

Section B - Chapter 10

Lumber River Subbasin 03-07-59

Lockwoods Folly and Shallotte Rivers

10.1 Subbasin Overview

Subbasin 03-07-59 at a Glance

Land and Water Area

Total area:	267 mi ²
Land area:	260 mi ²
Water area:	7 mi ²

Population Statistics

2000 Est. Pop.: 21,177 people

Land Cover (percent)

Forest/Wetland:	75%
Surface Water:	3%
Urban:	4%
Agriculture:	18%

Counties

Brunswick

Municipalities

Boiling Spring Lakes, Bolivia,
Carolina Shores, Holden Beach,
Oak Island, Ocean Isle Beach,
Shallotte, Sunset Beach and
Varnumtown

This subbasin is entirely located in Brunswick County and is the only subbasin in the entire Lumber River basin where all waters drain to the Atlantic Ocean. Population growth in the subbasin is primarily concentrated in the coastal communities but also around the towns of Shallotte and Calabash. Brunswick County has the highest estimated population change for the 2000-2020 year projection of 39,742 (refer to Table A-5, Section A for further information).

There are three NPDES wastewater discharge permits in this subbasin with a total permitted flow of 0.02 MGD. There is also one individual NPDES stormwater permit in the subbasin. Brunswick County and South Brunswick Water and Sewer Authority are required to develop a stormwater program under Phase II (page 69). There is also one registered swine operation in this subbasin.

There were three benthic macroinvertebrate community sites sampled in 2001 as part of basinwide monitoring. One site was Not Rated, as biocriteria were being developed (page 57) to assess swamp streams. Another site received a Fair bioclassification, and the last benthic site sampled was part of a special study investigation.

There was one fish community site sampled and was Not Rated due to biocriteria still in development. Data were also collected from 13 ambient stations. See Figure B-10 and Table B-19 for locations and summaries of data from these monitoring sites. Refer to the *2002 Lumber River Basinwide Assessment Report* at <http://www.esb.enr.state.nc.us/bar.html> and Section A, Chapter 3 for more information on monitoring.

The Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section (page 45) has classified 674 acres as approved, 1,426 acres as conditionally approved-open, 711 acres as conditionally approved-closed, and 1,469 acres as prohibited/restricted.

Figure B-10 Lumber River Subbasin 03-07-59

Legend

- Subbasin Boundary
- Ambient Monitoring Station
- Benthic Station
- Fish Community Station
- Fish Tissue Station

NPDES Discharges

- Major
- Minor

Use Support Rating

- Supporting
- Impaired
- Not Rated
- No Data

Other Symbols

- County Boundary
- Primary Roads
- Municipality

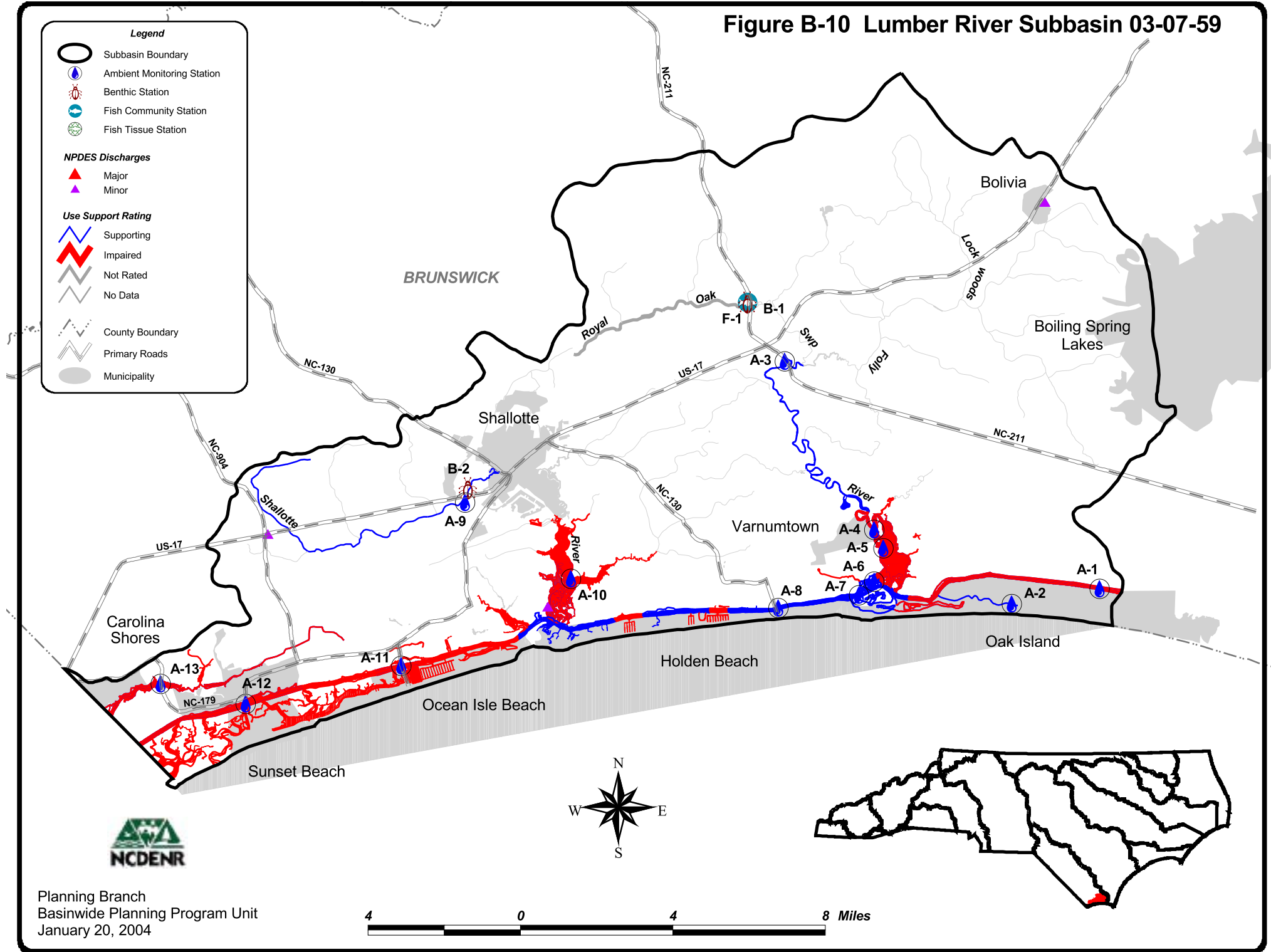


Table B-19 DWQ Monitoring Locations, Bioclassifications and Notable Chemical Parameters (1996-2001) for Subbasin 03-07-59

Benthic Macroinvertebrate Community Monitoring Sites					
Site¹	Waterbody	County	Location	1996	2001
B-1	Royal Oak Swamp	Brunswick	NC 211	Good-Fair	Not Rated
B-2	Shallotte River ²	Brunswick	Near US 17	Good-Fair	Fair Good-Fair (resample 2003)
SB-1	Royal Oak Swamp	Brunswick	NC 211	Not Rated (1998)	Not Rated (1999)
Fish Community Monitoring Sites					
Site¹	Waterbody	County	Location	1996	2001
F-1	Royal Oak Swamp ²	Brunswick	NC 211	--	Not Rated
Ambient Monitoring Sites					
Site¹	Waterbody	County	Location	Station #	Noted Parameters³
A-1	Intracoastal Waterway	Brunswick	CM R16 at Beaverdam Creek	I9380000	None
A-2	Montgomery Slough	Brunswick	SR 1105	I9385000	Fecal coliform bacteria*
A-3	Lockwoods Folly River	Brunswick	NC 211	I9420000	None
A-4	Lockwoods Folly River	Brunswick	At Varnum	I9440000	Fecal coliform bacteria*
A-5	Lockwoods Folly River	Brunswick	CM R8 - downstream of Varnum	I9450000	Fecal coliform bacteria*
A-6	Lockwoods Folly River	Brunswick	West Channel Islands	I9500000	None
A-7	Intracoastal Waterway	Brunswick	CM R42 West of Lockwoods Folly River	I9510000	Fecal coliform bacteria*
A-8	Intracoastal Waterway	Brunswick	NC 130	I9530000	None
A-9	Shallotte River	Brunswick	Business US 17	I9700000	None
A-10	Shallotte River	Brunswick	At Shell Point	I9820000	None
A-11	Intracoastal Waterway	Brunswick	NC 904	I9840000	None
A-12	Intracoastal Waterway	Brunswick	SR 1172	I9880000	Fecal coliform bacteria*
A-13	Calabash Creek	Brunswick	NC 179	I9916000	pH, Fecal coliform bacteria*

* Fecal coliform bacteria levels exceeded criteria for shellfish harvesting waters only.

¹ B = benthic macroinvertebrates; F = fish community; A = ambient monitoring station; SB = benthic macroinvertebrates special study site.

² Historical data available at this site. Refer to Appendix II.

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

Use support ratings are summarized in Part 10.2 below. Recommendations, current status and future recommendations for waters that were Impaired in 1999 are discussed in Part 10.3 below. Current status and future recommendations for newly Impaired waters are discussed in Part 10.4 below. Supporting waters with noted water quality impacts are discussed in Part 10.5 below. Water quality issues related to the entire subbasin are discussed in Part 10.6. Refer to Appendix III for use support methods and more information on all monitored waters.

10.2 Use Support Summary

Use support ratings (page 47) in subbasin 03-07-59 were assigned for aquatic life, recreation, fish consumption and shellfish harvesting categories. All waters in the subbasin are considered Impaired on an evaluated basis because of a fish consumption advice (page 59). Also 25.6 Atlantic coastline miles are Impaired in the fish consumption category based on fish tissue monitoring data.

Refer to Table B-20 for a summary of use support ratings by category for waters in the subbasin. Use support ratings for waters that were monitored and Impaired for the shellfish harvesting category in 1999 are presented in Table B-21. Use support ratings for specific waterbodies that were monitored and Impaired for the shellfish harvesting category in 2003 are presented in Table B-22 where these waters are identified by an assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database and the 303(d) Impaired waters list. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

Table B-20 Summary of Use Support Ratings by Use Support Category in Subbasin 03-07-59

Use Support Rating	Basis	Aquatic Life	Fish Consumption	Recreation	Shellfish Harvesting
Supporting	Monitored	22.2 mi 2,170.0 Est. ac	0	22.2 mi 2,039.2 Est. ac 25.6 coast	673.9 Est. ac
	All Waters	22.2 mi 2,170.0 Est. ac	0	22.2 mi 2,039.2 Est. ac 25.6 coast	673.9 Est. ac
Impaired	Monitored	0	25.6 coast	0	3,607.0 Est. ac
	All Waters	0	146.5 mi 4305.6 Est. ac	0	3,607.0 Est. ac
Not Rated	Monitored	5.9 mi	0	0	0
No Data	N/A	118.4 mi 2,135.5 Est. ac	0	123.7 mi 2,267.3 Est. ac	0
Total	Monitored	28.1 mi 2,170.0 Est. ac	25.6 coast	22.2 mi 2,039.2 Est. ac 25.6 coast	4,280.8 Est. ac
	All Waters	146.5 mi 4,305.6 Est. ac 25.6 coast	146.5 mi 4,305.6 Est. ac 25.6 coast	146.5 mi 4,305.6 Est. ac 25.6 coast	4,280.8 Est. ac
	Percent Monitored	19.2% mi 50.4% Est. ac	100.0% coast	15.2% mi 47.4% Est. ac 100% coast	100%

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

Table B-21 Previously Impaired Shellfish Harvesting (SA) Waters in Subbasin 03-07-59

Name	1999 Status	Acres
Calabash (DEH Area A-1)	Partially Supporting	1,138
Shalotte River (DEH Area A-2)	Partially Supporting	571
Lockwoods Folly River (DEH Area A-3)	Partially Supporting	913
Total 1999 Impaired Acres		2,622

Table B-22 Currently Impaired Shellfish Harvesting (SA) Waters in Subbasin 03-07-59

Name	Assessment Unit Number	DEH Classification Status *	Acres
Portions of Intracoastal Waterway	15-25	CAO, PRO, CAC	2,118
Portions of Lockwoods Folly River	15-25-1-(16)	CAO, PRO, CAC	606.2
Portions of Shallotte River	15-25-1-(10)	CAO, PRO, CAC	647.3
Mullet Creek	15-25-1-19	PRO	5.7
Sams Branch	15-25-2-12-(2)	PRO	1
Spring Creek	15-25-1-21	PRO	2.4
Jinnys Branch	15-25-2-16-1-(2)	PRO	1
Kilbart Slough	15-25-4	PRO	0.7
Mill Creek	15-25-1-18-(2)	PRO	2
The Mill Pond	15-25-2-11-(2)	PRO	3
The Swash	15-25-2-14	CAO	3.9
Shallotte Creek	15-25-2-15-(3)	CAO	135.6
Saucepan Creek	15-25-2-16	PRO	62.6
Goose Creek	15-25-2-16-4-(2)	PRO	4.2
Calabash River	15-25-5	PRO	3.4
Hangman Branch	15-25-5-1	PRO	10.2
Total 2003 Impaired Acres			3,606.9

* Division of Environmental Health Classifications: PRO = prohibited; COA = Conditionally Approved-Open; and CAC = Conditionally Approved Closed.

10.3 Status and Recommendations of Previously Impaired Waters

10.3.1 Impaired Class SA Waters

Portions of Lockwoods Folly and Shallotte Rivers, Intracoastal Waterway and all of Calabash Creek were partially supporting in the 1999 basin plan because they were classified as prohibited and conditionally approved closed to shellfish harvesting by DEH SS (page 45). It was recommended that management strategies be developed for shellfish harvesting waters. These strategies included, but were not limited to, reducing NPS runoff, resolving septic system impacts, and working more closely with other state and local agencies to address all pollution impacts to SA waters. The differences in acreage estimates between years are not necessarily related to changes in water quality, but to different methods of estimating acreage and changes in use support methodology (Appendix III). These waters are discussed below in Part 10.4.1.

10.4 Status and Recommendations of Waters Newly Impaired Waters

10.4.1 Portions of the Intracoastal Waterway, Lockwoods Folly River, Shallotte River, Mullet Creek, Sams Branch, Spring Creek, Jinnys Branch, Kilbart Slough, Mill Creek, The Mill Pond, The Swash, Shallotte Creek, Saucepan Creek, Goose Creek, Calabash River, Hangman Branch

Current Status

Portions or all of these waters are currently Impaired (see Table B-22 for listing and acreages). These areas are prohibited, conditionally approved-closed or conditionally approved-open to shellfish harvesting because of bacteria levels (page 66) that do not meet approved area criteria. All waters in the subbasin are considered Impaired on an evaluated basis because of fish consumption advice (page 59).

2003 Recommendations

DWQ, DEH SS and NC Coastal Nonpoint Source Program (refer to page 156) are developing the database and expertise necessary to assess shellfish harvesting use support using a frequency of closure based approach. This database will allow DWQ to better assess the extent and duration of closures in Class SA waters. These tools are not available for use support determinations in Class SA waters for the 2003 Lumber River basin assessment. DWQ believed it important to identify frequency of closures in these waters, resulting in an interim methodology to be used based on existing databases and GIS shapefiles. This will likely bring changes in reported acreages in future assessments using the permanent methods and tools that define areas and closure frequency.

For the 2003 Lumber River basin assessment, DWQ used an interim frequency of closures based method to assign use support ratings to Class SA waters. DWQ worked with DEH SS to determine the number of days and acreages that identified conditionally approved-open Class SA waters which were closed to shellfish harvesting in the Lumber River basin during the assessment period (September 1, 1996 to August 31, 2001). For the one growing area with conditionally approved-open (CAO) Class SA waters, DEH SS and DWQ staff defined subareas (within the larger conditionally approved-open area) that were opened and closed at the same time. The number of days these conditionally approved-open waters were closed was determined using proclamation summary sheets and the original proclamations. The number of days that approved areas in the growing area were closed due to preemptive closures because of named storms was not counted. DEH SS will continue to monitor bacteriological water quality in these waters. DWQ, DEH, DCM and DMF are currently developing tools to better track water quality changes, make use support decisions, and support research in shellfish harvesting waters of North Carolina (refer to Appendix III for more information).

DMF is in the process of developing Coastal Habitat Protection Plans (CHPP) with DWQ and DCM. These plans will identify existing and potential threats to habitats important to coastal fisheries and recommend actions to restore and protect them. The plans will also provide a framework for adoption of rules to protect habitats vital to coastal fisheries. The plans will help to assure consistent actions among the Coastal Resources Commission (CRC), Environmental Management Commission (EMC) and the Marine Fisheries Commission (MFC). For more

information on these plans, contact the Habitat Protection Section at (252) 726-7021 or visit the CHPP website at <http://www.ncfisheries.net/habitat/chpp1.htm>.

In November 1999, the Coastal Resources Commission (CRC) enacted rules designed to protect coastal waters. The rules require a 30-foot buffer for new development along coastal shorelines in the 20 CAMA counties. The new rules became effective in August 2000. Visit <http://dcm2.enr.state.nc.us/> for more information on these rules.

A Land Use Plan Review Team authorized by the CRC has recommended better implementation of land use plans and involvement of local governments in the basinwide planning process. In September 2000, the team provided the CRC with a set of recommendations to restructure the existing land use planning program. Since land use plans affect permit decisions, growth patterns and community visions, any revisions to the process can potentially have widespread impact to coastal decision-making and inevitably water quality. Therefore, DWQ will play an active role in land use planning discussions, especially with respect to water quality concerns (refer to page 145 for more information).

Local governments should consider water quality impacts in all aspects of government operations. Land use planning should discourage development in wetlands and areas draining to sensitive coastal areas. Land use plans should incorporate preservation and limited development of land adjacent to approved shellfish harvesting areas. Best management practices should be implemented during all land-disturbing activities to reduce runoff and delivery of bacterial contaminants to shellfish harvesting waters. Local governments with jurisdictions around the large areas of conditionally approved-open waters should work together with the DENR agencies to develop strategies for reducing sources and delivery of bacterial contaminants to these waters in an effort to reduce the extent and duration of temporary closures. A long-term strategy should be put in place to eventually restore shellfish harvesting to prohibited areas where human activities have caused these closures.

10.4.2 Atlantic Ocean [AU# 99-(1)]

Current Status and 2002 Recommendations

The Atlantic Ocean (25.6 coastline miles) is currently Impaired in the fish consumption category because there is a statewide consumption advice for mercury in fish tissue that is applied to waters east and south of I-85, including the Atlantic Ocean where king mackerel fish tissue was analyzed in 1999.

10.5 Status and Recommendations for Waters with Noted Impacts

The surface waters discussed in this section are Supporting designated uses based on DWQ's use support assessment and are not considered to be Impaired unless otherwise noted. However, notable water quality problems and concerns have been documented for some waters based on this assessment. Attention and resources should be focused on these waters to prevent additional degradation or facilitate water quality improvement.

Waters in the following section are identified by assessment unit number (AU#). This number is used to track defined segments in the water quality assessment database and the 303(d) Impaired

waters list. The assessment unit number is a subset of the DWQ index number (classification identification number). A letter attached to the end of the AU# indicates that the assessment is smaller than the DWQ index segment. No letter indicates that the assessment unit and the DWQ index segment are the same.

10.5.1 Calabash River [AU# 15-25-5]

Current Status and 2003 Recommendations

Calabash River is currently Impaired for shellfish harvesting. However, it is observed from the DWQ ambient monitoring station, I9916000, that the pH values (site A-13) were lower than 6.8 in 18.4 percent of the samples. The 10th percentile illustrates the value of the lower 10 percent of the measurements. The 10th percentile of pH was 6.7. The state's standard for saltwater is a range of 6.8 to 8.5. Possible adjacent swamp waters could be influencing this watershed. It was also observed at this ambient site that the fecal coliform values exceeded the geometric mean of 14/100 ml in more than 10 percent of the samples for class SA waters. See page 66 for more information. DWQ will continue to monitor this site.

Current Water Quality Initiatives

Calabash River watershed comprises one of 20 watersheds in the Lumber River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for the implementation of NCWRP restoration projects. Refer to page 147 in Section C for more information.

South Brunswick Water and Sewer Authority received a \$3,000,000 State Revolving Grant for a new collection system. See page 145 for more information.

10.5.2 Shallotte River [AU# 15-25-2-(1)]

Current Status and 2003 Recommendations

Site B-2 near US 17 was reduced from a Good-Fair bioclassification in 1996 to a Fair bioclassification during the 2001 assessment. The decrease in bioclassification was possibly due to drought conditions and subsequent affects of brackish intrusion during the low flow period. DWQ resampled this site in September 2003 to assess potential drought impacts. The site assessment in 2003 received a Good-Fair bioclassification. However, this assessment found the highest number of taxa out of its historical sampling regime including the freshwater/brackish shrimp, *Macrobrachium olfersii*. This crayfish-like species inhabits the transitional zones between fresh and brackish water and is rarely seen. This individual is only the second one found in North Carolina. The Shallotte River is currently rated Supporting for the aquatic life category.

Current Water Quality Initiatives

The Shallotte River watershed comprises one of 20 watersheds in the Lumber River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for the implementation of NCWRP restoration projects. Refer to page 147 in Section C for more information.

10.5.3 Lockwoods Folly River [AU# 15-25-1-(11) & 15-25-(16)a & b]

Current Status and 2003 Recommendations

Lockwoods Folly River from north of Varnum to the mouth is Impaired for the shellfish harvesting category. The data from ambient monitoring sites, I9440000 and I9450000, showed the fecal coliform values exceeded the geometric mean of 14/100 ml in more than 10 percent of the samples for Class SA waters. See page 66 for more information. DWQ will continue to monitor these stations.

Current Water Quality Initiatives

The NC Coastal Land Trust received a \$652,000 grant from the CWMTF to acquire 263 acres along Lockwoods Folly River and Sandy Branch. See page 152 for project description.

Lockwoods Folly River watershed comprises one of 20 watersheds in the Lumber River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for the implementation of NCWRP restoration projects. Refer to page 147 for more information.

The Army Corps of Engineers has a \$1,440,000 aquatic habitat restoration project on the Lower Lockwoods Folly River (see page 144 for details on the project).

10.5.4 Doe Creek [AU# 15-25-1-13]

Current Status and 2003 Recommendations

A private developer was assessed a civil penalty for land clearing activities where earth and fill were deliberately placed into wetlands. These activities caused extreme turbid water in an unnamed tributary to Doe Creek. DWQ has required the developer to implement a restoration plan.

10.5.5 Mill Creek [AU# 15-25-1-18-(2)]

Current Status and 2003 Recommendations

A private owner was assessed a civil penalty for excavating 19,000 linear feet of ditches in wetlands. An unnamed tributary of Mill Creek was impacted by this activity. DWQ has required the owner to implement a restoration plan.

10.5.6 Jinny's Branch and Saucepan Creek

Current Status and Water Quality Initiatives

Jinny's Branch and Saucepan Creek are currently Impaired for the shellfish harvesting category. The Jinny's Branch/Saucepan Creek watershed comprises one of 20 watersheds in the Lumber River basin that has been identified by the NC Wetlands Restoration Program (NCWRP) as an area with the greatest need and opportunity for stream and wetland restoration efforts. This watershed will be given higher priority than nontargeted watersheds for the implementation of NCWRP restoration projects. Refer to page 147 in Section C for more information.

10.5.7 Davis Creek

Current Water Quality Initiatives

The Town of Long Beach received a \$456,000 grant from the CWMTF to acquire 30 acres along Davis Creek. See page 152 for project description.

10.5.8 Bird Island

Current Water Quality Initiatives

NC Division of Coastal Management received a \$2,750,000 grant from the CWMTF to purchase Bird Island. See page 152 for project description.

10.5.9 Montgomery Slough [AU# 15-25v]

Current Status

Montgomery Slough is currently Supporting for the aquatic life category. However, it is currently Impaired for the shellfish harvesting category.

Current Water Quality Initiative

The Town of Oak Island received a total of \$2,200,155 from the State Revolving Grants Program for new collections lines and treatment modifications. See page 145 for more information.

10.6 Additional Water Quality Issues within Subbasin 03-07-59

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.

10.6.1 Water Quality Threats to Streams in Urbanizing Watersheds

Streams in this subbasin are already impacted from urban stormwater runoff in shellfish harvesting waters and continue to be threatened development pressure. In order to prevent aquatic habitat degradation and impaired biological communities, protection measures must be put in place immediately. Refer to page 73 for a description of urban stream water quality problems and recommendations for reducing impacts and restoring water quality.

10.6.2 Impacts of Post-Hurricane De-Snagging on Instream Habitats

Many streams in the subbasin have noted impacts from the recent hurricanes. The biological community in the streams can recover rapidly if instream habitat is maintained. De-s snagging operations should carefully remove debris from stream channels to restore natural flow and leave enough instream habitats so the biological community can recover. Refer to page 68 for more information on this issue.

10.6.3 Golf Courses

The number of golf courses in Brunswick County has grown vastly through the last five years making many of the small towns' centers of golf activity. Utilizing best management practices during and after construction of the courses can greatly reduce nonpoint source pollution to adjacent streams. It is critical to implement and maintain these management practices throughout the life of the golf course. See page 78 for more information.