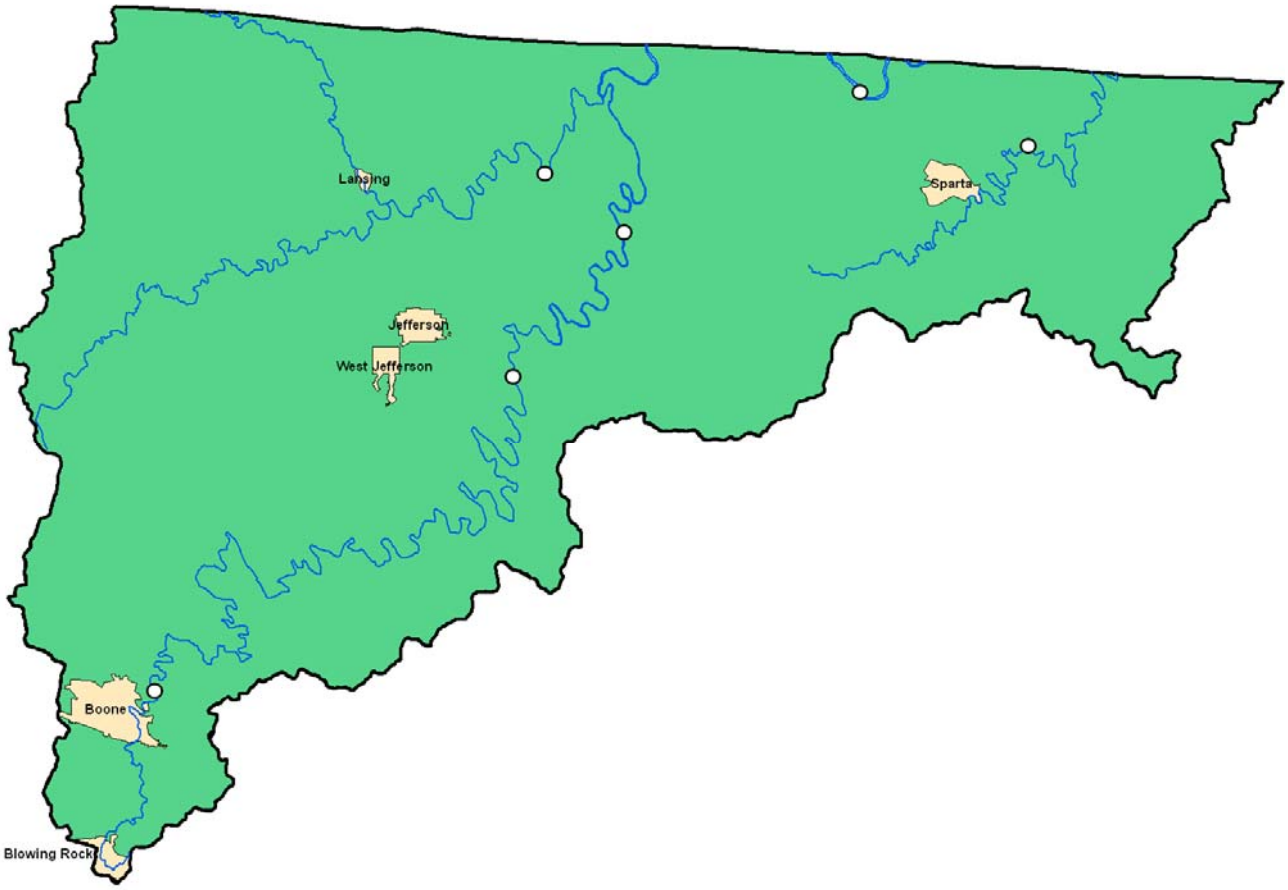


New River Basin
Ambient Monitoring System Report

January 1, 2004 through December 31, 2008

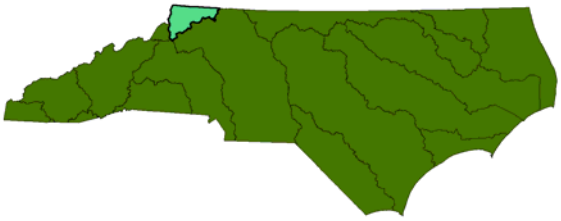


TABLE OF CONTENTS

EXECUTIVE SUMMARY **4**

INTRODUCTION **5**

PARAMETERS **8**

Dissolved Oxygen *8*

pH *8*

Specific Conductance *8*

Turbidity *8*

Nutrients *8*

Fecal Coliform Bacteria *9*

WATER QUALITY MONITORING RESULTS SUMMARY **10**

ASSESSMENT AND INTERPRETATION METHODS **11**

Assessment Considerations *11*

Providing Confidence in the Exceedance of Water Quality Standards *12*

Methods Used to Summarize Results *14*

Box and Whisker Plots *14*

Scatter Plots – Change Over Time *15*

Maps *16*

WATER QUALITY ANALYSIS **17**

Stream Flow and Drought *17*

Long Term Trends *17*

Geographic Assessment *20*

Significant Issues *20*

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 examined 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

Table 1. Parametric coverage for the Ambient Monitoring System. 6
Table 2. Selected water quality standards 6
Table 3. Monitoring stations in the New River Basin 7
Table 4. Frequency of Evaluation Level Exceedances 10
Table 5a. Summary of Water Quality Parameter Averages 10
Table 5b. Summary of Water Quality Parameter Averages (Nutrients) 11
Table 6. Exceedance Confidence 13
Table 7. Flow Adjusted Long Term Trends (1990-2008) 18

FIGURES

Figure 1. DWQ's Ambient Monitoring System in the New River Basin. 7
Figure 2. An Example Box Plot for a Station 14
Figure 3. A Box Plot for Comparing HUCs 15
Figure 4. Scatter Plot Example, Dissolved Oxygen over Time 15
Figure 5. Example Map 16
Figure 6. Average Monthly Flow in the New River Basin 17
Figure 7. Flow Adjusted Long Term Trends (1990-2008) 18
Figure 8. Fecal Coliform in the New River Basin 20
Figure 9. Box Plots of Water Temperature and Dissolved Oxygen in the New River Basin 29
Figure 10. Box Plots of pH and Specific Conductance in the New River Basin 30
Figure 11. Box Plots of Turbidity and Fecal Coliform in the New River Basin 31
Figure 12. Box Plots of Ammonia and Total Kjeldahl Nitrogen in the New River Basin 32
Figure 13. Box Plots of Nitrates/Nitrites and Total Phosphorus in the New River Basin 33

APPENDIXES

Appendix A. AMS Station Summary Sheets 21
Appendix B. Station Box & Whisker Plots 28
Appendix C. References 34

EXECUTIVE 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 (January 1, 2004 through December 31, 2008) chemical and physical measurements were obtained by DWQ from 6 stations located in the New River Basin.

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 a numeric standard. If less than 10 results were collected, then no comparison to evaluation levels was made. When more than 10 percent of the results exceeded the evaluation level (10% criteria), a binomial statistical test was employed to determine how much statistical confidence there is that the results statistically exceed the 10% criteria. If at least 95% confidence was found that a 10% exceedance occurred, then that is termed a statistically significant exceedance (SSE). This method was applied for all parameters with an evaluation level, except for fecal coliform bacteria, which uses a 20% criteria in most waters as well as a geometric mean criteria. See page 9 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.

This review of water quality exceedances was performed using data that were collected between January 1, 2004 and December 31, 2008. No sites were found to have SSEs. Furthermore there were no sites with 10% exceedances that did not rise to the level of SSEs. One site did have a fecal coliform exceedance rate of exactly 20%, which does not exceed the evaluation level of 20%.

There are no areas of particular concern in the New River Basin using these criteria. However, long term trending indicates that some parameters may become problematic in the future. Fecal coliform, nitrates & nitrites, turbidity, and specific conductance all appear to be increasing over time.

INTRODUCTION

The DWQ's Ambient Monitoring System (AMS) 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.

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 1**).

Within this document, an analysis of how monitoring results compare with water quality standards and evaluation levels is presented. An educational and 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. A summary of selected water quality standards are listed in **Table 2**.

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 6 stations in the basin throughout the assessment period. The locations of the sampling sites are illustrated in **Figure 1**, and listed in **Table 3**.

In January 2007 the DWQ began collection of samples from a series of randomly determined sites. A description of the Random Ambient Monitoring System (RAMS) can be found here: http://h2o.enr.state.nc.us/esb/rams.html. There are currently two RAMS sites located in the New River Basin. Because this report assesses in a five-year window and RAMS stations will only have 2 years of data, they are not included in the ambient report. Once a sufficient number of samples have been collected statewide, RAMS data will be discussed in a separate report.

Table 1. Parametric coverage for the Ambient Monitoring System.

Parameter
Dissolved oxygen (s)
pH (s)
Specific conductance
Temperature (s)
Total phosphorus
Ammonia as N
Total Kjeldahl as N
Nitrate+nitrite as N (s)
Total suspended solids
Turbidity (s)
Fecal coliform bacteria (s)
Chlorophyll *a* (s)

Notes:
An 's' indicates the parameter has a standard.
Chlorophyll *a* and nutrient sampling is only done in areas of concern, such as NSW, estuaries, lakes, and areas with known enrichment issues.

Table 2. Selected water quality standards

	Standards for All Freshwater			Standards to Support Additional Uses		
Parameter	**Aquatic Life**	**Human Health**	**Water Supply Classifications**	**Trout Water**	**HQW**	**Swamp Waters**
Chloride (mg/l)	230		250			
Chlorophyll *a* (ug/L)	40[2]			15[2]		
Coliform, total (MFTCC/100 ml)[3]			50[2] (WS-I only)			
Coliform, fecal (MFFCC/100 ml)[4]		200[2]				
Dissolved oxygen (mg/L)	4.0[5,6]			6.0		[2, 6]
Hardness, total (mg/L)			100			
Nitrate nitrogen (mg/L)			10			
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]		

Notes:
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).

Figure 1. DWQ's Ambient Monitoring System in the New River Basin.

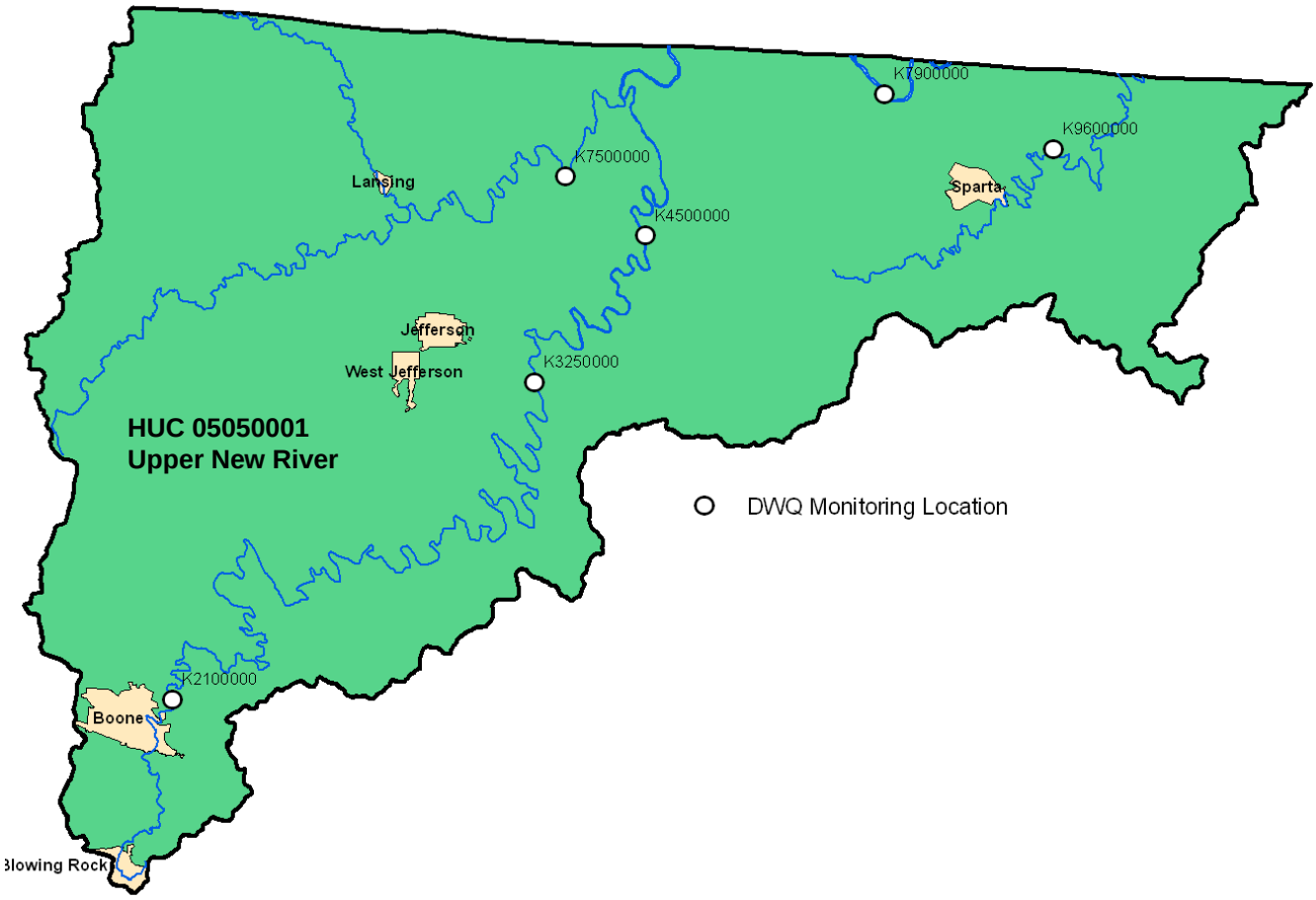


Table 3. Monitoring stations in the New River Basin

Station	Stream Class	Location	Latitude	Longitude
HUC 05050001: Upper New River				
K2100000	C +	S FORK NEW RIV AT US 221 AND 421 AT PERKINSVILLE	36.2209	-81.63978
K3250000	WS-IV HQW	S FORK NEW RIV AT NC 16 AND 88 NR JEFFERSON	36.3947	-81.4075
K4500000	B ORW	S FORK NEW RIV AT US 221 NR SCOTTVILLE	36.4738	-81.33649
K7500000	C +	N FORK NEW RIV AT SR 1573 AT CRUMPLER	36.504	-81.39004
K7900000	C ORW	NEW RIV AT SR 1345 AT AMELIA	36.5519	-81.18172
K9600000	C	LITTLE RIV AT SR 1426 NR EDWARDS CROSSROADS	36.5247	-81.06939

Primary Water Use Classifications
C: Aquatic Life
B: Primary Recreation
WS-I, WS-II, WS-III, WS-IV, WS-V: Water Supply
SA: Saltwater Shellfish Harvesting
SB: Saltwater Primary Recreation
SC: Saltwater Aquatic Life

Secondary Water Use Classifications
Sw: Swamp Water
HQW: High Quality Water
ORW: Outstanding Resource Water
Tr: Trout Waters
CA, +: Critical Area

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. For freshwaters, 15A NCAC 02B .0211 (3)(b) specifies:

Dissolved oxygen: not less than 6.0 mg/l for trout waters; for non-trout waters, not less than a daily average of 5.0 mg/l with a minimum instantaneous value of not less than 4.0 mg/l; swamp waters, lake coves or backwaters, and lake bottom waters may have lower values if caused by natural conditions.

pH

The pH of natural waters can vary throughout the state. Low values, such as less than 7.0 Standard Units (SU), can be found in waters rich in dissolved organic matter, such as swamp lands. High values, such as greater than 7.0 SU 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 SU. 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 SU. or greater than 9.0 SU. to warrant attention. In swamp waters, a pH below 4.3 SU. is of concern.

Specific Conductance

In this report, conductivity is synonymous with specific conductance. It is reported in micro-mhos 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. North Carolina freshwater streams have a natural conductance range of 17-65 µmhos/cm (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.

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.

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 and other plants may occur (i.e. algal blooms and infestations).

At neutral pH in water, ammonia normally forms an ionized solution of ammonium hydroxide, with a small amount of deionized ammonia. However, as pH increases, more ammonia is left deionized. Deionized ammonia is 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 New River Basin, the standard specified in Administrative Code 15A NCAC 02B.0211 (3)(e) (May 1, 2007) 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."

All of the New River basin in North Carolina is composed of fresh waters. All sites where the geometric mean was greater than 200 colonies/100ml, or where greater than 20 percent of the results exceed 400 colonies/100ml (i.e. all sites that exceed the evaluation level) are indicated on the respective station summary sheets.

Fecal coliform problems are screened using annual summaries of Ambient sampling results. If the screening indicates that the station may be in violation of the standard, the standard is assessed using the method required by law. All such class B (and class SB/SA in coastal basins) waters are assessed, and other waters as resources permit. The required assessment method is known as "5 in 30", collecting a minimum five samples within a span of 30 days. If a water body exceeds the standard more then 20% of the time during the 30-day period or the geomean for the 30-day period is greater than 200, then that water body is considered impaired and is added to the impaired water list, the 303(d) list.

WATER QUALITY MONITORING RESULTS SUMMARY

Water Quality within the basin during the evaluation period is summarized in the following tables. **Table 4** shows how often water quality evaluation levels were exceeded. **Table 5** shows average values, for comparison against HUC and basinwide averages.

Table 4. Frequency of Evaluation Level Exceedances

Station	Stream Class	Water Temperature (>29 degrees C)	D.O. (<4 mg/L)	pH (<6 SU)	pH (>9 SU)	Turbidity (>50 NTU)	Nitrate & Nitrite (>10 mg/L)	Fecal coliform (>400 cols/100mL)
HUC 05050001: Upper New River								
K2100000	C +	0.0%	0.0%	0.0%	0.0%	1.8%	NS	8.9%
K3250000	WS-IV HQW	0.0%	0.0%	0.0%	3.4%	3.4%	0.0%	5.4%
K4500000	B ORW	0.0%	0.0%	0.0%	0.0%	5.2%	NS	3.6%
K7500000	C +	0.0%	0.0%	0.0%	0.0%	8.8%	NS	20.0%
K7900000	C ORW	0.0%	0.0%	0.0%	1.7%	8.6%	NS	13.0%
K9600000	C	0.0%	0.0%	0.0%	1.7%	3.4%	NS	9.1%

Notes:
NS - No Standard exists for this parameter in this stream class.

Table 5a. Summary of Water Quality Parameter Averages

Station	Stream Class	Water Temperature (°C)		D.O. (mg/L)		pH (SU)		Spec. conductance (umhos/cm at 25°C)		Turbidity (NTU)		Fecal coliform (# colonies per 100mL)	
HUC 05050001		**14.0**		**10.2**		**7.6**		**84**		**13.9**		**46**	
		N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
K2100000	C +	57	12.7	57	10.3	57	7.5	57	161	57	5.6	56	89.8
K3250000	WS-IV HQW	58	14.5	58	10.3	58	7.7	58	85	58	8.1	56	20.0
K4500000	B ORW	58	14.4	58	10.1	58	7.6	57	72	58	9.8	55	19.4
K7500000	C +	57	13.6	57	10.3	57	7.6	56	69	57	21.4	55	82.2
K7900000	C ORW	58	14.7	58	10.1	58	7.6	57	67	58	31.0	54	35.5
K9600000	C	58	13.8	58	10.3	58	7.7	57	51	58	7.5	55	96.7

The means displayed in this table are arithmetic means, except for fecal coliform, which is a geometric mean.

Table 5b. Summary of Water Quality Parameter Averages (Nutrients)

Station	Agency	Total Nitrogen (mg/L)		Total Organic Nitrogen (mg/L)		Total Inorganic Nitrogen (mg/L)		NH3 as N (mg/L)		NO2 + NO3 as N (mg/L)		Total Phosphorus (mg/L)	
HUC 05050001		**2.01**		**0.66**		**1.35**		**0.02**		**0.90**		**0.08**	
		N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
K2100000	C +	57	2.08	57	0.24	57	1.84	57	0.02	57	1.82	57	0.14
K3250000	WS-IV HQW	58	0.90	58	0.24	58	0.65	58	0.02	58	0.63	58	0.04
K4500000	B ORW	58	0.87	58	0.25	58	0.62	58	0.02	58	0.60	58	0.05
K7500000	C +												
K7900000	C ORW	58	0.92	58	0.34	58	0.58	58	0.03	58	0.56	58	0.08
K9600000	C												

Notes: Empty rows indicate that no samples were collected for that parameter at that station.

ASSESSMENT AND INTERPRETATION METHODS

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 8.02; 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 9) 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 than 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.

Assessment Considerations

Total Metals

The North Carolina Division of Water Quality is currently reviewing water quality standards for metals. Review of historical total metals data and biological data has shown that no correlation exists between exceedance of total metals ambient standards and biological impairment. Therefore, as of May 2007 DWQ has suspended collection of total metals at AMS stations.

Providing Confidence in the Exceedance of Water Quality Standards

Historically, NC DWQ has used guidance provided by the US EPA for determining when the number of results that exceed a water quality standard indicate potential water quality issues. 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 (74 percent) than when there are 3 exceedances out of 10 (99 percent confidence) (**Table 6**).

Table 6. 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 evaluation level.

Methods Used to Summarize Results

Methods used to summarize the results in this report encompass both tabular and graphical formats. Box and whisker plots, scatterplots, and maps were used to depict data for a variety of water quality parameters throughout the basin. For the box plots, stations with fewer then 10 data points for a given parameter were not included. This occasionally occurred when a new station was added, an old station was removed, or a station was moved to a new location in the basin.

Individual station summary sheets 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 **Appendix A** to this report.

The results were depicted in the following ways:

- Comparing stations – box plots
- Assessing stations – tables
- Illustrating regional variation – maps

Box and Whisker Plots

One method of analyzing data in this report is through the use of box and whisker plots. **Figure 2** is an annotated example of a box and whisker plot that illustrates the distribution of the results for a particular parameter at a single site. This box plot contains both the median and mean values. Differences between the median and mean can illustrate the distribution of the results. For example, if the mean is considerably larger then the median, then there are likely a few very high concentrations raising the mean. Another useful measure is to compare the 90th percentile against the evaluation level. For most parameters, 10% exceedance of the evaluation levels is considered a violation. Therefore the 90th (or 10th in the case of minimum evaluation levels) percentile exceeding the evaluation level is an equivalent statement. Box plots for each station are included in **Appendix B**.

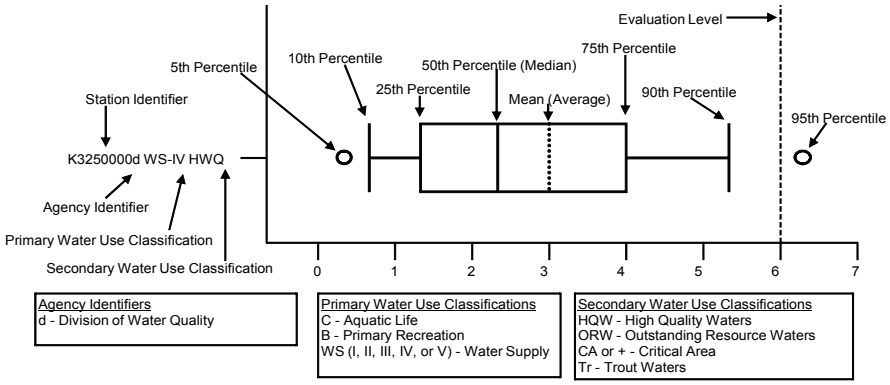


Figure 2. An Example Box Plot for a Station

Figure 3 is an example of a box and whisker plot that is comparing four HUCs for a single parameter. In this case the box plots are vertical instead of horizontal. Also note that a "mean diamond" is present on each. The center line of each diamond is the average. The short lines above and below the center are called "overlap marks" and represent a 95% confidence interval for the mean. To compare means, extend the overlap marks as shown in the figure. If the overlap mark of one diamond is closest to the mean line of another diamond then the two averages are not significantly different. If the overlap line is closer to the other diamond's overlap mark, then they are significantly different. Because there is only one HUC in the North Carolina New River basin, this type of analysis was not used.

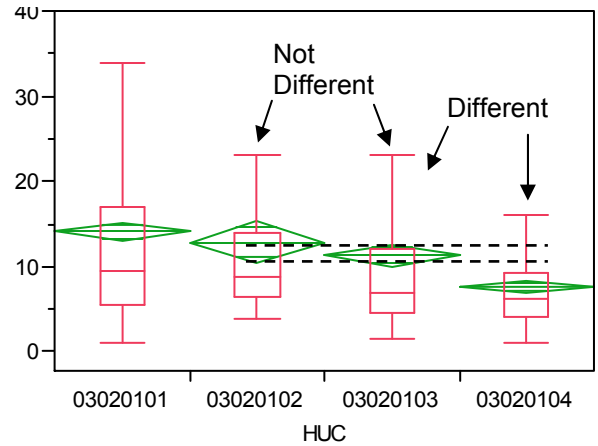
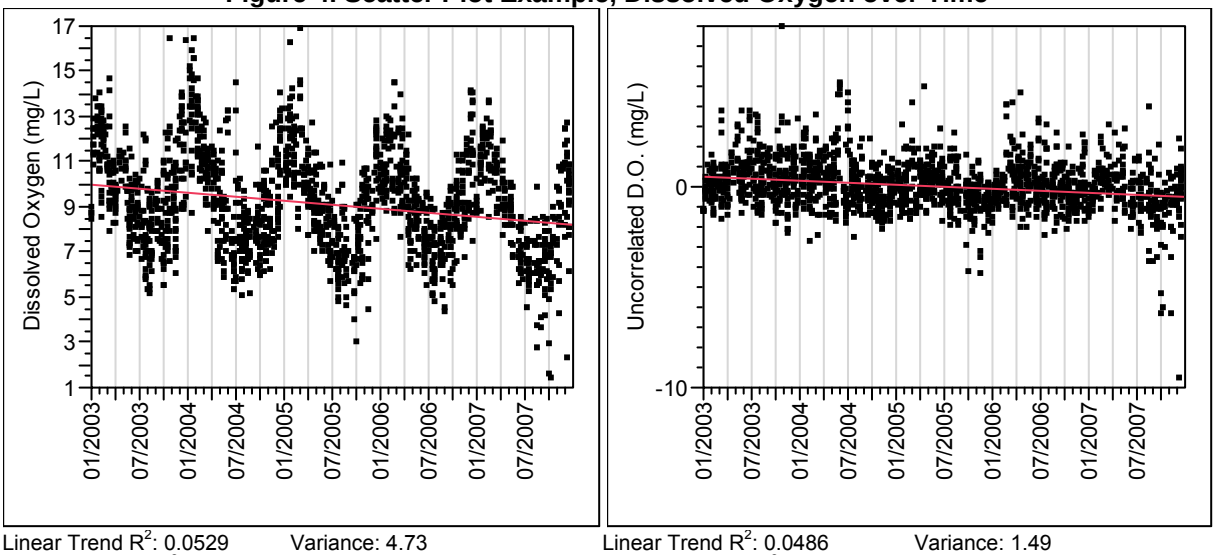


Figure 3. A Box Plot for Comparing HUCs

Scatter Plots – Change Over Time

Change over time trends are illustrated in scatterplots. If there is at least 95% confidence that a particular linear trend explains the data better then chance (Prob > F of 0.05 or less) then that linear trend was included on the graph. Note that this is different from the r^2. The percentage of variance explained by the linear model (r^2 value) is displayed for each trend. Occasionally other effects can give the appearance of a trend. This is most common when the number of samples is high and the correlation is small. In the example below on the right, drought events in 2005 and 2007 may be responsible for the slight trend present in the data.

Figure 4. Scatter Plot Example, Dissolved Oxygen over Time



Linear Trend R^2: 0.0529 Variance: 4.73
Minimum Noise R^2: 0.1596

Linear Trend R^2: 0.0486 Variance: 1.49
Minimum Noise R^2: 0.3834

In the example above, two types of change over time graphs are shown. The left graph shows *raw* dissolved oxygen results over time. The Linear Trend RSquare value estimates how much of the variation in the results can be explained by the linear trend, in this case only about 5%. The Minimum Noise RSquare is the amount of variation that definitely cannot be explained by variation over time. This is based on the variation that can be found in results from a single day, such as the variation between sites. This is likely an underestimate of noise in most cases. The greater the noise, the less likely there is a trend that has not been captured.

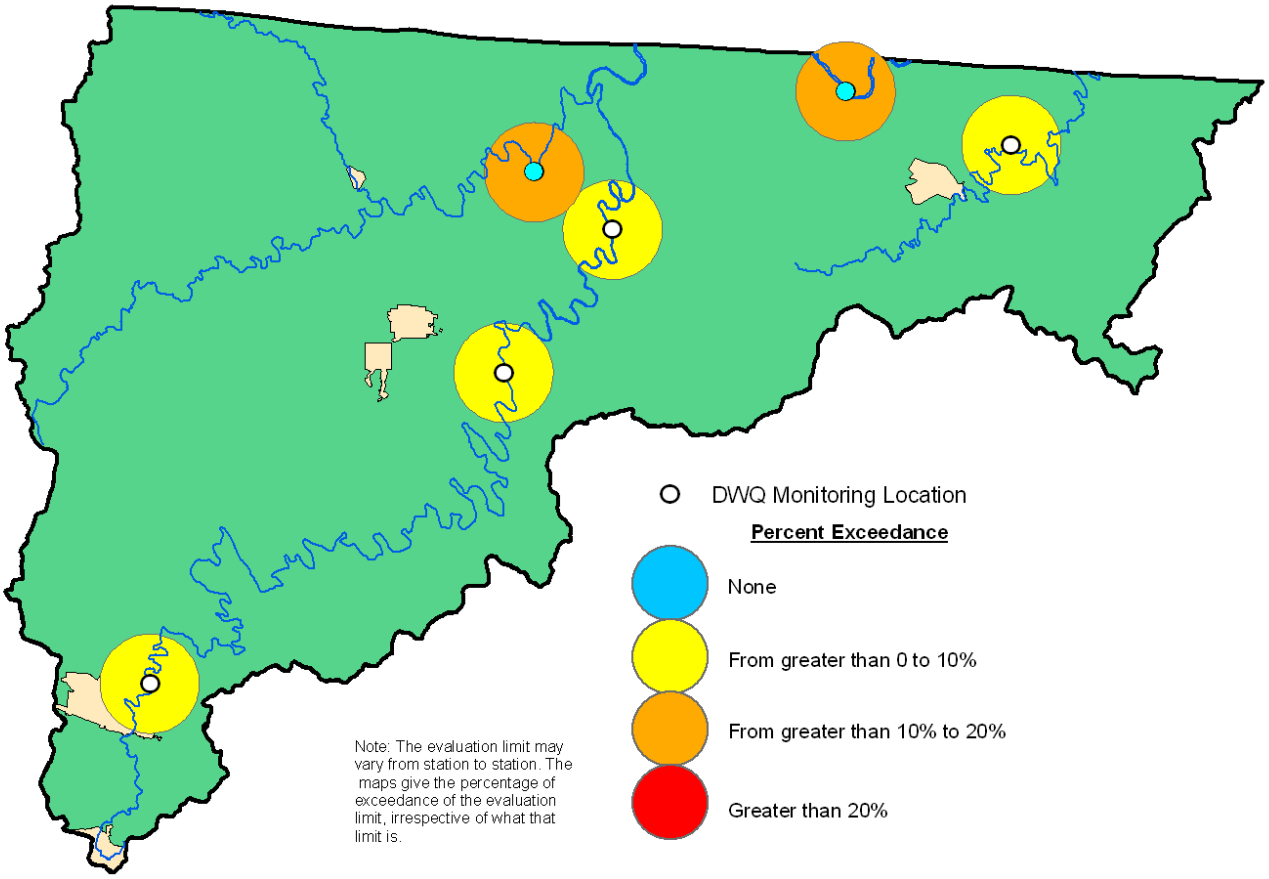
When helpful/possible, seasonal or other cyclical variation has been removed from the data via regression so that trends can be seen more easily. The graph on the left shows more variation within each year then there is between

years. The variance is 4.73 mg/L. In the graph on the right, all variation that correlates to variation in water temperature has been removed via linear regression. This reduces the variance by over half to 1.49 mg/L. Then it becomes clear visually that there are no strong temporal trends in the dissolved oxygen data that cannot be explained by changes in temperature. This type of analysis was not used in the New River basin report.

Maps

Maps are used to display data for the whole basin at once, so that the relationship of stations to each other can be seen, and regional patterns become clear. The colors signify the degree of exceedance at each location.

Figure 5. Example Map

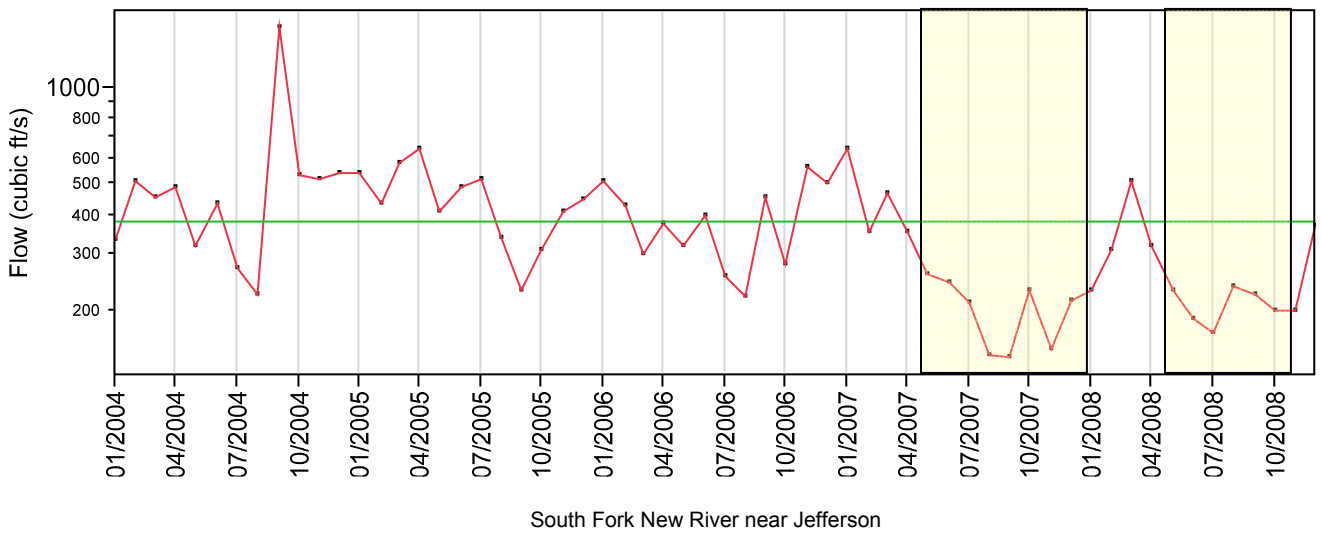


WATER QUALITY ANALYSIS

Stream Flow and Drought

The rate at which a volume of water moves through a stream (the flow rate) can have an impact on the measurement of other parameters. In particular, droughts can have major effects on parameters such as dissolved oxygen, turbidity, pH, and others by reducing stream flow. Therefore it is useful to track changes in stream flow over the course of the assessment period, to see when drought or high flow events might be present. A drought affected the New River Basin from May 2007 through January 2008, and again from May 2008 through November 2008. A daily average flow of 73 cubic feet per second was recorded on August 24th 2008, which is the lowest flow recorded at this station since 1943.

Figure 6. Average Monthly Flow in the New River Basin



Long Term Trends

In order to evaluate meaningful change over time, flow adjusted long term trends were evaluated. This data was developed in the following way:

- Water Quality Data collected by DWQ for the period 1990 through 2008 was downloaded from the EPA STORET database.
- Flow data for the South Fork New River near Jefferson for the period 1990 through 2008 was downloaded from the USGS website. Flow data was not available for all the sites, so the South Fork site was used to represent flow for the whole region.
- The water quality data was tested for flow-related trends using linear regression.
- The residuals of the linear regression were evaluated for change over time using a seasonal version of Kendall's Tao and visualized using linear regression.

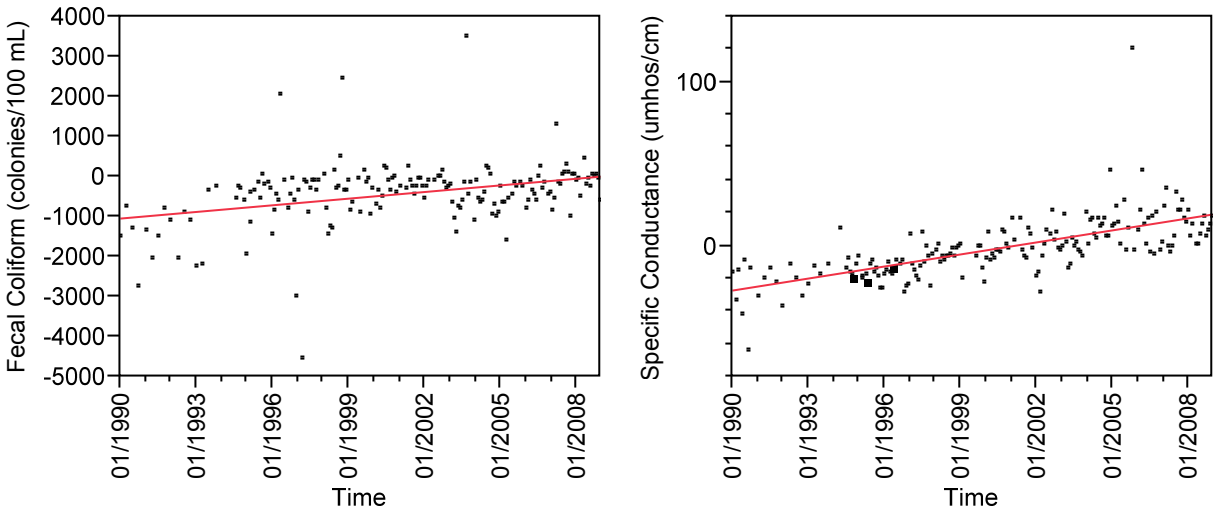
Kendall's Analysis is a non-parametric procedure that gives a probability estimate and an estimate of change per year. If the probability of chance replicating the results is less than 0.05, then the results are considered significant at the 95% confidence level. The probability parameter was adjusted to minimize the effect of serial correlation.

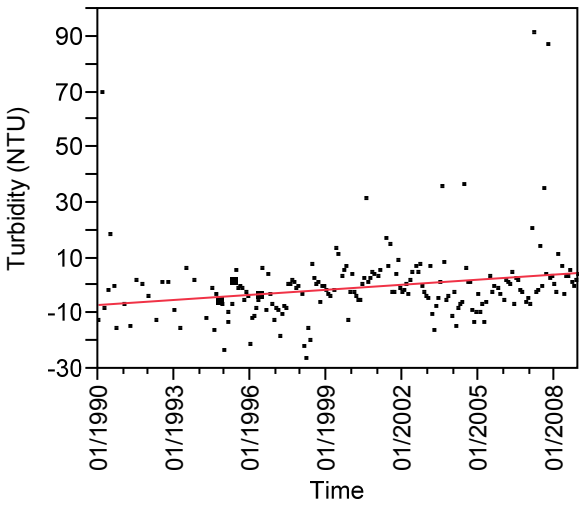
Table 7. Flow Adjusted Long Term Trends (1990-2008)

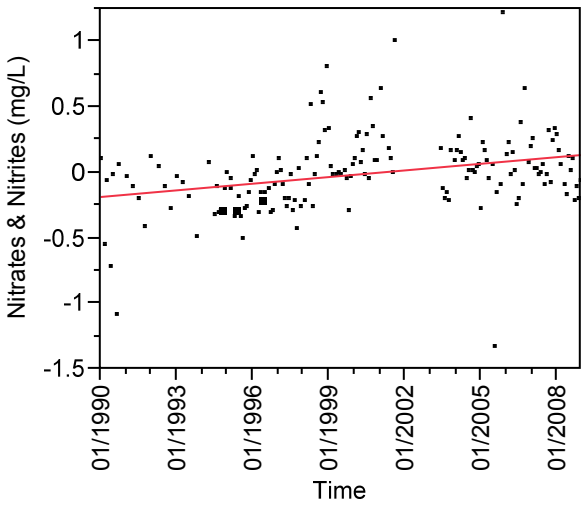
Parameter	*Probability of Chance*	*Estimated Rate of Change per Year*	*Units*	*Significant?*
Fecal Coliform	**0.0017**	**28.84**	**Colonies per 100mL**	**Yes**
Dissolved Oxygen	0.0802	0.03159	mg/L	No
pH	0.0627	0.03112	SU	No
Specific Conductance	**< 0.0001**	**2.289**	**umhos/cm**	**Yes**
Turbidity	**0.0361**	**0.3581**	**NTU**	**Yes**
Water Temperature	0.6504	-0.0253	^{o}C	No
Ammonia	0.2369	-0.003631	mg/L	No
Nitrates & Nitrites	**0.0072**	**0.01665**	**mg/L**	**Yes**
Total Kjeldahl Nitrogen	**0.0476**	**-0.007377**	**mg/L**	**Yes**
Total Phosphorus	0.4133	-0.001147	mg/L	No

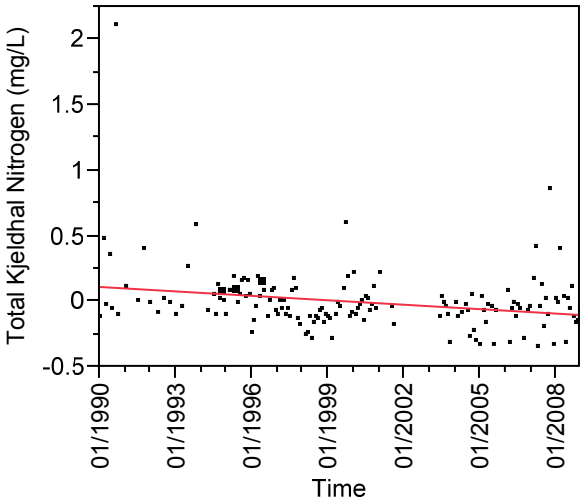
Statistically significant deteriorating trends were found for fecal coliform, specific conductance, turbidity, and nitrates. Increasing population and development in the region may be contributing to these rising indicators. Total Kjeldahl Nitrogen is slowly lessening over time however, which may indicate that increased nitrate concentrations are not yet resulting in more algae growth. Those parameters with significant trends are displayed in **Figure 7**.

Figure 7. Flow Adjusted Long Term Trends (1990-2008)









The x axis of these graphs show time, and the y axis shows a water quality parameter, as it varies from what was expected when the parameter was compared to flow. If the result was less than expected based on flow, then it is displayed in these graphs in the negative range. Likewise, if the result was more than expected based solely on flow, then it is displayed in the positive range. In this fashion effects based on flow are removed that would otherwise confound attempts to construct trends looking for other causes of change.

Geographic Assessment

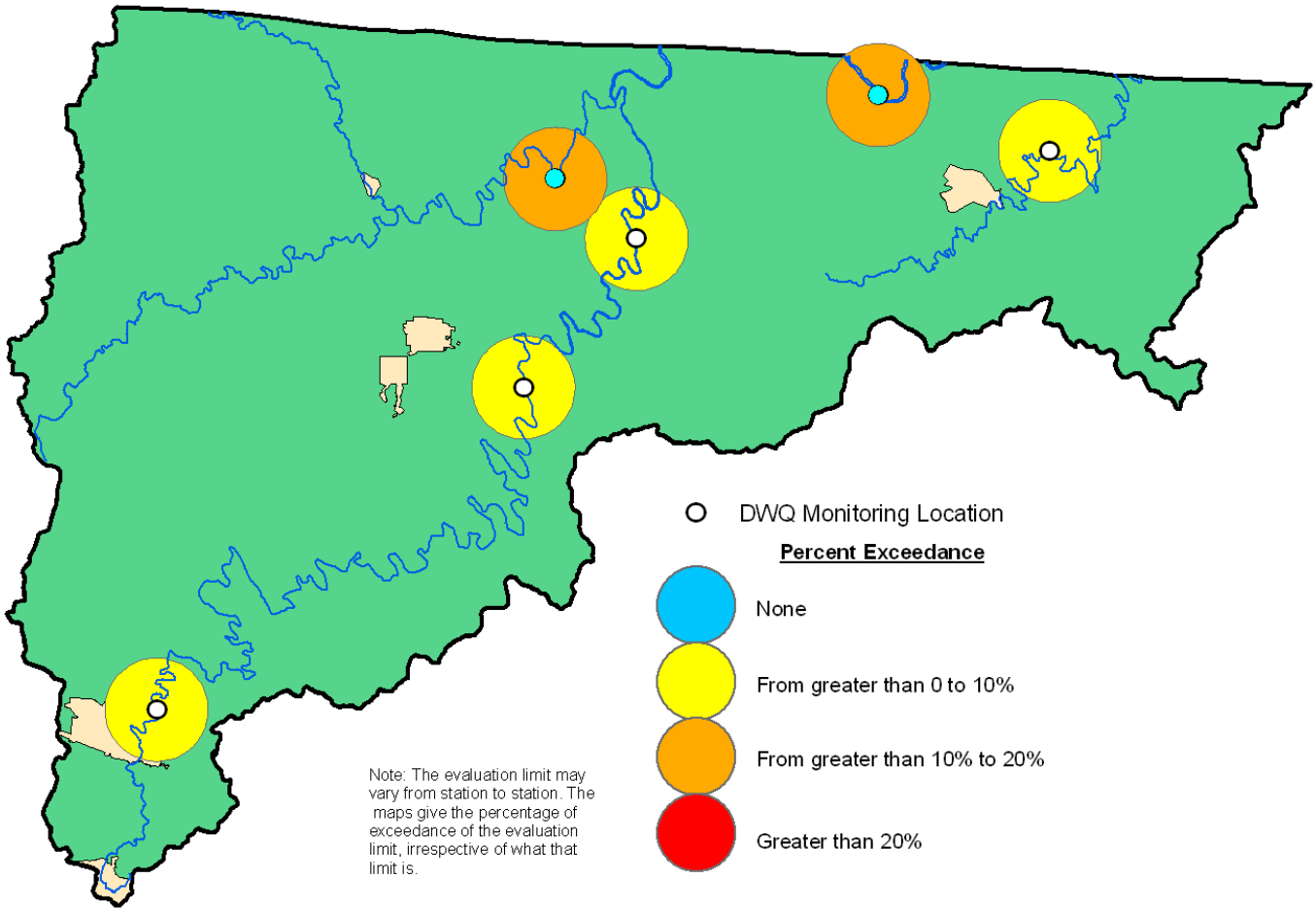


Figure 8. Fecal Coliform in the New River Basin

There are no stations with greater than 20% exceedances in the New River basin during the assessment period. However all stations did have at least one spike above the standard of 400 colonies per 100mL. Spikes often occur during rains events when fecal matter is washed into streams from urban, suburban, and agricultural areas. Rain events may also stir up fecal coliform already present in the sediment.

Significant Issues

No significant issues were identified in the New River basin. Information on specific parameters and specific stations can be found in **Appendix A** (station summary sheets) and **Appendix B** (box plots). Box plots were constructed for each of the following parameters: water temperature, dissolved oxygen, pH, specific conductance, turbidity, fecal coliform, ammonia, total kjeldahl nitrogen, total nitrates and nitrites, and total phosphorus.

Appendix A: Station Summary Sheets

Ambient Monitoring System Station Summaries
NCDENR, Division of Water Quality
Basinwide Assessment Report

Location: S FORK NEW RIV AT US 221 AND 421 AT PERKINSVILLE
Station #: K2100000 **Hydrologic Unit Code:** 05050001
Latitude: 36.22088 **Longitude:** -81.63978 **Stream class:** C +
Agency: NCAMBNT **NC stream index:** 10-1-(3.5)

Time period: 01/22/2004 to 12/15/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		7.7	8.2	8.6	9.8	12	13.1	13.7
	57	0	<5	0	0		7.7	8.2	8.6	9.8	12	13.1	13.7
pH (SU)	57	0	<6	0	0		6.7	6.9	7.2	7.5	7.8	7.9	8.4
	57	0	>9	0	0		6.7	6.9	7.2	7.5	7.8	7.9	8.4
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				98	111	126	156	180	220	310
Water Temperature (°C)	57	0	>29	0	0		1.8	3.1	6.6	14	19.2	20.7	25.7
Other													
TSS (mg/L)	19	12	N/A				2.5	2.5	2.5	4	6.2	6.2	12
Turbidity (NTU)	57	4	>50	1	1.8		1	1	1.4	2.3	3.6	6.5	150
Nutrients (mg/L)													
NH3 as N	57	39	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.08
NO2 + NO3 as N	57	0	N/A				0.24	1.18	1.35	1.7	2.2	3	3.9
TKN as N	57	20	N/A				0.2	0.2	0.2	0.21	0.28	0.35	0.89
Total Phosphorus	57	0	N/A				0.03	0.04	0.05	0.1	0.22	0.26	0.48
Metals (ug/L)													
Aluminum, total (Al)	14	2	N/A				50	50	61	83	122	190	210
Arsenic, total (As)	14	14	>10	0	0		5	5	5	5	6	10	10
Cadmium, total (Cd)	14	14	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	14	14	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	14	9	>7	0	0		2	2	2	2	2	4	4
Iron, total (Fe)	14	0	>1000	0	0		190	195	240	265	315	435	500
Lead, total (Pb)	14	14	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	14	14	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	14	5	>50	0	0		10	10	10	12	16	19	21

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
56	90	5	8.9	

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
%Conf : States the percent 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: S FORK NEW RIV AT NC 16 AND 88 NR JEFFERSON
Station #: K3250000 **Hydrologic Unit Code:** 05050001
Latitude: 36.39473 **Longitude:** -81.40750 **Stream class:** WS-IV HQW
Agency: NCAMBNT **NC stream index:** 10-1-(26)

Time period: 01/29/2004 to 12/16/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		7.6	8.3	8.8	10.1	11.6	12.9	14.1
	58	0	<5	0	0		7.6	8.3	8.8	10.1	11.6	12.9	14.1
pH (SU)	58	0	<6	0	0		6.6	6.9	7.4	7.6	8	8.5	9.4
	58	0	>9	2	3.4		6.6	6.9	7.4	7.6	8	8.5	9.4
Spec. conductance (umhos/cm at 25°C)	58	0	N/A				48	61	67	73	79	89	656
Water Temperature (°C)	58	0	>29	0	0		2	5.2	7.8	14.6	21.2	23.9	27.1
Other													
TSS (mg/L)	18	8	N/A				2.5	2.5	2.9	6	6.2	12.1	13
Turbidity (NTU)	58	2	>50	2	3.4		1	1.2	1.8	2.8	4.8	19.3	100
Nutrients (mg/L)													
NH3 as N	58	39	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.06
NO2 + NO3 as N	58	0	>10	0	0		0.15	0.38	0.52	0.66	0.76	0.85	1
TKN as N	58	28	N/A				0.2	0.2	0.2	0.2	0.27	0.36	1.7
Total Phosphorus	58	9	N/A				0.02	0.02	0.02	0.02	0.03	0.05	0.28
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				110	114	130	180	210	562	730
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	8	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	12	>7	0	0		2	2	2	2	2	2	2
Iron, total (Fe)	13	0	>1000	1	7.7		200	204	235	280	380	852	1100
Lead, total (Pb)	13	13	>25	0	0		10	10	10	10	10	10	10
Manganese, total (Mn)	12	1	>200	0	0		10	11	16	19	27	37	40
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	13	>25	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	13	11	>50	0	0		10	10	10	10	10	11	11

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
56	20	3	5.4	

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
%Conf : States the percent 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: S FORK NEW RIV AT US 221 NR SCOTTVILLE
Station #: K4500000 **Hydrologic Unit Code:** 05050001
Latitude: 36.47378 **Longitude:** -81.33649 **Stream class:** B ORW
Agency: NCAMBNT **NC stream index:** 10-1-(33.5)

Time period: 01/29/2004 to 12/16/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.6	8.1	8.5	9.8	11.5	12.7	14.2
	58	0	<5	0	0		5.6	8.1	8.5	9.8	11.5	12.7	14.2
pH (SU)	58	0	<6	0	0		6.6	6.8	7.2	7.5	7.8	8.5	9
	58	0	>9	0	0		6.6	6.8	7.2	7.5	7.8	8.5	9
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				35	57	66	73	79	82	148
Water Temperature (°C)	58	0	>29	0	0		1	4	7.3	14.4	21.5	25.4	27
Other													
TSS (mg/L)	19	8	N/A				2.5	2.5	5	6.2	14	48	354
Turbidity (NTU)	58	3	>50	3	5.2		1	1.2	2	2.8	6.5	23.3	120
Nutrients (mg/L)													
NH3 as N	58	43	N/A				0.02	0.02	0.02	0.02	0.02	0.03	0.06
NO2 + NO3 as N	58	0	N/A				0.08	0.31	0.46	0.66	0.74	0.86	0.95
TKN as N	58	31	N/A				0.2	0.2	0.2	0.2	0.27	0.35	1.4
Total Phosphorus	58	11	N/A				0.02	0.02	0.02	0.02	0.03	0.07	0.66
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				64	74	102	200	560	11480	17000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	7	>7	1	7.7		2	2	2	2	3	16	24
Iron, total (Fe)	13	0	>1000	3	23.1	96.6	280	296	355	470	1025	13280	20000
Lead, total (Pb)	13	12	>25	0	0		10	10	10	10	10	13	15
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	12	>88	0	0		10	10	10	10	10	11	12
Zinc, total (Zn)	13	7	>50	1	7.7		10	10	10	10	13	51	71

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
55	19	2	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
%Conf : States the percent 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: N FORK NEW RIV AT SR 1573 AT CRUMPLER
Station #: K7500000 **Hydrologic Unit Code:** 05050001
Latitude: 36.50403 **Longitude:** -81.39004 **Stream class:** C +
Agency: NCAMBNT **NC stream index:** 10-2-(12)

Time period: 01/29/2004 to 12/16/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	57	0	<4	0	0		7	8.2	8.9	10.1	11.9	13.2	14.2
	57	0	<5	0	0		7	8.2	8.9	10.1	11.9	13.2	14.2
pH (SU)	57	0	<6	0	0		6.6	7	7.2	7.5	7.9	8.2	8.6
	57	0	>9	0	0		6.6	7	7.2	7.5	7.9	8.2	8.6
Spec. conductance (umhos/cm at 25°C)	56	0	N/A				52	58	61	67	73	80	160
Water Temperature (°C)	57	0	>29	0	0		0	4.4	6.6	13.9	20.2	24	25.6
Other													
TSS (mg/L)	18	3	N/A				2.5	5.6	6.2	11.5	20	262.6	268
Turbidity (NTU)	57	2	>50	5	8.8		1	1.5	2.7	6.1	13	33.2	330
Metals (ug/L)													
Aluminum, total (Al)	12	0	N/A				82	90	222	330	548	604	610
Arsenic, total (As)	12	12	>10	0	0		5	5	5	5	9	10	10
Cadmium, total (Cd)	12	12	>2	0	0		1	1	2	2	2	2	2
Chromium, total (Cr)	12	12	>50	0	0		10	10	25	25	25	25	25
Copper, total (Cu)	12	11	>7	0	0		2	2	2	2	2	3	3
Iron, total (Fe)	12	0	>1000	1	8.3		200	218	380	575	922	1070	1100
Lead, total (Pb)	12	12	>25	0	0		10	10	10	10	10	10	10
Mercury, total (Hg)	10	10	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	12	12	>88	0	0		10	10	10	10	10	10	10
Zinc, total (Zn)	12	10	>50	0	0		10	10	10	10	10	27	33

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
55	82	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
%Conf : States the percent 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: NEW RIV AT SR 1345 AT AMELIA
Station #: K7900000 **Hydrologic Unit Code:** 05050001
Latitude: 36.55190 **Longitude:** -81.18172 **Stream class:** C ORW
Agency: NCAMBNT **NC stream index:** 10

Time period: 01/29/2004 to 12/16/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.2	7.9	8.5	9.6	11.6	13.1	14.5
	58	0	<5	0	0		5.2	7.9	8.5	9.6	11.6	13.1	14.5
pH (SU)	58	0	<6	0	0		6.5	7	7.2	7.6	8	8.4	9.1
	58	0	>9	1	1.7		6.5	7	7.2	7.6	8	8.4	9.1
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				42	55	62	67	74	78	91
Water Temperature (°C)	58	0	>29	0	0		0.7	3.8	7.4	14.7	22	26.4	27.7
Other													
TSS (mg/L)	19	7	N/A				2.5	2.5	5	6.2	18	171	280
Turbidity (NTU)	58	1	>50	5	8.6		1	1.4	2.1	3.9	11.8	61	450
Nutrients (mg/L)													
NH3 as N	58	43	N/A				0.02	0.02	0.02	0.02	0.02	0.04	0.1
NO2 + NO3 as N	58	1	N/A				0.05	0.25	0.38	0.58	0.77	0.86	0.9
TKN as N	58	24	N/A				0.2	0.2	0.2	0.2	0.27	0.52	2.8
Total Phosphorus	58	9	N/A				0.02	0.02	0.02	0.03	0.04	0.13	0.96
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				60	64	108	320	4075	15600	16000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	12	>50	0	0		17	20	25	25	25	25	25
Copper, total (Cu)	13	9	>7	3	23.1	96.6	2	2	2	2	9	20	23
Iron, total (Fe)	13	0	>1000	5	38.5	99.9	220	228	250	520	6050	19600	20000
Lead, total (Pb)	13	12	>25	0	0		10	10	10	10	10	12	13
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	11	>88	0	0		10	10	10	10	10	12	13
Zinc, total (Zn)	13	8	>50	2	15.4	86.6	10	10	10	10	26	69	73

Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
54	36	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
%Conf : States the percent 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 1426 NR EDWARDS CROSSROADS
Station #: K9600000 **Hydrologic Unit Code:** 05050001
Latitude: 36.52465 **Longitude:** -81.06939 **Stream class:** C
Agency: NCAMBNT **NC stream index:** 10-9-(6)

Time period: 01/29/2004 to 12/16/2008

	# results	# ND	EL	Results not meeting EL #	%	%Conf	Min	Percentiles 10th	25th	50th	75th	90th	Max
Field													
D.O. (mg/L)	58	0	<4	0	0		5.9	7.9	8.8	10	11.7	12.8	14.5
	58	0	<5	0	0		5.9	7.9	8.8	10	11.7	12.8	14.5
pH (SU)	58	0	<6	0	0		6.4	7.1	7.3	7.6	7.9	8.4	9.4
	58	0	>9	1	1.7		6.4	7.1	7.3	7.6	7.9	8.4	9.4
Spec. conductance (umhos/cm at 25°C)	57	0	N/A				26	42	47	51	56	61	86
Water Temperature (°C)	58	0	>29	0	0		0.6	4.4	7.3	13.4	20.2	23.7	26.4
Other													
TSS (mg/L)	19	7	N/A				2.5	2.5	2.8	5.5	6.2	53	178
Turbidity (NTU)	58	7	>50	2	3.4		1	1	1.5	2.5	5.3	9.3	110
Metals (ug/L)													
Aluminum, total (Al)	13	0	N/A				51	52	69	120	240	10956	18000
Arsenic, total (As)	13	13	>10	0	0		5	5	5	5	5	10	10
Cadmium, total (Cd)	13	13	>2	0	0		1	1.4	2	2	2	2	2
Chromium, total (Cr)	13	13	>50	0	0		10	16	25	25	25	25	25
Copper, total (Cu)	13	12	>7	1	7.7		2	2	2	2	2	11	17
Iron, total (Fe)	13	0	>1000	1	7.7		89	101	185	200	345	11616	19000
Lead, total (Pb)	13	12	>25	0	0		10	10	10	10	10	13	15
Mercury, total (Hg)	12	12	>0.012	0	0		0.2	0.2	0.2	0.2	0.2	0.2	0.2
Nickel, total (Ni)	13	12	>88	0	0		10	10	10	10	10	19	25
Zinc, total (Zn)	13	12	>50	1	7.7		10	10	10	10	10	52	80

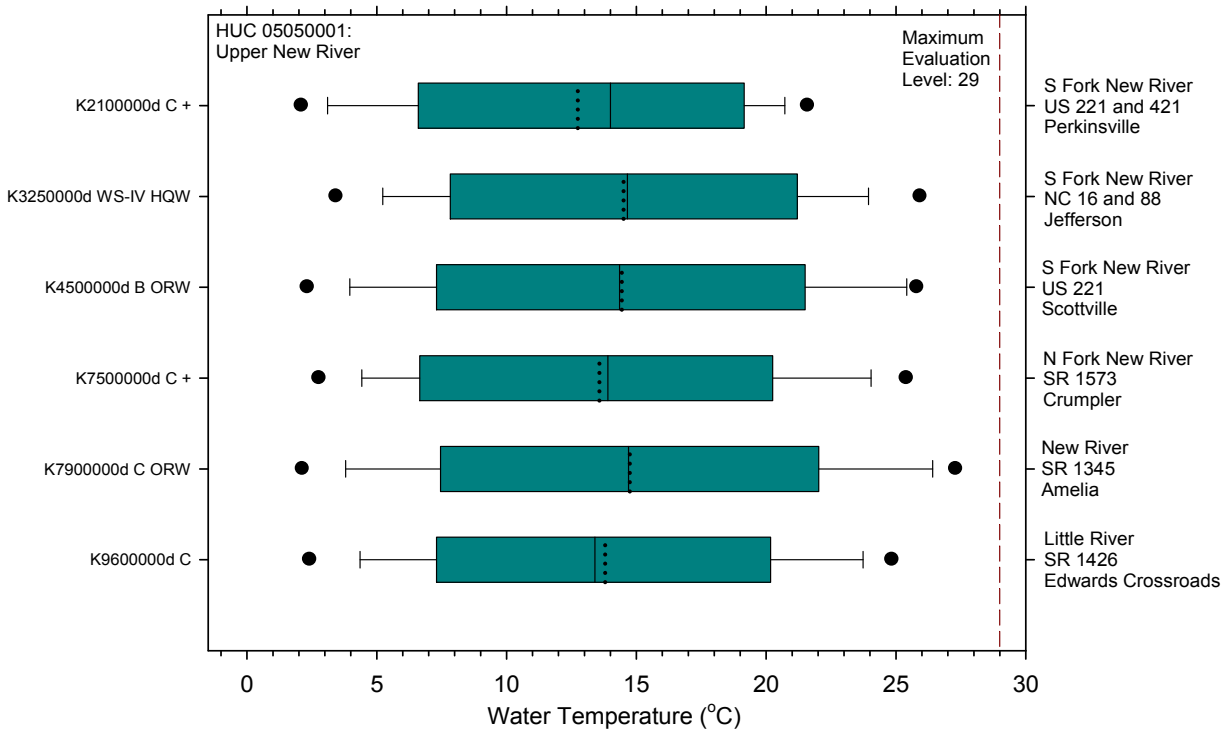
Fecal Coliform Screening(#/100mL)

# results:	Geomean	# > 400:	% > 400:	%Conf:
55	97	5	9.1	

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
%Conf : States the percent 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

Appendix B: Station Box & Whisker Plots

Figure 9. Box Plots of Water Temperature and Dissolved Oxygen in the New River Basin



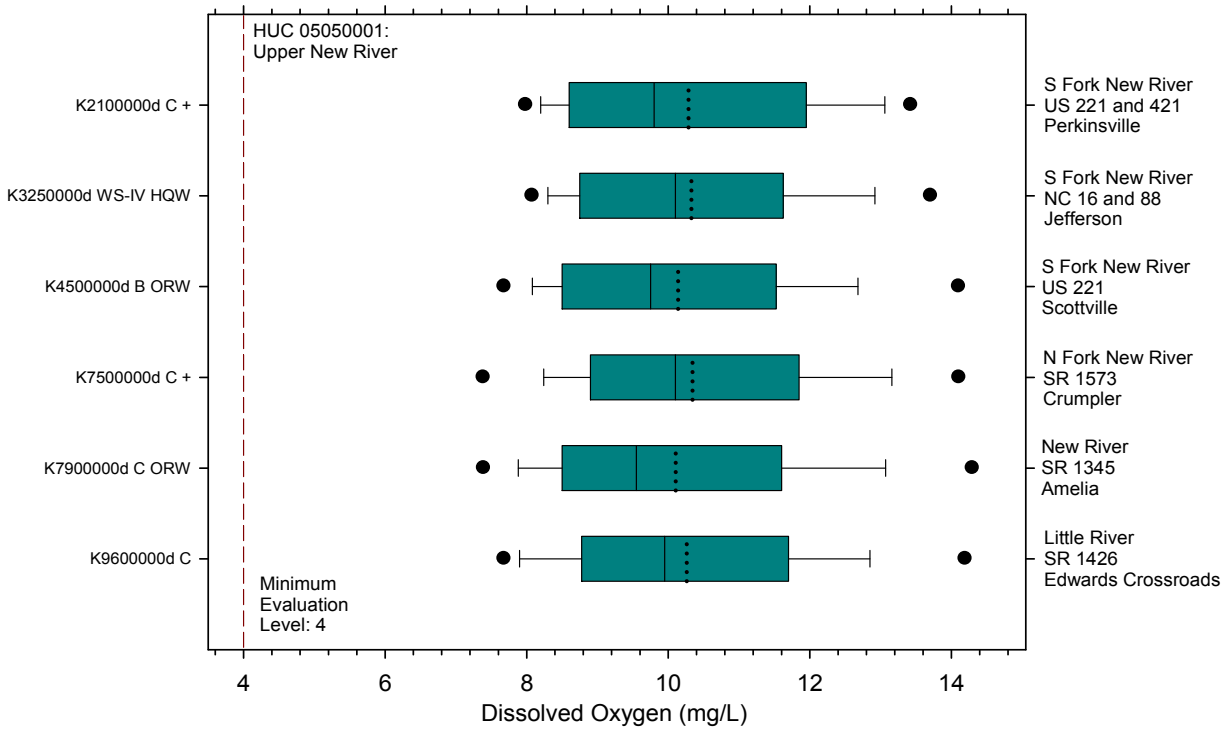
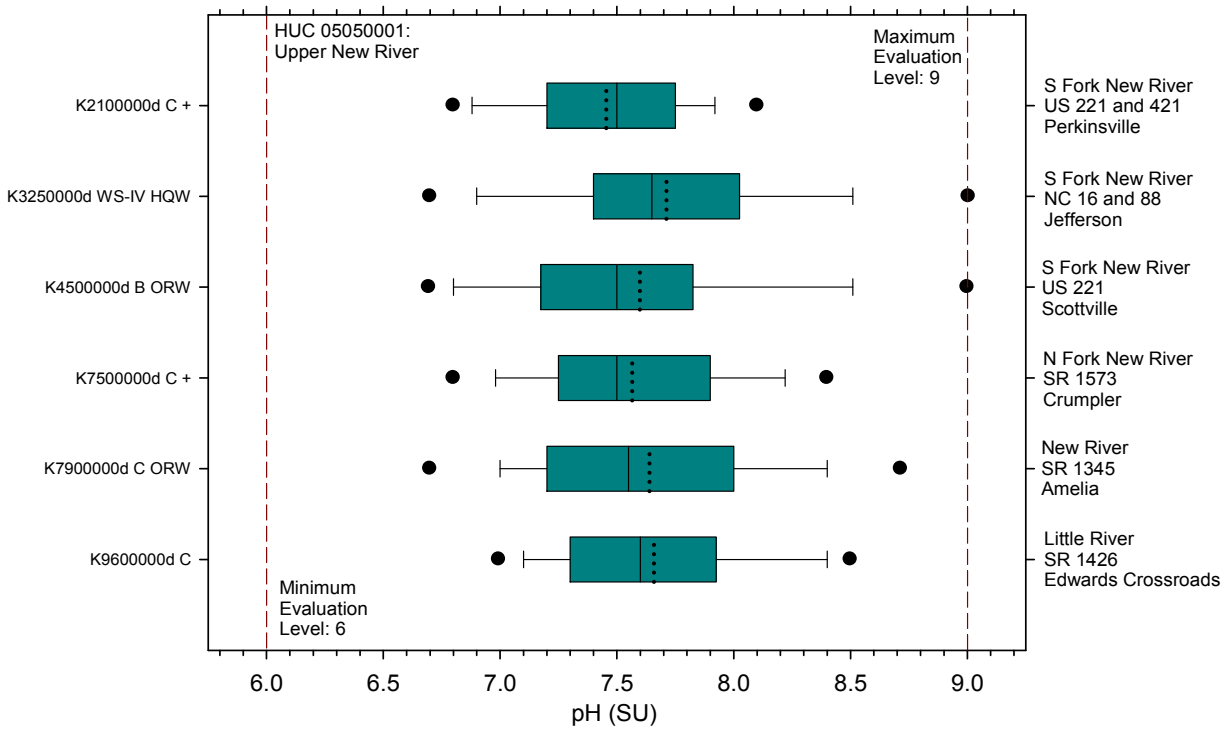


Figure 10. Box Plots of pH and Specific Conductance in the New River Basin



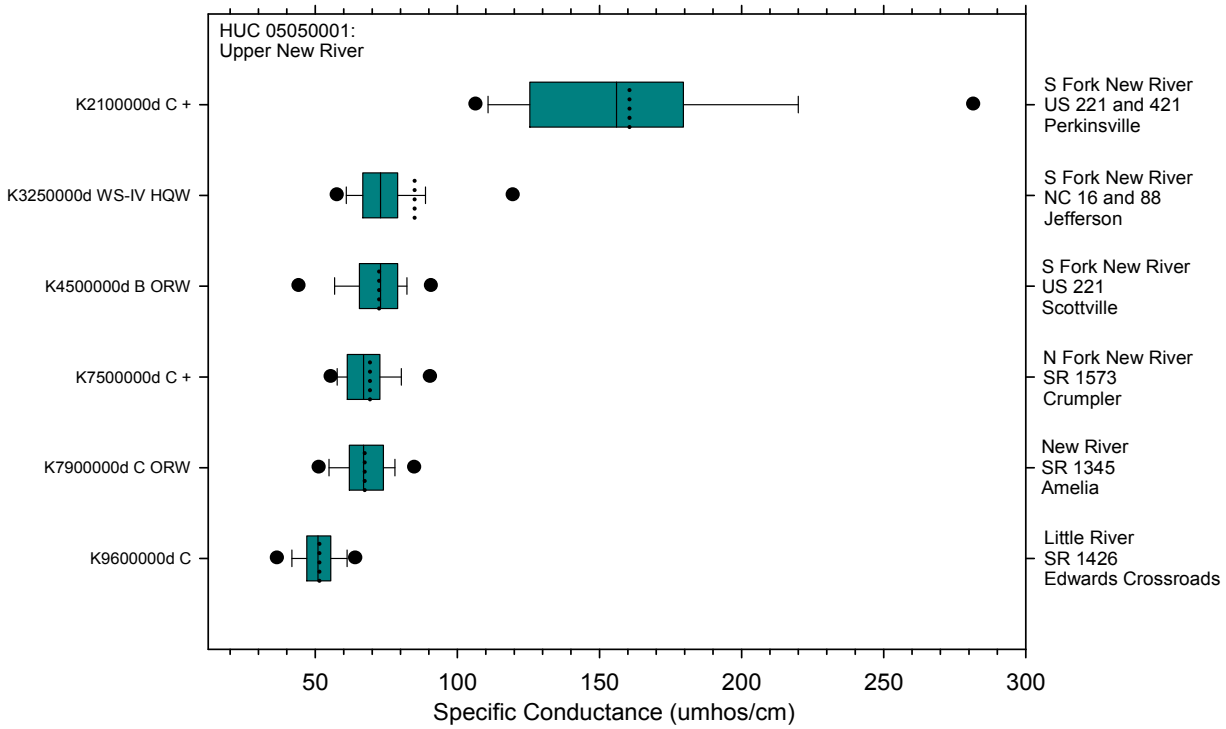
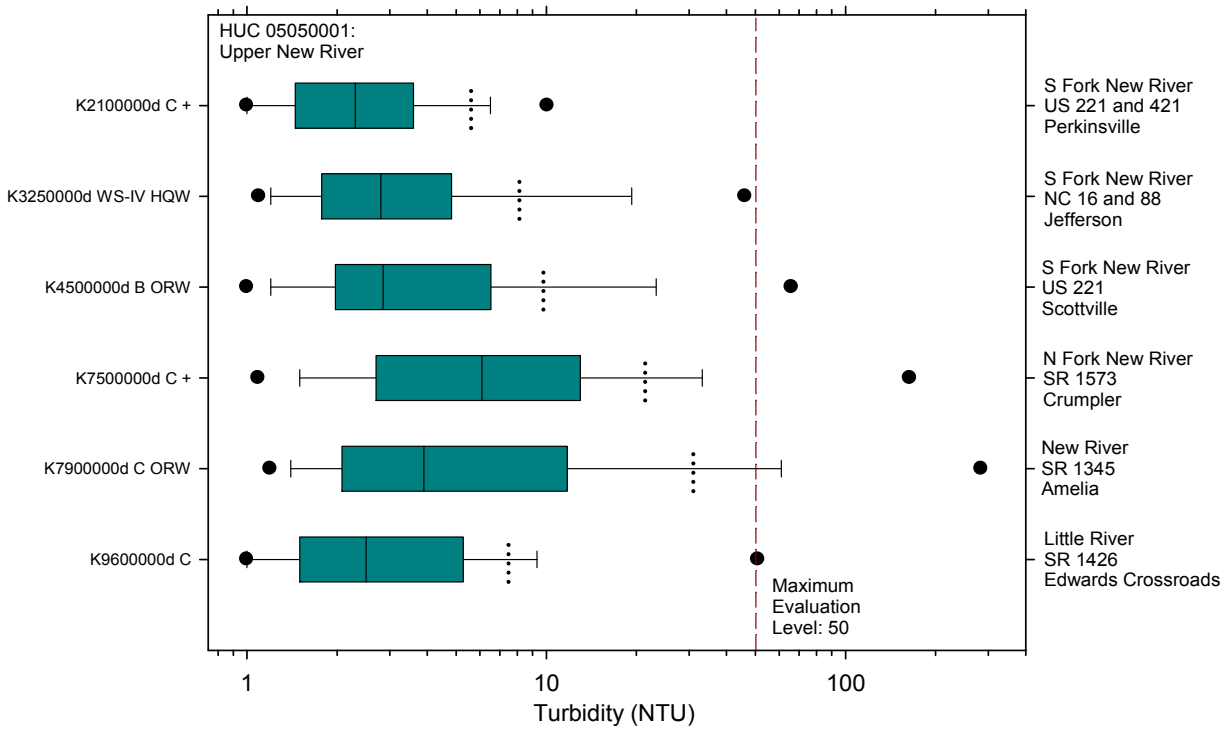


Figure 11. Box Plots of Turbidity and Fecal Coliform in the New River Basin



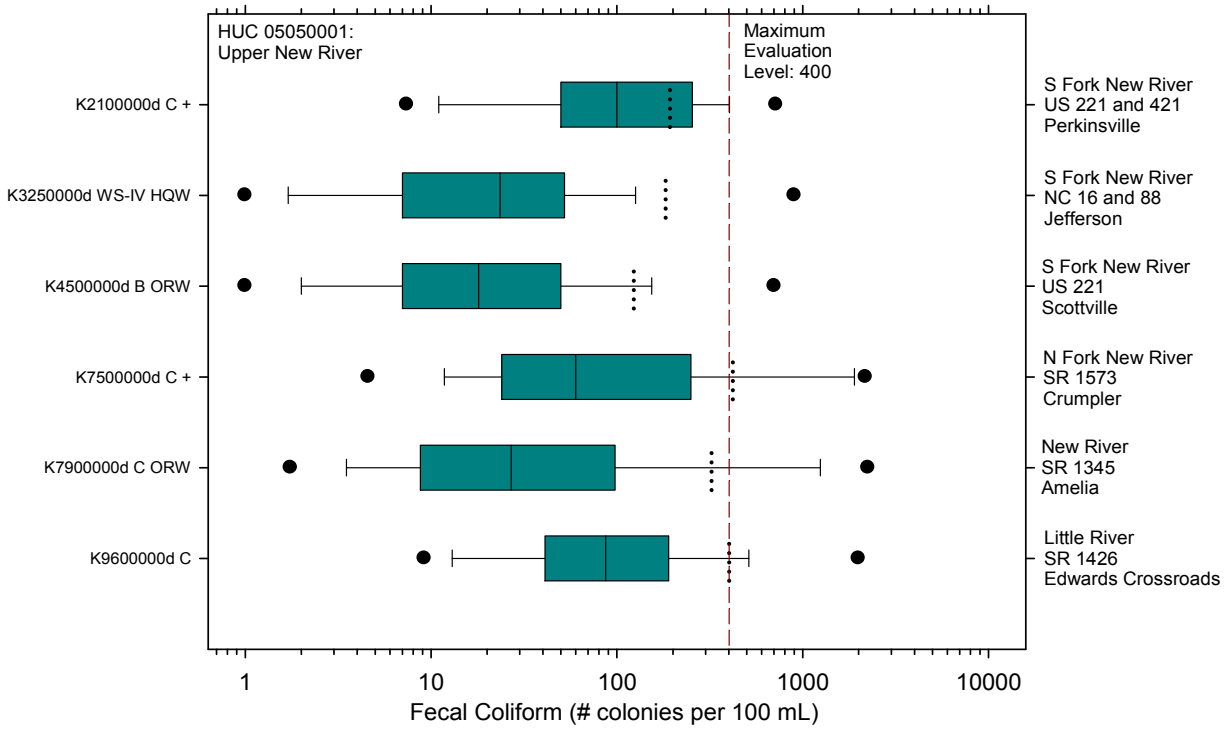
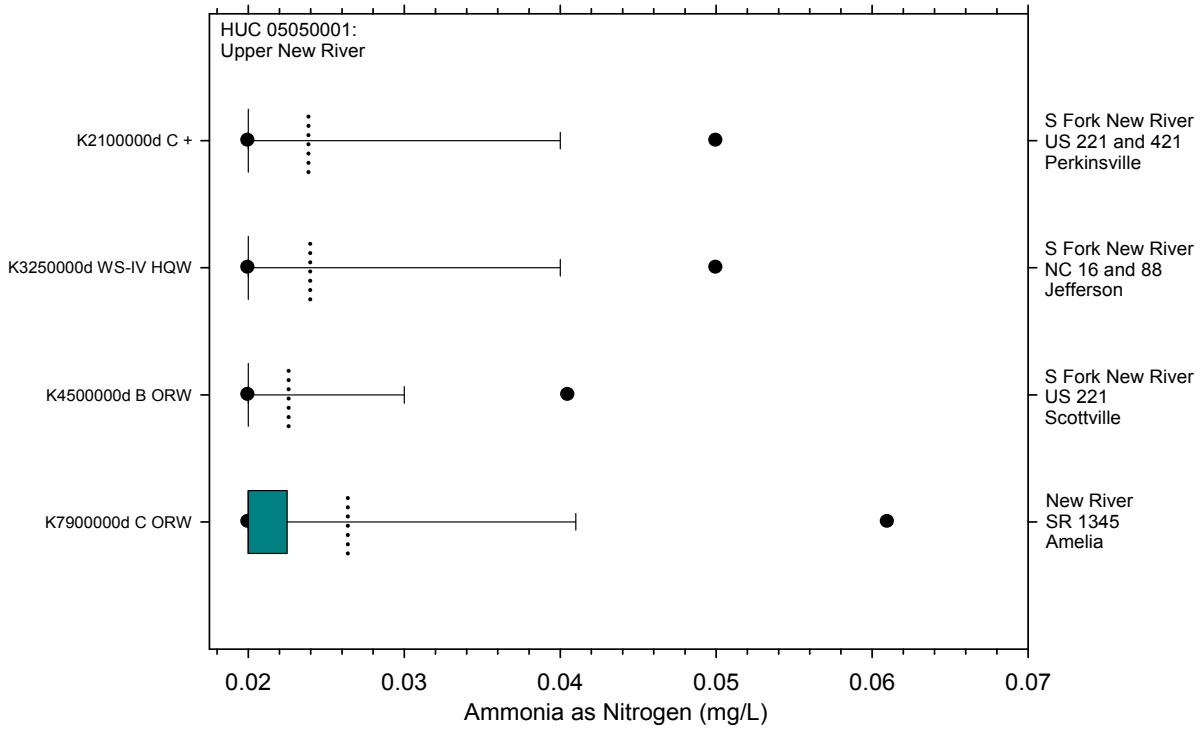


Figure 12. Box Plots of Ammonia and Total Kjeldahl Nitrogen in the New River Basin



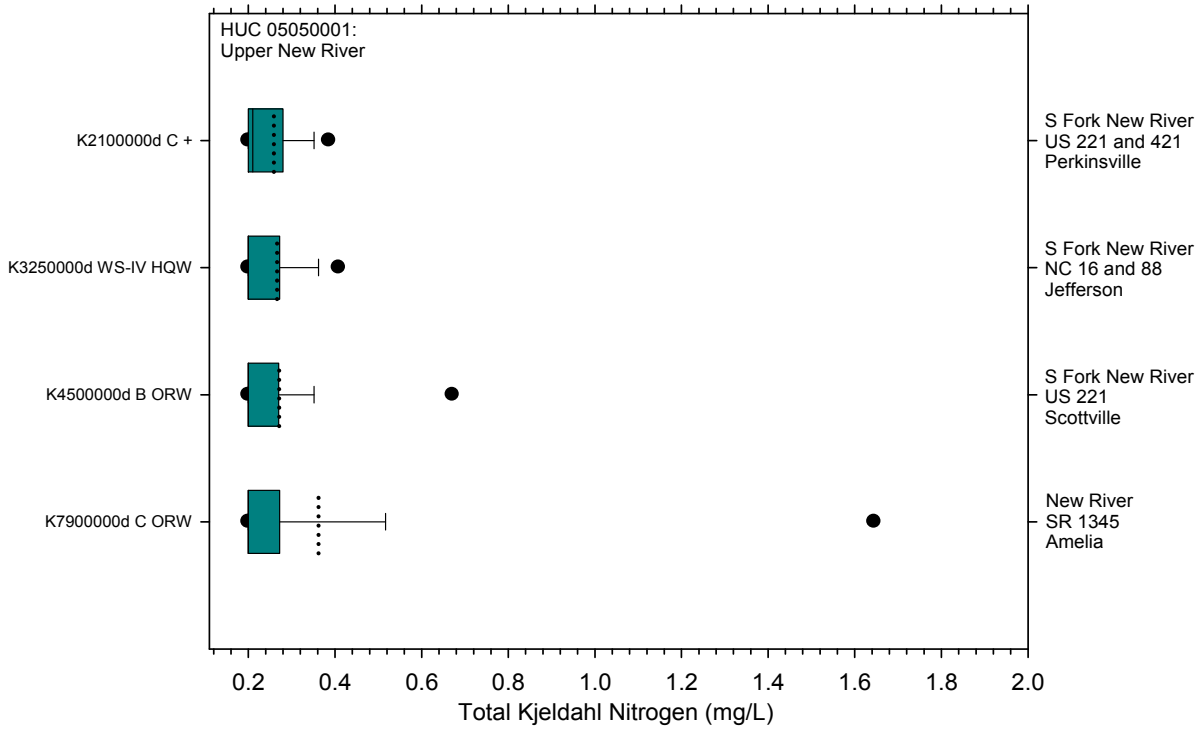
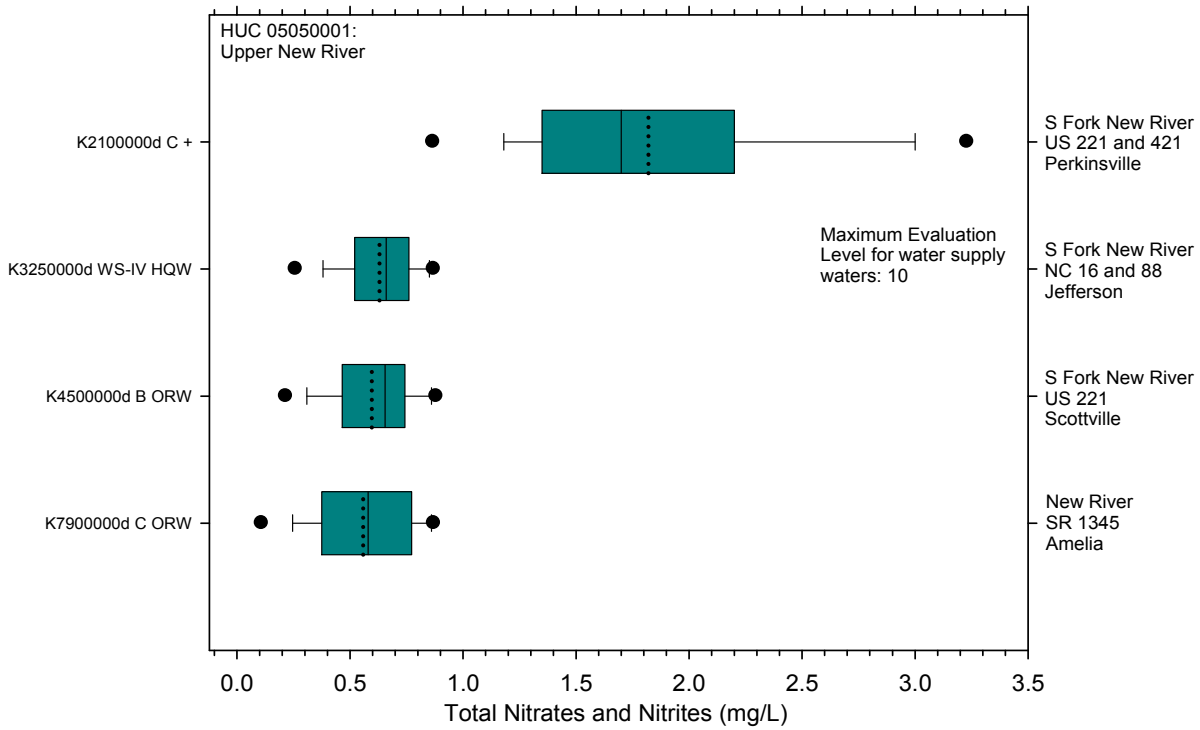
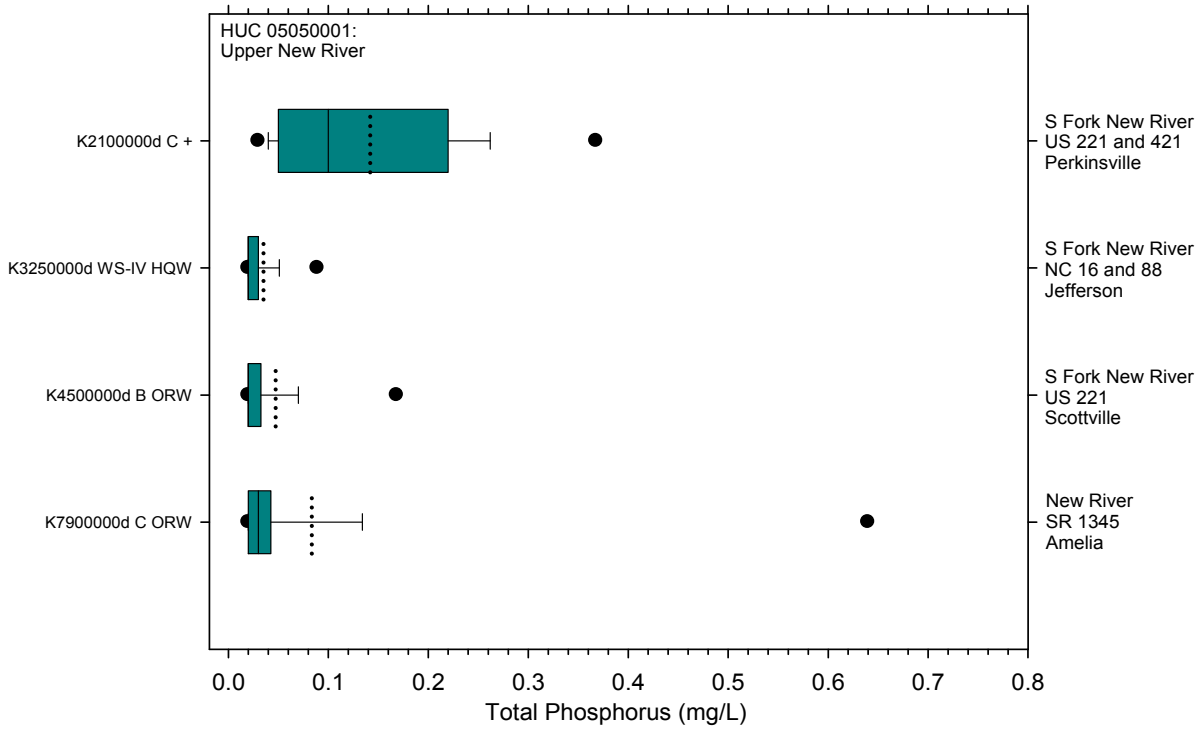


Figure 13. Box Plots of Nitrates/Nitrites and Total Phosphorus in the New River Basin





Appendix C: References

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