

# Section B - Chapter 1

## Neuse River Subbasin 03-04-01

### Eno River, Little River, Flat River and Falls Lake

## 1.1 Subbasin Overview

***Subbasin 03-04-01 at a Glance***

**Land and Water Area**  
 Total area: 772 mi<sup>2</sup>  
 Land area: 740 mi<sup>2</sup>  
 Water area: 32 mi<sup>2</sup>

**Population**  
 2000 Est. Pop.: 208,310 people  
 Pop. Density: 270 persons/mi<sup>2</sup>

**Land Cover (percent)**  
 Forest/Wetland: 72.6  
 Water: 2.7  
 Urban: 7.3  
 Cultivated Crop: 3.4  
 Pasture/  
 Managed Herbaceous: 13.7

**Counties**  
 Durham, Granville, Orange, Person  
 and Wake

**Municipalities**  
 Hillsborough, Butner, Creedmoor,  
 Stem, Bahama, Durham, Roxboro  
 and Raleigh

Population growth in this subbasin is concentrated around Durham, Hillsborough and North Raleigh. Population density is highest (320-1,600 persons/mi<sup>2</sup>) in the watersheds in Durham and west and south into RTP. The northern areas of the subbasin are mostly in agricultural land use. Land cover is mostly forest and farmland except along the I-40/I-85 corridor. New development can be seen around Falls Lake and north of Durham.

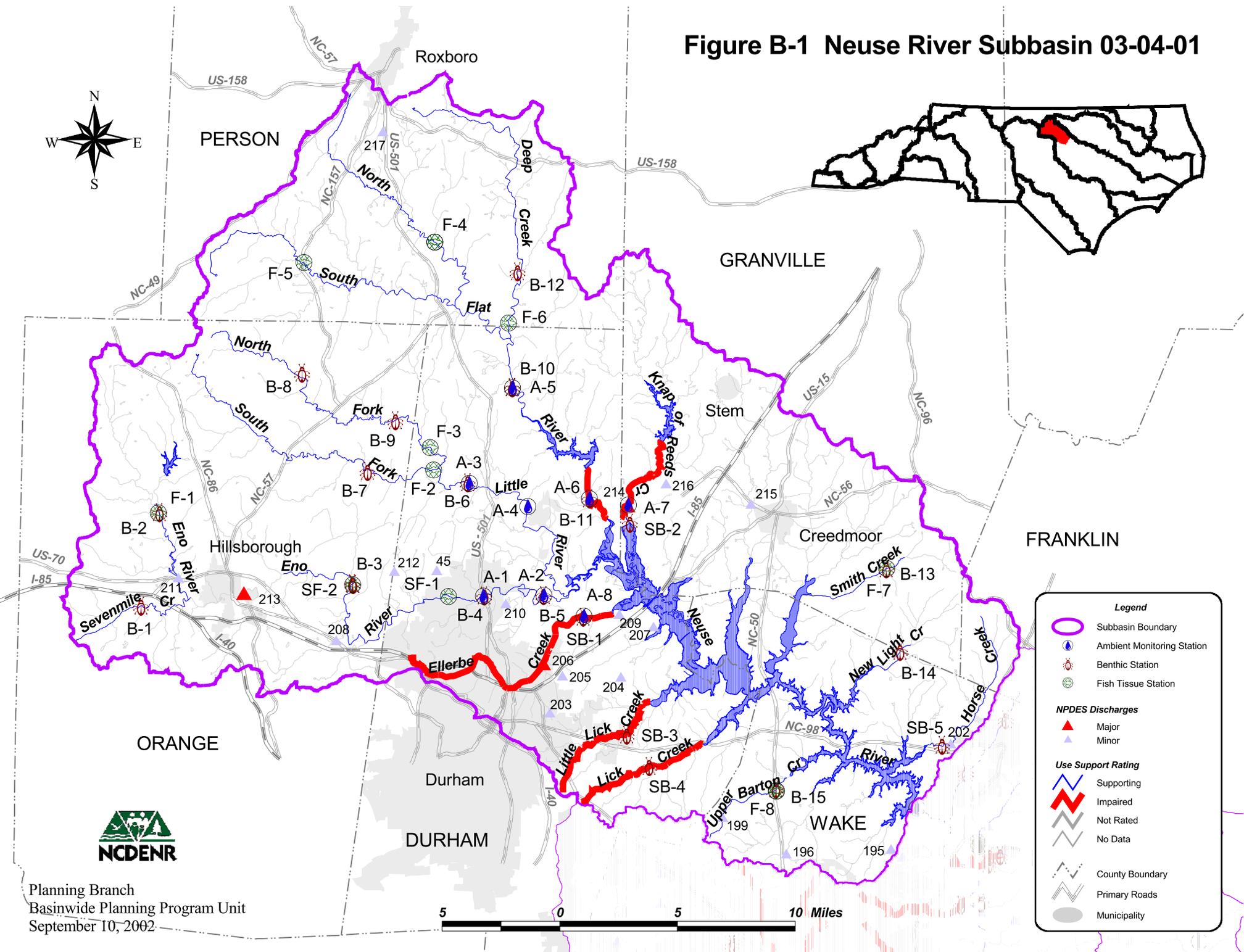
There are 47,428 acres of managed public lands in this subbasin, mostly associated with Eno River State Park and the Falls of the Neuse Game Lands.

There are eight NPDES wastewater discharge permits in this subbasin with a total permitted flow of just over 26 MGD (Figure B-1). The largest are Hillsborough WWTP (3 MGD, map #213), Butner WWTP (3.5 MGD, map #216) and Durham North WWTP (20 MGD, map #206). There are also three individual NPDES stormwater permits in the subbasin. Refer to Appendix I for identification and more information on NPDES permit holders. Durham has a Phase I stormwater permit, and Durham and Wake counties will be required to develop stormwater programs under Phase II (page 76). Durham, Orange and Wake counties have also submitted model stormwater ordinances as required by the Neuse NSW

strategy stormwater rules (page 64). Issues related to compliance with NPDES permit conditions are discussed below in Part 1.3 or Part 1.4 for impaired waters and in Part 1.5 for other waters. There are also 17 registered animal operations in this subbasin.

There were 15 benthic macroinvertebrate community samples and eight fish community samples (Figure B-1 and Table B-1) collected in 2000 as part of basinwide monitoring. Eight sites improved, seven sites remained the same, and three sites had lower bioclassifications. Five sites were monitored for the first time. There were also seven special study samples collected in the subbasin during the assessment period. Data were collected from eight ambient monitoring stations as well. Refer to *2001 Neuse River Basinwide Assessment Report* at <http://www.esb.enr.state.nc.us/bar.html> and Section A, Chapter 3 for more information on monitoring.

Figure B-1 Neuse River Subbasin 03-04-01



**Legend**

- Subbasin Boundary
- Ambient Monitoring Station
- Benthic Station
- Fish Tissue Station
- NPDES Discharges**
- Major
- Minor
- Use Support Rating**
- Supporting
- Impaired
- Not Rated
- No Data
- County Boundary
- Primary Roads
- Municipality



Table B-1 DWQ Monitoring Locations in Subbasin 03-04-01

<b>Benthic Macroinvertebrate Community Monitoring Sites</b>					
<b>Map #<sup>1</sup></b>	<b>Waterbody</b>	<b>County</b>	<b>Location</b>	<b>1995</b>	<b>2000</b>
B-1	Sevenmile Cr <sup>2</sup>	Orange	SR 1120	Good	Good-Fair
B-2	Eno R <sup>2</sup>	Orange	SR 1336	Good-Fair	Good
B-3	Eno R <sup>2</sup>	Orange	SR 1569	Excellent	Excellent
B-4	Eno R <sup>2</sup>	Durham	US 15/501	Good	Excellent
B-5	Eno R <sup>2</sup>	Durham	SR 1004	Good	Good
B-6	Little R <sup>2</sup>	Durham	SR 1461	Good	Excellent
B-7	S Fk Little R	Orange	SR 1538	Good-Fair	Good
B-8	N Fk Little R	Orange	SR 1519	Fair	Good-Fair
B-9	N Fk Little R	Orange	SR 1538	Good	Good-Fair
B-10	Flat R <sup>2</sup>	Durham	S 1614	Excellent	Good
B-11	Flat R <sup>2,3</sup>	Durham	SR 1004	Fair	Fair
B-12	Deep Cr <sup>2</sup>	Person	SR 1715	Good	Good
B-13	Smith Cr <sup>2</sup>	Granville	SR 1710	Good-Fair	Good
B-14	New Light Cr	Wake	SR 1912	Good-Fair	Good
B-15	Upper Barton Cr <sup>2</sup>	Wake	NC 50	Good-Fair	Good-Fair
SB-1	Ellerbe Cr	Durham	SR 1636	Poor	Fair
SB-2	Knap of Reeds Cr	Durham	be WWTP	Fair	Fair
SB-3	L. Lick Cr	Durham	SR 1814	Poor	Poor
SB-4	Lick Cr	Durham	SR 1905	Fair	Fair
SB-5	Horse Cr	Wake	SR 1923	Fair	Fair
<b>Fish Community Monitoring Sites</b>					
<b>Map #<sup>1</sup></b>	<b>Waterbody</b>	<b>County</b>	<b>Location</b>	<b>1995</b>	<b>2000</b>
F-1	Eno R	Orange	SR 1336	---	Excellent
F-2	S Fk Little R	Durham	SR 1461	---	Excellent
F-3	N Fk Little R	Durham	SR 1461	---	Good
F-4	N Flat R	Person	SR 1715	---	Excellent
F-5	S Flat R	Person	NC 157	---	Good
F-6	Deep Cr <sup>2</sup>	Person	SR 1734	Excellent	Excellent
F-7	Smith Cr	Granville	SR 1710	Good	Good-Fair
F-8	Upper Barton Cr	Wake	NC 50	Good	Good
SF-1	Eno R	Durham	SR 1003	---	Excellent
SF-2	Eno R	Orange	SR 1519	---	Excellent
<b>Ambient Monitoring Sites</b>					
<b>Map #<sup>1</sup></b>	<b>Waterbody</b>	<b>County</b>	<b>Location</b>	<b>Station #</b>	<b>Noted Parameters<sup>3</sup></b>
A-1	Eno River	Durham	Near Durham	J0770000	none
A-2	Eno River	Durham	SR 1004	J0810000	none
A-3	Little River	Durham	SR 1461	J0820000	none
A-4	Little River	Durham	SR 1628	J0840000	none
A-5	Flat River	Durham	Near Quail Roost	J1070000	none
A-6	Flat River	Durham	SR 1004	J1100000	DO
A-7	Knap of Reeds Creek	Granville	Near Butner	J1210000	none
A-8	Ellerbe Creek	Durham	SR 1636	J1330000	none

<sup>1</sup> B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site; and SF = fish community special study site.

<sup>2</sup> Historical data available at this site. Refer to Appendix II.

<sup>3</sup> Parameters are noted if in excess of state standards in greater than 10 percent of all samples.

Use support ratings are summarized in Part 1.2 below. Recommendations, current status and future recommendations for waters that were impaired in 1998 are discussed in Part 1.3 below. Current status and future recommendations for newly impaired waters are discussed in Part 1.4 below. Supporting waters with noted water quality impacts are discussed in Part 1.5 below. Water quality issues related to the entire subbasin are discussed in Part 1.6. Unless otherwise noted, all discussions are for the aquatic life and secondary recreation use support category. Refer to Appendix III for a complete list of monitored waters by use support category and for more information on supporting monitored waters.

## 1.2 Use Support Summary

Use support ratings (page 54) in subbasin 03-04-01 were assigned for aquatic life and secondary recreation, fish consumption, primary recreation and water supply. All waters in the subbasin are considered impaired on an evaluated basis because of fish consumption advisories (page 93). All water supply waters are supporting on an evaluated basis based on reports from DEH regional water treatment plant consultants.

There were 188 stream miles (40 percent) and 13,346 freshwater acres (93 percent) monitored during this assessment period in the aquatic life and secondary recreation use support category. Approximately 33 (17 percent) of the monitored stream miles are impaired. The main cause of impairment in the subbasin was habitat degradation (page 89). Refer to Table B-2 for a summary of use support ratings by use support category for waters in the subbasin. Use support ratings for waters that were monitored and impaired in at least one use support category or were impaired in 1998 are presented in Table B-3.

Table B-2 Summary of Use Support Ratings by Use Support Category in Subbasin 03-04-01

Use Support Rating	Basis	Aquatic Life and Secondary Recreation	Fish Consumption	Primary Recreation	Water Supply
Supporting	Monitored	150.0 mi 13,465.9 ac	0	16.2 mi 9,530.3 ac	0
	All Waters	321.4 mi 14,320.4 ac	0	16.2 mi 9,530.3 ac	435.4 mi 14,361.6 ac
Impaired	Monitored	<b>32.3 mi</b>	0	0	0
	All Waters	32.3 mi	467.1 mi 14,361.6 ac	0	0
Not Rated	Monitored	6.0 mi	0	0	0
No Data	N/A	107.3 mi 41.2 ac	0	4.9 mi 974.4 ac	0
Total	Monitored	188.3 mi 13,345.9 ac	0	16.2 mi 9,530.3 ac	0
	All Waters	467.1 mi 14,361.6 ac	467.1 mi 14,361.6 ac	21.1 mi 10,504.7 ac	435.4 mi 14,361.6 ac
	Percent Monitored	40% mi 93% ac	0%	77% mi 91% ac	0%

Note: All waters include monitored, evaluated and waters that were not assessed.

Table B-3 Previously or Currently Impaired Waters in Subbasin 03-04-01

Name	1998 Status	2002 Status	2002 Use Support Category	Miles
Ellerbe Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	11.0
Flat River	Impaired	Impaired	Aquatic Life/Secondary Recreation	1.1
Knap of Reeds Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	5.2
Lick Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	7.2
Little Lick Creek	Impaired	Impaired	Aquatic Life/Secondary Recreation	7.8
New Light Creek	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
North Fork Little River	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
South Flat River	Impaired	Supporting	Aquatic Life/Secondary Recreation	N/A
			<b>Total 2002 Impaired Miles</b>	<b>32.3</b>

### 1.3 Status and Recommendations of Previously Impaired Waters

#### 1.3.1 Ellerbe Creek

##### 1998 Recommendations

Ellerbe Creek was not supporting from the source to Falls Lake. It was recommended that a more detailed analysis of the watershed be done to evaluate restoration potential.

##### Current Status

Ellerbe Creek (11 miles) is currently impaired from the source to Falls Lake because of a Fair bioclassification at site SB-1. The ambient monitoring station (A-8) also detected elevated lead and zinc. Dissolved oxygen was occasionally below the water quality standard of 5 mg/l, and the geometric mean of fecal coliform bacteria was 198 colonies/100ml water. This creek is heavily impacted by urban runoff from Durham.

##### 2002 Recommendations

DWQ will establish a biological monitoring station above the WWTP in order to monitor changes in the upper Ellerbe Creek watershed. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Ellerbe Creek. DWQ will continue to support the City of Durham stormwater programs.

The NCWRP has initiated a Local Watershed Plan (page 213) in the Ellerbe Creek watershed. The LWP seeks to identify all sources of nonpoint source pollution and, through a stakeholder process, will develop recommendations to improve water quality. Ellerbe Creek is also a NCWRP targeted local watershed (page 203).

The impaired biological community in Ellerbe Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

### Current Water Quality Initiatives

The Ellerbe Creek Watershed Association (page 215) and Friends of South Ellerbe Creek (page 216) sponsor Stream Watch groups and have other important water quality initiatives in this watershed. There is also a Durham Soil and Water Conservation restoration project (page 212) on Goose Creek, a tributary of Ellerbe Creek in Durham.

### **1.3.2 Flat River below Lake Michie**

#### 1998 Recommendations

The Flat River below Lake Michie was partially supporting from the dam to Falls Lake. Low dissolved oxygen being released from the dam was noted as a potential cause of the impaired biological community. It was recommended that the City of Durham reevaluate release policies from the dam in order to restore the biological community.

#### Current Status

The Flat River (1.1 miles) is currently impaired from Lake Michie to Falls Lake because of a Fair bioclassification at site B-11. The ambient monitoring station (A-6) also detected dissolved oxygen below 5 mg/l in 12.8 percent of samples. Low dissolved oxygen (page 92) may be adversely impacting the biological community.

#### 2002 Recommendations

DWQ will work with the City of Durham to evaluate low dissolved oxygen releases from the dam. As part of the 303(d) approach, a management strategy will be developed to ensure that low dissolved oxygen from Lake Michie does not adversely impact the biological community in the Flat River. DWQ will continue to monitor the segment below Lake Michie to evaluate any changes in dam operation.

### **1.3.3 Knap of Reeds Creek**

#### 1998 Recommendations

Knap of Reeds Creek was partially supporting from Lake Butner to Falls Lake. It was recommended that DWQ continue to monitor the creek to evaluate further improvements at the Butner WWTP, high copper levels and potential low dissolved oxygen releases from Lake Butner Dam.

#### Current Status

Knap of Reeds Creek (5.2 miles) is currently impaired from Lake Butner to Falls Lake because of a Fair bioclassification at site SB-2. The ambient monitoring station (A-7) also detected elevated manganese, and the geometric mean of fecal coliform bacteria was 151 colonies/100ml water. Although copper was above the copper action level 10.1 percent of the time, the 90<sup>th</sup> percentile was below 13 mg/l (refer to Appendix III, use support methods).

#### 2002 Recommendations

As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Knap of Reeds Creek. DWQ will continue to monitor this segment to evaluate future improvements at the WWTP and upstream water quality. DWQ continues to recommend that Butner WWTP (map #216) improve plant

operations and collection systems as needed to reduce the potential for negative water quality impacts to Knap of Reeds Creek.

#### **1.3.4 Lick Creek**

##### 1998 Recommendations

Lick Creek was partially supporting from the source to Falls Lake. It was recommended that the City of Durham address stormwater impacts.

##### Current Status

Lick Creek (7.2 miles) is currently impaired from the source to Falls Lake because of a Poor bioclassification at site SB-4. This creek is heavily impacted by urban runoff from Durham. There was little vegetation in the riparian zone at the sample site; the stream was entrenched and had little aquatic habitat.

##### 2002 Recommendations

DWQ will continue monitoring Lick Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Lick Creek. DWQ will continue to support the City of Durham stormwater programs. Because of the water quality problems noted above, Lick Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Lick Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

#### **1.3.5 Little Lick Creek**

##### 1998 Recommendations

Little Lick Creek was not supporting from the source to Falls Lake. It was recommended that DWQ continue to monitor the stream to assess water quality after removal of three wastewater discharges and increases in urban stormwater impacts. It was recommended that the City of Durham address stormwater impacts.

##### Current Status

Little Lick Creek (7.8 miles) is currently impaired from the source to Falls Lake because of a Poor bioclassification at site SB-3. This creek is heavily impacted by urban runoff from Durham. Few riffles and many eroded streambanks were noted at the sample site.

##### 2002 Recommendations

DWQ will continue monitoring Lick Creek. As part of the 303(d) list approach, DWQ will begin the process of identifying problem parameters that may be causing biological impairment in Lick Creek. DWQ will continue to support the City of Durham stormwater programs. Because of the water quality impairment noted above, Little Lick Creek is a NCWRP targeted local watershed (page 203).

The impaired biological community in Little Lick Creek is typical of streams that run through urban areas. Refer to page 81 for a description of urban stream problems and recommendations for reducing impacts and restoring water quality.

### **1.3.6 New Light Creek**

#### 1998 Recommendations

New Light Creek was partially supporting from the source to Falls Lake because of a Fair bioclassification. It was recommended that DWQ resample the stream.

#### Current Status

New Light Creek is supporting from the source to Falls Lake because of a Good bioclassification at site B-14. However, there were noted agricultural impacts to the stream including embedded riffles and eroded streambanks.

#### 2002 Recommendations

DWQ will continue to monitor New Light Creek to evaluate potential impacts from agricultural operations (page 85) in the watershed as well as any future development. DWQ will contact Division of Soil and Water Conservation (DSWC) (page 202) to evaluate the potential for installation of agricultural BMPs that would protect water quality and aquatic habitat in New Light Creek. Because of the water quality impacts noted above, New Light Creek is a NCWRP targeted local watershed (page 203).

### **1.3.7 North Fork Little River**

#### 1998 Recommendations

The North Fork Little River was partially supporting from the source to SR 1519 because of a Fair bioclassification in 1995. There were no specific recommendations made for this segment.

#### Current Status

The North Fork Little River is currently supporting from the source to the Flat River because of a Good-Fair bioclassification at site B-8. Few pools and riffles and little aquatic habitat were noted at the sample site.

#### 2002 Recommendations

DWQ will continue to monitor the North Fork Little River to evaluate potential impacts from future development or other land use changes in the watershed. North Fork Little River is HQW (page 43). All land-disturbing activities in this watershed should use BMPs to prevent further degradation. Restoration activities may be needed to return high water quality to this portion of the North Fork Little River. Because the North Fork Little River is HQW, in a water supply watershed and has noted water quality impacts, the NCWRP has targeted this local watershed (page 203). Triangle J Council of Governments has also prioritized this watershed for buffer protection.

#### Current Water Quality Initiatives

Durham County received \$377,000 CWMTF (page 210) to acquire buffers along portions of the North Fork Little River (page 212).

### **1.3.8 South Flat River**

#### 1998 Recommendations

The South Flat River was partially supporting from the source to SR 1009 because of a Fair bioclassification in 1990. It was recommended that DWQ resample the stream.

#### Current Status

The South Flat River is currently supporting from the source to the Flat River because of a Good bioclassification at site F-5. There are indications of nutrient enrichment to the stream from surrounding land uses.

#### 2002 Recommendations

DWQ will continue to monitor the South Flat River to evaluate potential impacts from agricultural operations (page 85) in the watershed as well as from any future development. DWQ will contact Division of Soil and Water Conservation (DSWC) (page 202) to evaluate the potential for installation of agricultural BMPs that would protect water quality and aquatic habitat in the South Flat River. Because the South Flat River is in a water supply watershed and has noted water quality impacts, the NCWRP has targeted this local watershed (page 203). Triangle J Council of Governments has also prioritized this watershed for buffer protection.

## **1.4 Status and Recommendations for Newly Impaired Waters**

There are no newly impaired waters in subbasin 03-04-01. Refer to Part 1.5 below for information on waters with noted water quality impacts.

## **1.5 Status and Recommendations for Waters with Noted Impacts**

The surface waters discussed in this section are supporting designated uses (unless otherwise noted) based on DWQ's use support assessment and are not considered to be impaired. However, notable water quality problems and concerns have been documented for some waters based on this assessment. While these waters are not considered impaired, attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement. Many of the waters discussed are water supplies (page 85) and are important resources to communities in subbasins 03-04-01 and 03-04-02.

### **1.5.1 Flat River above Lake Michie**

#### Current Status and 2002 Recommendations

The Flat River above Lake Michie has a lower bioclassification than in 1995, however, is currently supporting based on a Good bioclassification at site B-10. DWQ will continue to monitor this segment to evaluate impacts of land use changes in this part of the watershed. Durham received a CWMTF (page 210) grant to preserve buffers and greenways on the North Flat River.

## **1.5.2 Corporation Lake and Lake Ben Johnson (Eno River)**

### *Current Status and 2002 Recommendations*

Corporation Lake is muddy and may be experiencing increases in nutrient loading which could increase the potential for algal blooms (page 92). DWQ will continue to monitor the lake to evaluate any future degradation in water quality. As the lake is a water supply, Hillsborough should pursue measures to protect the watershed from land use activity that could increase nutrient loading. Hillsborough received a CWMTF (page 212) to acquire buffers on the West Fork Eno River above Corporation Lake and Lake Ben Johnson.

NCWRP (page 203) has initiated a project to restore 1,200 linear feet of Stillhouse Branch (page 213), a tributary of the Eno River, running through Hillsborough. Because of the noted water quality problems and ongoing water quality initiatives, the NCWRP has targeted this local watershed (page 203).

The Eno River Association (page 216) has prepared a riparian corridor conservation design for the Conservation Trust for North Carolina (page 218) that identifies preservation and restoration opportunities in the Eno River watershed.

## **1.5.3 Little River Reservoir**

### *Current Status and 2002 Recommendations*

The Little River Reservoir experiences periodic low dissolved oxygen (page 92) that may be related to elevated nutrient inputs increasing the potential for algal blooms (page 92). DWQ will continue to monitor the lake to evaluate any future degradation in water quality. As the lake is a water supply, Durham should pursue measures to protect the watershed from land use activity that could increase nutrient loading.

## **1.5.4 Lake Rogers**

### *Current Status and 2002 Recommendations*

Lake Rogers experiences elevated nutrient inputs increasing potential for algae blooms (page 92). DWQ will continue to monitor the lake to evaluate any future degradation in water quality. As the lake is a water supply, Creedmoor should pursue measures to protect the watershed from land use activity that could increase nutrient loading.

The City of Creedmoor has a CWMTF grant to acquire buffers on Lake Rogers (page 212). NCWRP has initiated a Local Watershed Plan (page 203) in the Lake Rogers watershed as well. Because of the noted water quality problems, NCWRP has targeted this local watershed (page 203).

## **1.5.5 Falls of the Neuse Reservoir (Falls Lake)**

### *Current Status and 2002 Recommendations*

The upper part of the reservoir is periodically muddy and nutrient levels are unchanged from previous monitoring. Algal biomass was high in 1999. Low dissolved oxygen (page 92) in mid-reservoir and low mean Secchi depths (measure of clarity) indicate that the Falls Lake Reservoir

experiences some water quality problems that are related to nutrient loading (algal activity) and sediment loading from the surrounding watershed. DWQ will continue to monitor the lake to evaluate any future degradation in water quality. The City of Raleigh should pursue measures to protect the watershed from land use activity that could increase nutrient and sediment loading.

## **1.6 Additional Water Quality Issues Within Subbasin 03-04-01**

This section discusses issues that may threaten water quality in the subbasin that are not specific to particular streams, lakes or reservoirs. The issues discussed may be related to waters near certain land use activities or within proximity to different pollution sources.

### **1.6.1 Water Quality Threats to Streams in Urbanizing Watersheds**

Many of the streams in this subbasin that are not already impaired from urban stormwater runoff are threatened by development pressure throughout this subbasin. In order to prevent aquatic habitat degradation and impaired biological communities, protection measures must be put in place immediately. Refer to page 81 for a description of urban stream water quality problems and recommendations for reducing impacts and restoring water quality.

### **1.6.2 Upper Neuse Watershed Management Plan**

The Upper Neuse River Basin Association (page 217) has developed a watershed management plan that would help protect all waters in subbasin 03-04-01 from the increasing potential for sediment and nutrient impacts.