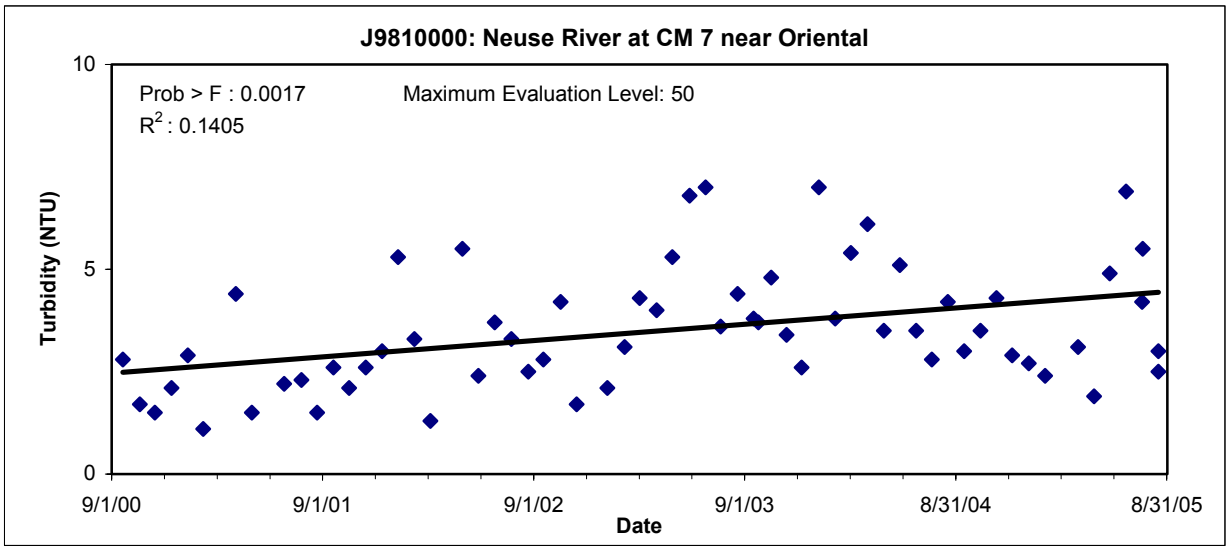
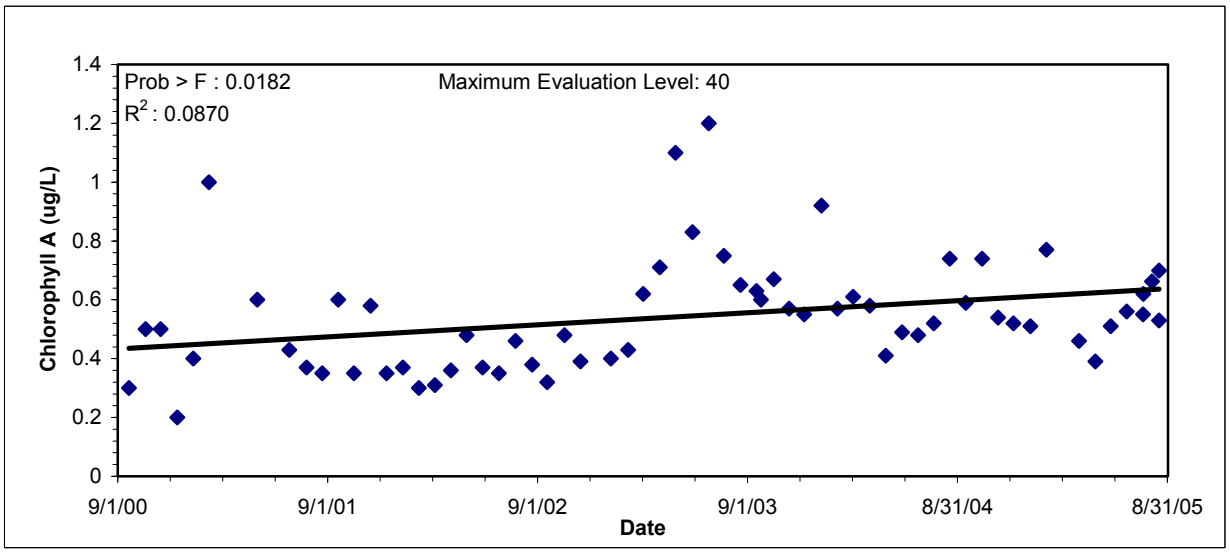


Figure 54. Trends in Selected Parameters for Station J9530000: Neuse River at CM 9 near Minnesott Beach





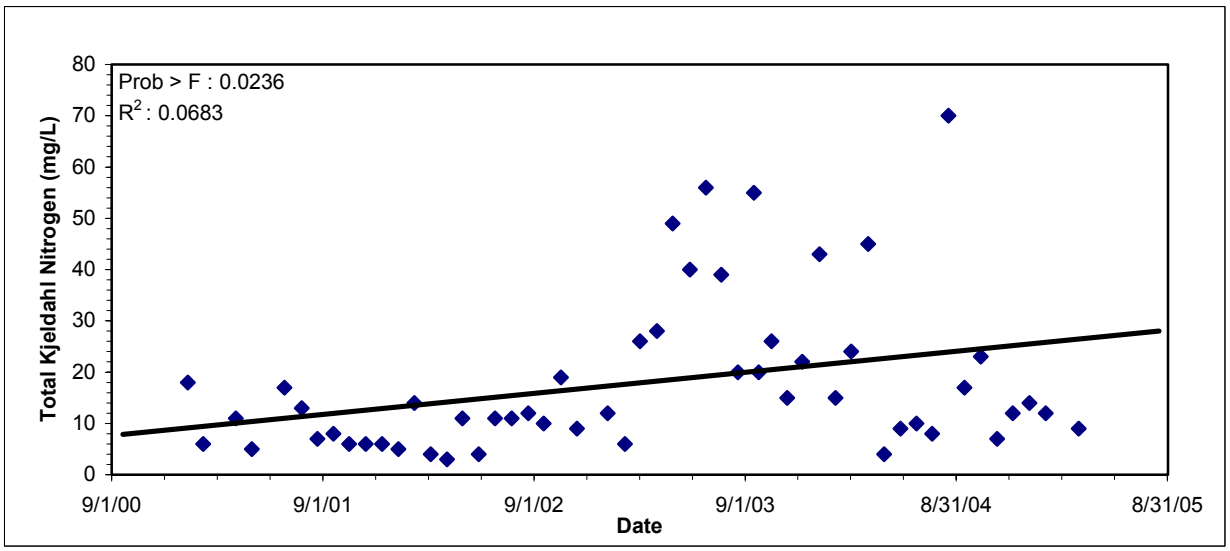


Figure 55. Trends in Selected Parameters for Station J9810000: Neuse River at CM 7 near Oriental

Appendix A: Station Summary Sheets

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: ENO RIV AT US 501 NR DURHAM
Station #: J0770000 **Subbasin:** NEU01
Latitude: 36.07197 **Longitude:** -78.90864 **Stream class:** WS-IV NSW
Agency: NCAMBNT **NC stream index:** 27-2-(19)

Time period: 09/14/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	65	0	<4	0	0		5.6	6.5	7.5	9.7	11.7	12.8	18.1
	65	0	<5	0	0		5.6	6.5	7.5	9.7	11.7	12.8	18.1
pH (SU)	65	0	<6	3	4.6		5.7	6.4	6.6	6.9	7.1	7.4	7.7
	65	0	>9	0	0		5.7	6.4	6.6	6.9	7.1	7.4	7.7
Salinity (ppt)	33	0	N/A				0	0	0	0.1	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	65	0	N/A				30	80	98	112	138	183	293
Water Temperature (°C)	65	0	>32	0	0		3	7.5	10	17.2	24.8	26.9	29.3
Other													
Chloride (mg/L)	3	0	>250	0	0		6	6	6	14	14	14	14
Hardness (mg/L as CaCO3)	3	0	>100	0	0		10	10	10	18	21	21	21
TSS (mg/L)	30	4	N/A				0	2	4	5	8	28	41
Turbidity (NTU)	58	0	>50	2	3.4		2	4	4	6	15	34	110
Nutrients (mg/L)													
NH3 as N	22	9	N/A				0.01	0.01	0.02	0.02	0.08	0.27	0.5
NO2 + NO3 as N	22	0	>10	0	0		0.02	0.04	0.11	0.25	0.47	0.55	0.69
TKN as N	20	1	N/A				0.2	0.25	0.3	0.36	0.54	1	1.4
Total Phosphorus	22	2	N/A				0.01	0.02	0.03	0.04	0.07	0.14	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				75	79	120	170	460	1300	2300
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	11	>7	0	0		2	2	2	2	3	3	5
Iron, total (Fe)	19	0	>1000	2	10.5	No	220	340	550	690	920	1800	2000
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	19	1	>200	0	0		10	37	45	53	110	160	180
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	14	>50	0	0		10	10	10	10	12	15	20

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
55	75	10	18	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: ENO RIV AT SR 1004 NR DURHAM
Station #: J0810000 **Subbasin:** NEU01
Latitude: 36.07254 **Longitude:** -78.86270 **Stream class:** WS-IV NSW
Agency: NCAMBNT **NC stream index:** 27-2-(19.5)

Time period: 09/14/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	56	0	<4	1	1.8		3.6	5.2	6.9	8.7	11.5	12.6	17.5
	56	0	<5	3	5.4		3.6	5.2	6.9	8.7	11.5	12.6	17.5
pH (SU)	56	0	<6	0	0		6.1	6.5	6.8	7	7.1	7.3	7.6
	56	0	>9	0	0		6.1	6.5	6.8	7	7.1	7.3	7.6
Salinity (ppt)	26	0	N/A				0	0	0	0.1	0.1	0.1	0.2
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				68	81	100	120	142	202	450
Water Temperature (°C)	56	0	>32	0	0		3	6.7	9.2	16	23.7	26.3	27.8
Other													
Chloride (mg/L)	2	0	>250	0	0		4	4	4	8	12	12	12
Hardness (mg/L as CaCO3)	2	0	>100	0	0		34	34	34	35	36	36	36
TSS (mg/L)	19	5	N/A				1	2	2	5	9	16	45
Turbidity (NTU)	58	0	>50	4	6.9		2	4	6	9	15	34	110
Nutrients (mg/L)													
NH3 as N	34	15	N/A				0.01	0.02	0.02	0.03	0.05	0.19	1
NO2 + NO3 as N	34	2	>10	0	0		0.01	0.12	0.25	0.36	0.49	0.65	2.5
TKN as N	32	0	N/A				0.22	0.24	0.32	0.39	0.57	0.69	1.8
Total Phosphorus	34	1	N/A				0.02	0.03	0.04	0.06	0.1	0.18	0.61
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				81	82	158	225	480	1170	1800
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	9	>7	0	0		2	2	2	2	3	4	6
Iron, total (Fe)	18	0	>1000	3	16.7	No	320	428	622	740	900	2100	2100
Lead, total (Pb)	18	17	>25	0	0		10	10	10	10	10	12	25
Manganese, total (Mn)	18	0	>200	3	16.7	No	39	43	52	66	190	270	270
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	13	>50	0	0		10	10	10	10	12	15	19

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	87	9	16	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT SR 1461 NR ORANGE FACTORY
Station #: J0820000 **Subbasin:** NEU01
Latitude: 36.14159 **Longitude:** -78.91930 **Stream class:** WS-II HQW NSW CA
Agency: NCAMBNT **NC stream index:** 27-2-21-(3.5)

Time period: 09/14/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	<4	1	1.6		3.8	6.1	7.7	10.4	11.9	12.8	17.8
	64	0	<5	1	1.6		3.8	6.1	7.7	10.4	11.9	12.8	17.8
pH (SU)	64	0	<6	2	3.1		5.9	6.4	6.7	6.9	7.1	7.4	8
	64	0	>9	0	0		5.9	6.4	6.7	6.9	7.1	7.4	8
Salinity (ppt)	32	0	N/A				0	0	0	0	0	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	63	0	N/A				57	71	81	88	100	120	315
Water Temperature (°C)	64	0	>32	0	0		0.8	6	9.1	15.4	24	25.9	28.2
Other													
Chloride (mg/L)	3	0	>250	0	0		4	4	4	6	6	6	6
Hardness (mg/L as CaCO3)	3	0	>100	0	0		18	18	18	27	28	28	28
TSS (mg/L)	31	12	N/A				0	2	2	3	6	15	150
Turbidity (NTU)	58	0	>50	5	8.6		1	2	3	6	16	42	120
Nutrients (mg/L)													
NH3 as N	21	14	N/A				0.01	0.01	0.02	0.02	0.04	0.39	0.5
NO2 + NO3 as N	21	2	>10	0	0		0.03	0.05	0.1	0.19	0.41	0.72	0.79
TKN as N	20	1	N/A				0.2	0.23	0.29	0.35	0.47	0.59	1
Total Phosphorus	21	3	N/A				0.02	0.02	0.03	0.04	0.07	0.19	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	1	N/A				50	60	110	140	180	1900	3300
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	14	>7	0	0		2	2	2	2	2	4	4
Iron, total (Fe)	19	0	>1000	3	15.8	No	150	510	680	780	960	2200	4800
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	19	0	>200	2	10.5	No	11	15	17	31	49	790	2000
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	13	>50	0	0		10	10	10	10	11	23	25

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	49	9	16	

Key:
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV RES AT SR 1628 AT ORANGE FACTORY
Station #: J0840000 **Subbasin:** NEU01
Latitude: 36.12721 **Longitude:** -78.87471 **Stream class:** WS-II HQW NSW CA
Agency: NCAMBNT **NC stream index:** 27-2-21-(3.5)

Time period: 09/18/2000 to 05/13/2002

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	16	0	<4	1	6.2		3.1	3.9	6.2	7.8	9.6	13.4	16
	16	0	<5	2	12.5	No	3.1	3.9	6.2	7.8	9.6	13.4	16
pH (SU)	16	0	<6	0	0		6.1	6.2	6.7	7	7	7.1	7.1
	16	0	>9	0	0		6.1	6.2	6.7	7	7	7.1	7.1
Spec. conductance (umhos/cm at 25°C)	16	0	N/A				60	67	80	95	117	244	300
Water Temperature (°C)	16	0	>32	0	0		8	8	9.7	17.9	25.6	27.3	28
Other													
Chloride (mg/L)	3	0	>250	0	0		4	4	4	5	5	5	5
Hardness (mg/L as CaCO3)	3	0	>100	0	0		14	14	14	19	22	22	22
TSS (mg/L)	5	0	N/A				3	3	4	8	10	11	11
Turbidity (NTU)	17	0	>50	0	0		2	2	3	4	10	32	35
Nutrients (mg/L)													
NH3 as N	9	2	N/A				0.01	0.01	0.05	0.09	0.35	0.51	0.51
NO2 + NO3 as N	9	4	>10	0	0		0.01	0.01	0.03	0.17	0.37	1.1	1.1
TKN as N	7	1	N/A				0.4	0.4	0.4	0.48	1	1	1
Total Phosphorus	9	4	N/A				0.02	0.02	0.02	0.03	0.09	0.5	0.5
Metals (ug/L)													
Aluminum, total (Al)	5	1	N/A				50	50	59	150	350	440	440
Arsenic, total (As)	5	5	>10	0	0		10	10	10	10	10	10	10
Cadmium, total (Cd)	5	5	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	5	5	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	5	5	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	5	0	>1000	0	0		74	74	107	420	615	700	700
Lead, total (Pb)	5	5	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	5	0	>200	1	20		64	64	66	82	378	660	660
Mercury, total (Hg)	5	5	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	5	5	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	5	4	>50	0	0		10	10	10	10	16	23	23

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
17	6	0	0	

Key:
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: FLAT RIV AT SR 1614 NR QUAIL ROOST
Station #: J1070000 **Subbasin:** NEU01
Latitude: 36.20021 **Longitude:** -78.88615 **Stream class:** WS-III NSW
Agency: NCAMBNT **NC stream index:** 27-3-(1)

Time period: 09/14/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	1	1.7		3.2	5.3	6.6	8	11.3	12.8	18.1
	58	0	<5	3	5.2		3.2	5.3	6.6	8	11.3	12.8	18.1
pH (SU)	57	0	<6	0	0		6	6.4	6.6	6.8	7	7.3	7.4
	57	0	>9	0	0		6	6.4	6.6	6.8	7	7.3	7.4
Salinity (ppt)	26	0	N/A				0	0	0	0	0	0	0
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				51	64	73	81	90	100	300
Water Temperature (°C)	58	0	>32	0	0		0.8	5.4	9	15.1	23.5	26	26.8
Other													
Chloride (mg/L)	3	0	>250	0	0		5	5	5	6	7	7	7
Hardness (mg/L as CaCO3)	2	0	>100	0	0		20	20	20	26	31	31	31
TSS (mg/L)	19	4	N/A				0	2	2	3	6	11	220
Turbidity (NTU)	57	0	>50	3	5.3		3	4	5	8	20	37	130
Nutrients (mg/L)													
NH3 as N	8	4	N/A				0.01	0.01	0.02	0.16	0.2	0.5	0.5
NO2 + NO3 as N	8	1	>10	0	0		0.03	0.03	0.05	0.19	0.48	0.57	0.57
TKN as N	7	1	N/A				0.3	0.3	0.35	0.5	0.6	1	1
Total Phosphorus	8	2	N/A				0.02	0.02	0.03	0.05	0.23	0.5	0.5
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				52	95	145	200	408	1331	4400
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	12	>7	0	0		2	2	2	2	2	4	5
Iron, total (Fe)	18	0	>1000	5	27.8	Yes	460	658	818	880	1125	2210	5900
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	18	0	>200	1	5.6		21	27	38	50	113	244	730
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	15	>50	0	0		10	10	10	10	10	17	21

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
53	67	7	13	

Key:
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: FLAT RIV AT SR 1004 NR WILLARDSVILLE
Station #: J1100000 **Subbasin:** NEU01
Latitude: 36.13186 **Longitude:** -78.82784 **Stream class:** WS-IV NSW CA
Agency: NCAMBNT **NC stream index:** 27-3-(9)

Time period: 09/14/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	<4	15	23.4	Yes	1.3	3	4	6.7	9.6	12.6	16.3
	64	0	<5	23	35.9	Yes	1.3	3	4	6.7	9.6	12.6	16.3
pH (SU)	64	0	<6	0	0		6	6.1	6.5	6.8	7	7.1	7.3
	64	0	>9	0	0		6	6.1	6.5	6.8	7	7.1	7.3
Salinity (ppt)	33	0	N/A				0	0	0	0	0	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				49	54	66	76	95	106	260
Water Temperature (°C)	64	0	>32	0	0		4	7.1	9.2	16.6	23.2	26.7	31.9
Other													
Chloride (mg/L)	2	0	>250	0	0		6	6	6	6	6	6	6
Hardness (mg/L as CaCO3)	2	0	>100	0	0		20	20	20	21	22	22	22
TSS (mg/L)	29	2	N/A				2	4	5	6	8	11	14
Turbidity (NTU)	57	0	>50	0	0		2	4	6	10	15	22	50
Nutrients (mg/L)													
NH3 as N	41	10	N/A				0.01	0.01	0.02	0.05	0.11	0.19	0.52
NO2 + NO3 as N	41	5	>10	0	0		0.02	0.02	0.07	0.18	0.33	0.37	0.5
TKN as N	39	1	N/A				0.2	0.36	0.4	0.52	0.62	0.65	1
Total Phosphorus	41	2	N/A				0.02	0.03	0.04	0.05	0.07	0.14	0.5
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				76	98	235	330	608	810	900
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	8	>7	0	0		2	2	2	2	3	4	4
Iron, total (Fe)	18	0	>1000	4	22.2	Yes	370	496	740	940	1075	1320	1500
Lead, total (Pb)	18	16	>25	1	5.6		10	10	10	10	10	13	31
Manganese, total (Mn)	18	0	>200	9	50	Yes	65	69	86	165	618	1460	2000
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	13	>50	0	0		10	10	10	10	10	15	19

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
55	29	0	0	

Key:
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: KNAP OF REEDS CRK AT WWTP OUTFALL NR BUTNER
Station #: J1210000 **Subbasin:** NEU01
Latitude: 36.12797 **Longitude:** -78.79852 **Stream class:** WS-IV NSW
Agency: NCAMBNT **NC stream index:** 27-4-(6)

Time period: 09/14/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	<4	0	0		5.1	5.6	6.3	8	9.6	11.6	15.3
	64	0	<5	0	0		5.1	5.6	6.3	8	9.6	11.6	15.3
pH (SU)	64	0	<6	1	1.6		5.9	6.3	6.5	6.9	7.1	7.3	8.5
	64	0	>9	0	0		5.9	6.3	6.5	6.9	7.1	7.3	8.5
Salinity (ppt)	33	0	N/A				0	0	0.05	0.1	0.2	0.2	0.3
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				45	91	150	330	475	624	1000
Water Temperature (°C)	64	0	>32	0	0		4.7	7.2	11.5	18.9	25.4	27.8	28.6
Other													
Chloride (mg/L)	3	0	>250	0	0		8	8	8	110	190	190	190
Hardness (mg/L as CaCO3)	2	0	>100	0	0		14	14	14	34	54	54	54
TSS (mg/L)	29	7	N/A				2	2	3	4	10	23	120
Turbidity (NTU)	57	2	>50	0	0		1	2	3	6	11	22	50
Nutrients (mg/L)													
NH3 as N	41	2	N/A				0.02	0.02	0.03	0.05	0.15	0.31	0.87
NO2 + NO3 as N	41	0	>10	1	2.4		0.13	0.27	0.78	2.8	4.25	6.32	15
TKN as N	39	0	N/A				0.38	0.5	0.62	0.81	1.1	1.4	4.5
Total Phosphorus	41	0	N/A				0.05	0.09	0.17	0.6	1.5	3.38	4.2
Metals (ug/L)													
Aluminum, total (Al)	18	2	N/A				50	50	72	150	572	2030	2300
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	2	>7	2	11.1	No	2	2	4	5	6	8	11
Iron, total (Fe)	18	0	>1000	4	22.2	Yes	59	150	485	800	1018	2830	3100
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	18	0	>200	6	33.3	Yes	13	44	87	140	292	398	470
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	2	>50	5	27.8	Yes	10	10	17	24	60	78	94

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
57	115	10	18	

Key:
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: ELLERBE CRK AT SR 1636 NR DURHAM
Station #: J1330000 **Subbasin:** NEU01
Latitude: 36.05949 **Longitude:** -78.83224 **Stream class:** WS-IV NSW CA
Agency: NCAMBNT **NC stream index:** 27-5-(2)

Time period: 09/18/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	<4	0	0		5.3	6.1	6.6	8	10.3	11.7	16
	64	0	<5	0	0		5.3	6.1	6.6	8	10.3	11.7	16
pH (SU)	64	0	<6	0	0		6.1	6.5	6.8	7	7.3	7.5	7.8
	64	0	>9	0	0		6.1	6.5	6.8	7	7.3	7.5	7.8
Salinity (ppt)	31	0	N/A				0	0.02	0.1	0.2	0.2	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				104	213	290	364	418	443	501
Water Temperature (°C)	64	0	>32	0	0		4	9.3	12.5	18.4	24.5	26.3	27.5
Other													
Chloride (mg/L)	3	0	>250	0	0		22	22	22	42	43	43	43
Hardness (mg/L as CaCO3)	2	0	>100	0	0		60	60	60	65	70	70	70
TSS (mg/L)	29	3	N/A				2	2	4	8	14	63	130
Turbidity (NTU)	57	0	>50	5	8.8		2	2	3	6	12	36	190
Nutrients (mg/L)													
NH3 as N	42	8	N/A				0.01	0.02	0.03	0.05	0.16	0.49	1.1
NO2 + NO3 as N	42	1	>10	0	0		0.01	0.47	0.95	1.55	2.32	3.37	5.8
TKN as N	40	1	N/A				0.6	0.62	0.73	0.85	0.98	1.39	2
Total Phosphorus	42	1	N/A				0.03	0.08	0.13	0.25	0.48	1.04	4.5
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				69	89	118	170	580	1520	4400
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	2	>7	1	5.6		2	2	2	3	5	6	10
Iron, total (Fe)	18	0	>1000	1	5.6		150	150	270	400	792	1260	3600
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	18	0	>200	1	5.6		26	31	54	68	105	151	250
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	0	>50	5	27.8	Yes	18	25	33	39	53	66	69

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
57	176	14	25	No

Key:
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ND: number of observations reported to be below detection level (non-detect)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 2000 NR FALLS
Station #: J1890000 **Subbasin:** NEU02
Latitude: 35.94077 **Longitude:** -78.58010 **Stream class:** WS-IV NSW
Agency: NCAMBNT **NC stream index:** 27-(20.7)

Time period: 09/22/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	<4	0	0		6.2	6.6	7.7	8.9	11	13	16.3
	64	0	<5	0	0		6.2	6.6	7.7	8.9	11	13	16.3
pH (SU)	64	0	<6	0	0		6	6.5	6.7	6.8	7	7.2	7.9
	64	0	>9	0	0		6	6.5	6.7	6.8	7	7.2	7.9
Salinity (ppt)	34	0	N/A				0	0	0	0	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				62	77	87	96	110	130	220
Water Temperature (°C)	64	0	>32	0	0		4.3	6.7	9.9	17.2	23.9	27.4	30.2
Other													
Hardness (mg/L as CaCO3)	2	1	>100	0	0		1	1	1	26	52	52	52
TSS (mg/L)	30	2	N/A				2	3	5	6	8	10	13
Turbidity (NTU)	55	0	>50	0	0		2	3	4	6	7	10	15
Nutrients (mg/L)													
NH3 as N	43	9	N/A				0.02	0.02	0.02	0.09	0.24	0.43	0.59
NO2 + NO3 as N	43	16	>10	0	0		0.01	0.02	0.02	0.07	0.14	0.17	0.29
TKN as N	43	1	N/A				0.25	0.39	0.48	0.59	0.67	0.9	1.1
Total Phosphorus	44	3	N/A				0.02	0.02	0.03	0.04	0.05	0.11	0.5
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				71	84	120	185	295	478	640
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	13	>7	0	0		2	2	2	2	2	3	4
Iron, total (Fe)	18	0	>1000	1	5.6		140	140	252	345	618	1271	3800
Lead, total (Pb)	18	17	>25	1	5.6		10	10	10	10	10	80	710
Manganese, total (Mn)	4	0	>200	1	25		150	150	158	180	1320	1700	1700
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	18	>50	0	0		10	10	10	10	10	10	10

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
51	15	0	0	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SMITH CRK AT SR 2045 BURLINGTON MILL RD NR WAKE FOREST
Station #: J2230000 **Subbasin:** NEU02
Latitude: 35.91820 **Longitude:** -78.53480 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-23-(2)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.9	5.5	6.1	7.2	9	10.2	11.2
	51	0	<5	1	2		4.9	5.5	6.1	7.2	9	10.2	11.2
pH (SU)	51	0	<6	0	0		6.3	6.4	6.5	6.7	7	7.2	8
	51	0	>9	0	0		6.3	6.4	6.5	6.7	7	7.2	8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				72	87	110	145	173	189	216
Water Temperature (°C)	53	0	>32	0	0		2.6	7.3	12.2	21.1	24.9	26.9	27.9
Other													
TSS (mg/L)	56	2	N/A				1	3	4	10	18	37	62
Turbidity (NTU)	56	0	>50	1	1.8		2	3	6	8	16	28	65
Nutrients (mg/L)													
NH3 as N	55	3	N/A				0.01	0.02	0.04	0.06	0.09	0.12	0.46
NO2 + NO3 as N	56	0	N/A				0.04	0.33	0.56	0.81	0.95	1.18	1.56
TKN as N	55	6	N/A				0.1	0.2	0.24	0.36	0.5	0.6	1.37
Total Phosphorus	56	0	N/A				0.02	0.04	0.05	0.07	0.09	0.12	0.45
Metals (ug/L)													
Aluminum, total (Al)	33	2	N/A				50	81	135	274	698	1860	3500
Cadmium, total (Cd)	37	33	>2	0	0		0	0	0	0	1	1	1
Chromium, total (Cr)	34	21	>50	1	2.9		1	2	4	5	7	10	94
Copper, total (Cu)	37	19	>7	2	5.4		2	2	2	2	3	6	48
Iron, total (Fe)	37	0	>1000	23	62.2	Yes	58	528	808	1100	1412	2258	3100
Lead, total (Pb)	33	21	>25	0	0		0	0	1	2	5	5	5
Mercury, total (Hg)	28	28	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	37	31	>88	1	2.7		2	2	2	5	10	10	510
Zinc, total (Zn)	37	25	>50	2	5.4		5	5	5	10	10	37	70

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	125	11	20	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 2215 BUFFALO RD NR NEUSE
Station #: J2330000 **Subbasin:** NEU02
Latitude: 35.84790 **Longitude:** -78.53020 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(22.5)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	Results not meeting EL			95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.7	5.4	6.1	7	9	10.4	10.8
	51	0	<5	1	2		4.7	5.4	6.1	7	9	10.4	10.8
pH (SU)	51	0	<6	0	0		6.4	6.5	6.6	6.7	7	7.4	7.8
	51	0	>9	0	0		6.4	6.5	6.6	6.7	7	7.4	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				61	94	109	139	155	172	181
Water Temperature (°C)	53	0	>32	0	0		2.3	7.7	12.2	22.1	25.1	26.4	27.5
Other													
TSS (mg/L)	64	0	N/A				2	6	9	14	20	32	121
Turbidity (NTU)	64	0	>50	2	3.1		3	5	7	12	16	22	100
Nutrients (mg/L)													
NH3 as N	63	1	N/A				0.01	0.04	0.06	0.08	0.12	0.18	0.48
NO2 + NO3 as N	64	0	N/A				0.05	0.11	0.17	0.25	0.36	0.51	30.3
TKN as N	64	1	N/A				0.1	0.3	0.38	0.5	0.6	0.8	1.09
Total Phosphorus	64	0	N/A				0.02	0.03	0.05	0.06	0.09	0.11	0.31
Metals (ug/L)													
Aluminum, total (Al)	2	0	N/A				180	180	180	415	650	650	650
Cadmium, total (Cd)	2	2	>2	0	0		0	0	0	0	0	0	0
Chromium, total (Cr)	2	1	>50	0	0		5	5	5	5	5	5	5
Copper, total (Cu)	2	0	>7	0	0		2	2	2	4	6	6	6
Iron, total (Fe)	2	0	>1000	2	100		1200	1200	1200	1650	2100	2100	2100
Lead, total (Pb)	2	0	>25	0	0		1	1	1	2	2	2	2
Mercury, total (Hg)	2	2	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	2	2	>88	0	0		5	5	5	5	5	5	5
Zinc, total (Zn)	2	0	>50	0	0		11	11	11	14	17	17	17

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
64	90	5	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT MILBURNIE DAM NR RALEIGH
Station #: J2360000 **Subbasin:** NEU02
Latitude: 35.80222 **Longitude:** -78.53861 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(22.5)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	52	0	<4	1	1.9		3.8	4.5	5.2	6.4	8.6	9.8	10.8
	52	0	<5	10	19.2	Yes	3.8	4.5	5.2	6.4	8.6	9.8	10.8
pH (SU)	52	0	<6	0	0		6	6.4	6.5	6.6	7	7.4	7.7
	52	0	>9	0	0		6	6.4	6.5	6.6	7	7.4	7.7
Spec. conductance (umhos/cm at 25°C)	52	0	N/A				62	89	106	159	188	211	227
Water Temperature (°C)	54	0	>32	0	0		2.5	7.4	11.6	21.9	26.2	27.4	28.9
Other													
Chlorophyll A (ug/L)	42	3	>40	0	0		1	2	6	12	16	23	27
TSS (mg/L)	60	0	N/A				2	5	6	9	13	22	80
Turbidity (NTU)	60	0	>50	1	1.7		3	5	7	9	14	19	70
Nutrients (mg/L)													
NH3 as N	60	5	N/A				0.01	0.02	0.03	0.05	0.11	0.14	0.24
NO2 + NO3 as N	61	4	N/A				0.01	0.03	0.1	0.21	0.38	0.48	0.74
TKN as N	61	2	N/A				0.1	0.3	0.39	0.5	0.6	0.8	1.54
Total Phosphorus	60	0	N/A				0.01	0.03	0.05	0.06	0.08	0.12	0.38

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	40	7	12	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CRABTREE CRK AT SR 1795 NR UMSTEAD STATE PARK
Station #: J2850000 **Subbasin:** NEU02
Latitude: 35.83770 **Longitude:** -78.78084 **Stream class:** B NSW
Agency: NCAMBNT **NC stream index:** 27-33-(3.5)

Time period: 09/22/2000 to 08/09/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	55	0	<4	3	5.5		1.6	4.9	6.2	8.2	10.3	12.6	15.6
	55	0	<5	5	9.1		1.6	4.9	6.2	8.2	10.3	12.6	15.6
pH (SU)	54	0	<6	0	0		6.1	6.5	6.7	6.9	7	7.4	7.6
	54	0	>9	0	0		6.1	6.5	6.7	6.9	7	7.4	7.6
Salinity (ppt)	26	0	N/A				0	0	0	0.1	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				74	86	95	112	154	200	439
Water Temperature (°C)	56	0	>32	0	0		2.6	6.3	11.8	19.8	25.3	27.6	31.8
Other													
TSS (mg/L)	18	0	N/A				3	4	8	18	22	28	31
Turbidity (NTU)	55	0	>50	5	9.1		1	13	19	26	35	54	140
Nutrients (mg/L)													
NH3 as N	8	1	N/A				0.01	0.01	0.01	0.06	0.16	0.24	0.24
NO2 + NO3 as N	8	2	N/A				0.03	0.03	0.11	0.18	0.27	0.3	0.3
TKN as N	7	1	N/A				0.3	0.3	0.4	0.5	0.6	1.4	1.4
Total Phosphorus	8	1	N/A				0.02	0.02	0.03	0.07	0.08	0.1	0.1
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				220	400	500	695	2025	2750	5000
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	1	>7	1	5.6		2	2	3	3	4	8	24
Iron, total (Fe)	18	0	>1000	10	55.6	Yes	190	586	838	1100	1850	2520	4500
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	13	>50	2	11.1	No	10	10	10	10	17	71	99

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
52	35	3	6	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CRABTREE CRK AT SR 1649 NR RALEIGH
Station #: J3000000 **Subbasin:** NEU02
Latitude: 35.84545 **Longitude:** -78.72444 **Stream class:** B NSW
Agency: NCAMBNT **NC stream index:** 27-33-(3.5)

Time period: 09/22/2000 to 08/09/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	55	0	<4	0	0		5	5.6	6.6	8	10.6	12.3	14.9
	55	0	<5	0	0		5	5.6	6.6	8	10.6	12.3	14.9
pH (SU)	55	0	<6	0	0		6	6.5	6.7	7	7.2	7.4	8.8
	55	0	>9	0	0		6	6.5	6.7	7	7.2	7.4	8.8
Salinity (ppt)	25	0	N/A				0	0	0.1	0.1	0.1	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				82	102	112	201	290	399	480
Water Temperature (°C)	56	0	>32	0	0		3	5.7	11.2	17.9	24.2	25.9	29
Other													
TSS (mg/L)	18	5	N/A				1	2	2	6	16	66	156
Turbidity (NTU)	55	0	>50	6	10.9	No	3	4	5	13	30	60	130
Nutrients (mg/L)													
NH3 as N	35	8	N/A				0.01	0.01	0.03	0.05	0.08	0.2	0.77
NO2 + NO3 as N	35	0	N/A				0.02	0.14	0.25	0.34	0.57	0.85	1.4
TKN as N	34	0	N/A				0.3	0.45	0.59	0.66	0.81	1.15	1.6
Total Phosphorus	35	0	N/A				0.06	0.06	0.11	0.28	0.53	1.08	1.8
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				69	142	188	525	948	2770	4300
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	1	>7	0	0		2	2	3	3	4	5	6
Iron, total (Fe)	18	0	>1000	9	50	Yes	220	373	465	950	1225	2370	4800
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	3	>50	3	16.7	No	10	10	13	24	35	62	70

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
52	75	5	10	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CRABTREE CRK AT LASSITER MILL DAM AT RALEIGH
Station #: J3210000 **Subbasin:** NEU02
Latitude: 35.82722 **Longitude:** -78.65083 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-33-(10)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	2	3.9		3.4	4.5	5.3	6.3	8.4	10.5	11.7
	51	0	<5	10	19.6	Yes	3.4	4.5	5.3	6.3	8.4	10.5	11.7
pH (SU)	51	0	<6	0	0		6.3	6.4	6.5	6.6	7	7.3	7.7
	51	0	>9	0	0		6.3	6.4	6.5	6.6	7	7.3	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				77	120	137	172	192	213	366
Water Temperature (°C)	53	0	>32	0	0		2.8	7.8	12.1	22.4	25.9	27.6	28
Other													
TSS (mg/L)	60	0	N/A				2	4	5	8	14	29	45
Turbidity (NTU)	60	0	>50	2	3.3		4	5	7	11	21	29	60
Nutrients (mg/L)													
NH3 as N	59	2	N/A				0.01	0.03	0.05	0.08	0.11	0.14	0.28
NO2 + NO3 as N	60	0	N/A				0.02	0.16	0.29	0.36	0.55	0.78	2.02
TKN as N	60	0	N/A				0.2	0.34	0.42	0.56	0.67	0.82	1.6
Total Phosphorus	59	0	N/A				0.01	0.05	0.08	0.14	0.22	0.5	1.11
Metals (ug/L)													
Aluminum, total (Al)	38	0	N/A				89	117	187	315	632	1600	1723
Cadmium, total (Cd)	39	35	>2	0	0		0	0	0	0	1	1	1
Chromium, total (Cr)	35	23	>50	0	0		1	1	3	5	5	10	14
Copper, total (Cu)	39	12	>7	1	2.6		2	2	2	3	4	6	10
Iron, total (Fe)	39	0	>1000	20	51.3	Yes	119	660	760	1050	1420	2209	2717
Lead, total (Pb)	39	20	>25	0	0		0	1	1	2	5	5	5
Mercury, total (Hg)	28	28	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	39	32	>88	0	0		2	2	2	5	10	10	39
Zinc, total (Zn)	39	6	>50	1	2.6		9	10	12	17	24	38	64

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	147	11	18	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CRABTREE CRK AT SR 2000 OLD WAKE FOREST RD AT RALEIGH
Station #: J3251000 **Subbasin:** NEU02
Latitude: 35.81584 **Longitude:** -78.62568 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-33-(10)

Time period: 09/22/2000 to 08/09/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	56	0	<4	0	0		4.8	5.6	6.7	8.8	10.6	12.5	15.6
	56	0	<5	2	3.6		4.8	5.6	6.7	8.8	10.6	12.5	15.6
pH (SU)	56	0	<6	2	3.6		5.5	6.3	6.5	6.8	7	7.2	7.6
	56	0	>9	0	0		5.5	6.3	6.5	6.8	7	7.2	7.6
Salinity (ppt)	26	0	N/A				0	0	0	0.1	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				56	98	116	168	209	264	300
Water Temperature (°C)	56	0	>32	0	0		3	6.7	11.3	17.6	23.5	25.1	28.5
Other													
TSS (mg/L)	18	2	N/A				2	3	3	6	12	60	313
Turbidity (NTU)	55	0	>50	5	9.1		4	5	7	14	28	49	300
Nutrients (mg/L)													
NH3 as N	7	3	N/A				0.01	0.01	0.01	0.14	0.2	1.4	1.4
NO2 + NO3 as N	7	0	N/A				0.03	0.03	0.26	0.33	0.51	0.59	0.59
TKN as N	6	1	N/A				0.3	0.3	0.3	0.35	0.61	0.64	0.64
Total Phosphorus	7	1	N/A				0.06	0.06	0.06	0.07	0.12	0.5	0.5
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				120	156	185	445	1150	2940	6900
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	8	>7	0	0		2	2	2	2	3	5	5
Iron, total (Fe)	18	0	>1000	11	61.1	Yes	770	833	890	1150	1500	2940	9600
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	4	>50	2	11.1	No	10	10	10	16	20	59	130

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
54	239	14	26	No

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: PIGEON HOUSE BRANCH AT DORTCH ST AT RALEIGH
Station #: J3300000 **Subbasin:** NEU02
Latitude: 35.79387 **Longitude:** -78.64262 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-33-18

Time period: 09/02/2000 to 08/09/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	56	0	<4	1	1.8		3.7	5.2	6.4	8.3	9.8	10.9	12.5
	56	0	<5	2	3.6		3.7	5.2	6.4	8.3	9.8	10.9	12.5
pH (SU)	56	0	<6	0	0		6.2	6.4	6.6	7	7.1	7.3	8.1
	56	0	>9	0	0		6.2	6.4	6.6	7	7.1	7.3	8.1
Salinity (ppt)	26	0	N/A				0	0	0.08	0.1	0.13	0.39	1.2
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				64	105	278	303	331	401	2237
Water Temperature (°C)	56	0	>32	0	0		5.5	6.8	11.8	17.4	22.6	24.7	26
Other													
TSS (mg/L)	18	4	N/A				1	2	2	4	9	21	48
Turbidity (NTU)	55	0	>50	4	7.3		2	2	3	4	8	37	200
Nutrients (mg/L)													
NH3 as N	8	3	N/A				0.01	0.01	0.01	0.06	0.31	0.93	0.93
NO2 + NO3 as N	8	0	N/A				0.06	0.06	1.8	2	2.58	2.9	2.9
TKN as N	7	1	N/A				0.3	0.3	0.39	0.4	0.5	0.6	0.6
Total Phosphorus	8	1	N/A				0.02	0.02	0.04	0.08	0.1	0.1	0.1
Metals (ug/L)													
Aluminum, total (Al)	18	2	N/A				50	50	68	125	205	2020	3100
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	0	>7	12	66.7	Yes	4	4	5	9	12	24	28
Iron, total (Fe)	18	0	>1000	2	11.1	No	390	462	525	675	755	1600	2500
Lead, total (Pb)	18	16	>25	0	0		10	10	10	10	10	11	14
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	0	>50	5	27.8	Yes	17	17	28	32	51	74	210

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
54	1093	41	76	Yes

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CRABTREE CRK AT SR 2036 NEW HOPE RD NR WILDERS GROVE
Station #: J3470000 **Subbasin:** NEU02
Latitude: 35.78250 **Longitude:** -78.56139 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-33-(10)

Time period: 09/12/2000 to 02/04/2004

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	23	0	<4	0	0		4.5	4.7	5.5	7.6	9.8	10.4	10.6
	23	0	<5	3	13	No	4.5	4.7	5.5	7.6	9.8	10.4	10.6
pH (SU)	23	0	<6	0	0		6.3	6.3	6.5	6.6	7	7.3	7.9
	23	0	>9	0	0		6.3	6.3	6.5	6.6	7	7.3	7.9
Spec. conductance (umhos/cm at 25°C)	23	0	N/A				113	123	135	153	167	183	294
Water Temperature (°C)	23	0	>32	0	0		4.6	4.7	9	18	25.1	26.7	27.5
Other													
TSS (mg/L)	41	4	N/A				1	1	2	6	14	33	129
Turbidity (NTU)	41	0	>50	0	0		2	4	4	10	20	32	50
Nutrients (mg/L)													
NH3 as N	40	5	N/A				0.01	0.01	0.04	0.05	0.07	0.11	0.17
NO2 + NO3 as N	41	0	N/A				0.06	0.26	0.31	0.37	0.42	0.67	2.11
TKN as N	40	0	N/A				0.1	0.2	0.33	0.5	0.6	0.64	0.8
Total Phosphorus	40	0	N/A				0.03	0.04	0.07	0.12	0.17	0.24	3.75
Metals (ug/L)													
Aluminum, total (Al)	34	2	N/A				50	66	135	350	618	1630	4100
Cadmium, total (Cd)	38	31	>2	1	2.6		0	0	0	0	1	1	10
Chromium, total (Cr)	35	22	>50	0	0		1	1	3	5	5	10	10
Copper, total (Cu)	38	10	>7	4	10.5	No	1	2	2	3	5	9	12
Iron, total (Fe)	38	0	>1000	14	36.8	Yes	312	615	750	925	1325	2284	4900
Lead, total (Pb)	38	20	>25	0	0		0	0	1	2	5	5	5
Mercury, total (Hg)	29	29	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	38	29	>88	0	0		2	2	3	6	10	10	57
Zinc, total (Zn)	38	13	>50	2	5.3		5	9	10	10	15	23	59

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
41	203	12	29	No

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: WALNUT CRK AT SR 2551 BARWELL RD NR RALEIGH
Station #: J3970000 **Subbasin:** NEU02
Latitude: 35.74930 **Longitude:** -78.53450 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-34-(4)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.7	5.5	5.9	6.8	8.8	10.4	11.1
	51	0	<5	2	3.9		4.7	5.5	5.9	6.8	8.8	10.4	11.1
pH (SU)	51	0	<6	0	0		6.3	6.4	6.6	6.7	7	7.2	7.7
	51	0	>9	0	0		6.3	6.4	6.6	6.7	7	7.2	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				69	102	121	139	158	177	223
Water Temperature (°C)	53	0	>32	0	0		2.6	6.6	11.5	21	25	26.3	27.4
Other													
TSS (mg/L)	60	3	N/A				1	2	3	5	10	66	245
Turbidity (NTU)	60	0	>50	5	8.3		4	6	8	10	15	38	130
Nutrients (mg/L)													
NH3 as N	59	3	N/A				0.01	0.03	0.05	0.07	0.1	0.18	0.4
NO2 + NO3 as N	60	0	N/A				0.2	0.24	0.31	0.38	0.49	0.6	0.78
TKN as N	58	5	N/A				0.1	0.2	0.3	0.4	0.58	0.92	24.9
Total Phosphorus	60	1	N/A				0.01	0.03	0.04	0.05	0.07	0.16	0.62
Metals (ug/L)													
Aluminum, total (Al)	55	2	N/A				50	73	119	188	400	1720	5376
Arsenic, total (As)	19	19	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	58	50	>2	0	0		0	0	0	1	1	1	1
Chromium, total (Cr)	55	38	>50	0	0		1	2	5	5	5	10	12
Copper, total (Cu)	58	18	>7	6	10.3	No	2	2	2	3	4	9	23
Iron, total (Fe)	58	0	>1000	49	84.5	Yes	75	989	1191	1424	1704	3080	10680
Lead, total (Pb)	58	35	>25	1	1.7		0	1	1	5	5	5	27
Mercury, total (Hg)	48	48	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	58	49	>88	0	0		2	2	5	10	10	10	26
Zinc, total (Zn)	58	18	>50	4	6.9		5	7	10	12	23	48	82

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	131	9	15	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 2555 AUBURN KNIGHTDALE RD NR RALEIGH
Station #: J4050000 **Subbasin:** NEU02
Latitude: 35.72660 **Longitude:** -78.51390 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(22.5)

Time period: 09/12/2000 to 08/22/2005

	#	#		Results not meeting EL			Percentiles						
	result	ND	EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.8	5.5	6.2	6.7	9.2	10.5	11.5
	51	0	<5	1	2		4.8	5.5	6.2	6.7	9.2	10.5	11.5
pH (SU)	51	0	<6	0	0		6.3	6.4	6.6	6.6	6.9	7.1	7.8
	51	0	>9	0	0		6.3	6.4	6.6	6.6	6.9	7.1	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				67	79	104	122	139	162	204
Water Temperature (°C)	53	0	>32	0	0		2.3	7.1	11.2	21.6	25.4	26.6	27.8
Other													
TSS (mg/L)	60	1	N/A				1	5	7	12	22	60	179
Turbidity (NTU)	60	0	>50	4	6.7		3	5	9	13	21	44	200
Nutrients (mg/L)													
NH3 as N	59	3	N/A				0.01	0.04	0.06	0.08	0.12	0.18	0.56
NO2 + NO3 as N	60	0	N/A				0.08	0.16	0.22	0.28	0.36	0.45	0.59
TKN as N	60	0	N/A				0.1	0.3	0.4	0.5	0.66	0.81	8.08
Total Phosphorus	59	3	N/A				0.01	0.04	0.05	0.06	0.09	0.16	0.36
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				111	245	280	536	1047	4250	6685
Arsenic, total (As)	19	19	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	19	19	>2	0	0		1	1	1	1	1	1	1
Chromium, total (Cr)	19	17	>50	0	0		5	5	5	5	5	7	7
Copper, total (Cu)	19	6	>7	3	15.8	No	2	2	2	3	3	11	13
Iron, total (Fe)	19	0	>1000	11	57.9	Yes	300	699	737	1089	2524	6522	6920
Lead, total (Pb)	19	15	>25	0	0		5	5	5	5	5	10	12
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	10	>50	0	0		10	10	10	10	14	33	45

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
61	104	7	11	

Key:
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ND: number of observations reported to be below detection level (non-detect)
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: POPLAR CRK AT SR 2049 BETHLEHEM RD NR KNIGHTDALE
Station #: J4080000 **Subbasin:** NEU02
Latitude: 35.73090 **Longitude:** -78.47760 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-35

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		5.2	6.1	6.8	7.5	9.2	10.4	11.6
	51	0	<5	0	0		5.2	6.1	6.8	7.5	9.2	10.4	11.6
pH (SU)	51	0	<6	0	0		6.1	6.4	6.5	6.7	6.9	7.2	7.8
	51	0	>9	0	0		6.1	6.4	6.5	6.7	6.9	7.2	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				59	76	90	101	115	136	176
Water Temperature (°C)	53	0	>32	0	0		2	7.2	11.5	19.9	23.7	25	27.4
Other													
TSS (mg/L)	60	2	N/A				1	2	4	6	10	36	157
Turbidity (NTU)	60	0	>50	2	3.3		2	3	6	10	15	30	95
Nutrients (mg/L)													
NH3 as N	59	2	N/A				0.01	0.03	0.04	0.07	0.11	0.16	0.28
NO2 + NO3 as N	60	0	N/A				0.33	0.81	1.03	1.3	1.65	2.04	3.56
TKN as N	58	1	N/A				0.1	0.25	0.34	0.46	0.6	0.8	1.32
Total Phosphorus	60	1	N/A				0.01	0.06	0.1	0.15	0.2	0.27	0.68

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	156	11	18	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1700 COVERED BRIDGE RD NR ARCHERS LODGE
Station #: J4130000 **Subbasin:** NEU02
Latitude: 35.67490 **Longitude:** -78.43640 **Stream class:** WS-V NSW
Agency: LNBA **NC stream index:** 27-(36)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	40	0	<4	0	0		5	5.6	5.9	6.7	7.5	9	10.2
	40	0	<5	0	0		5	5.6	5.9	6.7	7.5	9	10.2
pH (SU)	40	0	<6	0	0		6.3	6.4	6.5	6.7	7	7.1	7.4
	40	0	>9	0	0		6.3	6.4	6.5	6.7	7	7.1	7.4
Spec. conductance (umhos/cm at 25°C)	40	0	N/A				77	90	107	145	168	203	238
Water Temperature (°C)	42	0	>32	0	0		5.1	8.8	17.2	23.1	25.6	26.5	28.3
Other													
TSS (mg/L)	34	0	N/A				4	6	9	14	28	38	313
Turbidity (NTU)	34	0	>50	2	5.9		5	6	9	14	24	36	150
Nutrients (mg/L)													
NH3 as N	19	0	N/A				0.03	0.03	0.06	0.08	0.1	0.14	0.14
NO2 + NO3 as N	19	0	>10	0	0		0.23	0.25	0.53	0.73	0.93	1.03	1.04
TKN as N	19	0	N/A				0.38	0.43	0.51	0.58	0.8	1.17	1.18
Total Phosphorus	19	0	N/A				0.04	0.09	0.12	0.15	0.29	0.43	0.43
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				188	233	330	675	1036	1743	11735
Arsenic, total (As)	19	19	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	19	19	>2	0	0		1	1	1	1	1	1	1
Chromium, total (Cr)	19	18	>50	0	0		5	5	5	5	5	5	9
Copper, total (Cu)	19	5	>7	1	5.3		2	2	2	3	4	5	18
Iron, total (Fe)	19	0	>1000	8	42.1	Yes	508	603	690	872	1808	2551	8619
Lead, total (Pb)	19	18	>25	0	0		5	5	5	5	5	5	19
Manganese, total (Mn)	19	0	>200	3	15.8	No	61	65	75	97	149	268	709
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	17	>25	0	0		10	10	10	10	10	12	13
Zinc, total (Zn)	19	9	>50	2	10.5	No	10	10	10	11	18	51	53

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
19	108	3	16	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT NC 42 NR CLAYTON
Station #: J4170000 **Subbasin:** NEU02
Latitude: 35.64732 **Longitude:** -78.40567 **Stream class:** WS-IV NSW
Agency: LNBA **NC stream index:** 27-(38.5)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.9	5.5	6.2	6.8	8.9	10.4	11.8
	51	0	<5	1	2		4.9	5.5	6.2	6.8	8.9	10.4	11.8
pH (SU)	51	0	<6	0	0		6.3	6.5	6.6	6.7	7	7.2	7.9
	51	0	>9	0	0		6.3	6.5	6.6	6.7	7	7.2	7.9
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				79	98	119	137	165	203	307
Water Temperature (°C)	53	0	>32	0	0		1.7	7.3	11.3	20.6	25.1	26.2	27.6
Other													
TSS (mg/L)	60	0	N/A				2	4	6	9	22	42	181
Turbidity (NTU)	60	0	>50	2	3.3		2	4	7	12	24	38	110
Nutrients (mg/L)													
NH3 as N	59	2	N/A				0.01	0.02	0.05	0.07	0.1	0.23	0.39
NO2 + NO3 as N	60	0	>10	0	0		0.15	0.29	0.51	0.7	0.88	1.05	1.66
TKN as N	60	0	N/A				0.2	0.34	0.43	0.51	0.62	0.8	1.55
Total Phosphorus	59	0	N/A				0.03	0.08	0.11	0.17	0.29	0.42	0.56
Metals (ug/L)													
Aluminum, total (Al)	57	0	N/A				94	139	238	400	956	1653	8670
Arsenic, total (As)	19	19	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	58	51	>2	0	0		0	0	0	1	1	1	1
Chromium, total (Cr)	56	39	>50	0	0		1	1	5	5	5	10	10
Copper, total (Cu)	58	18	>7	3	5.2		2	2	2	3	3	6	13
Iron, total (Fe)	58	0	>1000	23	39.7	Yes	230	480	640	872	1423	2618	6684
Lead, total (Pb)	58	38	>25	0	0		0	1	1	5	5	5	12
Manganese, total (Mn)	58	0	>200	8	13.8	No	53	63	79	98	156	274	478
Mercury, total (Hg)	48	48	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	58	46	>25	1	1.7		2	2	5	10	10	10	80
Zinc, total (Zn)	58	17	>50	1	1.7		5	9	10	12	17	27	61

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
61	99	7	11	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT NC 42 NR CLAYTON
Station #: J4170000 **Subbasin:** NEU02
Latitude: 35.64732 **Longitude:** -78.40567 **Stream class:** WS-IV NSW
Agency: NCAMBNT **NC stream index:** 27-(38.5)

Time period: 09/20/2000 to 08/02/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.2	5.7	6.5	8.8	10.3	11.9	15.3
	58	0	<5	0	0		5.2	5.7	6.5	8.8	10.3	11.9	15.3
pH (SU)	58	0	<6	0	0		6	6.2	6.4	6.8	7	7.1	7.2
	58	0	>9	0	0		6	6.2	6.4	6.8	7	7.1	7.2
Salinity (ppt)	25	0	N/A				0	0	0.1	0.1	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				72	104	130	176	198	228	306
Water Temperature (°C)	58	0	>32	0	0		4.2	7.6	10.8	17.2	23.2	26.3	27.5
Other													
Chloride (mg/L)	2	0	>250	0	0		16	16	16	16	17	17	17
Hardness (mg/L as CaCO3)	3	0	>100	0	0		16	16	16	23	36	36	36
TSS (mg/L)	20	0	N/A				3	8	8	12	50	118	150
Turbidity (NTU)	58	0	>50	7	12.1	No	4	6	7	13	28	66	120
Nutrients (mg/L)													
NH3 as N	8	1	N/A				0.02	0.02	0.03	0.08	0.19	0.28	0.28
NO2 + NO3 as N	8	1	>10	0	0		0.01	0.01	0.19	1.02	1.2	1.4	1.4
TKN as N	6	0	N/A				0.4	0.4	0.48	0.5	0.69	0.94	0.94
Total Phosphorus	9	1	N/A				0.1	0.1	0.11	0.19	0.27	0.5	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				220	240	320	590	2400	4100	6600
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	4	>7	2	10.5	No	2	2	2	3	4	7	9
Iron, total (Fe)	19	0	>1000	8	42.1	Yes	620	630	700	940	2600	4400	5400
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	19	0	>200	5	26.3	Yes	61	64	69	120	230	460	650
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	4	>50	0	0		10	10	10	12	18	22	43

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	138	10	18	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1908 FIRE DEPT RD NR WILSON MILLS
Station #: J4190000 **Subbasin:** NEU02
Latitude: 35.60670 **Longitude:** -78.33740 **Stream class:** WS-IV NSW
Agency: LNBA **NC stream index:** 27-(38.5)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		5.1	5.7	6.2	7.3	9.1	10.6	12.1
	51	0	<5	0	0		5.1	5.7	6.2	7.3	9.1	10.6	12.1
pH (SU)	51	0	<6	0	0		6.2	6.5	6.6	6.7	7	7.2	8.1
	51	0	>9	0	0		6.2	6.5	6.6	6.7	7	7.2	8.1
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				72	89	109	118	166	191	277
Water Temperature (°C)	53	0	>32	0	0		1.3	7	11.2	20.9	25	26.3	29
Other													
TSS (mg/L)	60	1	N/A				1	5	7	12	28	44	310
Turbidity (NTU)	60	0	>50	4	6.7		2	5	8	11	22	38	180
Nutrients (mg/L)													
NH3 as N	59	2	N/A				0.01	0.02	0.03	0.06	0.09	0.12	0.27
NO2 + NO3 as N	60	0	>10	0	0		0.17	0.3	0.44	0.56	0.72	0.86	1.43
TKN as N	60	0	N/A				0.1	0.34	0.4	0.5	0.6	0.85	1.71
Total Phosphorus	60	1	N/A				0.01	0.08	0.1	0.16	0.3	0.38	0.7

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	109	8	14	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT US 70 AT SMITHFIELD
Station #: J4370000 **Subbasin:** NEU02
Latitude: 35.51283 **Longitude:** -78.34988 **Stream class:** WS-V NSW
Agency: NCAMBNT **NC stream index:** 27-(41.7)

Time period: 09/20/2000 to 08/02/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		5.6	5.9	6.7	8.7	10.4	11.5	14.9
	57	0	<5	0	0		5.6	5.9	6.7	8.7	10.4	11.5	14.9
pH (SU)	57	0	<6	0	0		6.1	6.5	6.6	7	7.2	7.3	8.2
	57	0	>9	0	0		6.1	6.5	6.6	7	7.2	7.3	8.2
Salinity (ppt)	25	0	N/A				0	0	0.1	0.1	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				69	92	121	156	176	205	463
Water Temperature (°C)	57	0	>32	0	0		4.4	8.1	11.5	17.4	24	27.4	29.3
Other													
Chloride (mg/L)	2	0	>250	0	0		16	16	16	16	16	16	16
Hardness (mg/L as CaCO3)	1	0	>100	0	0		20	20	20	20	20	20	20
TSS (mg/L)	19	1	N/A				2	8	12	17	45	76	140
Turbidity (NTU)	57	0	>50	6	10.5	No	5	7	9	16	28	55	140
Nutrients (mg/L)													
NH3 as N	34	10	N/A				0.01	0.02	0.02	0.03	0.06	0.21	0.67
NO2 + NO3 as N	34	1	>10	0	0		0.01	0.28	0.35	0.52	0.68	0.88	0.99
TKN as N	32	0	N/A				0.3	0.37	0.4	0.49	0.55	0.63	0.88
Total Phosphorus	34	0	N/A				0.05	0.11	0.12	0.17	0.23	0.33	0.49
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				280	307	390	640	1550	2260	3700
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	1	>7	2	11.1	No	2	3	3	3	4	14	76
Iron, total (Fe)	18	0	>1000	10	55.6	Yes	690	762	808	1100	1575	2890	4600
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	18	0	>200	4	22.2	Yes	47	55	71	115	180	453	480
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	4	>50	0	0		10	10	10	14	18	27	46

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
55	132	9	16	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SWIFT CRK AT SR 1152 HOLLY SPRINGS RD NR MACEDONIA
Station #: J4414000 **Subbasin:** NEU02
Latitude: 35.71877 **Longitude:** -78.75270 **Stream class:** WS-III NSW
Agency: LNBA **NC stream index:** 27-43-(1)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.2	4.8	5.9	6.5	8.6	10.2	11.3
	51	0	<5	6	11.8	No	4.2	4.8	5.9	6.5	8.6	10.2	11.3
pH (SU)	51	0	<6	0	0		6.4	6.4	6.5	6.7	7	7.4	7.7
	51	0	>9	0	0		6.4	6.4	6.5	6.7	7	7.4	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				61	80	94	122	153	174	190
Water Temperature (°C)	53	0	>32	0	0		2.7	8.1	12.3	22.5	26.2	28	28.6
Other													
TSS (mg/L)	60	0	N/A				1	2	4	7	12	35	69
Turbidity (NTU)	60	0	>50	1	1.7		2	4	6	9	14	25	55
Nutrients (mg/L)													
NH3 as N	60	4	N/A				0.01	0.02	0.04	0.06	0.1	0.14	0.36
NO2 + NO3 as N	60	4	>10	0	0		0.01	0.07	0.12	0.21	0.49	0.7	1.16
TKN as N	58	1	N/A				0.1	0.2	0.33	0.5	0.6	0.71	2.06
Total Phosphorus	59	1	N/A				0.01	0.04	0.05	0.06	0.09	0.14	0.66

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	142	9	15	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SWIFT CRK AT NC 42 NR CLAYTON
Station #: J4510000 **Subbasin:** NEU02
Latitude: 35.61314 **Longitude:** -78.54863 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-43-(8)

Time period: 09/20/2000 to 08/02/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	56	0	<4	0	0		4.5	5.4	6.3	8.3	10.4	11.6	13.8
	56	0	<5	3	5.4		4.5	5.4	6.3	8.3	10.4	11.6	13.8
pH (SU)	56	0	<6	1	1.8		4.4	6.3	6.5	6.8	7	7.1	7.8
	56	0	>9	0	0		4.4	6.3	6.5	6.8	7	7.1	7.8
Salinity (ppt)	23	0	N/A				0	0	0	0	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				50	63	75	87	110	130	196
Water Temperature (°C)	56	0	>32	0	0		2.7	7.9	11.1	17.1	22.9	26.8	28.6
Other													
TSS (mg/L)	19	3	N/A				2	2	3	6	21	43	62
Turbidity (NTU)	56	0	>50	1	1.8		4	5	7	9	13	25	60
Nutrients (mg/L)													
NH3 as N	33	2	N/A				0.01	0.02	0.05	0.07	0.08	0.13	1.2
NO2 + NO3 as N	33	2	N/A				0.01	0.09	0.12	0.22	0.3	0.39	0.6
TKN as N	31	0	N/A				0.3	0.31	0.4	0.5	0.57	0.7	1.3
Total Phosphorus	34	3	N/A				0.02	0.03	0.04	0.06	0.14	0.25	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				76	130	180	290	470	1400	2200
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	10	>7	0	0		2	2	2	2	3	4	5
Iron, total (Fe)	19	0	>1000	18	94.7	Yes	900	1200	1400	1500	1800	2600	2700
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	14	>50	0	0		10	10	10	10	11	14	15

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
54	91	5	9	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SWIFT CREEK AT SR 1525 NR CLAYTON
Station #: J4510500 **Subbasin:** NEU02
Latitude: 35.59996 **Longitude:** -78.53560 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-43-(8)

Time period: 02/24/2005 to 03/31/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	2	0	<4	0	0		8.6	8.6	8.6	9.5	10.3	10.3	10.3
	2	0	<5	0	0		8.6	8.6	8.6	9.5	10.3	10.3	10.3
pH (SU)	2	0	<6	0	0		6.7	6.7	6.7	6.8	6.8	6.8	6.8
	2	0	>9	0	0		6.7	6.7	6.7	6.8	6.8	6.8	6.8
Salinity (ppt)	2	0	N/A				0	0	0	0	0	0	0
Spec. conductance (umhos/cm at 25°C)	2	0	N/A				75	75	75	78	80	80	80
Water Temperature (°C)	2	0	>32	0	0		9.4	9.4	9.4	12.5	15.7	15.7	15.7
Other													
Turbidity (NTU)	2	0	>50	0	0		11	11	11	15	19	19	19
Nutrients (mg/L)													
NH3 as N	2	0	N/A				0.08	0.08	0.08	0.08	0.08	0.08	0.08
NO2 + NO3 as N	2	0	N/A				0.17	0.17	0.17	0.19	0.2	0.2	0.2
TKN as N	2	0	N/A				0.56	0.56	0.56	0.56	0.57	0.57	0.57
Total Phosphorus	2	0	N/A				0.05	0.05	0.05	0.06	0.07	0.07	0.07

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
2	255	1	50	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SWIFT CRK AT NC 210 NR SMITHFIELD
Station #: J4590000 **Subbasin:** NEU03
Latitude: 35.51860 **Longitude:** -78.38190 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-43-(8)

Time period: 09/13/2000 to 08/25/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		5.1	5.3	6.3	7.3	8.7	10.4	13.1
	51	0	<5	0	0		5.1	5.3	6.3	7.3	8.7	10.4	13.1
pH (SU)	51	0	<6	0	0		6.3	6.5	6.7	6.8	7	7.3	7.7
	51	0	>9	0	0		6.3	6.5	6.7	6.8	7	7.3	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				63	75	85	116	127	139	196
Water Temperature (°C)	53	0	>32	0	0		2.4	7.5	14.4	21.5	25.6	26.8	29.2
Other													
TSS (mg/L)	59	3	N/A				1	2	2	5	12	22	49
Turbidity (NTU)	59	0	>50	0	0		1	4	5	9	14	26	40
Nutrients (mg/L)													
NH3 as N	59	5	N/A				0.01	0.01	0.03	0.06	0.09	0.15	0.33
NO2 + NO3 as N	59	3	N/A				0.01	0.1	0.14	0.22	0.29	0.39	0.8
TKN as N	58	3	N/A				0.1	0.28	0.34	0.44	0.62	0.92	55
Total Phosphorus	59	0	N/A				0.02	0.04	0.04	0.06	0.08	0.17	0.5

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	93	2	3	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MIDDLE CRK AT PRISTINE WATER RD NR APEX
Station #: J4620000 **Subbasin:** NEU03
Latitude: 35.71058 **Longitude:** -78.83592 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-43-15-(1)

Time period: 09/13/2000 to 08/25/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.5	4.6	5.9	7.3	9.2	10.7	11.5
	51	0	<5	6	11.8	No	4.5	4.6	5.9	7.3	9.2	10.7	11.5
pH (SU)	51	0	<6	0	0		6.2	6.5	6.7	6.8	7	7.1	7.8
	51	0	>9	0	0		6.2	6.5	6.7	6.8	7	7.1	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				53	73	82	90	102	114	380
Water Temperature (°C)	53	0	>32	0	0		2	7.2	13.2	19.2	22.8	24.9	26.5
Other													
TSS (mg/L)	59	1	N/A				1	2	4	7	19	41	90
Turbidity (NTU)	60	0	>50	2	3.3		1	6	8	14	26	38	100
Nutrients (mg/L)													
NH3 as N	60	3	N/A				0.01	0.02	0.03	0.07	0.1	0.13	0.21
NO2 + NO3 as N	60	4	N/A				0.01	0.04	0.08	0.21	0.36	0.5	0.9
TKN as N	58	3	N/A				0.1	0.2	0.3	0.42	0.59	0.8	1.15
Total Phosphorus	59	2	N/A				0.01	0.02	0.04	0.05	0.09	0.15	0.63

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	170	20	33	Yes

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MIDDLE CRK AT SR 1152 HOLLY SPRINGS RD NR HOLLY SPRINGS
Station #: J4690000 **Subbasin:** NEU03
Latitude: 35.66090 **Longitude:** -78.80420 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-43-15-(1)

Time period: 09/13/2000 to 08/25/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.4	5.4	6.3	7.1	8.9	10.3	12.1
	51	0	<5	1	2		4.4	5.4	6.3	7.1	8.9	10.3	12.1
pH (SU)	51	0	<6	0	0		6.4	6.4	6.6	6.8	7.1	7.3	8
	51	0	>9	0	0		6.4	6.4	6.6	6.8	7.1	7.3	8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				86	97	103	118	265	356	576
Water Temperature (°C)	53	0	>32	0	0		3.2	7	13.3	19.4	22.9	25.1	26.4
Other													
TSS (mg/L)	60	4	N/A				1	2	4	6	10	18	149
Turbidity (NTU)	60	0	>50	5	8.3		1	4	9	13	19	44	150
Nutrients (mg/L)													
NH3 as N	59	4	N/A				0.01	0.02	0.04	0.06	0.09	0.11	0.21
NO2 + NO3 as N	60	1	N/A				0.1	0.57	0.99	1.32	1.65	2.1	4.1
TKN as N	60	1	N/A				0.2	0.5	0.6	0.7	0.9	1.1	1.53
Total Phosphorus	60	0	N/A				0.07	0.13	0.28	0.39	0.78	1.14	4.7

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	179	15	25	No

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MIDDLE CRK AT US 401 NR BANKS
Station #: J4870000 **Subbasin:** NEU03
Latitude: 35.63180 **Longitude:** -78.71600 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-43-15-(4)

Time period: 09/13/2000 to 07/09/2005

	# result	# ND	Results not meeting EL				Percentiles						
			EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	48	0	<4	0	0		4.3	5.3	5.7	7	8.7	10.1	10.9
	48	0	<5	3	6.2		4.3	5.3	5.7	7	8.7	10.1	10.9
pH (SU)	48	0	<6	0	0		6.3	6.4	6.6	6.9	7.2	7.2	7.7
	48	0	>9	0	0		6.3	6.4	6.6	6.9	7.2	7.2	7.7
Spec. conductance (umhos/cm at 25°C)	48	0	N/A				82	106	114	123	190	254	490
Water Temperature (°C)	48	0	>32	0	0		3.8	6.9	12.8	19.6	23.8	25.2	26.9
Other													
TSS (mg/L)	58	0	N/A				2	4	5	8	15	27	129
Turbidity (NTU)	58	0	>50	2	3.4		1	4	7	12	20	31	140
Nutrients (mg/L)													
NH3 as N	58	3	N/A				0.01	0.03	0.05	0.08	0.11	0.15	0.9
NO2 + NO3 as N	58	0	N/A				0.16	0.23	0.38	0.6	0.88	1.41	2.94
TKN as N	58	1	N/A				0.2	0.39	0.5	0.61	0.8	1	1.6
Total Phosphorus	57	1	N/A				0.01	0.07	0.1	0.14	0.22	0.33	1.2
Metals (ug/L)													
Aluminum, total (Al)	56	0	N/A				53	98	164	313	626	1180	4300
Arsenic, total (As)	17	17	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	56	47	>2	1	1.8		0	0	0	1	1	1	3
Chromium, total (Cr)	53	34	>50	0	0		1	1	5	5	5	10	20
Copper, total (Cu)	56	24	>7	3	5.4		2	2	2	2	3	5	10
Iron, total (Fe)	56	0	>1000	40	71.4	Yes	280	424	832	1312	1779	2408	6482
Lead, total (Pb)	56	37	>25	0	0		0	0	1	5	5	5	14
Mercury, total (Hg)	47	46	>0.012	1	2.1		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	53	39	>88	0	0		2	2	5	10	10	11	36
Zinc, total (Zn)	56	14	>50	5	8.9		9	10	10	16	24	42	345

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	147	12	21	No

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MIDDLE CRK AT SR 1006 OLD STAGE RD NR WILLOW SPRINGS
Station #: J4980000 **Subbasin:** NEU03
Latitude: 35.60910 **Longitude:** -78.68660 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-43-15-(4)

Time period: 09/13/2000 to 08/25/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.8	5.5	6	6.8	9	10.2	12.4
	51	0	<5	2	3.9		4.8	5.5	6	6.8	9	10.2	12.4
pH (SU)	51	0	<6	0	0		6.1	6.4	6.6	6.8	7.1	7.3	7.8
	51	0	>9	0	0		6.1	6.4	6.6	6.8	7.1	7.3	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				69	79	92	105	178	238	444
Water Temperature (°C)	53	0	>32	0	0		3.3	7	13.6	20.3	23.9	26.2	27.8
Other													
TSS (mg/L)	60	0	N/A				1	4	5	7	14	18	64
Turbidity (NTU)	60	0	>50	1	1.7		1	5	6	12	19	36	120
Nutrients (mg/L)													
NH3 as N	60	3	N/A				0.01	0.03	0.04	0.06	0.09	0.12	0.5
NO2 + NO3 as N	59	0	N/A				0.04	0.23	0.37	0.54	0.84	1.19	2.75
TKN as N	60	1	N/A				0.2	0.3	0.4	0.6	0.8	0.93	2.8
Total Phosphorus	60	0	N/A				0.05	0.07	0.1	0.13	0.22	0.39	0.8

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	97	8	13	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MIDDLE CRK AT NC 50 NR CLAYTON
Station #: J5000000 **Subbasin:** NEU03
Latitude: 35.56894 **Longitude:** -78.59230 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-43-15-(4)

Time period: 09/20/2000 to 08/02/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		4.9	6	6.4	8.6	10.4	12.6	14
	58	0	<5	1	1.7		4.9	6	6.4	8.6	10.4	12.6	14
pH (SU)	58	0	<6	0	0		6.1	6.4	6.5	6.9	7	7.2	7.7
	58	0	>9	0	0		6.1	6.4	6.5	6.9	7	7.2	7.7
Salinity (ppt)	25	0	N/A				0	0	0	0	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				58	76	91	130	170	204	407
Water Temperature (°C)	58	0	>32	0	0		3.3	8	11.2	16.7	22.5	26	27.6
Other													
TSS (mg/L)	20	0	N/A				2	3	5	7	12	39	100
Turbidity (NTU)	58	0	>50	1	1.7		4	5	7	9	17	32	665
Nutrients (mg/L)													
NH3 as N	9	1	N/A				0.01	0.01	0.02	0.06	0.29	0.94	0.94
NO2 + NO3 as N	9	1	N/A				0.01	0.01	0.24	0.4	0.51	0.57	0.57
TKN as N	7	0	N/A				0.3	0.3	0.3	0.3	1.5	2.2	2.2
Total Phosphorus	10	1	N/A				0.04	0.04	0.06	0.11	0.25	0.49	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				140	180	220	320	560	1100	1500
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	11	>7	0	0		2	2	2	2	3	4	5
Iron, total (Fe)	19	0	>1000	17	89.5	Yes	610	830	1200	1400	1900	2000	2600
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	10	>50	1	5.3		10	10	10	10	13	17	620

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	102	5	9	

Key:
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MIDDLE CRK AT NC 210 NR SMITHFIELD
Station #: J5010000 **Subbasin:** NEU03
Latitude: 35.50750 **Longitude:** -78.40139 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-43-15-(4)

Time period: 09/13/2000 to 08/25/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		5.1	5.2	6.2	7.3	8.6	10	12.6
	51	0	<5	0	0		5.1	5.2	6.2	7.3	8.6	10	12.6
pH (SU)	51	0	<6	0	0		6.2	6.4	6.6	6.8	7	7.1	7.7
	51	0	>9	0	0		6.2	6.4	6.6	6.8	7	7.1	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				70	100	120	145	162	211	322
Water Temperature (°C)	53	0	>32	0	0		2.3	7.3	14.2	20.9	25.1	25.8	27.7
Other													
TSS (mg/L)	60	3	N/A				1	2	3	5	8	15	28
Turbidity (NTU)	60	0	>50	0	0		1	4	6	9	15	24	40
Nutrients (mg/L)													
NH3 as N	60	5	N/A				0.01	0.01	0.02	0.05	0.07	0.11	0.2
NO2 + NO3 as N	60	0	N/A				0.08	0.18	0.26	0.38	0.48	0.67	1.07
TKN as N	58	1	N/A				0.18	0.3	0.4	0.5	0.63	0.81	2.1
Total Phosphorus	60	0	N/A				0.03	0.05	0.07	0.09	0.11	0.16	0.4

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	75	4	7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: BLACK CRK AT SR 1162 BLACK CREEK RD NR FOUR OAKS
Station #: J5170000 **Subbasin:** NEU04
Latitude: 35.46925 **Longitude:** -78.45681 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-45-(2)

Time period: 12/08/2004 to 08/25/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	13	0	<4	3	23.1	Yes	2.6	2.7	3.5	6.2	7.7	9.8	10.7
	13	0	<5	5	38.5	Yes	2.6	2.7	3.5	6.2	7.7	9.8	10.7
pH (SU)	13	0	<6	0	0		6.6	6.6	6.6	6.7	6.9	6.9	6.9
	13	0	>9	0	0		6.6	6.6	6.6	6.7	6.9	6.9	6.9
Spec. conductance (umhos/cm at 25°C)	13	0	N/A				57	60	80	140	160	177	181
Water Temperature (°C)	15	0	>32	0	0		7	9	14.5	21.8	26.2	29.1	29.1
Other													
TSS (mg/L)	9	0	N/A				2	2	4	5	7	15	15
Turbidity (NTU)	9	0	>50	0	0		4	4	5	7	14	19	19
Nutrients (mg/L)													
NH3 as N	9	0	N/A				0.02	0.02	0.04	0.06	0.07	0.09	0.09
NO2 + NO3 as N	9	0	N/A				0.09	0.09	0.11	0.3	0.35	1.32	1.32
TKN as N	9	1	N/A				0.2	0.2	0.28	0.63	1.09	2.03	2.03
Total Phosphorus	9	0	N/A				0.05	0.05	0.07	0.09	0.16	0.38	0.38

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
9	84	1	11	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: BLACK CRK AT I 95 NR SMITHFIELD
Station #: J5185000 **Subbasin:** NEU03
Latitude: 35.46639 **Longitude:** -78.38056 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-45-(14)

Time period: 09/13/2000 to 11/10/2004

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	38	0	<4	1	2.6		3.2	5.4	6.1	7.4	8.9	9.9	12.1
	38	0	<5	1	2.6		3.2	5.4	6.1	7.4	8.9	9.9	12.1
pH (SU)	38	0	<6	1	2.6		5.7	6.2	6.5	6.7	6.9	7	7.6
	38	0	>9	0	0		5.7	6.2	6.5	6.7	6.9	7	7.6
Spec. conductance (umhos/cm at 25°C)	38	1	N/A				50	54	62	128	156	165	249
Water Temperature (°C)	38	0	>32	0	0		3	7.8	13.8	21.1	25.1	28.5	29.9
Other													
TSS (mg/L)	51	2	N/A				1	2	4	5	8	24	470
Turbidity (NTU)	51	0	>50	1	2		1	3	4	6	11	16	55
Nutrients (mg/L)													
NH3 as N	51	4	N/A				0.01	0.01	0.02	0.04	0.07	0.11	0.22
NO2 + NO3 as N	51	15	N/A				0.01	0.01	0.01	0.1	0.16	0.27	0.4
TKN as N	51	0	N/A				0.2	0.34	0.47	0.6	0.75	1.01	1.7
Total Phosphorus	51	2	N/A				0.01	0.03	0.04	0.05	0.09	0.13	0.17

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
49	51	4	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1201 RICHARDSON BRIDGE RD NR COX MILL
Station #: J5250000 **Subbasin:** NEU02
Latitude: 35.37410 **Longitude:** -78.19620 **Stream class:** WS-IV NSW
Agency: LNBA **NC stream index:** 27-(49.5)

Time period: 09/12/2000 to 08/22/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.2	5.2	6.1	7	9	10.3	11.8
	51	0	<5	3	5.9		4.2	5.2	6.1	7	9	10.3	11.8
pH (SU)	51	0	<6	0	0		6.2	6.4	6.4	6.6	6.8	7	8
	51	0	>9	0	0		6.2	6.4	6.4	6.6	6.8	7	8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				62	81	93	108	126	175	304
Water Temperature (°C)	53	0	>32	0	0		1.4	6.1	10.9	20.9	25	26.2	28.8
Other													
TSS (mg/L)	60	0	N/A				4	6	9	18	31	38	325
Turbidity (NTU)	60	0	>50	3	5		3	7	10	16	27	39	320
Nutrients (mg/L)													
NH3 as N	60	2	N/A				0.01	0.02	0.04	0.06	0.1	0.17	0.48
NO2 + NO3 as N	60	0	>10	0	0		0.2	0.28	0.4	0.53	0.69	0.92	1.3
TKN as N	60	0	N/A				0.1	0.21	0.4	0.5	0.64	0.86	1.96
Total Phosphorus	60	0	N/A				0.02	0.08	0.1	0.15	0.21	0.31	0.57
Metals (ug/L)													
Aluminum, total (Al)	58	0	N/A				88	190	308	591	978	1433	15225
Arsenic, total (As)	19	19	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	58	54	>2	0	0		0	0	0	1	1	1	1
Chromium, total (Cr)	57	36	>50	0	0		1	2	5	5	6	10	12
Copper, total (Cu)	58	17	>7	3	5.2		2	2	2	3	4	6	17
Iron, total (Fe)	58	0	>1000	37	63.8	Yes	530	689	812	1324	1839	2728	8676
Lead, total (Pb)	58	37	>25	0	0		0	1	2	5	5	5	16
Manganese, total (Mn)	58	0	>200	8	13.8	No	42	62	79	100	176	257	861
Mercury, total (Hg)	48	47	>0.012	1	2.1		0.2	0.2	0.2	0.2	0.2	0.2	2
Nickel, total (Ni)	58	44	>25	0	0		2	2	5	10	10	10	19
Zinc, total (Zn)	58	20	>50	1	1.7		5	7	10	10	14	23	62

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	109	7	12	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: HANNAH CRK AT SR 1158 ALLEN CROSSROADS RD NR BENSON
Station #: J5390000 **Subbasin:** NEU04
Latitude: 35.38677 **Longitude:** -78.51096 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-52-6

Time period: 02/25/2004 to 08/25/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	28	0	<4	0	0		4.2	4.3	5.1	5.8	7.5	10.2	10.8
	28	0	<5	6	21.4	Yes	4.2	4.3	5.1	5.8	7.5	10.2	10.8
pH (SU)	28	0	<6	0	0		6.3	6.3	6.5	6.6	6.8	6.8	7
	28	0	>9	0	0		6.3	6.3	6.5	6.6	6.8	6.8	7
Spec. conductance (umhos/cm at 25°C)	28	0	N/A				71	75	86	124	142	196	284
Water Temperature (°C)	30	0	>32	0	0		6.8	9.4	16.2	21.2	24.8	26.8	27.5
Other													
TSS (mg/L)	19	0	N/A				1	1	4	6	9	32	56
Turbidity (NTU)	19	0	>50	0	0		2	4	8	10	18	26	28
Nutrients (mg/L)													
NH3 as N	19	0	N/A				0.03	0.04	0.05	0.07	0.12	0.14	0.35
NO2 + NO3 as N	19	1	N/A				0.01	0.03	0.17	0.26	0.64	0.93	1.2
TKN as N	19	0	N/A				0.21	0.33	0.38	0.64	0.81	1	1.4
Total Phosphorus	19	0	N/A				0.04	0.05	0.07	0.09	0.15	0.38	0.52

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
19	140	3	16	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: HANNAH CRK AT SR 1227 IVEY RD NR BENSON
Station #: J5390800 **Subbasin:** NEU04
Latitude: 35.40245 **Longitude:** -78.49520 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-52-6

Time period: 02/25/2004 to 08/25/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	28	0	<4	11	39.3	Yes	0.7	0.9	2.4	5.5	7.9	9.7	10.6
	28	0	<5	11	39.3	Yes	0.7	0.9	2.4	5.5	7.9	9.7	10.6
pH (SU)	28	0	<6	0	0		6	6.3	6.5	6.7	6.8	6.9	7.1
	28	0	>9	0	0		6	6.3	6.5	6.7	6.8	6.9	7.1
Spec. conductance (umhos/cm at 25°C)	28	0	N/A				60	67	118	132	154	191	217
Water Temperature (°C)	30	0	>32	0	0		7.1	9.3	16.6	21.3	24.4	27.7	28.3
Other													
TSS (mg/L)	19	0	N/A				3	3	4	8	10	17	24
Turbidity (NTU)	19	0	>50	1	5.3		4	4	6	11	20	29	55
Nutrients (mg/L)													
NH3 as N	19	0	N/A				0.02	0.03	0.04	0.08	0.13	0.17	0.39
NO2 + NO3 as N	19	2	N/A				0.01	0.01	0.03	0.17	0.43	0.66	0.7
TKN as N	19	0	N/A				0.21	0.22	0.4	0.68	1.16	1.38	1.44
Total Phosphorus	19	0	N/A				0.04	0.04	0.07	0.11	0.14	0.33	0.4

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
19	74	3	16	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: HANNAH CRK AT I95 NR BENSON
Station #: J5400000 **Subbasin:** NEU04
Latitude: 35.40720 **Longitude:** -78.48320 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-52-6

Time period: 09/13/2000 to 01/29/2004

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	23	0	<4	5	21.7	Yes	0.5	0.9	4.5	7.6	9.5	10.5	11.2
	23	0	<5	7	30.4	Yes	0.5	0.9	4.5	7.6	9.5	10.5	11.2
pH (SU)	23	0	<6	2	8.7		5.6	5.9	6.2	6.5	6.7	7	7.7
	23	0	>9	0	0		5.6	5.9	6.2	6.5	6.7	7	7.7
Spec. conductance (umhos/cm at 25°C)	23	0	N/A				84	88	98	126	141	187	239
Water Temperature (°C)	23	0	>32	0	0		3.2	5.6	9.8	19	24.9	25.8	26.3
Other													
TSS (mg/L)	41	2	N/A				1	1	2	5	11	20	44
Turbidity (NTU)	41	0	>50	0	0		1	2	3	6	14	31	50
Nutrients (mg/L)													
NH3 as N	41	5	N/A				0.01	0.01	0.02	0.05	0.11	0.25	0.34
NO2 + NO3 as N	41	15	N/A				0.01	0.01	0.01	0.05	0.15	0.34	0.64
TKN as N	41	1	N/A				0.2	0.32	0.4	0.69	1.02	1.3	1.9
Total Phosphorus	41	0	N/A				0.02	0.03	0.04	0.08	0.14	0.2	0.52

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
41	51	4	10	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT SR 2333 SMITHFIELD RD NR ZEBULON
Station #: J5620000 **Subbasin:** NEU06
Latitude: 35.85770 **Longitude:** -78.36650 **Stream class:** WS-II HQW NSW
Agency: LNBA **NC stream index:** 27-57-(1)

Time period: 09/13/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	15	29.4	Yes	0.5	1.2	3.5	6.3	8.3	10.5	11.5
	51	0	<5	19	37.3	Yes	0.5	1.2	3.5	6.3	8.3	10.5	11.5
pH (SU)	51	0	<6	1	2		5.8	6.2	6.3	6.5	6.6	6.7	7.3
	51	0	>9	0	0		5.8	6.2	6.3	6.5	6.6	6.7	7.3
Spec. conductance (umhos/cm at 25°C)	51	3	N/A				50	57	64	72	83	95	126
Water Temperature (°C)	53	0	>32	2	3.8		3.4	5.6	12.6	20.6	25	28.2	32.3
Other													
TSS (mg/L)	60	4	N/A				1	1	2	4	6	10	60
Turbidity (NTU)	60	0	>50	0	0		0	2	3	6	9	15	36
Nutrients (mg/L)													
NH3 as N	60	10	N/A				0.01	0.01	0.02	0.05	0.07	0.11	0.27
NO2 + NO3 as N	60	14	>10	0	0		0.01	0.01	0.02	0.06	0.11	0.2	0.68
TKN as N	59	1	N/A				0.1	0.24	0.38	0.5	0.7	0.9	2.25
Total Phosphorus	59	1	N/A				0.01	0.03	0.04	0.07	0.1	0.13	0.28

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	53	4	7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT SR 2320 RILEY HILL RD NR ZEBULON
Station #: J5630000 **Subbasin:** NEU06
Latitude: 35.83734 **Longitude:** -78.36024 **Stream class:** WS II HQW NSW
Agency: LNBA **NC stream index:** 27-57-(1)

Time period: 05/04/2003 to 09/22/2003

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	10	0	<4	8	80	Yes	1.6	1.7	2.4	3	3.9	5.3	5.4
	10	0	<5	9	90	Yes	1.6	1.7	2.4	3	3.9	5.3	5.4
pH (SU)	10	0	<6	0	0		6	6	6.3	6.5	6.6	6.7	6.7
	10	0	>9	0	0		6	6	6.3	6.5	6.6	6.7	6.7
Spec. conductance (umhos/cm at 25°C)	10	1	N/A				50	50	53	65	82	115	119
Water Temperature (°C)	10	0	>32	0	0		18.8	19.2	22.6	23.8	26.3	27.7	27.8
Other													
TSS (mg/L)	5	0	N/A				3	3	3	4	5	5	5
Turbidity (NTU)	5	0	>50	0	0		4	4	4	7	9	9	9
Nutrients (mg/L)													
NH3 as N	10	2	N/A				0.01	0.01	0.02	0.09	0.11	0.26	0.27
NO2 + NO3 as N	10	3	>10	0	0		0.01	0.01	0.01	0.06	0.1	0.12	0.12
TKN as N	10	0	N/A				0.18	0.19	0.3	0.48	0.62	0.76	0.76
Total Phosphorus	10	0	N/A				0.07	0.07	0.07	0.07	0.08	0.1	0.1

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
10	44	1	10	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT US 301 NR KENLY
Station #: J5690000 **Subbasin:** NEU06
Latitude: 35.58290 **Longitude:** -78.15930 **Stream class:** WS-V NSW
Agency: LNBA **NC stream index:** 27-57-(8.5)

Time period: 09/13/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	4	7.8		3.5	4.3	5.5	6.6	7.9	10.7	11.1
	51	0	<5	7	13.7	No	3.5	4.3	5.5	6.6	7.9	10.7	11.1
pH (SU)	51	0	<6	0	0		6	6.3	6.4	6.5	6.7	7	7.5
	51	0	>9	0	0		6	6.3	6.4	6.5	6.7	7	7.5
Spec. conductance (umhos/cm at 25°C)	51	3	N/A				50	51	59	72	89	107	152
Water Temperature (°C)	53	0	>32	0	0		3.8	5.7	12.9	20.8	25.1	26.5	30.2
Other													
TSS (mg/L)	60	0	N/A				1	2	3	4	6	8	18
Turbidity (NTU)	60	0	>50	0	0		1	4	5	6	9	11	21
Nutrients (mg/L)													
NH3 as N	60	7	N/A				0.01	0.01	0.03	0.06	0.08	0.13	0.45
NO2 + NO3 as N	60	2	>10	0	0		0.01	0.08	0.12	0.16	0.25	0.36	0.53
TKN as N	60	0	N/A				0.2	0.27	0.4	0.51	0.63	0.93	2.26
Total Phosphorus	59	1	N/A				0.01	0.04	0.06	0.09	0.12	0.15	1.4

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	77	4	7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT I95 NR LOWELL MILL
Station #: J5730000 **Subbasin:** NEU06
Latitude: 35.56990 **Longitude:** -78.16260 **Stream class:** WS-V NSW
Agency: LNBA **NC stream index:** 27-57-(8.5)

Time period: 09/13/2000 to 12/13/2002

	# result	# ND	Results not meeting EL: EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	5	0	<4	0	0		5.8	5.8	6.4	6.9	9.9	11.5	11.5
	5	0	<5	0	0		5.8	5.8	6.4	6.9	9.9	11.5	11.5
pH (SU)	5	0	<6	1	20		5.8	5.8	6	6.3	6.8	7.1	7.1
	5	0	>9	0	0		5.8	5.8	6	6.3	6.8	7.1	7.1
Spec. conductance (umhos/cm at 25°C)	5	1	N/A				70	70	76	84	96	107	107
Water Temperature (°C)	5	0	>32	0	0		7	7	9.5	21	25.4	25.5	25.5
Other													
TSS (mg/L)	28	5	N/A				1	1	1	2	5	8	10
Turbidity (NTU)	28	0	>50	0	0		1	2	3	4	7	9	10
Nutrients (mg/L)													
NH3 as N	27	1	N/A				0.01	0.02	0.04	0.05	0.07	0.1	0.1
NO2 + NO3 as N	27	0	>10	0	0		0.08	0.09	0.16	0.2	0.28	0.33	0.43
TKN as N	27	0	N/A				0.2	0.2	0.4	0.6	0.6	0.8	0.9
Total Phosphorus	27	1	N/A				0.01	0.05	0.09	0.14	0.18	0.31	0.36

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
28	78	4	14	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV NR SR 2339 AT LOWELL MILL
Station #: J5730300 **Subbasin:** NEU06
Latitude: 35.56780 **Longitude:** -78.16252 **Stream class:** WS-V NSW
Agency: LNBA **NC stream index:** 27-57-(8.5)

Time period: 01/30/2003 to 01/30/2004

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	18	0	<4	1	5.6		3.7	4	4.6	6	8.7	10.8	11.1
	18	0	<5	5	27.8	Yes	3.7	4	4.6	6	8.7	10.8	11.1
pH (SU)	18	0	<6	0	0		6.2	6.2	6.3	6.5	6.7	6.8	7.2
	18	0	>9	0	0		6.2	6.2	6.3	6.5	6.7	6.8	7.2
Spec. conductance (umhos/cm at 25°C)	18	0	N/A				50	54	59	72	92	129	141
Water Temperature (°C)	18	0	>32	0	0		4.1	4.1	10.3	21.1	25.3	27.4	28.8
Other													
TSS (mg/L)	13	0	N/A				2	3	4	7	16	22	23
Turbidity (NTU)	13	0	>50	0	0		6	6	8	10	11	19	22
Nutrients (mg/L)													
NH3 as N	13	2	N/A				0.01	0.01	0.01	0.05	0.08	0.24	0.34
NO2 + NO3 as N	13	0	>10	0	0		0.04	0.06	0.11	0.18	0.28	0.46	0.53
TKN as N	13	0	N/A				0.25	0.28	0.34	0.46	0.8	1.56	2.01
Total Phosphorus	13	0	N/A				0.06	0.06	0.07	0.09	0.1	0.26	0.37

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
13	71	1	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT SR 2339 BAGLEY RD NR LOWELL MILL
Station #: J5750000 **Subbasin:** NEU06
Latitude: 35.56128 **Longitude:** -78.15935 **Stream class:** WS-V NSW
Agency: LNBA **NC stream index:** 27-57-(8.5)

Time period: 02/23/2004 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	28	0	<4	0	0		4.6	5.3	6.1	7.1	7.9	9.9	10.6
	28	0	<5	2	7.1		4.6	5.3	6.1	7.1	7.9	9.9	10.6
pH (SU)	28	0	<6	0	0		6.1	6.3	6.4	6.6	6.7	6.9	7.4
	28	0	>9	0	0		6.1	6.3	6.4	6.6	6.7	6.9	7.4
Spec. conductance (umhos/cm at 25°C)	28	1	N/A				50	61	68	88	104	138	149
Water Temperature (°C)	30	0	>32	0	0		5.1	8.9	15.3	21.1	25.1	29.1	32
Other													
TSS (mg/L)	19	0	N/A				2	3	4	5	9	13	18
Turbidity (NTU)	19	0	>50	1	5.3		4	4	6	8	13	24	58
Nutrients (mg/L)													
NH3 as N	19	1	N/A				0.01	0.03	0.04	0.07	0.09	0.12	0.19
NO2 + NO3 as N	19	0	>10	0	0		0.1	0.1	0.14	0.22	0.31	0.85	1.13
TKN as N	19	0	N/A				0.28	0.39	0.43	0.53	0.58	0.94	1.02
Total Phosphorus	19	0	N/A				0.04	0.04	0.08	0.09	0.12	0.14	0.19

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
19	52	1	5	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT SR 2320 NR PRINCETON
Station #: J5850000 **Subbasin:** NEU06
Latitude: 35.51252 **Longitude:** -78.15883 **Stream class:** WS-V NSW
Agency: NCAMBNT **NC stream index:** 27-57-(8.5)

Time period: 09/20/2000 to 08/02/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	56	0	<4	2	3.6		2.2	5	6.5	9.2	11	12.1	15
	56	0	<5	5	8.9		2.2	5	6.5	9.2	11	12.1	15
pH (SU)	56	0	<6	2	3.6		5.8	6.2	6.5	6.9	7	7.1	7.2
	56	0	>9	0	0		5.8	6.2	6.5	6.9	7	7.1	7.2
Salinity (ppt)	24	0	N/A				0	0	0	0	0	0	0.1
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				36	53	64	73	87	106	200
Water Temperature (°C)	56	0	>32	0	0		3.1	7.9	10.2	17.1	22.9	26.9	28.1
Other													
Chloride (mg/L)	3	0	>250	0	0		4	4	4	11	12	12	12
Hardness (mg/L as CaCO3)	2	0	>100	0	0		8	8	8	11	14	14	14
TSS (mg/L)	20	1	N/A				1	2	3	4	8	27	1100
Turbidity (NTU)	55	0	>50	2	3.6		3	3	4	6	10	21	70
Nutrients (mg/L)													
NH3 as N	9	5	N/A				0.01	0.01	0.01	0.02	0.2	0.38	0.38
NO2 + NO3 as N	9	1	>10	0	0		0.01	0.01	0.17	0.24	0.37	0.53	0.53
TKN as N	7	0	N/A				0.3	0.3	0.3	0.4	0.63	1.4	1.4
Total Phosphorus	9	0	N/A				0.06	0.06	0.07	0.09	0.11	0.14	0.14
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				93	117	150	195	362	1015	3400
Arsenic, total (As)	18	18	>10	0	0		5	5	9	10	10	10	10
Cadmium, total (Cd)	18	18	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	18	18	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	12	>7	0	0		2	2	2	2	3	3	3
Iron, total (Fe)	18	0	>1000	16	88.9	Yes	880	952	1275	1450	1800	2850	5100
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	18	0	>200	2	11.1	No	38	39	42	58	105	352	640
Mercury, total (Hg)	18	18	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	18	14	>50	1	5.6		10	10	10	10	10	23	81

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
54	75	5	9	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT SR 1234 CAPPS BRIDGE RD NR CROSSROADS
Station #: J5900000 **Subbasin:** NEU06
Latitude: 35.46620 **Longitude:** -78.09420 **Stream class:** WS-IV NSW
Agency: LNBA **NC stream index:** 27-57-(20.2)

Time period: 09/13/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.4	5.1	5.8	6.8	7.9	10.5	11.1
	51	0	<5	2	3.9		4.4	5.1	5.8	6.8	7.9	10.5	11.1
pH (SU)	51	0	<6	1	2		5.8	6.3	6.5	6.6	6.8	7.1	7.6
	51	0	>9	0	0		5.8	6.3	6.5	6.6	6.8	7.1	7.6
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				53	65	77	94	119	153	171
Water Temperature (°C)	53	0	>32	0	0		4.4	6.1	13.3	21.4	25.2	28.2	31.8
Other													
TSS (mg/L)	60	3	N/A				1	2	3	6	9	12	28
Turbidity (NTU)	60	0	>50	0	0		1	3	5	8	11	15	34
Nutrients (mg/L)													
NH3 as N	60	4	N/A				0.01	0.01	0.03	0.05	0.08	0.1	0.27
NO2 + NO3 as N	60	0	>10	0	0		0.05	0.15	0.22	0.29	0.38	0.4	0.49
TKN as N	60	0	N/A				0.2	0.31	0.44	0.6	0.7	0.8	1.62
Total Phosphorus	60	0	N/A				0.03	0.05	0.07	0.1	0.13	0.15	3.4

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	56	3	5	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE RIV AT US 581 AT ASYLUM
Station #: J5930000 **Subbasin:** NEU06
Latitude: 35.39300 **Longitude:** -78.02500 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-57-(22)

Time period: 09/13/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	0	0		4.4	5.2	5.7	6.8	8.1	10.6	11.4
	51	0	<5	3	5.9		4.4	5.2	5.7	6.8	8.1	10.6	11.4
pH (SU)	51	0	<6	1	2		5.8	6.3	6.5	6.6	6.7	7	7.8
	51	0	>9	0	0		5.8	6.3	6.5	6.6	6.7	7	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				52	76	93	114	143	167	182
Water Temperature (°C)	53	0	>32	0	0		4.6	6.1	13.8	21.6	25.3	27.4	29.1
Other													
TSS (mg/L)	60	1	N/A				1	2	3	5	8	13	22
Turbidity (NTU)	60	0	>50	0	0		1	3	4	7	11	15	23
Nutrients (mg/L)													
NH3 as N	60	9	N/A				0.01	0.01	0.03	0.05	0.08	0.09	0.35
NO2 + NO3 as N	60	0	N/A				0.05	0.15	0.2	0.34	0.42	0.52	1.32
TKN as N	60	0	N/A				0.1	0.3	0.4	0.5	0.6	0.76	1.28
Total Phosphorus	60	0	N/A				0.01	0.05	0.07	0.09	0.1	0.15	0.6

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	71	3	5	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1915 NR GOLDSBORO
Station #: J5970000 **Subbasin:** NEU05
Latitude: 35.33712 **Longitude:** -77.99734 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-(56)

Time period: 09/20/2000 to 08/02/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		4.8	5.4	6.1	8.2	10.2	11.7	14.5
	58	0	<5	1	1.7		4.8	5.4	6.1	8.2	10.2	11.7	14.5
pH (SU)	58	0	<6	2	3.4		5.8	6.3	6.5	6.8	7	7.2	7.3
	58	0	>9	0	0		5.8	6.3	6.5	6.8	7	7.2	7.3
Salinity (ppt)	25	0	N/A				0	0	0	0.1	0.1	0.1	0.1
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				70	80	99	120	140	179	252
Water Temperature (°C)	58	0	>32	0	0		3.8	8.9	11.4	17.7	24.4	27	29.6
Other													
Chlorophyll A (ug/L)	42	8	>40	0	0		1	1	1	3	4	9	22
TSS (mg/L)	20	0	N/A				4	6	10	18	24	42	46
Turbidity (NTU)	58	0	>50	3	5.2		5	7	9	14	22	40	95
Nutrients (mg/L)													
NH3 as N	35	2	N/A				0.01	0.02	0.02	0.04	0.07	0.18	0.58
NO2 + NO3 as N	35	0	N/A				0.01	0.21	0.33	0.41	0.53	0.66	0.82
TKN as N	33	0	N/A				0.3	0.38	0.41	0.49	0.6	0.7	1
Total Phosphorus	35	0	N/A				0.05	0.07	0.09	0.12	0.15	0.2	0.3
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				220	270	390	570	790	1400	1700
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	7	>7	0	0		2	2	2	2	3	3	4
Iron, total (Fe)	19	0	>1000	15	78.9	Yes	460	850	1100	1400	1900	2400	2400
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	14	>50	0	0		10	10	10	10	11	13	18

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	67	4	7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: WALNUT CRK AT SR 1730 SAINT JOHNS CHURCH RD NR WALNUT CREEK
Station #: J6010950 **Subbasin:** NEU05
Latitude: 35.28170 **Longitude:** -77.86860 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-68

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	4	7.8		2.5	4	5.4	6.4	7.9	9.9	11.3
	51	0	<5	9	17.6	Yes	2.5	4	5.4	6.4	7.9	9.9	11.3
pH (SU)	51	0	<6	1	2		5.6	6.1	6.3	6.5	6.7	7	7.8
	51	0	>9	0	0		5.6	6.1	6.3	6.5	6.7	7	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				73	80	83	91	110	128	170
Water Temperature (°C)	53	0	>32	0	0		3.9	6	14.2	21.7	25.5	27.9	31.5
Other													
TSS (mg/L)	60	7	N/A				1	1	2	3	4	4	12
Turbidity (NTU)	61	0	>50	0	0		1	2	2	3	4	6	8
Nutrients (mg/L)													
NH3 as N	60	2	N/A				0.01	0.01	0.04	0.07	0.13	0.2	0.4
NO2 + NO3 as N	60	0	N/A				0.19	0.25	0.51	0.84	1.32	1.75	2.46
TKN as N	60	1	N/A				0.2	0.2	0.35	0.47	0.6	0.74	1.08
Total Phosphorus	59	0	N/A				0.01	0.02	0.03	0.05	0.07	0.08	0.25

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	41	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1731 NR SEVEN SPRINGS
Station #: J6024000 **Subbasin:** NEU05
Latitude: 35.22900 **Longitude:** -77.84600 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(56)

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	1	2		3.9	4.8	5.3	6.7	8.1	9.9	10.8
	51	0	<5	7	13.7	No	3.9	4.8	5.3	6.7	8.1	9.9	10.8
pH (SU)	51	0	<6	0	0		6.1	6.4	6.5	6.6	6.8	7	7.8
	51	0	>9	0	0		6.1	6.4	6.5	6.6	6.8	7	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				60	72	86	100	117	148	247
Water Temperature (°C)	53	0	>32	0	0		4.1	6	14.8	22	25.4	28.2	31.5
Other													
TSS (mg/L)	60	1	N/A				2	3	5	13	22	39	90
Turbidity (NTU)	61	0	>50	1	1.6		3	4	6	12	19	25	100
Nutrients (mg/L)													
NH3 as N	60	7	N/A				0.01	0.01	0.03	0.05	0.08	0.11	0.38
NO2 + NO3 as N	60	0	N/A				0.14	0.23	0.35	0.49	0.6	0.71	1.38
TKN as N	60	0	N/A				0.1	0.38	0.4	0.5	0.6	0.8	1.88
Total Phosphorus	60	0	N/A				0.02	0.06	0.09	0.1	0.13	0.16	0.26

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	55	5	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: BEAR CRK AT SR 1311 BEAR CREEK RD NR KINSTON
Station #: J6044500 **Subbasin:** NEU05
Latitude: 35.24890 **Longitude:** -77.78430 **Stream class:** WS IV Sw NSW
Agency: LNBA **NC stream index:** 27-72-(5)

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				4.1	5.3	6	7.5	8.3	10.2	11.1
pH (SU)	51	0	<4.3	0	0		5.9	6.2	6.3	6.5	6.7	6.9	7.7
	51	0	>9	0	0		5.9	6.2	6.3	6.5	6.7	6.9	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				56	74	82	99	110	136	173
Water Temperature (°C)	53	0	>32	0	0		4.7	6.6	14.2	21.7	23.6	25.5	26.8
Other													
TSS (mg/L)	60	3	N/A				1	2	4	7	13	23	74
Turbidity (NTU)	61	0	>50	2	3.3		1	2	4	6	10	20	70
Nutrients (mg/L)													
NH3 as N	60	1	N/A				0.01	0.02	0.06	0.09	0.13	0.25	0.46
NO2 + NO3 as N	60	0	>10	0	0		0.2	1.53	1.93	2.24	2.54	2.88	3.29
TKN as N	59	2	N/A				0.1	0.3	0.37	0.52	0.72	0.98	1.4
Total Phosphorus	60	0	N/A				0.02	0.04	0.08	0.11	0.16	0.27	0.42

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	59	7	12	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MOSLEY CRK AT SR 1327 WILLEY MEASLEY RD NR LAGRANGE
Station #: J6055000 **Subbasin:** NEU05
Latitude: 35.31194 **Longitude:** -77.73139 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-77-2

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				4	4.9	5.7	7.1	8.1	9.6	10.7
pH (SU)	51	0	<4.3	0	0		5.5	6.3	6.4	6.5	6.7	6.9	7.7
	51	0	>9	0	0		5.5	6.3	6.4	6.5	6.7	6.9	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				71	82	92	99	112	149	224
Water Temperature (°C)	53	0	>32	0	0		5.1	6.9	14.8	21.4	23.8	25.6	26.7
Other													
TSS (mg/L)	60	6	N/A				1	1	2	4	8	14	28
Turbidity (NTU)	61	0	>50	0	0		1	2	3	5	8	14	24
Nutrients (mg/L)													
NH3 as N	60	4	N/A				0.01	0.01	0.03	0.06	0.11	0.14	0.32
NO2 + NO3 as N	60	0	N/A				0.1	0.49	1.3	1.58	1.87	2.24	3.1
TKN as N	58	1	N/A				0.1	0.3	0.4	0.51	0.65	0.83	2.33
Total Phosphorus	60	0	N/A				0.02	0.06	0.07	0.09	0.14	0.19	0.34

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	83	5	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT NC 11 AT KINSTON
Station #: J6150000 **Subbasin:** NEU05
Latitude: 35.25879 **Longitude:** -77.58353 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(75.7)

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	1	2		3.6	4.8	5.6	6.4	7.8	9.7	10.8
	51	0	<5	6	11.8	No	3.6	4.8	5.6	6.4	7.8	9.7	10.8
pH (SU)	51	0	<6	0	0		6.1	6.3	6.4	6.6	6.8	7.1	7.7
	51	0	>9	0	0		6.1	6.3	6.4	6.6	6.8	7.1	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				66	84	114	128	147	182	232
Water Temperature (°C)	53	0	>32	0	0		5.4	7.2	15.9	22.6	26.4	28.8	31.2
Other													
TSS (mg/L)	60	0	N/A				2	4	7	12	17	25	233
Turbidity (NTU)	61	0	>50	2	3.3		3	5	8	11	20	26	95
Nutrients (mg/L)													
NH3 as N	60	6	N/A				0.01	0.01	0.02	0.04	0.08	0.1	0.31
NO2 + NO3 as N	60	0	N/A				0.16	0.23	0.39	0.5	0.62	0.75	0.85
TKN as N	59	3	N/A				0.1	0.3	0.4	0.5	0.6	0.84	1.84
Total Phosphorus	60	0	N/A				0.02	0.06	0.08	0.1	0.12	0.15	0.32

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	48	3	5	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT NC 11 AT KINSTON
Station #: J6150000 **Subbasin:** NEU05
Latitude: 35.25879 **Longitude:** -77.58353 **Stream class:** C NSW
Agency: NCAMBNT **NC stream index:** 27-(75.7)

Time period: 09/27/2000 to 08/30/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	162	0	<4	1	0.6		3.4	5.8	6.8	8.3	10.5	12.6	14.7
	162	0	<5	5	3.1		3.4	5.8	6.8	8.3	10.5	12.6	14.7
pH (SU)	162	0	<6	8	4.9		3.7	6.3	6.5	6.8	7	7.3	8.4
	162	0	>9	0	0		3.7	6.3	6.5	6.8	7	7.3	8.4
Salinity (ppt)	160	17	N/A				0.01	0.04	0.05	0.06	0.07	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	158	0	N/A				67	84	94	114	130	147	220
Water Temperature (°C)	161	0	>32	0	0		3	6.8	11.4	18.6	25.7	28	30.1
Other													
Chlorophyll A (ug/L)	50	10	>40	1	2		1	1	1	2	4	12	43
TSS (mg/L)	20	0	N/A				3	3	9	14	18	27	28
Turbidity (NTU)	59	0	>50	0	0		3	6	8	13	19	31	50
Nutrients (mg/L)													
NH3 as N	136	26	N/A				0.02	0.02	0.02	0.03	0.04	0.06	0.11
NO2 + NO3 as N	136	0	N/A				0.12	0.32	0.43	0.55	0.65	0.79	1.1
TKN as N	136	0	N/A				0.29	0.38	0.44	0.5	0.57	0.63	0.71
Total Phosphorus	136	0	N/A				0.05	0.07	0.08	0.11	0.13	0.14	0.21
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				240	262	332	505	750	1560	2900
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	7	>7	0	0		2	2	2	2	3	3	4
Iron, total (Fe)	20	0	>1000	17	85	Yes	760	864	1125	1350	1600	2180	2800
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>50	3	15	No	10	10	10	10	11	118	170

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	46	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT NC 55 NR GRAINGERS
Station #: J6250000 **Subbasin:** NEU05
Latitude: 35.29570 **Longitude:** -77.49620 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(75.7)

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	5	9.8		3.1	3.8	5.2	6.4	7.7	10	11.3
	51	0	<5	10	19.6	Yes	3.1	3.8	5.2	6.4	7.7	10	11.3
pH (SU)	51	0	<6	0	0		6	6.3	6.5	6.6	6.9	7.2	7.9
	51	0	>9	0	0		6	6.3	6.5	6.6	6.9	7.2	7.9
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				74	86	104	110	136	157	254
Water Temperature (°C)	53	0	>32	0	0		5.8	6.9	16	22.8	26.2	28.5	31
Other													
TSS (mg/L)	60	0	N/A				2	3	4	7	14	23	49
Turbidity (NTU)	60	0	>50	0	0		3	4	6	7	12	19	35
Nutrients (mg/L)													
NH3 as N	60	7	N/A				0.01	0.01	0.03	0.05	0.09	0.13	0.5
NO2 + NO3 as N	60	0	N/A				0.03	0.32	0.52	0.75	2.15	2.7	3.77
TKN as N	59	1	N/A				0.1	0.3	0.4	0.5	0.6	0.75	1.89
Total Phosphorus	60	0	N/A				0.02	0.04	0.06	0.1	0.12	0.13	0.19

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	91	9	15	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR SR 1802 BRAXTONS RD NR TICK BITE
Station #: J6340000 **Subbasin:** NEU05
Latitude: 35.33527 **Longitude:** -77.45702 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(75.7)

Time period: 01/30/2003 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	46	0	<4	8	17.4	Yes	2.5	3.5	4.5	6	7.5	9.8	10.5
	46	0	<5	14	30.4	Yes	2.5	3.5	4.5	6	7.5	9.8	10.5
pH (SU)	46	0	<6	0	0		6.2	6.4	6.4	6.6	6.9	7.1	7.9
	46	0	>9	0	0		6.2	6.4	6.4	6.6	6.9	7.1	7.9
Spec. conductance (umhos/cm at 25°C)	46	0	N/A				71	91	121	146	162	179	214
Water Temperature (°C)	48	0	>32	0	0		5.6	6.6	16.6	23.2	26.7	28.6	30.6
Other													
TSS (mg/L)	32	0	N/A				1	3	6	14	28	64	80
Turbidity (NTU)	32	0	>50	1	3.1		3	5	8	13	25	36	55
Nutrients (mg/L)													
NH3 as N	32	5	N/A				0.01	0.01	0.02	0.06	0.08	0.16	0.34
NO2 + NO3 as N	32	0	N/A				0.15	0.19	0.36	0.44	0.53	1.05	3.43
TKN as N	32	1	N/A				0.2	0.31	0.45	0.54	0.76	0.92	1.84
Total Phosphorus	32	0	N/A				0.03	0.05	0.08	0.1	0.13	0.17	9.96
Metals (ug/L)													
Aluminum, total (Al)	32	0	N/A				125	231	468	775	1603	2235	5465
Arsenic, total (As)	18	18	>10	0	0		5	5	5	5	5	5	5
Cadmium, total (Cd)	32	32	>2	0	0		1	1	1	1	1	1	1
Chromium, total (Cr)	32	30	>50	0	0		5	5	5	5	5	5	8
Copper, total (Cu)	32	12	>7	0	0		2	2	2	2	4	5	6
Iron, total (Fe)	32	0	>1000	28	87.5	Yes	220	909	1316	1810	2512	3058	10643
Lead, total (Pb)	32	30	>25	0	0		5	5	5	5	5	5	7
Mercury, total (Hg)	32	32	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	32	30	>88	0	0		10	10	10	10	10	10	15
Zinc, total (Zn)	32	12	>50	1	3.1		10	10	10	12	21	38	68

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
32	74	2	6	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR SR 1803 NR TICK BITE
Station #: J6370000 **Subbasin:** NEU05
Latitude: 35.33660 **Longitude:** -77.41760 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-(75.7)

Time period: 09/15/2000 to 12/12/2002

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	5	0	<4	0	0		6	6	6.2	6.6	8.5	9.3	9.3
	5	0	<5	0	0		6	6	6.2	6.6	8.5	9.3	9.3
pH (SU)	5	0	<6	0	0		6.6	6.6	6.7	6.8	7.2	7.6	7.6
	5	0	>9	0	0		6.6	6.6	6.7	6.8	7.2	7.6	7.6
Spec. conductance (umhos/cm at 25°C)	5	0	N/A				117	117	120	154	206	246	246
Water Temperature (°C)	5	0	>32	0	0		7	7	9.5	22	25.9	26.3	26.3
Other													
TSS (mg/L)	25	0	N/A				2	3	4	7	11	21	36
Turbidity (NTU)	25	0	>50	0	0		3	3	5	8	12	14	22
Nutrients (mg/L)													
NH3 as N	25	1	N/A				0.01	0.02	0.03	0.06	0.1	0.13	0.39
NO2 + NO3 as N	25	0	N/A				0.29	0.36	0.44	0.57	0.72	0.78	1.24
TKN as N	25	2	N/A				0.1	0.16	0.4	0.5	0.55	0.6	0.7
Total Phosphorus	24	0	N/A				0.02	0.05	0.09	0.11	0.12	0.14	0.16
Metals (ug/L)													
Aluminum, total (Al)	23	1	N/A				0	54	140	260	390	558	780
Cadmium, total (Cd)	23	18	>2	0	0		0	0	0	0	0	3	10
Chromium, total (Cr)	19	9	>50	0	0		1	1	2	5	6	10	20
Copper, total (Cu)	23	11	>7	1	4.3		1	2	2	2	3	7	10
Iron, total (Fe)	23	0	>1000	15	65.2	Yes	600	740	900	1100	1300	1700	1800
Lead, total (Pb)	23	5	>25	0	0		0	0	1	1	2	3	5
Mercury, total (Hg)	13	13	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	23	17	>88	0	0		2	2	2	3	5	5	40
Zinc, total (Zn)	23	18	>50	0	0		5	5	5	5	10	25	34

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
25	42	0	0	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE CRK AT NC 97 AT ZEBULON
Station #: J6410000 **Subbasin:** NEU07
Latitude: 35.82500 **Longitude:** -78.30420 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-86-2-4

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	30	0	<4	0	0		4.3	4.6	5.9	6.9	8.2	10.4	11.2
	30	0	<5	3	10	No	4.3	4.6	5.9	6.9	8.2	10.4	11.2
pH (SU)	30	0	<6	2	6.7		5.8	6	6.3	6.6	6.7	6.8	7
	30	0	>9	0	0		5.8	6	6.3	6.6	6.7	6.8	7
Spec. conductance (umhos/cm at 25°C)	30	1	N/A				50	74	84	94	106	126	144
Water Temperature (°C)	32	0	>32	0	0		2.8	8.8	14.4	21.1	22.8	23.6	24.5
Other													
TSS (mg/L)	30	0	N/A				3	3	4	5	8	18	56
Turbidity (NTU)	30	0	>50	0	0		7	8	9	11	13	17	36
Nutrients (mg/L)													
NH3 as N	40	1	N/A				0.01	0.03	0.04	0.07	0.1	0.12	0.24
NO2 + NO3 as N	40	0	N/A				0.04	0.09	0.12	0.2	0.26	0.37	1.1
TKN as N	39	0	N/A				0.28	0.4	0.4	0.58	0.7	0.85	3.7
Total Phosphorus	40	1	N/A				0.01	0.06	0.09	0.11	0.15	0.18	0.33

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
41	117	8	20	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE CRK AT NC 39 AT ZEBULON
Station #: J6450000 **Subbasin:** NEU07
Latitude: 35.81250 **Longitude:** -78.26810 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-86-2-4

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	40	0	<4	4	10	No	3.2	3.9	4.4	6	7.2	9	11
	40	0	<5	14	35	Yes	3.2	3.9	4.4	6	7.2	9	11
pH (SU)	40	0	<6	1	2.5		5.7	6.5	6.6	6.8	6.9	7	7.2
	40	0	>9	0	0		5.7	6.5	6.6	6.8	6.9	7	7.2
Spec. conductance (umhos/cm at 25°C)	40	0	N/A				71	86	101	142	266	483	510
Water Temperature (°C)	42	0	>32	0	0		3	9.7	16.6	21.8	24.2	25.6	27
Other													
TSS (mg/L)	35	0	N/A				3	4	5	6	10	15	75
Turbidity (NTU)	35	0	>50	0	0		5	5	7	9	12	14	40
Nutrients (mg/L)													
NH3 as N	51	4	N/A				0.01	0.01	0.03	0.06	0.09	0.16	0.33
NO2 + NO3 as N	51	0	N/A				0.02	0.04	0.17	0.62	1.39	5.21	10.8
TKN as N	51	1	N/A				0.2	0.37	0.49	0.67	0.8	1.18	1.4
Total Phosphorus	51	0	N/A				0.04	0.06	0.09	0.15	0.25	0.4	0.73

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
52	102	7	13	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: MOCCASIN CRK AT SR 1131 ANTIOC CHURCH RD NR CONNER
Station #: J6500000 **Subbasin:** NEU07
Latitude: 35.73010 **Longitude:** -78.18950 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-86-2

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	6	11.8	No	2.7	3.8	5	6.5	8.8	10.8	11.6
	51	0	<5	12	23.5	Yes	2.7	3.8	5	6.5	8.8	10.8	11.6
pH (SU)	51	0	<6	1	2		5.6	6.3	6.6	6.7	6.9	7.1	8
	51	0	>9	0	0		5.6	6.3	6.6	6.7	6.9	7.1	8
Spec. conductance (umhos/cm at 25°C)	51	1	N/A				50	58	63	74	92	116	173
Water Temperature (°C)	53	0	>32	0	0		0.7	6.7	11.9	21.1	24.2	25.4	26.5
Other													
TSS (mg/L)	60	1	N/A				1	2	3	5	7	15	80
Turbidity (NTU)	60	0	>50	1	1.7		1	5	7	9	12	17	55
Nutrients (mg/L)													
NH3 as N	60	3	N/A				0.01	0.01	0.03	0.06	0.1	0.13	0.35
NO2 + NO3 as N	60	2	N/A				0.01	0.06	0.1	0.16	0.22	0.28	0.34
TKN as N	60	0	N/A				0.1	0.3	0.42	0.53	0.68	0.89	1
Total Phosphorus	59	0	N/A				0.02	0.05	0.07	0.08	0.11	0.15	0.2

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	116	5	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: TURKEY CRK AT SR 1101 CLAUDE LEWIS RD NR MIDDLESEX
Station #: J6680000 **Subbasin:** NEU07
Latitude: 35.75190 **Longitude:** -78.15970 **Stream class:** C NSW
Agency: LNBA **NC stream index:** 27-86-3-(1)

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	<4	16	31.4	Yes	1.9	2.2	3.1	5.7	8	10.2	11.2
	51	0	<5	23	45.1	Yes	1.9	2.2	3.1	5.7	8	10.2	11.2
pH (SU)	51	0	<6	4	7.8		5.1	6	6.5	6.5	6.7	6.9	7.8
	51	0	>9	0	0		5.1	6	6.5	6.5	6.7	6.9	7.8
Spec. conductance (umhos/cm at 25°C)	51	1	N/A				50	53	62	84	108	118	159
Water Temperature (°C)	53	0	>32	0	0		0.8	6.7	12	21.4	24.3	26.7	28.4
Other													
TSS (mg/L)	60	1	N/A				1	2	3	4	6	9	84
Turbidity (NTU)	60	0	>50	1	1.7		2	6	8	9	12	16	80
Nutrients (mg/L)													
NH3 as N	60	4	N/A				0.01	0.02	0.04	0.07	0.11	0.16	0.61
NO2 + NO3 as N	60	3	N/A				0.01	0.03	0.06	0.1	0.14	0.2	0.61
TKN as N	60	1	N/A				0.2	0.26	0.45	0.54	0.7	0.9	1.8
Total Phosphorus	58	1	N/A				0.01	0.04	0.05	0.07	0.08	0.11	0.2

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	79	5	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK AT NC 581 NR LUCAMA
Station #: J6740000 **Subbasin:** NEU07
Latitude: 35.69142 **Longitude:** -78.10928 **Stream class:** WS-V NSW
Agency: NCAMBNT **NC stream index:** 27-86-(1)

Time period: 09/13/2000 to 08/02/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	1	<4	4	6.9		0.2	4.5	6.8	9.1	11.1	12.6	15
	58	1	<5	6	10.3	No	0.2	4.5	6.8	9.1	11.1	12.6	15
pH (SU)	58	0	<6	4	6.9		5.6	6.3	6.5	6.7	7	7.1	7.2
	58	0	>9	0	0		5.6	6.3	6.5	6.7	7	7.1	7.2
Salinity (ppt)	25	0	N/A				0	0	0	0	0	0	0
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				42	49	54	60	67	77	520
Water Temperature (°C)	58	0	>32	0	0		4.4	7.6	11.3	15.9	24.3	27.5	28.7
Other													
Chloride (mg/L)	3	0	>250	0	0		4	4	4	5	6	6	6
Hardness (mg/L as CaCO3)	2	1	>100	0	0		1	1	1	12	22	22	22
TSS (mg/L)	20	1	N/A				2	3	4	6	8	9	10
Turbidity (NTU)	57	0	>50	0	0		3	3	4	7	8	9	21
Nutrients (mg/L)													
NH3 as N	35	3	N/A				0.02	0.03	0.03	0.06	0.11	0.24	0.75
NO2 + NO3 as N	35	6	>10	0	0		0.01	0.02	0.09	0.12	0.19	0.25	2.5
TKN as N	34	0	N/A				0.36	0.46	0.51	0.6	0.66	0.81	1.2
Total Phosphorus	35	1	N/A				0.02	0.03	0.04	0.05	0.06	0.17	0.22
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				66	75	120	160	220	450	520
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	14	>7	0	0		2	2	2	2	2	3	3
Iron, total (Fe)	19	0	>1000	15	78.9	Yes	360	510	1100	1300	1500	1700	1900
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	19	0	>200	7	36.8	Yes	43	45	58	120	260	980	1200
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	18	>50	0	0		10	10	10	10	10	10	17

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	15	0	0	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK AT US 301 WARD BLVD NR DIXIE
Station #: J6764000 **Subbasin:** NEU07
Latitude: 35.68790 **Longitude:** -77.94770 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-(7)

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				4.2	5.1	5.9	7	8.5	10.2	12
pH (SU)	51	0	<4.3	0	0		5.5	6.3	6.5	6.7	6.8	7.1	7.8
	51	0	>9	0	0		5.5	6.3	6.5	6.7	6.8	7.1	7.8
Spec. conductance (umhos/cm at 25°C)	51	1	N/A				50	55	62	104	136	153	188
Water Temperature (°C)	53	0	>32	0	0		1.3	7	13.2	22	25.9	28.9	30.9
Other													
TSS (mg/L)	60	0	N/A				2	3	4	5	7	8	16
Turbidity (NTU)	60	0	>50	0	0		1	4	6	7	9	11	14
Nutrients (mg/L)													
NH3 as N	60	5	N/A				0.01	0.01	0.02	0.03	0.07	0.11	0.36
NO2 + NO3 as N	60	11	N/A				0.01	0.01	0.02	0.15	0.27	0.33	0.5
TKN as N	60	1	N/A				0.3	0.4	0.5	0.62	0.74	0.81	1.87
Total Phosphorus	60	0	N/A				0.02	0.04	0.05	0.06	0.09	0.13	0.22

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	27	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK AT SR 1622 EVANSDALE RD NR WILSON
Station #: J6890000 **Subbasin:** NEU07
Latitude: 35.64290 **Longitude:** -77.89020 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-(7)

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				4.3	4.8	5.2	6.5	8.6	10.1	11.8
pH (SU)	51	0	<4.3	0	0		5.3	6.2	6.4	6.6	6.7	7.1	7.7
	51	0	>9	0	0		5.3	6.2	6.4	6.6	6.7	7.1	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				57	72	86	108	124	222	389
Water Temperature (°C)	53	0	>32	0	0		1.4	7.6	12.7	22.1	25.4	28.1	30.6
Other													
TSS (mg/L)	63	0	N/A				3	4	6	7	10	15	96
Turbidity (NTU)	63	0	>50	0	0		2	5	7	9	11	15	45
Nutrients (mg/L)													
NH3 as N	63	3	N/A				0.01	0.03	0.05	0.08	0.15	0.32	0.88
NO2 + NO3 as N	63	0	N/A				0.03	0.22	0.33	0.45	0.7	1.22	3.06
TKN as N	63	1	N/A				0.21	0.42	0.5	0.66	0.8	1.1	1.9
Total Phosphorus	63	0	N/A				0.03	0.06	0.07	0.1	0.14	0.27	0.5
Metals (ug/L)													
Aluminum, total (Al)	3	0	N/A				93	93	93	180	180	180	180
Cadmium, total (Cd)	3	3	>2	0	0		0	0	0	0	0	0	0
Chromium, total (Cr)	3	3	>50	0	0		10	10	10	10	20	20	20
Copper, total (Cu)	3	0	>7	0	0		2	2	2	2	3	3	3
Iron, total (Fe)	3	0	>1000	0	0		490	490	490	490	660	660	660
Lead, total (Pb)	3	2	>25	0	0		1	1	1	2	2	2	2
Mercury, total (Hg)	3	3	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	3	3	>88	0	0		5	5	5	5	5	5	5
Zinc, total (Zn)	3	2	>50	0	0		10	10	10	10	26	26	26

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	88	9	15	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK AT NC 58 NR STANTONSBURG
Station #: J7210000 **Subbasin:** NEU07
Latitude: 35.58610 **Longitude:** -77.81110 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-(7)

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				3.4	4.2	5	5.9	8.4	10.5	12.1
pH (SU)	51	0	<4.3	0	0		5.6	6.3	6.4	6.6	6.7	7.1	7.7
	51	0	>9	0	0		5.6	6.3	6.4	6.6	6.7	7.1	7.7
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				63	73	93	132	144	183	273
Water Temperature (°C)	53	0	>32	0	0		1.7	7.7	12.9	22.3	25.8	28	30.2
Other													
TSS (mg/L)	60	1	N/A				1	3	4	6	7	10	17
Turbidity (NTU)	60	0	>50	0	0		2	4	6	8	11	12	15
Nutrients (mg/L)													
NH3 as N	60	5	N/A				0.01	0.02	0.04	0.08	0.12	0.19	0.4
NO2 + NO3 as N	60	0	N/A				0.05	0.2	0.33	0.44	0.59	0.89	1.53
TKN as N	60	1	N/A				0.2	0.43	0.51	0.66	0.76	0.85	1.1
Total Phosphorus	60	1	N/A				0.01	0.05	0.06	0.09	0.12	0.18	0.28

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	101	7	12	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: TOISNOT SWAMP AT SR 1539 SAND PIT RD NR STANTONBURG
Station #: J7240000 **Subbasin:** NEU07
Latitude: 35.59760 **Longitude:** -77.79470 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-11-(5)

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				0.9	3.6	4.6	5.8	8	10.1	11.7
pH (SU)	51	0	<4.3	0	0		5.5	6	6.3	6.5	6.6	6.9	8.1
	51	0	>9	0	0		5.5	6	6.3	6.5	6.6	6.9	8.1
Spec. conductance (umhos/cm at 25°C)	51	1	N/A				50	67	76	91	104	138	163
Water Temperature (°C)	53	0	>32	0	0		2	7.4	13.1	22.3	25.1	26.2	27.2
Other													
TSS (mg/L)	59	1	N/A				1	2	3	4	10	13	28
Turbidity (NTU)	59	0	>50	0	0		2	5	6	9	12	17	27
Nutrients (mg/L)													
NH3 as N	59	3	N/A				0.01	0.02	0.05	0.08	0.12	0.18	0.44
NO2 + NO3 as N	59	2	N/A				0.01	0.06	0.12	0.23	0.3	0.43	0.64
TKN as N	59	2	N/A				0.2	0.37	0.5	0.63	0.77	1.04	1.6
Total Phosphorus	59	0	N/A				0.03	0.05	0.07	0.11	0.15	0.19	0.75

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	68	4	7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NAHUNTA SWAMP AT NC 58 NR CONTENTNEA
Station #: J7325000 **Subbasin:** NEU07
Latitude: 35.50810 **Longitude:** -77.74550 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-14

Time period: 09/15/2000 to 08/21/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				1.6	4.9	5.6	6.6	8.1	9.9	11
pH (SU)	51	0	<4.3	0	0		5.7	6.2	6.3	6.5	6.7	6.9	7.3
	51	0	>9	0	0		5.7	6.2	6.3	6.5	6.7	6.9	7.3
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				65	81	88	102	110	120	159
Water Temperature (°C)	53	0	>32	0	0		4.2	7.4	13.1	21.7	24.8	26.8	28.7
Other													
TSS (mg/L)	60	4	N/A				1	2	3	5	7	10	34
Turbidity (NTU)	60	0	>50	0	0		1	4	5	7	9	12	28
Nutrients (mg/L)													
NH3 as N	60	1	N/A				0.01	0.05	0.06	0.1	0.15	0.21	0.38
NO2 + NO3 as N	60	0	N/A				0.11	0.26	0.4	0.55	0.92	1.18	1.5
TKN as N	60	1	N/A				0.1	0.45	0.5	0.6	0.74	0.94	1.31
Total Phosphorus	60	0	N/A				0.03	0.06	0.08	0.13	0.16	0.2	0.37

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	92	4	7	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK AT US 13 AT SNOW HILL
Station #: J7330000 **Subbasin:** NEU07
Latitude: 35.45850 **Longitude:** -77.67530 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-(7)

Time period: 09/15/2000 to 08/21/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				2.8	4	5.1	6.1	8.3	9.8	11.5
pH (SU)	51	0	<4.3	0	0		5.8	6.1	6.4	6.6	6.8	7	7.9
	51	0	>9	0	0		5.8	6.1	6.4	6.6	6.8	7	7.9
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				56	71	87	115	130	139	191
Water Temperature (°C)	53	0	>32	0	0		0.9	8.6	13.7	22.2	25.7	27	29.3
Other													
TSS (mg/L)	60	0	N/A				1	2	3	6	8	11	18
Turbidity (NTU)	60	0	>50	0	0		1	4	6	8	10	11	21
Nutrients (mg/L)													
NH3 as N	60	3	N/A				0.01	0.01	0.04	0.07	0.1	0.16	1.5
NO2 + NO3 as N	60	1	N/A				0.1	0.18	0.37	0.5	0.6	0.71	1.09
TKN as N	60	0	N/A				0.2	0.38	0.5	0.6	0.73	1.03	2.7
Total Phosphorus	60	0	N/A				0.02	0.06	0.08	0.11	0.15	0.16	0.39

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	76	8	14	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK AT NC 123 AT HOOKERTON
Station #: J7450000 **Subbasin:** NEU07
Latitude: 35.42864 **Longitude:** -77.58265 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-86-(7)

Time period: 09/27/2000 to 08/30/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	162	0	N/A				4.2	5.3	5.9	7.4	10.2	12.5	14.1
pH (SU)	162	0	<4.3	0	0		5.2	6	6.3	6.5	6.8	7.2	8.2
	162	0	>9	0	0		5.2	6	6.3	6.5	6.8	7.2	8.2
Salinity (ppt)	160	16	N/A				0.03	0.04	0.04	0.05	0.06	0.2	0.5
Spec. conductance (umhos/cm at 25°C)	162	0	N/A				60	74	85	98	108	118	174
Water Temperature (°C)	162	0	>32	0	0		2.6	6.8	11	17.7	24.6	26.8	29.3
Other													
Chlorophyll A (ug/L)	51	12	>40	0	0		1	1	1	2	3	11	31
TSS (mg/L)	19	4	N/A				2	2	4	5	6	9	12
Turbidity (NTU)	59	0	>50	0	0		4	5	6	7	10	13	23
Nutrients (mg/L)													
NH3 as N	137	7	N/A				0.02	0.02	0.03	0.05	0.07	0.09	0.23
NO2 + NO3 as N	137	0	N/A				0.07	0.36	0.48	0.58	0.71	0.87	1.2
TKN as N	137	0	N/A				0.32	0.46	0.51	0.6	0.69	0.75	1.6
Total Phosphorus	137	0	N/A				0.05	0.06	0.08	0.12	0.15	0.17	0.32
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				170	187	272	340	420	489	670
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	13	>7	0	0		2	2	2	2	3	3	3
Iron, total (Fe)	20	0	>1000	18	90	Yes	880	1020	1350	1650	1900	2360	2500
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>50	0	0		10	10	10	10	13	19	25

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	50	2	3	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE CONTENTNEA CRK at SR 1218 CHINQUAPIN RD NR FARMVILLE
Station #: J7690000 **Subbasin:** NEU07
Latitude: 35.58810 **Longitude:** -77.54160 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-26

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				0.8	1.5	3.3	5.2	7.9	9.9	11.3
pH (SU)	51	0	<4.3	0	0		5.4	5.8	6.3	6.5	6.6	6.8	7.6
	51	0	>9	0	0		5.4	5.8	6.3	6.5	6.6	6.8	7.6
Spec. conductance (umhos/cm at 25°C)	51	1	N/A				50	74	94	108	120	172	411
Water Temperature (°C)	53	0	>32	0	0		1	8	13.1	21.8	25	26.6	27.4
Other													
TSS (mg/L)	60	2	N/A				1	3	4	6	9	16	60
Turbidity (NTU)	60	0	>50	0	0		1	4	5	6	11	13	38
Nutrients (mg/L)													
NH3 as N	60	2	N/A				0.01	0.09	0.14	0.2	0.32	0.56	2.3
NO2 + NO3 as N	60	0	N/A				0.05	0.17	0.23	0.34	0.5	1.13	2
TKN as N	60	0	N/A				0.43	0.6	0.83	1.1	1.4	2.27	20.6
Total Phosphorus	60	0	N/A				0.06	0.08	0.17	0.26	0.41	1.58	2.22

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	161	12	20	No

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE CONTENTNEA CRK AT SR 1125 NR BALLARDS CROSSROADS
Station #: J7739550 **Subbasin:** NEU07
Latitude: 35.52490 **Longitude:** -77.52271 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-86-26

Time period: 09/20/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	N/A				1.3	3.6	4.1	6	9.1	12.1	14.5
pH (SU)	60	0	<4.3	0	0		5.4	5.9	6.2	6.5	6.8	7.1	7.8
	60	0	>9	0	0		5.4	5.9	6.2	6.5	6.8	7.1	7.8
Salinity (ppt)	59	18	N/A				0.04	0.04	0.05	0.07	0.2	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	60	0	N/A				69	92	102	124	147	161	175
Water Temperature (°C)	59	0	>32	0	0		1	6	9.2	17.7	24	26.8	28.8
Other													
Chlorophyll A (ug/L)	49	5	>40	1	2		1	1	2	4	12	26	60
TSS (mg/L)	19	3	N/A				2	2	3	4	5	10	16
Turbidity (NTU)	60	0	>50	0	0		2	3	4	5	7	11	38
Nutrients (mg/L)													
NH3 as N	58	7	N/A				0.01	0.02	0.02	0.05	0.09	0.2	0.57
NO2 + NO3 as N	58	7	N/A				0.01	0.02	0.06	0.15	0.28	0.5	0.74
TKN as N	58	1	N/A				0.2	0.44	0.6	0.75	0.86	1.1	2
Total Phosphorus	58	0	N/A				0.08	0.11	0.18	0.28	0.36	0.44	0.6
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				85	90	130	170	218	405	720
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	16	>7	0	0		2	2	2	2	2	2	3
Iron, total (Fe)	20	0	>1000	18	90	Yes	830	956	1700	2050	2400	2970	3100
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	15	>50	0	0		10	10	10	10	11	13	30

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	67	3	5	

Key:
result: number of observations
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Results not meeting EL: number and percentages of observations not meeting evaluation level
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: LITTLE CONTENTNEA CRK AT SR 1110 AT SCUFFLETON
Station #: J7740000 **Subbasin:** NEU07
Latitude: 35.45670 **Longitude:** -77.48540 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-86-26

Time period: 09/14/2000 to 08/21/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				2.3	3.8	4.7	5.8	8.4	10.1	11.7
pH (SU)	51	0	<4.3	0	0		5.8	6	6.5	6.7	6.8	7.1	7.6
	51	0	>9	0	0		5.8	6	6.5	6.7	6.8	7.1	7.6
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				65	81	109	121	141	183	309
Water Temperature (°C)	53	0	>32	0	0		1.1	8.2	13.3	22	25.5	27.3	28.8
Other													
TSS (mg/L)	60	7	N/A				1	1	2	3	5	9	15
Turbidity (NTU)	60	0	>50	0	0		2	3	4	6	9	11	30
Nutrients (mg/L)													
NH3 as N	60	4	N/A				0.01	0.01	0.04	0.06	0.11	0.18	1.4
NO2 + NO3 as N	60	1	N/A				0.01	0.1	0.17	0.35	0.54	0.69	0.96
TKN as N	60	0	N/A				0.1	0.46	0.56	0.6	0.85	1.01	11
Total Phosphorus	60	0	N/A				0.04	0.08	0.14	0.23	0.29	0.42	5.98

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
60	120	9	15	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CONTENTNEA CRK NR SR 1800 AT GRIFTON
Station #: J7810000 **Subbasin:** NEU07
Latitude: 35.36852 **Longitude:** -77.43412 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-86-(7)

Time period: 09/27/2000 to 08/24/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	N/A				3.9	5.2	5.7	6.6	10.3	11.9	13.9
pH (SU)	59	0	<4.3	0	0		5.5	5.7	6.1	6.5	6.8	7.1	9.4
	59	0	>9	1	1.7		5.5	5.7	6.1	6.5	6.8	7.1	9.4
Salinity (ppt)	58	17	N/A				0.01	0.04	0.05	0.06	0.2	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	59	0	N/A				54	82	91	107	120	132	165
Water Temperature (°C)	59	0	>32	0	0		3	6.5	10.9	16.9	24.9	27.3	29
Other													
Chlorophyll A (ug/L)	49	15	>40	0	0		1	1	1	1	2	7	30
TSS (mg/L)	18	3	N/A				2	2	4	5	7	29	30
Turbidity (NTU)	59	0	>50	0	0		3	4	5	6	8	12	19
Nutrients (mg/L)													
NH3 as N	56	2	N/A				0.01	0.02	0.03	0.05	0.09	0.13	0.65
NO2 + NO3 as N	56	0	N/A				0.22	0.28	0.41	0.53	0.66	0.78	2.7
TKN as N	56	2	N/A				0.36	0.4	0.46	0.56	0.69	0.8	2
Total Phosphorus	56	0	N/A				0.06	0.07	0.11	0.14	0.19	0.22	0.3
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				160	210	240	270	370	420	490
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	14	>7	0	0		2	2	2	2	2	3	5
Iron, total (Fe)	19	0	>1000	19	100	Yes	1100	1200	1300	1800	2100	2200	2600
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	15	>50	1	5.3		10	10	10	10	10	12	67

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	62	4	7	

Key:
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1470 NR FORT BARNWELL
Station #: J7850000 **Subbasin:** NEU08
Latitude: 35.31389 **Longitude:** -77.30302 **Stream class:** C Sw NSW
Agency: LNBA **NC stream index:** 27-(85)

Time period: 09/15/2000 to 08/26/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				3	4.1	4.7	6.4	7.6	10.3	11
pH (SU)	51	0	<4.3	0	0		6.2	6.3	6.4	6.6	6.9	7	7.8
	51	0	>9	0	0		6.2	6.3	6.4	6.6	6.9	7	7.8
Spec. conductance (umhos/cm at 25°C)	51	0	N/A				71	88	108	119	139	159	232
Water Temperature (°C)	53	0	>32	0	0		5.1	6.1	14.1	23.4	26.3	28.5	31.4
Other													
Chlorophyll A (ug/L)	61	12	>40	0	0		0	1	1	3	4	7	24
TSS (mg/L)	60	0	N/A				2	3	4	5	10	14	50
Turbidity (NTU)	60	0	>50	0	0		3	4	6	7	11	16	34
Nutrients (mg/L)													
NH3 as N	62	6	N/A				0.01	0.02	0.03	0.05	0.09	0.11	0.25
NO2 + NO3 as N	62	0	N/A				0.04	0.21	0.37	0.5	0.65	0.75	1.02
TKN as N	62	0	N/A				0.1	0.36	0.4	0.51	0.68	0.9	7
Total Phosphorus	62	0	N/A				0.01	0.06	0.09	0.11	0.15	0.17	0.24

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	53	2	3	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1470 NR FORT BARNWELL
Station #: J7850000 **Subbasin:** NEU08
Latitude: 35.31389 **Longitude:** -77.30302 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(85)

Time period: 09/27/2000 to 08/30/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	162	0	N/A				4	5.2	6.1	7.5	10.2	12.4	14.4
pH (SU)	162	0	<4.3	0	0		5.6	6.1	6.4	6.6	6.9	7.2	8.4
	162	0	>9	0	0		5.6	6.1	6.4	6.6	6.9	7.2	8.4
Salinity (ppt)	160	15	N/A				0.04	0.04	0.05	0.06	0.07	0.1	0.2
Spec. conductance (umhos/cm at 25°C)	161	0	N/A				67	82	96	116	133	149	214
Water Temperature (°C)	162	0	>32	0	0		3	6.9	11.1	18.6	25.3	27.7	30.3
Other													
Chlorophyll A (ug/L)	50	5	>40	0	0		1	1	2	2	5	10	33
TSS (mg/L)	18	1	N/A				2	3	5	8	13	14	15
Turbidity (NTU)	58	0	>50	0	0		4	6	7	10	14	18	34
Nutrients (mg/L)													
NH3 as N	137	14	N/A				0.02	0.02	0.02	0.03	0.05	0.08	0.2
NO2 + NO3 as N	137	0	N/A				0.1	0.31	0.41	0.53	0.65	0.74	1.3
TKN as N	137	1	N/A				0.31	0.42	0.47	0.53	0.6	0.65	0.8
Total Phosphorus	137	0	N/A				0.05	0.07	0.09	0.12	0.14	0.16	0.24
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				210	253	320	415	615	959	2700
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	12	>7	0	0		2	2	2	2	3	4	6
Iron, total (Fe)	20	0	>1000	16	80	Yes	920	925	1100	1350	1600	1790	2700
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>50	0	0		10	10	10	10	12	16	18

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
56	40	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT REDHILL LANDING NR PERFECTION
Station #: J7860000 **Subbasin:** NEU08
Latitude: 35.24790 **Longitude:** -77.20820 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(85)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	62	0	N/A				3.9	5.8	6.6	8	11.2	12.8	15.1
pH (SU)	61	0	<4.3	0	0		6.2	6.5	6.8	7.1	7.7	8.3	9.2
	61	0	>9	2	3.3		6.2	6.5	6.8	7.1	7.7	8.3	9.2
Salinity (ppt)	60	15	N/A				0.01	0.03	0.04	0.06	0.2	0.2	0.9
Spec. conductance (umhos/cm at 25°C)	61	0	N/A				58	83	90	119	136	177	235
Water Temperature (°C)	62	0	>32	0	0		3.4	7	9.7	18.6	25.3	28.7	30.1
Other													
Chlorophyll A (ug/L)	52	5	>40	0	0		1	1	1	2	6	9	28
TSS (mg/L)	18	1	N/A				2	3	4	7	11	16	20
Turbidity (NTU)	63	0	>50	1	1.6		3	5	7	10	12	20	65
Nutrients (mg/L)													
NH3 as N	61	9	N/A				0.01	0.02	0.02	0.04	0.05	0.14	0.5
NO2 + NO3 as N	61	0	N/A				0.15	0.27	0.41	0.53	0.67	0.78	0.91
TKN as N	61	2	N/A				0.27	0.35	0.42	0.5	0.6	0.74	1.9
Total Phosphorus	61	1	N/A				0.06	0.07	0.09	0.11	0.14	0.18	1.4
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				140	174	288	420	568	797	910
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	14	>7	0	0		2	2	2	2	2	4	4
Iron, total (Fe)	20	0	>1000	14	70	Yes	489	812	880	1200	1650	1790	2000
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>50	0	0		10	10	10	10	12	19	25

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
61	37	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT SR 1400 AT STREETS FERRY
Station #: J7930000 **Subbasin:** NEU08
Latitude: 35.21060 **Longitude:** -77.12220 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(85)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	N/A				4.2	5.6	6.6	7.8	10.3	13.1	16.4
pH (SU)	63	0	<4.3	0	0		6.3	6.7	6.9	7.2	7.8	8.3	9.1
	63	0	>9	1	1.6		6.3	6.7	6.9	7.2	7.8	8.3	9.1
Salinity (ppt)	62	16	N/A				0.02	0.03	0.04	0.06	0.2	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				58	84	98	124	142	178	288
Water Temperature (°C)	64	0	>32	0	0		3.3	7	9.9	19.1	25.2	29.1	30.3
Other													
Chlorophyll A (ug/L)	55	11	>40	0	0		1	1	1	2	6	9	29
TSS (mg/L)	18	2	N/A				2	2	3	4	8	10	11
Turbidity (NTU)	64	0	>50	0	0		3	5	7	8	10	14	30
Nutrients (mg/L)													
NH3 as N	63	14	N/A				0.01	0.02	0.02	0.04	0.06	0.13	0.5
NO2 + NO3 as N	63	1	N/A				0.02	0.22	0.34	0.49	0.63	0.79	0.87
TKN as N	63	3	N/A				0.2	0.3	0.4	0.48	0.59	0.64	1
Total Phosphorus	63	1	N/A				0.05	0.07	0.08	0.11	0.13	0.15	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				130	170	260	400	520	720	720
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	14	>7	0	0		2	2	2	2	2	3	5
Iron, total (Fe)	19	0	>1000	13	68.4	Yes	460	800	1000	1200	1300	1700	1700
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	15	>50	0	0		10	10	10	10	10	16	20

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	35	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: CREEPING SWAMP AT NC 43 NR VANCEBORO
Station #: J8150000 **Subbasin:** NEU09
Latitude: 35.39164 **Longitude:** -77.23134 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-97-5-3

Time period: 09/21/2000 to 08/23/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	2	N/A				0.2	0.9	1.9	4.4	6.8	9.7	14.8
pH (SU)	58	0	<4.3	1	1.7		4.2	5.2	5.7	5.9	6.4	6.7	7.3
	58	0	>9	0	0		4.2	5.2	5.7	5.9	6.4	6.7	7.3
Salinity (ppt)	57	18	N/A				0.01	0.03	0.04	0.05	0.2	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				45	53	68	77	94	123	189
Water Temperature (°C)	57	0	>32	0	0		0.7	5.1	9.1	16.5	22.7	24.8	26.4
Other													
Chloride (mg/L)	1	0	>230	0	0		4	4	4	4	4	4	4
Chlorophyll A (ug/L)	46	9	>40	1	2.2		1	1	2	4	11	19	84
TSS (mg/L)	18	4	N/A				2	2	3	6	10	23	33
Turbidity (NTU)	57	0	>50	1	1.8		1	2	3	5	9	22	62
Nutrients (mg/L)													
NH3 as N	54	15	N/A				0.01	0.02	0.02	0.1	0.39	1.05	3.8
NO2 + NO3 as N	54	26	N/A				0.01	0.01	0.02	0.02	0.06	0.34	1
TKN as N	54	0	N/A				0.38	0.4	0.59	0.91	1.4	2.65	4.2
Total Phosphorus	54	1	N/A				0.02	0.02	0.04	0.08	0.16	0.21	0.37
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				240	270	320	480	810	2000	2600
Arsenic, total (As)	19	18	>10	1	5.3		5	5	10	10	10	10	15
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	13	>7	0	0		2	2	2	2	3	4	4
Iron, total (Fe)	19	0	>1000	12	63.2	Yes	210	370	930	2000	3400	7100	8300
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	13	>50	0	0		10	10	10	10	14	16	18

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
57	138	8	14	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SWIFT CRK AT MOUTH NR ASKIN
Station #: J8210000 **Subbasin:** NEU09
Latitude: 35.19278 **Longitude:** -77.08984 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-97-(6)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	63	0	N/A				0.7	3.8	5	7.4	9.7	12.5	15.7
pH (SU)	62	0	<4.3	0	0		6.2	6.4	6.7	7	7.4	8	9
	62	0	>8.5	1	1.6		6.2	6.4	6.7	7	7.4	8	9
Salinity (ppt)	61	12	N/A				0.01	0.03	0.05	0.07	0.2	0.3	3.2
Spec. conductance (umhos/cm at 25°C)	63	0	N/A				73	83	111	147	204	571	5790
Water Temperature (°C)	63	0	>32	0	0		3.2	6	10.3	19	26.1	29.3	32
Other													
Chlorophyll A (ug/L)	54	10	>40	3	5.6		1	1	1	2	12	36	61
TSS (mg/L)	18	4	N/A				1	2	2	4	7	12	16
Turbidity (NTU)	64	0	>25	2	3.1		2	3	4	6	8	15	70
Nutrients (mg/L)													
NH3 as N	63	10	N/A				0.01	0.02	0.03	0.05	0.1	0.16	0.5
NO2 + NO3 as N	63	3	N/A				0.02	0.09	0.26	0.39	0.59	0.73	1.1
TKN as N	63	2	N/A				0.3	0.39	0.49	0.61	0.72	0.81	1
Total Phosphorus	63	0	N/A				0.04	0.06	0.08	0.1	0.13	0.15	1
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				140	180	222	335	755	1300	2300
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	13	>3	3	15	No	2	2	2	2	3	4	4
Iron, total (Fe)	20	0	N/A				450	620	735	940	1100	1190	1300
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	12	>86	0	0		10	10	10	10	13	20	27

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	36	2	3	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SWIFT CRK AT NC 43 NR STREETS FERRY
Station #: J8230000 **Subbasin:** NEU09
Latitude: 35.23104 **Longitude:** -77.11388 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-97-(6)

Time period: 09/01/2000 to 08/30/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	250	0	N/A				0.9	2.4	3.2	4.6	8	11	14.4
pH (SU)	249	0	<4.3	1	0.4		3.2	5.9	6.2	6.4	6.7	7	8
	249	0	>8.5	0	0		3.2	5.9	6.2	6.4	6.7	7	8
Salinity (ppt)	245	57	N/A				0.04	0.05	0.06	0.08	0.2	0.22	3.9
Spec. conductance (umhos/cm at 25°C)	250	0	N/A				66	101	119	145	171	289	7040
Water Temperature (°C)	250	0	>32	0	0		2.6	6.1	11.1	17.8	24.1	26.9	28.8
Nutrients (mg/L)													
NH3 as N	249	25	N/A				0.01	0.02	0.03	0.05	0.09	0.16	1.5
NO2 + NO3 as N	249	8	N/A				0.01	0.05	0.19	0.46	0.73	0.93	2
TKN as N	249	7	N/A				0.2	0.38	0.45	0.58	0.68	0.79	2.5
Total Phosphorus	249	5	N/A				0.04	0.05	0.07	0.1	0.13	0.17	0.52

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
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Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 68 BELOW SWIFT CRK NR ASKIN
Station #: J8250000 **Subbasin:** NEU08
Latitude: 35.19009 **Longitude:** -77.09784 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(96)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	N/A				2.5	5.4	6.5	7.7	10.1	12.2	13.7
pH (SU)	64	0	<4.3	0	0		6.4	6.5	6.8	7.1	7.5	7.9	9.4
	64	0	>8.5	2	3.1		6.4	6.5	6.8	7.1	7.5	7.9	9.4
Salinity (ppt)	62	14	N/A				0.02	0.04	0.05	0.07	0.2	0.24	1.3
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				62	90	107	144	169	433	2436
Water Temperature (°C)	64	0	>32	0	0		3.4	6.7	10	19.1	25.1	29.2	31.8
Other													
Chlorophyll A (ug/L)	54	10	>40	0	0		1	1	1	2	5	8	22
TSS (mg/L)	18	4	N/A				2	2	3	6	10	11	11
Turbidity (NTU)	64	0	>25	2	3.1		4	4	6	8	11	16	39
Nutrients (mg/L)													
NH3 as N	63	5	N/A				0.01	0.02	0.03	0.06	0.1	0.18	0.5
NO2 + NO3 as N	63	0	N/A				0.03	0.18	0.33	0.46	0.63	0.77	0.84
TKN as N	63	2	N/A				0.3	0.41	0.48	0.56	0.63	0.76	1
Total Phosphorus	63	1	N/A				0.06	0.07	0.09	0.11	0.14	0.15	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				180	251	260	395	600	707	2100
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	14	>3	2	10	No	2	2	2	2	2	3	4
Iron, total (Fe)	20	0	N/A				540	740	972	1100	1525	1600	1700
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>86	0	0		10	10	10	10	12	19	33

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	33	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 64 NR BELLAIR
Station #: J8270000 **Subbasin:** NEU08
Latitude: 35.17801 **Longitude:** -77.09004 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(96)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	62	0	N/A				4.9	5.5	6.2	7.9	10.5	12.7	14.7
pH (SU)	62	0	<4.3	0	0		6.4	6.7	6.9	7.1	7.5	8	8.9
	62	0	>8.5	2	3.2		6.4	6.7	6.9	7.1	7.5	8	8.9
Salinity (ppt)	60	14	N/A				0.01	0.03	0.05	0.07	0.2	0.3	2.3
Spec. conductance (umhos/cm at 25°C)	62	0	N/A				64	90	114	149	207	660	4155
Water Temperature (°C)	62	0	>32	1	1.6		3.4	7	9.9	18.7	24.7	29.4	32.3

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 52 AT MOUTH OF NARROWS NR WASHINGTON FORKS
Station #: J8290000 **Subbasin:** NEU08
Latitude: 35.15010 **Longitude:** -77.07493 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(96)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	N/A				2.4	5.2	6.1	7.3	10.2	12.4	14.5
pH (SU)	64	0	<4.3	0	0		6.4	6.6	6.8	7.1	7.4	7.9	9.2
	64	0	>8.5	2	3.1		6.4	6.6	6.8	7.1	7.4	7.9	9.2
Salinity (ppt)	62	7	N/A				0.02	0.04	0.05	0.08	0.3	1.34	5.5
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				64	92	115	146	663	2538	10056
Water Temperature (°C)	64	0	>32	0	0		3.5	7.2	9.9	19.8	25.5	28.9	31.2
Other													
Chlorophyll A (ug/L)	53	7	>40	2	3.8		1	1	1	2	6	17	140
TSS (mg/L)	18	3	N/A				2	2	3	4	6	16	16
Turbidity (NTU)	64	0	>25	2	3.1		2	4	5	7	10	14	36
Nutrients (mg/L)													
NH3 as N	62	4	N/A				0.01	0.02	0.04	0.06	0.1	0.2	0.54
NO2 + NO3 as N	62	0	N/A				0.03	0.16	0.32	0.44	0.56	0.71	0.86
TKN as N	61	2	N/A				0.3	0.4	0.49	0.58	0.63	0.76	2
Total Phosphorus	62	1	N/A				0.06	0.07	0.09	0.12	0.14	0.17	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				160	181	238	330	585	699	910
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	12	>3	3	15	No	2	2	2	2	2	5	18
Iron, total (Fe)	20	0	N/A				510	725	852	980	1175	1490	1600
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>86	0	0		10	10	10	10	14	24	32

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	24	1	2	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV .5 MI UPS UNION POINT AT NEW BERN
Station #: J8570000 **Subbasin:** NEU10
Latitude: 35.10972 **Longitude:** -77.03174 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(96)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	N/A				3.1	6	7.7	9.3	11.6	13.7	15.5
pH (SU)	64	0	<4.3	0	0		6.3	6.7	7	7.4	7.8	8.3	8.8
	64	0	>8.5	4	6.2		6.3	6.7	7	7.4	7.8	8.3	8.8
Salinity (ppt)	62	4	N/A				0.02	0.04	0.07	0.28	2.73	6.18	10
Spec. conductance (umhos/cm at 25°C)	64	0	N/A				70	110	155	635	4968	10392	16979
Water Temperature (°C)	64	0	>32	0	0		3.6	7.1	11.2	20.1	26.1	29.1	31.8
Other													
Chlorophyll A (ug/L)	55	2	>40	8	14.5	No	1	1	2	9	28	53	80
TSS (mg/L)	18	2	N/A				2	2	4	6	8	12	16
Turbidity (NTU)	64	0	>25	0	0		2	4	5	6	8	11	23
Nutrients (mg/L)													
NH3 as N	63	15	N/A				0.01	0.02	0.02	0.04	0.08	0.13	1.2
NO2 + NO3 as N	63	7	N/A				0.01	0.04	0.18	0.31	0.44	0.56	0.76
TKN as N	63	2	N/A				0.4	0.49	0.54	0.6	0.66	0.79	1.6
Total Phosphorus	63	1	N/A				0.05	0.07	0.08	0.11	0.13	0.15	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				120	130	152	260	460	707	1100
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	2	10
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	11	>3	7	35	Yes	2	2	2	2	6	8	10
Iron, total (Fe)	20	0	N/A				360	503	562	820	1075	1290	1500
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>86	0	0		10	10	10	10	18	31	61

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	52	5	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: TRENT RIV AT SR 1129 NR TRENTON
Station #: J8690000 **Subbasin:** NEU11
Latitude: 35.06364 **Longitude:** -77.46107 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-101-(1)

Time period: 09/27/2000 to 08/24/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	59	0	N/A				1.4	4.1	5.1	6.5	9.5	11.5	13.8
pH (SU)	59	0	<4.3	0	0		5.5	5.9	6.4	6.7	7.1	7.4	7.6
	59	0	>9	0	0		5.5	5.9	6.4	6.7	7.1	7.4	7.6
Salinity (ppt)	58	17	N/A				0.04	0.05	0.06	0.09	0.2	0.2	0.2
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				56	97	113	144	187	229	285
Water Temperature (°C)	59	0	>32	0	0		3	7.2	12	17.2	23.5	25.8	26.7
Other													
Chlorophyll A (ug/L)	51	25	>40	0	0		1	1	1	1	2	12	38
TSS (mg/L)	19	7	N/A				2	2	2	4	5	7	27
Turbidity (NTU)	55	0	>50	0	0		1	2	2	3	4	8	14
Nutrients (mg/L)													
NH3 as N	53	8	N/A				0.02	0.02	0.02	0.03	0.05	0.21	0.54
NO2 + NO3 as N	53	0	N/A				0.17	0.22	0.37	0.64	0.88	1.22	3.2
TKN as N	53	1	N/A				0.27	0.35	0.45	0.66	0.79	0.9	1.4
Total Phosphorus	53	1	N/A				0.01	0.04	0.05	0.08	0.1	0.12	0.15
Metals (ug/L)													
Aluminum, total (Al)	19	1	N/A				50	69	110	220	320	490	770
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	19	19	>2	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	19	19	>50	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	15	>7	0	0		2	2	2	2	2	2	5
Iron, total (Fe)	19	0	>1000	2	10.5	No	110	120	320	660	850	1200	1600
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	19	19	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	19	15	>50	0	0		10	10	10	10	10	16	17

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
54	71	4	7	

Key:
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: TRENT RIV AT US 17 AT POLLOCKSVILLE
Station #: J8730000 **Subbasin:** NEU11
Latitude: 35.00993 **Longitude:** -77.21891 **Stream class:** C Sw NSW
Agency: NCAMBNT **NC stream index:** 27-101-(1)

Time period: 10/17/2000 to 08/30/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	133	0	N/A				3.5	4.4	4.9	6.2	8.9	11.8	13.6
pH (SU)	133	0	<4.3	0	0		5.9	6.4	6.6	6.8	7	7.2	8
	133	0	>9	0	0		5.9	6.4	6.6	6.8	7	7.2	8
Salinity (ppt)	132	2	N/A				0.04	0.05	0.06	0.07	0.08	0.09	0.2
Spec. conductance (umhos/cm at 25°C)	133	0	N/A				68	102	124	153	168	187	244
Water Temperature (°C)	133	0	>32	0	0		4	6.9	12	18.7	24.7	27.4	30.8
Nutrients (mg/L)													
NH3 as N	134	12	N/A				0.02	0.02	0.02	0.04	0.05	0.07	0.27
NO2 + NO3 as N	134	0	N/A				0.13	0.38	0.5	0.61	0.72	0.89	1.5
TKN as N	134	0	N/A				0.3	0.41	0.48	0.57	0.68	0.76	0.97
Total Phosphorus	134	0	N/A				0.05	0.07	0.08	0.12	0.14	0.16	0.29

Key:
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EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: TRENT RIV AT CM 14 ABOVE REEDY BR NR RHEMS
Station #: J8770000 **Subbasin:** NEU11
Latitude: 35.07508 **Longitude:** -77.11441 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-101-(31)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	N/A				3.1	5.3	6.3	8.2	10.3	12.1	14.3
pH (SU)	60	0	<4.3	0	0		6.5	6.8	7	7.2	7.5	7.7	8.8
	60	0	>8.5	2	3.3		6.5	6.8	7	7.2	7.5	7.7	8.8
Salinity (ppt)	58	5	N/A				0.03	0.06	0.08	0.2	2.5	6.71	11.1
Spec. conductance (umhos/cm at 25°C)	60	0	N/A				93	116	150	280	4548	11647	18881
Water Temperature (°C)	60	0	>32	1	1.7		4.9	7.9	10.4	21	26.6	29	32.7
Other													
Chlorophyll A (ug/L)	51	5	>40	1	2		1	1	2	4	15	27	60
TSS (mg/L)	18	3	N/A				2	2	2	4	5	7	12
Turbidity (NTU)	60	0	>25	0	0		2	3	4	4	7	10	16
Nutrients (mg/L)													
NH3 as N	58	11	N/A				0.01	0.02	0.02	0.04	0.1	0.18	0.5
NO2 + NO3 as N	58	9	N/A				0.01	0.02	0.15	0.34	0.47	0.63	0.88
TKN as N	58	2	N/A				0.36	0.45	0.5	0.61	0.66	0.81	1
Total Phosphorus	58	1	N/A				0.07	0.08	0.1	0.13	0.15	0.18	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				58	79	102	330	415	517	740
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	10	10
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	2	2
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	17	>3	0	0		2	2	2	2	2	3	20
Iron, total (Fe)	20	0	N/A				83	100	225	540	652	773	850
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	13	>86	0	0		10	10	10	10	25	35	71

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
58	30	1	2	

Key:
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: TRENT RIV AT HANCOCK ST RR BRIDGE AT NEW BERN
Station #: J8870000 **Subbasin:** NEU10
Latitude: 35.10090 **Longitude:** -77.04190 **Stream class:** SB Sw NSW
Agency: LNBA **NC stream index:** 27-101-(39)

Time period: 09/19/2000 to 08/19/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	51	0	N/A				3.7	4.5	5.4	6.7	7.8	9.4	10.6
pH (SU)	51	0	<4.3	0	0		6.1	6.5	6.7	7.1	7.3	7.5	7.8
	51	0	>8.5	0	0		6.1	6.5	6.7	7.1	7.3	7.5	7.8
Spec. conductance (umhos/cm at 25°C)	50	0	N/A				79	165	218	950	2890	8089	19300
Water Temperature (°C)	53	0	>32	0	0		4.8	6.7	12.4	24.2	26.4	29.1	31.7
Other													
Chlorophyll A (ug/L)	60	6	>40	2	3.3		1	1	3	6	17	32	95
TSS (mg/L)	60	0	N/A				1	3	5	8	13	22	46
Turbidity (NTU)	60	0	>25	2	3.3		1	2	4	6	8	16	28
Nutrients (mg/L)													
NH3 as N	62	5	N/A				0.01	0.01	0.04	0.09	0.14	0.19	0.33
NO2 + NO3 as N	62	10	N/A				0.01	0.01	0.11	0.25	0.39	0.49	0.82
TKN as N	62	1	N/A				0.1	0.5	0.68	0.8	1.06	1.29	2.07
Total Phosphorus	62	0	N/A				0.04	0.08	0.1	0.12	0.16	0.22	0.4

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
59	93	7	12	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 22 NR FAIRFIELD HARBOUR
Station #: J8900800 **Subbasin:** NEU10
Latitude: 35.07989 **Longitude:** -77.00607 **Stream class:** SC Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(96)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	64	0	N/A				3.5	6.1	7.5	9.4	11.5	13.8	15
pH (SU)	64	0	<4.3	0	0		6.5	6.7	7	7.4	7.9	8.2	9
	64	0	>8.5	2	3.1		6.5	6.7	7	7.4	7.9	8.2	9
Salinity (ppt)	61	1	N/A				0.02	0.05	0.2	0.6	4.5	7.96	13.2
Spec. conductance (umhos/cm at 25°C)	62	0	N/A				71	110	337	1277	8228	13623	21978
Water Temperature (°C)	64	0	>32	0	0		3.4	7.8	9.9	19.9	25.5	28.1	30.2
Other													
Chlorophyll A (ug/L)	55	1	>40	5	9.1		1	2	5	11	27	44	71
TSS (mg/L)	18	0	N/A				2	3	4	6	9	13	32
Turbidity (NTU)	64	0	>25	0	0		3	4	4	6	8	12	17
Nutrients (mg/L)													
NH3 as N	63	27	N/A				0.01	0.01	0.02	0.02	0.07	0.2	0.6
NO2 + NO3 as N	63	10	N/A				0.01	0.02	0.09	0.27	0.4	0.49	0.86
TKN as N	63	1	N/A				0.35	0.5	0.55	0.62	0.68	0.85	16
Total Phosphorus	63	1	N/A				0.04	0.06	0.08	0.1	0.13	0.17	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	0	N/A				67	75	103	265	580	760	890
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	46	50
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	9	10
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	12	>3	3	15	No	2	2	2	2	2	8	8
Iron, total (Fe)	20	0	N/A				140	201	335	740	1075	1390	1500
Lead, total (Pb)	20	19	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	20	14	>86	0	0		10	10	10	10	20	35	85

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	27	0	0	

Key:
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ND: number of observations reported to be below detection level (non-detect)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 2 AT MOUTH OF BROAD CRK NR THURMAN
Station #: J8902500 **Subbasin:** NEU10
Latitude: 35.04898 **Longitude:** -76.95687 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	63	0	N/A				5.6	7.4	8.2	9.4	11.2	13.6	16.4
pH (SU)	63	0	<4.3	0	0		6.3	6.9	7.2	7.6	7.9	8.2	8.8
	63	0	>8.5	2	3.2		6.3	6.9	7.2	7.6	7.9	8.2	8.8
Salinity (ppt)	61	0	N/A				0.06	0.39	0.97	3.2	6.9	12.2	14.7
Spec. conductance (umhos/cm at 25°C)	63	0	N/A				153	828	1831	6520	12270	20340	24578
Water Temperature (°C)	63	0	>32	0	0		3.4	7.6	9.9	19.8	24.5	28.1	30.3
Other													
Chlorophyll A (ug/L)	55	1	>40	9	16.4	Yes	1	8	14	18	34	57	200
TSS (mg/L)	17	0	N/A				4	4	5	7	10	22	25
Turbidity (NTU)	64	0	>25	0	0		2	3	4	6	7	10	13
Nutrients (mg/L)													
NH3 as N	63	38	N/A				0.01	0.01	0.02	0.02	0.04	0.11	1.2
NO2 + NO3 as N	63	24	N/A				0.01	0.01	0.02	0.07	0.24	0.37	0.5
TKN as N	63	2	N/A				0.37	0.48	0.54	0.68	0.75	0.89	15
Total Phosphorus	63	2	N/A				0.04	0.05	0.07	0.09	0.13	0.17	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	3	N/A				50	50	72	250	368	679	990
Arsenic, total (As)	20	19	>10	1	5		5	5	10	10	10	46	50
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	10	10
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	12	>3	3	15	No	2	2	2	2	3	4	6
Iron, total (Fe)	20	1	N/A				50	65	122	520	865	1190	1300
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	50
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	50
Zinc, total (Zn)	20	11	>86	1	5		10	10	10	10	20	47	92

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
62	9	0	0	

Key:
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ND: number of observations reported to be below detection level (non-detect)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 17 NR THURMAN
Station #: J8903500 **Subbasin:** NEU10
Latitude: 35.02335 **Longitude:** -76.96950 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	#	#		Results not meeting EL			Percentiles						
	result	ND	EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	N/A				6.8	7.3	8.9	10.3	12	13.3	16.1
pH (SU)	60	0	<4.3	0	0		6.7	7.2	7.8	8.1	8.4	8.7	9.1
	60	0	>8.5	10	16.7	Yes	6.7	7.2	7.8	8.1	8.4	8.7	9.1
Salinity (ppt)	59	0	N/A				0.05	0.12	1.2	3.3	7.6	11.7	16.21
Spec. conductance (umhos/cm at 25°C)	60	0	N/A				127	272	2190	6244	13095	19785	26548
Water Temperature (°C)	60	0	>32	0	0		3.5	8	11.9	20.9	26.3	29.1	31.8
Other													
Chlorophyll A (ug/L)	3	0	>40	1	33.3		32	32	32	34	49	49	49
Nutrients (mg/L)													
NH3 as N	4	4	N/A				0.02	0.02	0.02	0.02	0.16	0.2	0.2
NO2 + NO3 as N	4	3	N/A				0.02	0.02	0.02	0.06	0.14	0.15	0.15
TKN as N	4	1	N/A				0.6	0.6	0.6	0.66	0.72	0.72	0.72
Total Phosphorus	4	1	N/A				0.06	0.06	0.06	0.09	0.16	0.18	0.18

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 15 NR RIVERDALE
Station #: J8903600 **Subbasin:** NEU10
Latitude: 35.01447 **Longitude:** -76.95992 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	61	0	N/A				6.9	7.9	8.8	10.2	12.2	14.2	17.7
pH (SU)	61	0	<4.3	0	0		7	7.6	7.8	8.1	8.4	8.7	9
	61	0	>8.5	8	13.1	No	7	7.6	7.8	8.1	8.4	8.7	9
Salinity (ppt)	60	0	N/A				0.06	0.2	1.7	3.82	7.75	11.9	16.84
Spec. conductance (umhos/cm at 25°C)	61	0	N/A				136	447	3125	7362	13352	20051	27472
Water Temperature (°C)	61	0	>32	0	0		3.6	8	12.2	20.9	27.1	28.9	31.7
Other													
Chlorophyll A (ug/L)	1	0	>40	1	100		41	41	41	41	41	41	41
Nutrients (mg/L)													
NH3 as N	1	0	N/A				0.04	0.04	0.04	0.04	0.04	0.04	0.04
NO2 + NO3 as N	1	0	N/A				0.05	0.05	0.05	0.05	0.05	0.05	0.05
TKN as N	1	0	N/A				0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total Phosphorus	1	0	N/A				0.05	0.05	0.05	0.05	0.05	0.05	0.05

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 11 NR RIVERDALE
Station #: J8910000 **Subbasin:** NEU10
Latitude: 35.00040 **Longitude:** -76.93166 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	63	0	N/A				6.5	7.6	9	10.4	12.2	13.9	15.9
pH (SU)	63	0	<4.3	0	0		7	7.5	7.8	8	8.3	8.7	9.1
	63	0	>8.5	10	15.9	Yes	7	7.5	7.8	8	8.3	8.7	9.1
Salinity (ppt)	62	0	N/A				0.08	0.78	1.87	5.3	8.45	13.82	16.2
Spec. conductance (umhos/cm at 25°C)	63	0	N/A				178	1501	3573	9675	14258	23010	26499
Water Temperature (°C)	63	0	>32	1	1.6		3.6	7.3	10.7	20.4	26.8	28.9	32.8
Other													
Chlorophyll A (ug/L)	56	0	>40	8	14.3	No	5	9	13	20	33	45	93
TSS (mg/L)	20	0	N/A				4	5	6	8	12	19	24
Turbidity (NTU)	64	0	>25	0	0		1	3	4	5	7	10	24
Nutrients (mg/L)													
NH3 as N	69	44	N/A				0.01	0.01	0.02	0.02	0.04	0.12	0.5
NO2 + NO3 as N	69	28	N/A				0.01	0.01	0.02	0.05	0.17	0.33	0.87
TKN as N	69	3	N/A				0.4	0.46	0.58	0.68	0.77	0.93	1.7
Total Phosphorus	69	3	N/A				0.02	0.04	0.06	0.08	0.12	0.16	0.5
Metals (ug/L)													
Aluminum, total (Al)	21	3	N/A				50	50	86	160	270	520	670
Arsenic, total (As)	21	21	>10	0	0		5	5	10	10	10	50	50
Cadmium, total (Cd)	21	21	>5	0	0		2	2	2	2	6	10	10
Chromium, total (Cr)	21	21	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	21	15	>3	5	23.8	Yes	2	2	2	2	3	4	6
Iron, total (Fe)	21	2	N/A				50	62	145	260	630	776	840
Lead, total (Pb)	21	21	>25	0	0		10	10	10	10	10	10	50
Mercury, total (Hg)	21	21	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	21	21	>8.3	0	0		10	10	10	10	10	42	50
Zinc, total (Zn)	21	13	>86	0	0		10	10	10	10	37	52	74

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
61	4	0	0	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR KENNEL BEACH
Station #: J8920000 **Subbasin:** NEU10
Latitude: 34.98711 **Longitude:** -76.91987 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	61	0	N/A				6.8	7.9	8.9	10.5	12.1	14.1	16.2
pH (SU)	61	0	<4.3	0	0		7.4	7.6	7.8	8	8.3	8.6	9
	61	0	>8.5	6	9.8		7.4	7.6	7.8	8	8.3	8.6	9
Salinity (ppt)	60	0	N/A				0.14	1.02	2.45	5.59	9.47	13.88	16.9
Spec. conductance (umhos/cm at 25°C)	61	0	N/A				311	1882	4554	10047	16248	22978	27524
Water Temperature (°C)	61	0	>32	1	1.6		3.6	7.5	11.7	20.6	26.6	28.9	32.9
Other													
Chlorophyll A (ug/L)	2	0	>40	0	0		13	13	13	15	17	17	17
Nutrients (mg/L)													
NH3 as N	2	2	N/A				0.01	0.01	0.01	0.01	0.01	0.01	0.01
NO2 + NO3 as N	2	0	N/A				0.2	0.2	0.2	0.23	0.26	0.26	0.26
TKN as N	2	0	N/A				0.52	0.52	0.52	0.59	0.67	0.67	0.67
Total Phosphorus	2	0	N/A				0.12	0.12	0.12	0.13	0.14	0.14	0.14

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR ARAPAHOE
Station #: J8925000 **Subbasin:** NEU10
Latitude: 34.97617 **Longitude:** -76.87562 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	61	0	N/A				6.5	7.8	9.2	10.3	12.1	13.6	15
pH (SU)	61	0	<4.3	0	0		7	7.7	7.9	8.1	8.3	8.6	8.8
	61	0	>8.5	6	9.8		7	7.7	7.9	8.1	8.3	8.6	8.8
Salinity (ppt)	60	0	N/A				0.4	1.52	2.87	6.8	12.2	15.33	19.87
Spec. conductance (umhos/cm at 25°C)	61	0	N/A				692	2854	5354	11901	20338	25050	31894
Water Temperature (°C)	61	0	>32	0	0		3.5	7.6	11.4	21.3	27	29.1	31.1
Other													
Chlorophyll A (ug/L)	1	0	>40	0	0		24	24	24	24	24	24	24
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	0	N/A				0.03	0.03	0.03	0.03	0.03	0.03	0.03
TKN as N	1	0	N/A				0.59	0.59	0.59	0.59	0.59	0.59	0.59
Total Phosphorus	1	0	N/A				0.09	0.09	0.09	0.09	0.09	0.09	0.09

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: SLOCUM CRK AT SLOCUM RD AT CHERRY POINT
Station #: J9330000 **Subbasin:** NEU10
Latitude: 34.91770 **Longitude:** -76.91150 **Stream class:** SC Sw NSW
Agency: LNBA **NC stream index:** 27-112

Time period: 09/19/2000 to 08/19/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	40	0	N/A				3.7	4.1	4.6	5.6	6.7	8.6	10.2
pH (SU)	40	0	<4.3	0	0		6	6.4	6.5	7	7.2	7.4	7.5
	40	0	>8.5	0	0		6	6.4	6.5	7	7.2	7.4	7.5
Spec. conductance (umhos/cm at 25°C)	39	0	N/A				104	162	316	989	3784	14622	21100
Water Temperature (°C)	42	0	>32	0	0		5.3	10.6	19	25.4	27.9	30.5	31.9
Other													
Chlorophyll A (ug/L)	49	6	>40	2	4.1		1	1	4	10	19	35	78
TSS (mg/L)	37	1	N/A				1	6	8	11	20	30	43
Turbidity (NTU)	35	0	>25	3	8.6		2	4	6	9	12	22	80
Nutrients (mg/L)													
NH3 as N	50	1	N/A				0.01	0.02	0.03	0.07	0.14	0.22	2.19
NO2 + NO3 as N	50	20	N/A				0.01	0.01	0.01	0.05	0.1	0.14	10
TKN as N	49	1	N/A				0.1	0.37	0.7	0.97	1.15	1.48	2.11
Total Phosphorus	50	0	N/A				0.03	0.05	0.08	0.1	0.16	0.34	1.7

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:
49	84	8	16	

Key:
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR CHERRY POINT MCAS
Station #: J9431500 **Subbasin:** NEU10
Latitude: 34.96170 **Longitude:** -76.84182 **Stream class:** SB Sw NSW
Agency: NCAMBNT **NC stream index:** 27-(104)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	61	0	N/A				5.8	7.8	9	10.6	12.3	13.7	16
pH (SU)	61	0	<4.3	0	0		7	7.8	8	8.1	8.3	8.6	8.9
	61	0	>8.5	6	9.8		7	7.8	8	8.1	8.3	8.6	8.9
Salinity (ppt)	60	0	N/A				0.6	1.82	3.53	7.67	12.12	16.26	20.66
Spec. conductance (umhos/cm at 25°C)	61	0	N/A				1125	3414	6498	13541	20250	26643	33040
Water Temperature (°C)	61	0	>32	1	1.6		3.5	8	11.5	21.1	26.9	28.8	33.1
Other													
Chlorophyll A (ug/L)	1	0	>40	0	0		28	28	28	28	28	28	28
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.2	0.2	0.2	0.2	0.2	0.2	0.2
NO2 + NO3 as N	1	1	N/A				0.15	0.15	0.15	0.15	0.15	0.15	0.15
TKN as N	1	1	N/A				0.6	0.6	0.6	0.6	0.6	0.6	0.6
Total Phosphorus	1	1	N/A				0.1	0.1	0.1	0.1	0.1	0.1	0.1

Key:
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Results not meeting EL: number and percentages of observations not meeting evaluation level
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 9 NR MINNESOTT BEACH
Station #: J9530000 **Subbasin:** NEU10
Latitude: 34.94760 **Longitude:** -76.80875 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	62	0	<5	0	0		6.2	7.3	8.5	9.9	12	13.8	17.7
pH (SU)	62	0	<6.8	0	0		7.2	7.5	7.8	8	8.2	8.6	9
	62	0	>8.5	6	9.7		7.2	7.5	7.8	8	8.2	8.6	9
Salinity (ppt)	61	0	N/A				0.85	2.36	4.1	8.2	12.55	16.54	20.64
Spec. conductance (umhos/cm at 25°C)	62	0	N/A				1569	4346	7346	14156	20784	26994	32990
Water Temperature (°C)	62	0	>32	0	0		3.5	7.1	11.2	20.1	26.3	28.6	31.2
Other													
Chlorophyll A (ug/L)	55	0	>40	6	10.9	No	3	8	13	19	29	46	81
TSS (mg/L)	19	0	N/A				4	4	6	7	14	15	25
Turbidity (NTU)	63	0	>25	0	0		1	2	3	5	6	8	14
Nutrients (mg/L)													
NH3 as N	64	47	N/A				0.01	0.01	0.02	0.02	0.02	0.08	0.5
NO2 + NO3 as N	64	43	N/A				0.01	0.01	0.02	0.02	0.05	0.24	0.94
TKN as N	64	2	N/A				0.36	0.39	0.47	0.6	0.7	0.81	1.2
Total Phosphorus	64	2	N/A				0.02	0.03	0.05	0.07	0.1	0.13	0.5
Metals (ug/L)													
Aluminum, total (Al)	20	1	N/A				50	61	76	135	205	345	810
Arsenic, total (As)	20	20	>10	0	0		5	5	10	10	10	46	50
Cadmium, total (Cd)	20	20	>5	0	0		2	2	2	2	2	10	10
Chromium, total (Cr)	20	20	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	20	15	>3	4	20	Yes	2	2	2	2	2	6	8
Iron, total (Fe)	20	3	N/A				50	50	63	185	382	502	620
Lead, total (Pb)	20	20	>25	0	0		10	10	10	10	10	10	50
Mercury, total (Hg)	20	20	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	20	20	>8.3	0	0		10	10	10	10	10	10	50
Zinc, total (Zn)	20	12	>86	0	0		10	10	10	10	28	65	82

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
61	2	0	0		2	0	0	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR PIERCE
Station #: J9540000 **Subbasin:** NEU10
Latitude: 34.95234 **Longitude:** -76.76804 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<5	0	0		5.8	7.4	8.3	9.8	11.9	13.6	15
pH (SU)	60	0	<6.8	0	0		7.2	7.7	7.8	8	8.2	8.5	8.7
	60	0	>8.5	5	8.3		7.2	7.7	7.8	8	8.2	8.5	8.7
Salinity (ppt)	59	0	N/A				1.2	3.1	5.1	8.6	14.4	17.3	20.99
Spec. conductance (umhos/cm at 25°C)	60	0	N/A				2256	5612	9103	14852	23796	28136	33516
Water Temperature (°C)	60	0	>32	1	1.7		3.7	8	12.2	20.6	26.7	28.9	32.9
Other													
Chlorophyll A (ug/L)	1	0	>40	1	100		70	70	70	70	70	70	70
Nutrients (mg/L)													
NH3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
NO2 + NO3 as N	1	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
TKN as N	1	0	N/A				1.1	1.1	1.1	1.1	1.1	1.1	1.1
Total Phosphorus	1	0	N/A				0.1	0.1	0.1	0.1	0.1	0.1	0.1

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR JANEIRO
Station #: J9590000 **Subbasin:** NEU10
Latitude: 34.96601 **Longitude:** -76.73751 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<5	0	0		6.8	7.6	8.4	9.8	11.7	13.8	14.9
pH (SU)	60	0	<6.8	0	0		7.3	7.7	7.8	8	8.2	8.6	8.9
	60	0	>8.5	6	10	No	7.3	7.7	7.8	8	8.2	8.6	8.9
Salinity (ppt)	59	0	N/A				1.7	3.1	5.6	9.3	15	17.9	21.9
Spec. conductance (umhos/cm at 25°C)	60	0	N/A				3175	5615	9966	15732	24532	29069	34820
Water Temperature (°C)	60	0	>32	0	0		3.8	8	12.1	20.2	26.7	28.9	30.9
Nutrients (mg/L)													
NH3 as N	2	0	N/A				0.01	0.01	0.01	0.06	0.11	0.11	0.11
NO2 + NO3 as N	2	2	N/A				0.01	0.01	0.01	0.01	0.01	0.01	0.01
TKN as N	2	0	N/A				0.4	0.4	0.4	0.5	0.6	0.6	0.6
Total Phosphorus	2	0	N/A				0.03	0.03	0.03	0.04	0.05	0.05	0.05

Key:
result: number of observations
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Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR MERRIMON
Station #: J9685000 **Subbasin:** NEU10
Latitude: 34.98733 **Longitude:** -76.69781 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	60	0	<5	0	0		6.5	7.5	8.5	9.7	11.6	14	16.2
pH (SU)	60	0	<6.8	0	0		7.2	7.6	7.8	8	8.1	8.4	8.9
	60	0	>8.5	4	6.7		7.2	7.6	7.8	8	8.1	8.4	8.9
Salinity (ppt)	59	0	N/A				2	4.3	6.6	9.6	15	18.2	22.41
Spec. conductance (umhos/cm at 25°C)	60	0	N/A				3732	7713	11674	16615	24630	29458	35546
Water Temperature (°C)	60	0	>32	0	0		3.8	8	12.1	20.4	26.4	29.1	31.2
Other													
Chlorophyll A (ug/L)	2	0	>40	0	0		22	22	22	22	23	23	23
Nutrients (mg/L)													
NH3 as N	2	1	N/A				0.02	0.02	0.02	0.04	0.06	0.06	0.06
NO2 + NO3 as N	2	1	N/A				0.02	0.02	0.02	0.02	0.02	0.02	0.02
TKN as N	2	0	N/A				0.4	0.4	0.4	0.54	0.68	0.68	0.68
Total Phosphorus	2	0	N/A				0.04	0.04	0.04	0.05	0.06	0.06	0.06

Key:
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ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: BACK CRK AT SR 1300 NR MERRIMON
Station #: J9690000 **Subbasin:** NEU10
Latitude: 34.89201 **Longitude:** -76.62200 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-128-3

Time period: 09/14/2000 to 08/30/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<5	12	20.7	Yes	2.3	3.4	5.3	7	9	9.7	11.5
pH (SU)	57	0	<6.8	13	22.8	Yes	6.5	6.6	6.8	7.1	7.4	7.5	8.2
	57	0	>8.5	0	0		6.5	6.6	6.8	7.1	7.4	7.5	8.2
Salinity (ppt)	57	0	N/A				0.1	0.86	1.55	5.37	12.15	22.68	26.7
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				234	1446	3029	9218	20546	35915	41731
Water Temperature (°C)	58	0	>32	1	1.7		4.2	7.7	12.9	21.5	27.5	29.3	33.9
Other													
Chlorophyll A (ug/L)	48	0	>40	4	8.3		3	4	7	18	24	39	110
TSS (mg/L)	19	0	N/A				4	4	6	9	17	35	67
Turbidity (NTU)	57	1	>25	4	7		1	4	5	7	10	23	60
Nutrients (mg/L)													
NH3 as N	36	15	N/A				0.01	0.02	0.02	0.06	0.17	0.36	0.59
NO2 + NO3 as N	36	2	N/A				0.01	0.03	0.05	0.13	0.49	1.23	1.8
TKN as N	36	1	N/A				0.43	0.58	0.68	0.84	1	1.5	2.7
Total Phosphorus	36	1	N/A				0.06	0.06	0.08	0.11	0.17	0.33	0.39
Metals (ug/L)													
Aluminum, total (Al)	19	0	N/A				170	180	270	380	670	980	1800
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	25	50	50
Cadmium, total (Cd)	19	19	>5	0	0		2	2	2	2	2	10	10
Chromium, total (Cr)	19	19	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	14	>3	4	21.1	Yes	2	2	2	2	4	10	10
Iron, total (Fe)	19	0	N/A				150	180	260	490	710	800	1200
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	50	50
Mercury, total (Hg)	19	19	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>8.3	0	0		10	10	10	10	10	50	50
Zinc, total (Zn)	19	7	>86	1	5.3		10	10	10	12	33	55	160

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
56	99	8	14		125	42	75	Yes

Key:
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM 7 NR ORIENTAL
Station #: J9810000 **Subbasin:** NEU10
Latitude: 35.00888 **Longitude:** -76.66037 **Stream class:** SA HWQ NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	61	0	<5	0	0		6.6	7.5	8.3	9.7	11.7	13.4	14.8
pH (SU)	61	0	<6.8	0	0		7.3	7.5	7.8	7.9	8.1	8.3	8.9
	61	0	>8.5	3	4.9		7.3	7.5	7.8	7.9	8.1	8.3	8.9
Salinity (ppt)	60	0	N/A				2.7	4.52	7.55	10.85	16.32	19.19	23
Spec. conductance (umhos/cm at 25°C)	61	0	N/A				4766	8093	13142	18585	26603	30882	36334
Water Temperature (°C)	61	0	>32	0	0		3.7	6.6	11.3	20	25.5	28.7	30.8
Other													
Chlorophyll A (ug/L)	53	0	>40	6	11.3	No	3	5	8	12	22	44	70
TSS (mg/L)	18	0	N/A				3	3	6	8	10	19	20
Turbidity (NTU)	61	0	>25	0	0		1	2	2	3	4	5	7
Nutrients (mg/L)													
NH3 as N	61	46	N/A				0.01	0.01	0.02	0.02	0.02	0.09	0.5
NO2 + NO3 as N	61	42	N/A				0.01	0.01	0.02	0.02	0.03	0.13	0.95
TKN as N	61	2	N/A				0.2	0.35	0.39	0.51	0.61	0.77	1.2
Total Phosphorus	61	5	N/A				0.02	0.02	0.04	0.05	0.08	0.11	0.5
Metals (ug/L)													
Aluminum, total (Al)	19	1	N/A				50	63	82	100	150	270	530
Arsenic, total (As)	19	19	>10	0	0		5	5	10	10	10	50	50
Cadmium, total (Cd)	19	19	>5	0	0		2	2	2	2	10	10	10
Chromium, total (Cr)	19	19	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	19	16	>3	3	15.8	No	2	2	2	2	10	10	12
Iron, total (Fe)	19	8	N/A				50	50	50	70	180	240	310
Lead, total (Pb)	19	19	>25	0	0		10	10	10	10	10	10	50
Mercury, total (Hg)	19	19	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	19	19	>8.3	0	0		10	10	10	10	10	50	50
Zinc, total (Zn)	19	9	>86	1	5.3		10	10	10	11	40	54	90

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
60	2	0	0		1	0	0	

Key:
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR COCKLE POINT
Station #: J9860000 **Subbasin:** NEU10
Latitude: 35.02759 **Longitude:** -76.59756 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL EL	#	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	53	0	<5	0	0		7	7.5	8.3	9.6	11.5	13.7	15.9
pH (SU)	53	0	<6.8	0	0		7.4	7.5	7.7	7.9	8.1	8.3	8.9
	53	0	>8.5	1	1.9		7.4	7.5	7.7	7.9	8.1	8.3	8.9
Salinity (ppt)	53	0	N/A				3.4	6.1	9.3	12.3	18.25	19.96	22.71
Spec. conductance (umhos/cm at 25°C)	53	0	N/A				6053	10698	15898	21186	29523	31979	35968
Water Temperature (°C)	53	0	>32	0	0		3.5	6.2	10.8	20.1	26.7	28.8	31.2

Key:
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ND: number of observations reported to be below detection level (non-detect)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV NR PINEY POINT
Station #: J9900000 **Subbasin:** NEU10
Latitude: 35.06442 **Longitude:** -76.52654 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	EL	Results not meeting EL #	%	95%	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	52	0	<5	0	0		7	7.5	8.4	9.3	11.4	12.6	13.5
pH (SU)	52	0	<6.8	0	0		7.4	7.5	7.7	7.9	8	8.3	8.8
	52	0	>8.5	1	1.9		7.4	7.5	7.7	7.9	8	8.3	8.8
Salinity (ppt)	52	0	N/A				4.8	7.4	10.15	14.1	18.35	20.41	23.19
Spec. conductance (umhos/cm at 25°C)	52	0	N/A				8505	12950	17248	23440	29722	33173	36630
Water Temperature (°C)	52	0	>32	0	0		3.3	7.8	12.1	20	26.3	28.6	30.7

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: NEUSE RIV AT CM NR AT MOUTH NR PAMLICO
Station #: J9930000 **Subbasin:** NEU14
Latitude: 35.10997 **Longitude:** -76.47607 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-(118)

Time period: 09/20/2000 to 08/16/2005

	# result	# ND	Results not meeting EL: EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	52	0	<5	0	0		6.5	7.4	8.1	8.9	10.8	11.9	13.1
pH (SU)	52	0	<6.8	0	0		7.3	7.5	7.7	7.9	8	8.3	8.7
	52	0	>8.5	2	3.8		7.3	7.5	7.7	7.9	8	8.3	8.7
Salinity (ppt)	52	0	N/A				6.4	8.18	11.4	15.95	19.6	21.8	24.28
Spec. conductance (umhos/cm at 25°C)	52	0	N/A				11149	14172	19254	26152	31520	34629	38191
Water Temperature (°C)	52	0	>32	0	0		4	8.4	13.2	20.1	26.6	28.4	30.6
Other													
Chlorophyll A (ug/L)	45	0	>40	0	0		2	3	4	7	10	16	35
TSS (mg/L)	15	0	N/A				4	4	5	8	12	21	25
Turbidity (NTU)	53	1	>25	0	0		1	1	2	3	4	6	7
Nutrients (mg/L)													
NH3 as N	51	42	N/A				0.01	0.01	0.02	0.02	0.02	0.05	0.54
NO2 + NO3 as N	51	35	N/A				0.01	0.01	0.02	0.02	0.02	0.12	0.93
TKN as N	51	3	N/A				0.25	0.29	0.36	0.42	0.53	0.6	1
Total Phosphorus	51	7	N/A				0.02	0.02	0.03	0.04	0.06	0.08	0.5
Metals (ug/L)													
Aluminum, total (Al)	16	0	N/A				59	74	105	165	192	361	410
Arsenic, total (As)	16	16	>10	0	0		5	8	10	10	25	50	50
Cadmium, total (Cd)	16	15	>5	1	6.2		2	2	4	10	10	10	11
Chromium, total (Cr)	16	16	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	16	16	>3	0	0		2	2	2	2	10	11	12
Iron, total (Fe)	16	6	N/A				50	50	50	55	94	188	230
Lead, total (Pb)	16	16	>25	0	0		10	10	10	10	10	22	50
Mercury, total (Hg)	16	16	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	16	16	>8.3	0	0		10	10	10	10	10	22	50
Zinc, total (Zn)	16	7	>86	0	0		10	10	10	10	42	64	82

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
52	1	0	0		1	0	0	

Key:
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95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: W THOROFARE BAY AT CM 10WB NR ATLANTIC
Station #: J9938000 **Subbasin:** NEU14
Latitude: 34.96101 **Longitude:** -76.39201 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-148-2

Time period: 09/20/2000 to 06/05/2002

	# result	# ND	Results not meeting EL: EL	#	%	95%	Percentiles: Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	15	0	<5	0	0		6.4	6.8	7.9	8.5	9.6	10.8	11.8
pH (SU)	15	0	<6.8	1	6.7		6.7	7.1	7.8	7.9	8.1	8.2	8.3
	15	0	>8.5	0	0		6.7	7.1	7.8	7.9	8.1	8.2	8.3
Salinity (ppt)	14	0	N/A				12.8	13.5	20.12	21.55	22.65	24.75	26.1
Spec. conductance (umhos/cm at 25°C)	15	0	N/A				21520	22137	31558	34240	35761	38482	40781
Water Temperature (°C)	15	0	>32	0	0		2	6.1	13	20.7	24	27.4	27.6
Other													
TSS (mg/L)	4	0	N/A				4	4	4	6	20	25	25
Turbidity (NTU)	14	0	>25	0	0		1	1	2	3	3	5	6
Nutrients (mg/L)													
NH3 as N	6	4	N/A				0.01	0.01	0.01	0.01	0.13	0.2	0.2
NO2 + NO3 as N	6	5	N/A				0.01	0.01	0.01	0.06	0.11	0.15	0.15
TKN as N	5	0	N/A				0.34	0.34	0.37	0.4	0.45	0.49	0.49
Total Phosphorus	6	1	N/A				0.01	0.01	0.01	0.03	0.05	0.1	0.1
Metals (ug/L)													
Aluminum, total (Al)	3	0	N/A				81	81	81	150	210	210	210
Arsenic, total (As)	4	4	>10	0	0		10	10	10	10	40	50	50
Cadmium, total (Cd)	4	4	>5	0	0		10	10	10	10	10	10	10
Chromium, total (Cr)	4	4	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	4	4	>3	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	4	2	N/A				50	50	50	51	80	90	90
Lead, total (Pb)	4	4	>25	0	0		50	50	50	50	50	50	50
Mercury, total (Hg)	4	4	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	4	4	>8.3	0	0		10	10	10	30	50	50	50
Zinc, total (Zn)	4	0	>86	0	0		21	21	25	43	49	49	49

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
14	2	0	0		1	0	0	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
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Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: THOROFARE CANAL AT NC 12 NR ATLANTIC
Station #: J9940000 **Subbasin:** NEU14
Latitude: 34.92658 **Longitude:** -76.36443 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-149-1-1

Time period: 09/20/2000 to 06/05/2002

	# result	# ND	Results not meeting EL: EL	#	%	95%	Percentiles: Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	18	0	<5	0	0		6.1	6.5	7	7.9	9	10.3	11.6
pH (SU)	18	0	<6.8	0	0		7.1	7.2	7.6	7.9	8	8.2	8.2
	18	0	>8.5	0	0		7.1	7.2	7.6	7.9	8	8.2	8.2
Salinity (ppt)	17	0	N/A				17.1	17.5	21.95	24.2	27	30.54	34.7
Spec. conductance (umhos/cm at 25°C)	18	0	N/A				22883	27245	34302	37692	42080	45661	52511
Water Temperature (°C)	18	0	>32	0	0		2	8.9	13.2	21	25.7	28.6	28.7
Other													
TSS (mg/L)	6	0	N/A				2	2	7	12	24	32	32
Turbidity (NTU)	17	0	>25	0	0		1	2	2	4	6	7	8
Nutrients (mg/L)													
NH3 as N	9	5	N/A				0.01	0.01	0.02	0.06	0.15	0.5	0.5
NO2 + NO3 as N	9	8	N/A				0.01	0.01	0.01	0.1	0.15	0.5	0.5
TKN as N	8	1	N/A				0.3	0.3	0.33	0.42	0.55	1	1
Total Phosphorus	9	3	N/A				0.01	0.01	0.02	0.03	0.09	0.5	0.5
Metals (ug/L)													
Aluminum, total (Al)	5	0	N/A				140	140	175	410	750	900	900
Arsenic, total (As)	6	6	>10	0	0		10	10	10	30	50	50	50
Cadmium, total (Cd)	6	6	>5	0	0		2	2	8	10	10	10	10
Chromium, total (Cr)	6	6	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	6	6	>3	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	6	0	N/A				52	52	64	110	302	400	400
Lead, total (Pb)	6	6	>25	0	0		10	10	10	50	50	50	50
Mercury, total (Hg)	6	6	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	6	5	>8.3	1	16.7		10	10	10	16	50	50	50
Zinc, total (Zn)	6	0	>86	0	0		27	27	38	43	54	63	63

Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
17	4	0	0		4	1	6	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: BAY RIV AT CM 5 NR VANDEMERE
Station #: J9950000 **Subbasin:** NEU13
Latitude: 35.17057 **Longitude:** -76.65155 **Stream class:** SA HQW NSW
Agency: NCAMBNT **NC stream index:** 27-150-(9.5)

Time period: 10/23/2000 to 08/25/2005

	# result	# ND	Results not meeting EL	#	%	95%	Min	10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<5	0	0		6	6.8	7.8	9.1	11.3	13.3	16.4
pH (SU)	57	0	<6.8	2	3.5		6.5	7.3	7.4	7.7	7.9	8.1	8.4
	57	0	>8.5	0	0		6.5	7.3	7.4	7.7	7.9	8.1	8.4
Salinity (ppt)	57	0	N/A				0.01	7.78	9.35	13.6	18.1	20.02	21.8
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				26	13352	15808	22603	29522	32333	34693
Water Temperature (°C)	57	0	>32	0	0		1.5	7.5	12.8	18.7	27.1	29	31.3
Other													
Chlorophyll A (ug/L)	46	1	>40	1	2.2		1	4	8	11	18	29	160
TSS (mg/L)	18	1	N/A				5	6	8	10	18	30	34
Turbidity (NTU)	55	0	>25	0	0		1	2	2	4	5	8	11
Nutrients (mg/L)													
NH3 as N	53	34	N/A				0.01	0.01	0.02	0.02	0.02	0.11	0.5
NO2 + NO3 as N	53	24	N/A				0.01	0.01	0.02	0.02	0.12	0.32	1.4
TKN as N	52	1	N/A				0.31	0.43	0.5	0.61	0.72	0.88	1
Total Phosphorus	53	7	N/A				0.02	0.02	0.03	0.04	0.06	0.1	0.5
Metals (ug/L)													
Aluminum, total (Al)	18	0	N/A				120	120	172	225	292	363	570
Arsenic, total (As)	17	17	>10	0	0		5	5	10	10	25	50	50
Cadmium, total (Cd)	18	18	>5	0	0		2	2	2	10	10	10	10
Chromium, total (Cr)	18	18	>20	0	0		25	25	25	25	25	25	25
Copper, total (Cu)	18	17	>3	1	5.6		2	2	2	2	10	13	39
Iron, total (Fe)	18	5	N/A				50	50	50	70	115	152	260
Lead, total (Pb)	18	18	>25	0	0		10	10	10	10	10	50	50
Mercury, total (Hg)	18	18	>0.025	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	18	18	>8.3	0	0		10	10	10	10	10	50	50
Zinc, total (Zn)	18	10	>86	0	0		10	10	10	10	44	58	81

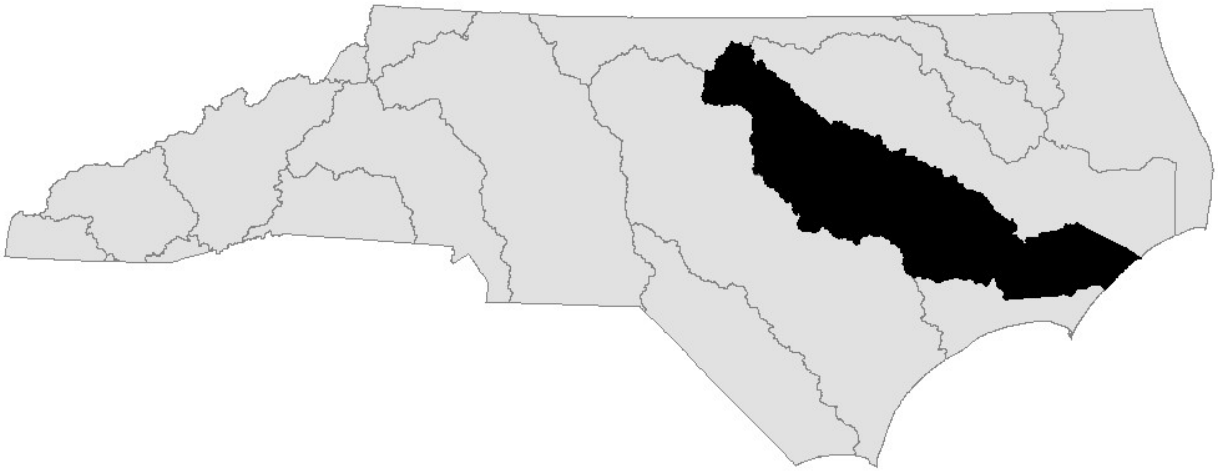
Fecal coliform (#/100mL)

# results:	Geomean	# > 400:	% > 400:	95%:	Median	# > 43	% > 43	95%
53	4	0	0		4	4	8	

Key:
result: number of observations
ND: number of observations reported to be below detection level (non-detect)
EL: Evaluation Level; applicable numeric or narrative water quality standard or action level
Results not meeting EL: number and percentages of observations not meeting evaluation level
95% : States whether there is 95% statistical confidence that the actual percentage of exceedances is at least 10% (20% for Fecal Coliform)
Stations with less than 10 results for a given parameter were not evaluated for statistical confidence

Neuse River Basin
Basinwide Assessment Report
Whole Effluent Toxicity Program

2001-2005



The Division of Water Quality's Whole Effluent Toxicity Monitoring Program

Acute and/or chronic toxicity tests are used to determine toxicity of discharges to sensitive aquatic species (usually fathead minnows or the water flea, *Ceriodaphnia dubia*). Results of these tests have been shown by researchers to be predictive of discharge effects to receiving stream populations.

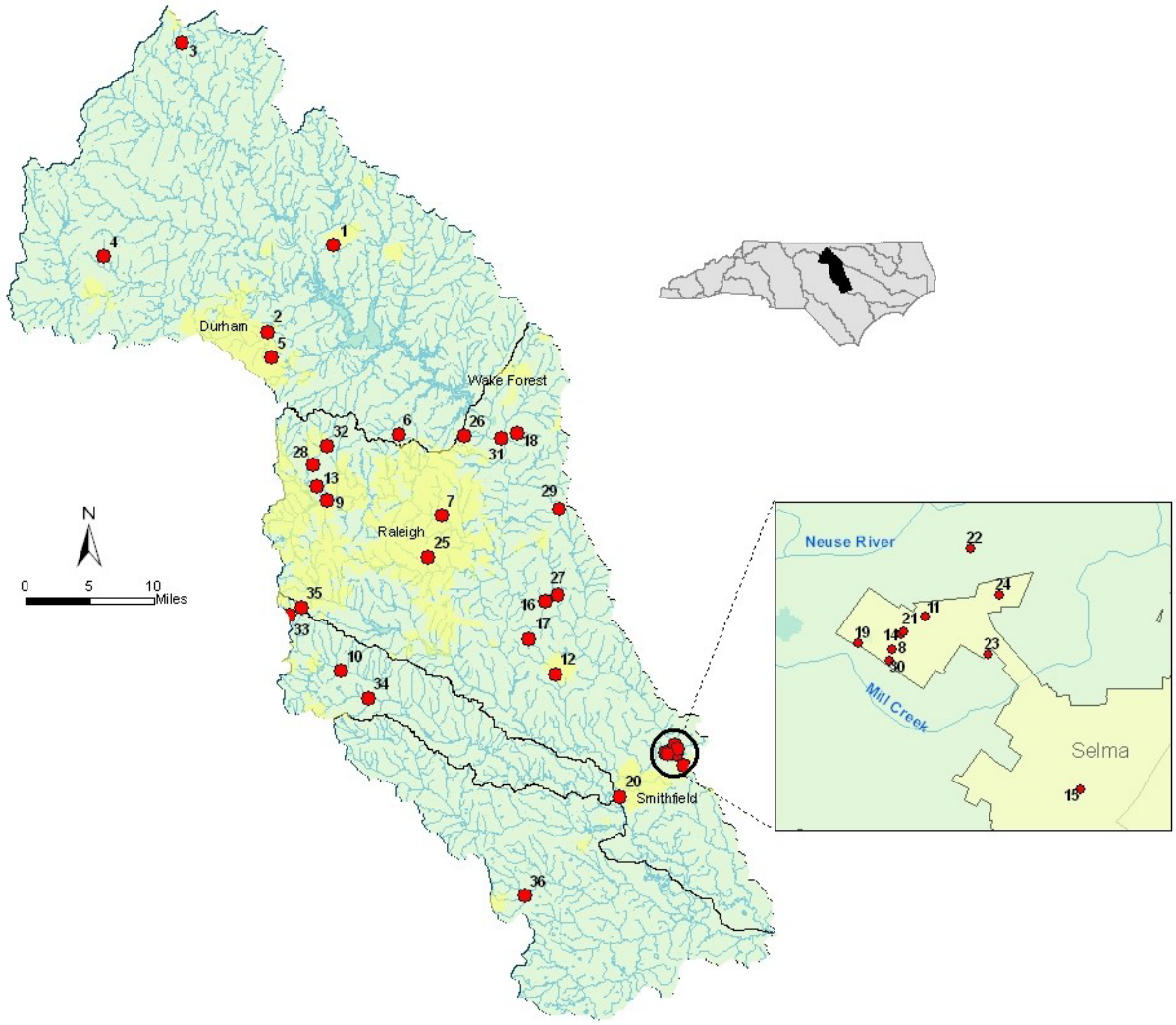
Many facilities are required to monitor whole effluent toxicity (WET) by their NPDES permit. Facilities without monitoring requirements may have their effluents evaluated for toxicity by DWQ's Aquatic Toxicology Laboratory. If toxicity is detected, DWQ may include aquatic toxicity testing upon permit renewal.

DWQ's Aquatic Toxicology Unit maintains a compliance summary for all facilities required to perform tests and provides a monthly update of this information to regional offices and WQ administration. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

WET Monitoring in the Neuse River Basin – 2001-2005

Sixty-eight facility permits in the Neuse River basin currently require whole effluent toxicity (WET) monitoring (Figures 1, 2 and Table 1). Forty-two facility permits have a WET limit while twenty-six require monitoring without a limit; the majority of the latter are episodic discharges associated with petroleum storage complexes.

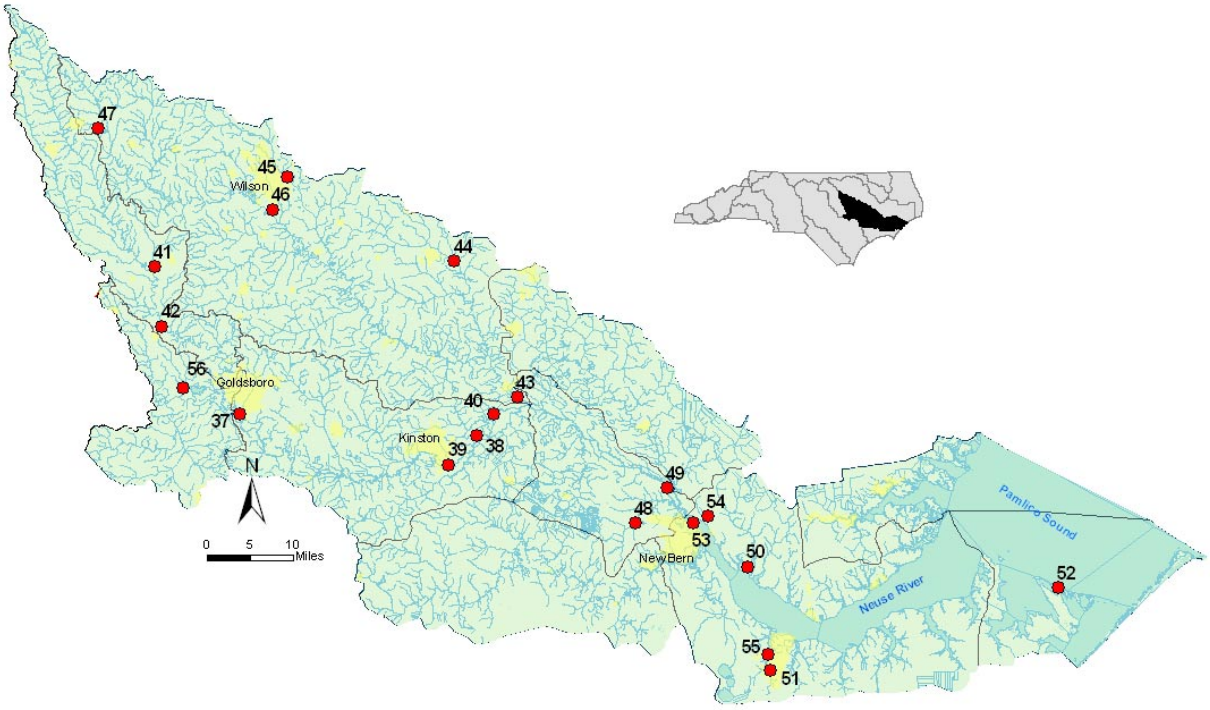
Figure 1. Neuse River basin (upper, subbasins 1-4) facilities required to conduct whole effluent toxicity testing



Key

1	Butner WWTP	**13**	Colonial Pipeline - RDU	**25**	Raleigh Convention Center
2	Durham-Northside WWTP	**14**	Colonial Pipeline-Selma	**26**	Raleigh-E.M. Johnson WTP
3	Eaton Corp	**15**	Crown Central Petroleum	**27**	Raleigh-Neuse WWTP
4	Hillsborough WWTP	**16**	CWS Kings Grant	**28**	RDU Airport Authority
5	W.P. Ballard and Co.-Durham	**17**	CWS Willowbrook	**29**	Square D-Phase I
6	Wildwood Green	**18**	Deer Chase Subdivision WWTP	**30**	TransMontaigne Term. - Selma
7	Alcatel Network Systems Inc.	**19**	Exxon Co. - Selma	**31**	Wake Forest WWTP
8	BP Selma Terminal	**20**	Johnston Co. Regional WWTF	**32**	Ward Transformer Co, Inc.
9	Cary North WWTP	**21**	Kinder Morgan Southeast - Selma #2	**33**	Apex Water Reclamation Facility
10	Cary South WWTP	**22**	Kinder Morgan Southeast - Selma #3	**34**	Fuquay-Varina WWTP
11	Citgo Selma Terminal	**23**	Kinder Morgan Southeast Terminals LLC	**35**	Motiva Enterprises LLC - Wake
12	Clayton WWTP	**24**	Magellan Selma Terminal	**36**	Benson WWTP

Figure 2. Neuse River basin (lower, subbasins 5-12) facilities required to conduct whole effluent toxicity testing



Key

37	Goldsboro WWTP	**44**	Farmville WWTP	**51**	Havelock WWTP
38	Kinston-Regional WRF	**45**	Wilson Technical Community College	**52**	NC DOT - Ferry Division WTP
39	Kinston-Peachtree WWTP	**46**	Wilson WWTP	**53**	New Bern WWTP
40	Unifi-Kinston LLC	**47**	Zebulon WWTP	**54**	Phillips Plating Co.
41	Kenly WWTP	**48**	Craven Co. Wood Energy	**55**	USMC Cherry Point
42	Princeton WWTP	**49**	Weyerhaeuser - New Bern	**56**	CP&L-Lee
43	Contentnea MSD WWTP	**50**	Fairfield Harbor Subdivision	**51**	Havelock WWTP

Table 1. Neuse River basin facilities required to conduct whole effluent toxicity testing

Subbasin/Facility	NPDES Permit No.	Receiving Stream	County	Flow (MGD)	IWC (%)	7Q10 (cfs)
03-04-01						
Butner WWTP (John Umstead Hosp)	NC0026824/001	Knapp Of Reeds Cr.	Granville	5.5	99	0.09
Durham-Northside WWTP	NC0023841/001	Ellerbe Cr.	Durham	20.0	99.5	0.075
Eaton Corp/001	NC0003379/001	UT North Flat R.	Person	NA	100.0	0
Hillsborough WWTP	NC0026433/001	Eno R.	Orange	3.0	96	0.18
W.P. Ballard and Company-Durham	NC0086720/001	UT Ellerbee Cr	Durham	0.014	100	0
Wildwood Green	NC0063614/001	UT Lower Barton Cr.	Wake	0.1	72	0.06
03-04-02						
Alcatel Network Systems Inc.	NC0086126/001	Crabtree Cr.	Wake	0.08	6.1	1.9
BP Selma Terminal - 002	NC0036145/002	UT Neuse R.	Johnston	VAR	100	0
BP Selma Terminal - 003	NC0036145/003	UT Mill Cr.	Johnston	VAR	100	0
Cary North WWTP	NC0048879/001	Crabtree Cr.	Wake	12.0	95.8	0.30
Cary South WWTP	NC0065102/001	Middle Cr.	Wake	12.8	90	0.3
Citgo Selma Terminal #001	NC0021954/001	UT Mill Cr.	Johnston	VAR	100	0
Citgo Selma Terminal #002	NC0021954/002	UT Mill Cr.	Johnston	VAR	100	0
Clayton WWTP	NC0025453/001	Neuse R.	Johnston	1.9	1.6	186
Colonial Pipeline- RDU/001	NC0081469/001	UT Crabtree Cr.	Wake	VAR	100	NA
Colonial Pipeline-Selma	NC0031011/001	UT Mill Cr.	Johnston	VAR	100	0
Crown Central Petroleum	NC0027227/001	UT Mill Cr.	Johnston	VAR	100	0
CWS Kings Grant	NC0062219/001	UT Poplar Cr.	Wake	0.07	100	0
CWS Willowbrook	NC0064378/001	UT Beddingfield Cr.	Wake	0.030	100	0
Deer Chase Subdivision WWTP	NC0063746/001	Toms Cr.	Wake	0.05	100	0
Exxon Co.-Selma	NC0027006/001	UT Mill Cr.	Johnston	VAR	100	0
Johnston Co. Regional WWTF	NC0030716/001	Neuse R.	Johnston	7.0	5.6	184
Kinder Morgan Southeast - Selma #2	NC0049204/001	UT Mill Cr.	Johnston	VAR	100	0
Kinder Morgan Southeast -Selma #3	NC0076457/001	UT Mill Cr.	Johnston	VAR	100	0
Kinder Morgan Southeast -001	NC0032875/001	UT Mill Cr.	Johnston	VAR	100	0
Kinder Morgan Southeast -002	NC0032875/002	UT Mill Cr.	Johnston	VAR	100	0
Magellan Selma Terminal	NC0052311/001	UT Mill Cr.	Johnston	VAR	100	0
Raleigh Convention Center	NC0088137/001	Rocky Br.	Wake	VAR	100	0
Raleigh- E.M. Johnson WTP- 001	NC0082376/001	UT Neuse R.	Wake	NA	100	0
Raleigh- E.M. Johnson WTP- 002	NC0082376/002	UT Honeycutt Cr.	Wake	NA	100	0
Raleigh-Neuse WWTP	NC0029033/001	Neuse R.	Wake	60.0	49.0	98.7
RDU Airport Authority-001	NC0084514/001	UT Brier Cr.	Wake	NA	100	0
RDU Airport Authority-002	NC0084514/002	Brier Cr.	Wake	NA	100	0
RDU Airport Authority-003	NC0084514/003	Brier Cr.	Wake	NA	100	0
RDU Airport Authority-004	NC0084514/004	UT Sycamore Cr.	Wake	NA	100	0
RDU Airport Authority-007	NC0084514/007	Brier Cr. Reservoir	Wake	NA	100	0
RDU Airport Authority-016	NC0084514/016	Haley's Cr.	Wake	NA	100	0
Square D-Phase I	NC0081540/001	Marks Cr.	Wake	0.021	14	0.20
TransMontaigne Term-Selma-002	NC0003549/002	UT Mill Cr.	Johnston	VAR	100	0
TransMontaigne Term-Selma-003	NC0003549/003	UT Mill Cr.	Johnston	VAR	100	0
Wake Forest WWTP	NC0030759/001	Neuse R.	Wake	2.4	5.3	67
Ward Transformer Co, Inc.	NC0045608/001	UT Little Brier Cr.	Wake	0.05	100	0
03-04-03						
Apex Water Reclamation Facility	NC0064050/001	UT Middle Cr.	Wake	3.6	100	0
Fuquay- Varina WWTP	NC0066516/001	Terrible Cr.	Wake	0.5	100	0
Motiva Enterprises LLC-Wake	NC0022217/001	Middle Cr.	Wake	VAR	100	0
03-04-04						
Benson WWTP	NC0020389/001	Hannah Cr.	Johnston	1.5	100	0

Table 1. Neuse River basin facilities required to conduct whole effluent toxicity testing (continued)

Subbasin/Facility	NPDES Permit No.	Receiving Stream	County	Flow (MGD)	IWC (%)	7Q10 (cfs)
03-04-05						
Goldsboro WWTP	NC0023949/002	Neuse R.	Wayne	4.0	2.2	271.1
Goldsboro WWTP	NC0023949/001	Neuse R.	Wayne	14.2	7.5	271.1
Kinston - Regional WRF	NC0024236/001	UT Neuse R.	Lenoir	4.5	100	0
Kinston-Peachtree WWTP	NC0020541/001	UT Neuse R.	Lenoir	6.75	100	0
Unifi-Kinston LLC	NC0003760/001	Neuse R.	Lenoir	3.6	1.9	283.1
03-04-06						
Kenly WWTP	NC0064891/001	Little R.	Johnston	0.63	22	4.4
Princeton WWTP	NC0026662/001	Little R.	Johnston	0.275	7.19	5.50
03-04-07						
Contentnea MSD WWTP	NC0032077/001	UT Contentnea Cr.	Pitt	2.85	100	0
Farmville WWTP	NC0029572/001	Little Contentnea Cr.	Pitt	3.5	98.7	0.07
Wilson Technical Community College	NC0084581/001	UT Toisnot Swp	Wilson	0.0144	100	0
Wilson WWTP	NC0023906/001	Contentnea Cr.	Wilson	14.0	97.37	0.5
Zebulon WWTP	NC0079316/001	Little Cr.	Wake	1.85	100	0
03-04-08						
Craven Co. Wood Energy - 001	NC0075281/001	Bachelor Cr.	Craven	0.20	68.89	0.14
Weyerhaeuser-New Bern	NC0003191/001	Neuse R.	Craven	32.0	13	329
03-04-10						
Fairfield Harbor Subdivision	NC0033111/001	Neuse R.	Craven	1.00	NA	TIDAL
Havelock WWTP	NC0021253/001	E. Prong Slocum Cr.	Craven	1.9	100	0
NC DOT - Ferry Division (RO) WTP	NC0077500/001	Cedar Island Bay	Carteret	0.01	NA	TIDAL
New Bern WWTP	NC0025348/001	Neuse R.	Craven	4.7	NA	TIDAL
Phillips Plating Co.	NC0001881/001	Neuse R.	Craven	0.10	NA	TIDAL
USMC Cherry Point	NC0003816/001	Neuse R.	Craven	3.5	NA	TIDAL
03-04-12						
CP&L Lee/001 Ash Pond	NC0003417/001	Neuse R.	Wayne	VAR	0.47	263.0
CP&L Lee/002	NC0003417/002	Neuse R.	Wayne	VAR	NA	263.0

The number of facilities in this basin with whole effluent toxicity limits steadily increased from 1986 (first year monitoring required) to 1997. The compliance rate of those facilities has generally risen since the inception of the program. Around 1995 the compliance rate stabilized in the range of 95-99% (Figure 3 and Table 2).

The Raleigh EM Johnson WTP, discharging to an unnamed tributary to Honeycutt Creek (subbasin 02), began monitoring for WET in September 2002 without a limit. The facility's effluent produced toxicity at its target concentration (90%) in 17 of 24 tests through November of 2005. Many of the failures appeared to be associated with total residual chlorine. The facility implemented effluent dechlorination in 2004. The facility also identified a polymer associated with operation of its filter press as a source of toxicity. That filter press effluent is now discharged to sanitary sewer. The facility has passed its four most recent tests, dating from May 2005. As of February 2006, the facility is allowed to recycle its filter backwash; wastewater discharges will now only occur about twice per year. Toxicity testing will occur during those discharges.

The New Bern WWTP, discharging to the Neuse River (Subbasin 10), had been unable to consistently comply with its whole effluent toxicity limit since 1994. The City determined that the failures were associated with ammonia. The plant previously used trickling filters for its secondary treatment; this technology is known to be deficient for ammonia removal. In June 2001 the City and DWQ entered into a special order by consent (SOC) that provided regulatory relief (no civil penalty assessments) to the City while it upgraded its treatment works for

advanced nitrogen and phosphorous removal using a Bardenpho process. That upgrade was completed and brought online in June of 2003. The facility has been compliant with its whole effluent toxicity limit since July of 2003.

Figure 3. NPDES facility whole effluent toxicity compliance in the Neuse River basin, 1986-2005. The compliance values were calculated by determining whether facilities with WET limits were meeting their ultimate permit limits during the given time period, regardless of any SOCs in force.

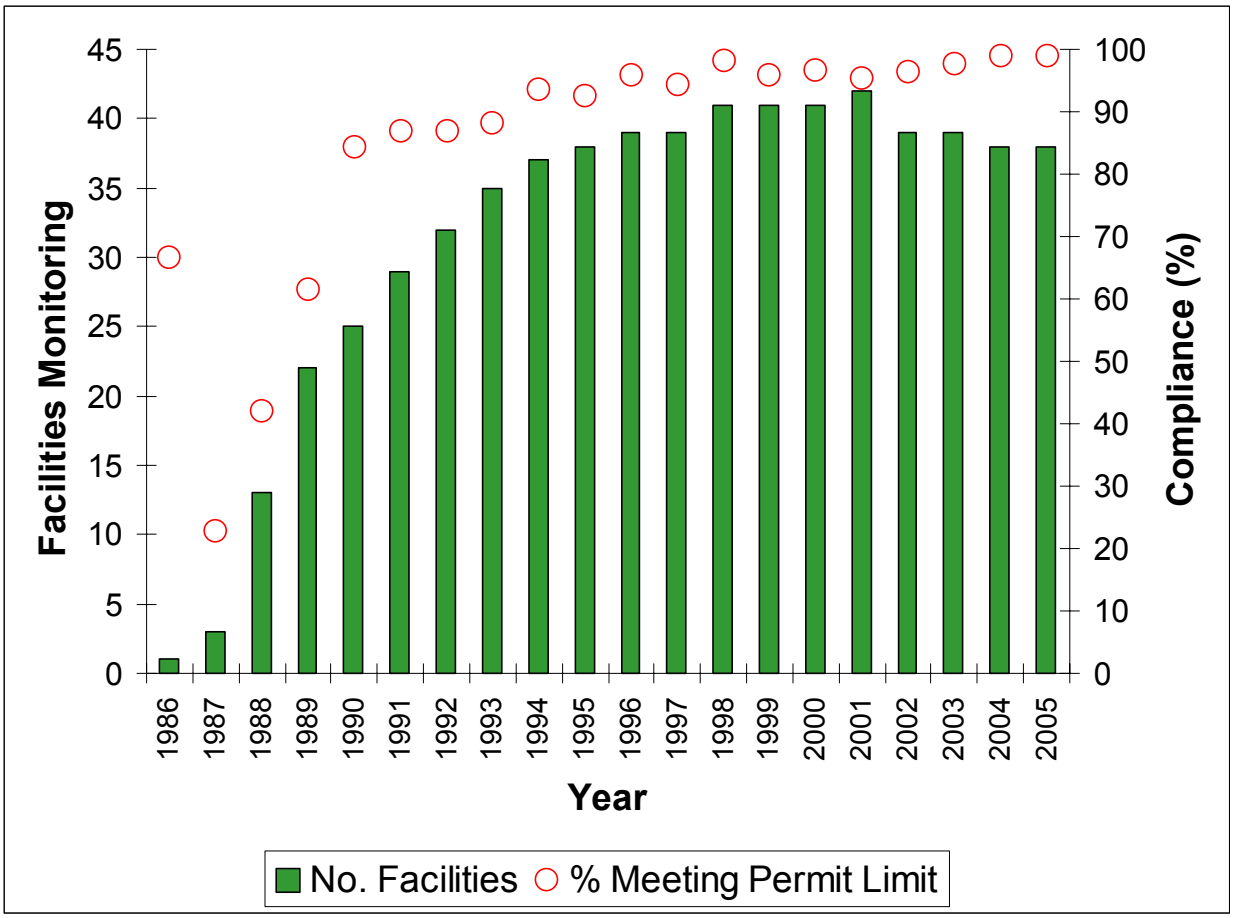


Table 2. Recent compliance record of facilities performing whole effluent toxicity testing in the Neuse River basin

Subbasin/Facility	NPDES Permit No.	2001- 2004 Passes	2001- 2004 Fails	2005 Passes	2005 Fails
03-04-01					
Butner WWTP (John Umstead Hospital)	NC0026824/001	19	2	4	0
Durham-Northside WWTP	NC0023841/001	18	1	4	0
Eaton Corp/001	NC0003379/001	5	0	0	1
Hillsborough WWTP	NC0026433/001	17	1	4	0
W.P. Ballard and Company-Durham	NC0086720/001	2	0	0	0
Wildwood Green	NC0063614/001	17	1	3	2
03-04-02					
Alcatel Network Systems Inc.	NC0086126/001	14	0	3	0
BP Selma Terminal - 002	NC0036145/002	4	0	1	0
Cary North WWTP	NC0048879/001	16	0	5	1
Cary South WWTP	NC0065102/001	16	0	4	0
Citgo Selma Terminal #001	NC0021954/001	4	0	1	0
Citgo Selma Terminal #002	NC0021954/002	4	0	1	0
Clayton WWTP	NC0025453/001	19	0	4	0

Table 2. Recent compliance record of facilities performing whole effluent toxicity testing in the Neuse River basin (continued)

Subbasin/Facility	NPDES Permit No.	2001- 2004 Passes	2001- 2004 Fails	2005 Passes	2005 Fails
Colonial Pipeline- RDU/001	NC0081469/001	4	0	1	0
Colonial Pipeline-Selma	NC0031011/001	4	0	1	0
CWS Kings Grant	NC0062219/001	16	0	4	0
CWS Willowbrook	NC0064378/001	17	1	4	0
Deer Chase Subdivision WWTP	NC0063746/001	20	3	4	0
Exxon Co.-Selma	NC0027006/001	4	0	1	0
Johnston Co. Regional WWTF	NC0030716/001	17	0	4	0
Kinder Morgan Southeast - Selma #2	NC0049204/001	3	1	1	0
Kinder Morgan Southeast -Selma #3	NC0076457/001	0	0	1	0
Kinder Morgan Southeast - 001	NC0032875/001	4	0	1	0
Kinder Morgan Southeast - 002	NC0032875/002	3	0	1	0
Magellan Selma Terminal	NC0052311/001	3	1	2	0
Raleigh- E.M. Johnson WTP- 002	NC0082376/002	3	14	4	3
Raleigh-Neuse WWTP	NC0029033/001	18	1	5	0
RDU Airport Authority-001	NC0084514/001	4	0	1	0
RDU Airport Authority-002	NC0084514/002	4	0	1	0
RDU Airport Authority-003	NC0084514/003	2	2	3	0
RDU Airport Authority-004	NC0084514/004	7	0	1	0
RDU Airport Authority-007	NC0084514/007	0	0	2	0
RDU Airport Authority-016	NC0084514/016	0	0	3	0
Smith Creek WWTP	NC0030759/001	17	0	4	0
Square D-Phase I	NC0081540/001	16	0	4	0
TransMontaigne Term-Selma-002	NC0003549/002	2	0	0	0
TransMontaigne Term-Selma-003	NC0003549/003	4	0	1	0
Ward Transformer Co, Inc.	NC0045608/001	16	0	4	0
03-04-03					
Apex Water Reclamation Facility	NC0064050/001	18	2	4	0
Fuquay-Varina WWTP	NC0066516/001	16	0	4	0
Motiva Enterprises LLC-Wake	NC0022217/001	4	0	1	0
03-04-04					
Benson WWTP	NC0020389/001	16	0	4	0
03-04-05					
Goldsboro WWTP-001	NC0023949/001	17	0	4	0
Goldsboro WWTP-002	NC0023949/002	8	0	4	0
Kinston - Regional WRF	NC0024236/001	16	0	4	0
Kinston-Peachtree WWTP	NC0020541/001	16	0	4	0
Unifi-Kinston LLC	NC0003760/001	16	0	4	0
03-04-06					
Kenly WWTP	NC0064891/001	18	0	4	0
Princeton WWTP	NC0026662/001	16	0	4	0
03-04-07					
Contentnea MSD WWTP	NC0032077/001	16	0	4	0
Farmville WWTP	NC0029572/001	18	0	4	0
Wilson WWTP	NC0023906/001	19	3	4	0
Zebulon WWTP	NC0079316/001	22	3	4	0
03-04-08					
Craven Co. Wood Energy 001	NC0075281/001	17	1	4	0
Weyerhaeuser New Bern	NC0003191/001	15	0	4	0
03-04-10					
Havelock WWTP	NC0021253/001	19	1	5	1
NC DOT - Ferry Division WTP	NC0077500/001	2	0	4	1
New Bern WWTP	NC0025348/001	10	13	4	0
Phillips Plating Co.	NC0001881/001	16	0	4	0
USMC Cherry Point	NC0003816/001	18	2	3	0
03-04-12					
CP&L Lee/001 Ash Pond	NC0003417/001	17	0	4	0

Note that “pass” denotes meeting a permit limit or, for those facilities with a monitoring requirement, meeting a target value. The actual test result may be a “pass” (from a pass/fail acute or chronic test), LC_{50}, or chronic value. Conversely, “fail” means failing to meet a permit limit or target value.