Section A - Chapter 3
Summary of Water Quality Information for the Lumber River Basin

3.1 General Sources of Pollution

Human activities can negatively impact surface water quality, even when the activity is far removed from the waterbody. With proper management of wastes and land use activities, these impacts can be minimized. Pollutants that enter waters fall into two general categories: *point sources* and *nonpoint sources*.

Point Sources

Piped discharges from:

- Municipal wastewater treatment plants
- Industrial facilities
- Small package treatment plants
- Large urban and industrial stormwater systems

Point sources are typically piped discharges and are controlled through regulatory programs administered by the state. All regulated point source discharges in North Carolina must apply for and obtain a National Pollutant Discharge Elimination System (NPDES) (see page 22) permit from the state.

Nonpoint sources are from a broad range of land use activities. Nonpoint source pollutants are typically carried to waters by rainfall, runoff or snowmelt. Sediment (see page 62) and nutrients (see page 76) are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria (see page 66), heavy metals, oil and grease, and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

Nonpoint Sources

- Construction activities
- Roads, parking lots and rooftops
- Agriculture
- Failing septic systems and straight pipes
- Timber harvesting
- Hydrologic modifications

Unlike point source pollution, nonpoint pollution sources are diffuse in nature and occur intermittently, depending on rainfall events and land disturbance. Given these characteristics, it is difficult and resource intensive to quantify nonpoint contributions to water quality degradation in a given watershed. While nonpoint source pollution control often relies on voluntary actions, the state has many programs designed to reduce nonpoint source pollution.

Every person living in or visiting a watershed contributes to impacts on water quality. Therefore, each individual should be aware of these contributions and take actions to reduce them.

Cumulative Effects

While any one activity may not have a dramatic effect on water quality, the cumulative effect of land use activities in a watershed can have a severe and long-lasting impact.

3.2 Description of Surface Water Classifications and Standards

North Carolina's Water Quality Standards Program adopted classifications and water quality standards for all the state's river basins by 1963. The program remains consistent with the Federal Clean Water Act and its amendments. Water quality classifications and standards have also been modified to promote protection of surface water supply watersheds, high quality waters, and the protection of unique and special pristine waters with outstanding resource values.

Statewide Classifications

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water. In addition to primary classifications, surface waters may be assigned a *supplemental* classification. Most supplemental classifications have been developed to provide special protection to sensitive or highly valued resource waters. Table A-14 briefly describes the best uses of each classification. A full description is available in the document titled: *Classifications and Water Quality Standards Applicable to Surface Waters and Wetlands of North Carolina, 2000*. Information on this subject is also available at DWQ's website: http://h2o.enr.state.nc.us/wqhome.html.

Table A-14 Primary and Supplemental Surface Water Classifications

PRIMARY FRESHWATER AND SALTWATER CLASSIFICATIONS*	
Class	**Best Uses**
C and SC	Aquatic life propagation/protection and secondary recreation.
B and SB	Primary recreation and Class C uses.
SA	Waters classified for commercial shellfish harvesting.
WS	*Water Supply watershed*. There are five WS classes ranging from WS-I through WS-V. WS classifications are assigned to watersheds based on land use characteristics of the area. Each water supply classification has a set of management strategies to protect the surface water supply. WS-I provides the highest level of protection and WS-IV provides the least protection. A Critical Area (CA) designation is also listed for watershed areas within a half-mile and draining to the water supply intake or reservoir where an intake is located.
SUPPLEMENTAL CLASSIFICATIONS	
Class	**Best Uses**
Sw	*Swamp Waters*: Recognizes waters that will naturally be more acidic (have lower pH values) and have lower levels of dissolved oxygen.
Tr	*Trout Waters*: Provides protection to freshwaters for natural trout propagation and survival of stocked trout.
HQW	*High Quality Waters*: Waters possessing special qualities including excellent water quality, Native or Special Native Trout Waters, Critical Habitat areas, or WS-I and WS-II water supplies.
ORW	*Outstanding Resource Waters*: Unique and special surface waters which are unimpacted by pollution and have some outstanding resource values.
NSW	*Nutrient Sensitive Waters*: Areas with water quality problems associated with excessive plant growth resulting from nutrient enrichment.

* Primary classifications beginning with a "S" are assigned to saltwaters.

Statewide Water Quality Standards

Each primary and supplemental classification is assigned a set of water quality *standards* that establish the level of water quality that must be maintained in the waterbody to support the uses associated with each classification. Some of the standards, particularly for HQW and ORW waters, outline protective management strategies aimed at controlling point and nonpoint source pollution. These strategies are discussed briefly below. The standards for C and SC waters establish the basic protection level for all state surface waters. The other primary and supplemental classifications have more stringent standards than for C and SC, and therefore, require higher levels of protection.

Some of North Carolina's surface waters are relatively unaffected by pollution sources and have water quality higher than the standards that are applied to the majority of the waters of the state. In addition, some waters provide habitat for sensitive biota such as trout, juvenile fish, or rare and endangered aquatic species.

High Quality Waters

There are 140.6 stream miles and 21.0 estuarine acres of HQW waters (Figure A-11) throughout the Lumber River basin. Special HQW protection management strategies are intended to prevent degradation of water quality below present levels from both point and nonpoint sources. HQW requirements for new wastewater discharge facilities and facilities which expand beyond their currently permitted loadings address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume, nutrients (in nutrient sensitive waters) and toxic substances.

Criteria for HQW Classification

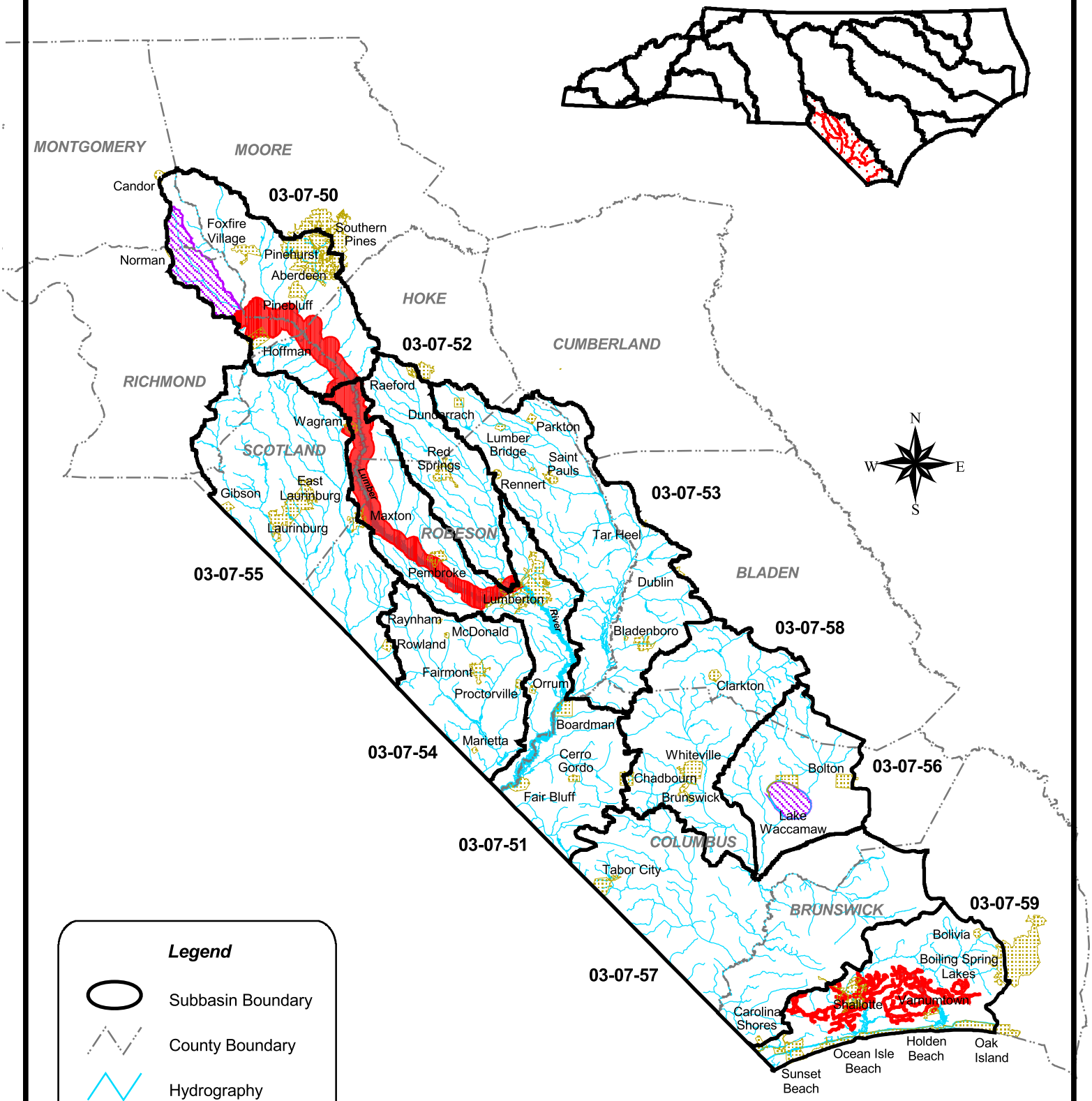
- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native or special native trout waters by the Wildlife Resources Commission.
- Waters designated as primary nursery areas or other functional nursery areas by the Division of Marine Fisheries.
- Waters classified by DWQ as WS-I, WS-II or SA.

For nonpoint source pollution, development activities which require a Sedimentation and Erosion Control Plan in accordance with rules established by the NC Sedimentation Control Commission or an approved local erosion and sedimentation control program, and which drain to and are within one mile of HQWs, are required to control runoff from the development using either a low density or high density option. The low density option requires a 30-foot vegetated buffer between development activities and the stream; whereas, the high density option requires structural stormwater controls. In addition, the Division of Land Resources requires more stringent erosion controls for land-disturbing projects within one mile of and draining to HQWs.

Outstanding Resource Waters

There are 20.0 stream miles and 8,840.2 freshwater acres of ORW waters (Figure A-11) in the Lumber River basin. These waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource.

Figure A-11 ORWs and HQWs in the Lumber River Basin



The ORW rule defines outstanding resource values as including one or more of the following:

- an outstanding fisheries resource;
- a high level of water-based recreation;
- a special designation such as National Wild and Scenic River or a National Wildlife Refuge;
- within a state or national park or forest; or
- a special ecological or scientific significance.

The requirements for ORW waters are more stringent than those for HQWs. Special protection measures that apply to North Carolina ORWs are set forth in 15A NCAC 2B .0225. At a minimum, no new discharges or expansions are permitted, and a 30-foot vegetated buffer or stormwater controls for new developments are required. In some circumstances, the unique characteristics of the waters and resources that are to be protected require that a specialized (or customized) ORW management strategy be developed.

Primary Recreation (Class B and SB)

There are 135.6 stream miles, 115.0 freshwater acres and 25.6 miles of Atlantic coastline classified for primary recreation in the Lumber River basin. Primary recreation is also a classified use of shellfish harvesting (Class SA) waters.

Water Supply Watersheds

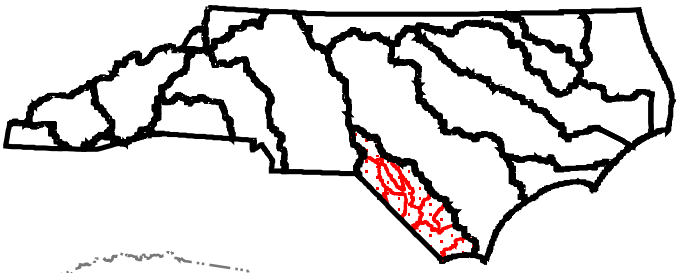
There are 216.7 stream miles classified as water supply watersheds in the Lumber River basin (Figure A-12). The purpose of the Water Supply Watershed Protection Program is to provide a proactive drinking water supply protection program for communities. Local governments administer the program based on state minimum requirements. There are restrictions on wastewater discharges, development, landfills and residual application sites to control the impacts of point and nonpoint sources of pollution.

There are five water supply classifications (WS-I to WS-V) that are defined according to the land use characteristics of the watershed. The WS-I classification carries the greatest protection for water supplies. No development is allowed in these watersheds. Generally, WS-I lands are publicly owned. WS-V watersheds have the least amount of protection and do not require development restrictions. These are either former water supply sources or sources used by industry. WS-I and WS-II classifications are also HQW by definition because requirements for these levels of water supply protection are at least as stringent as those for HQWs. Those watersheds classified as WS-II through WS-IV require local governments having jurisdiction within the watersheds to adopt and implement land use ordinances for development that are at least as stringent as the state's minimum requirements. A 30-foot vegetated setback is required on perennial streams in these watersheds.

Shellfish Harvesting

There are 4,280.8 acres of estuarine waters classified for shellfish harvesting (Figure A-12) in the Lumber River basin. The best uses of Class SA waters are for shellfishing for market purposes and any other usage specified by the "SB" or "SC" classification. Fecal coliform bacteria (see page 66) in Class SA waters shall meet the current sanitary and bacteriological standards as

Figure A-12 Water Supply Watersheds and Class SA Waters in the Lumber River Basin



MONTGOMERY
MOORE
HOKE
CUMBERLAND
RICHMOND
SCOTLAND
ROBESON
BLADEN
COLUMBUS
BRUNSWICK

03-07-50
03-07-51
03-07-52
03-07-53
03-07-54
03-07-55
03-07-56
03-07-57
03-07-58
03-07-59

Candor
Foxfire Village
Norman
Pinehurst
Southern Pines
Aberdeen
Pinebluff
Hoffman
Raeford
Dundarrach
Wagram
Lumber
Red Springs
Lumber Bridge
Parkton
Saint Pauls
Rennert
Gibson
East Laurinburg
Laurinburg
Maxton
Tar Heel
Pembroke
Lumberton
Dublin
Raynham
McDonald
Rowland
Bladenboro
Fairmont
Orrum
Proctorville
Clarkton
Boardman
Marietta
Cerro Gordo
Whiteville
Chadbourn
Bolton
Fair Bluff
Brunswick
Lake Waccamaw
Tabor City
Bolivia
Boiling Spring Lakes
Shallotte
Varnumtown
Carolina Shores
Holden Beach
Oak Island
Ocean Isle Beach
Sunset Beach

N
W
E
S

Legend

- Subbasin Boundary

Water Classification

- WS-II
- WS-IV
- SA Waters
- County Boundary
- Hydrography
- Municipality

7 0 7 14 21 Miles

NCDENR

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Basinwide Planning Program Unit
January 20, 2004

adopted by the Commission for Health Services. Domestic wastewater discharges are not allowed, and there are provisions for stormwater controls. Refer to 15A NCAC 2B .0221 for specifics on water quality standards in Class SA waters.

Pending and Recent Reclassifications in the Lumber River Basin

In 2000, by request from the Division of Water Resources and the Office of Conservation and Community Affairs' Natural Heritage Program, Lake Waccamaw (Columbus County) was designated as ORW (Outstanding Resource Water).

3.3 DWQ Water Quality Monitoring Programs in the Lumber River Basin

Staff in the Environmental Sciences Branch and Regional Offices of DWQ collect a variety of biological, chemical and physical data. The following discussion contains a brief introduction to each program, followed by a summary of water quality data in the Lumber River basin for that program. For more detailed information on sampling and assessment of streams in this basin, refer to the *Basinwide Assessment Report* for the Lumber River basin, available from the Environmental Sciences Branch website at http://www.esb.enr.state.nc.us/bar.html or by calling (919) 733-9960.

DWQ monitoring programs for the Lumber River Basin include:

- Benthic Macroinvertebrates (Section 3.3.1)
- Fish Assessments (Section 3.3.2)
- Aquatic Toxicity Monitoring (Section 3.3.3)
- Lake Assessment (Section 3.3.4)
- Ambient Monitoring System (Section 3.3.5)

3.3.1 Benthic Macroinvertebrate Monitoring

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily aquatic insect larvae. The use of benthos data has proven to be a reliable monitoring tool, as benthic macroinvertebrates are sensitive to subtle changes in water quality. Since macroinvertebrates have life cycles of six months to over one year, the effects of short-term pollution (such as a spill) will generally not be overcome until the following generation appears. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification to each benthic sample based on the number of different species present in the pollution intolerant groups of Ephemeroptera (Mayflies), Plecoptera (Stoneflies) and Trichoptera (Caddisflies), commonly referred to as EPTs; and a Biotic Index value, which gives an indication of overall community pollution tolerance. Different benthic macroinvertebrate criteria have been developed for different ecoregions (mountains, piedmont and coastal plain) within North Carolina. Bioclassifications fall into five categories ranging from Poor to Excellent.

Extensive evaluation of swamp streams across eastern North Carolina suggests that current coastal plain criteria are not appropriate for assessing the condition of water quality in these

special systems. Swamp streams are characterized by slower flow, lower dissolved oxygen, lower pH, dark-colored water and sometimes very complex braided channels that may cease flowing during summer low flow periods. This seasonal interruption in flow limits the diversity of the fauna, requiring special criteria to properly rate such streams. As of December 2002, DWQ finalized and approved a multi-metric system to refine biological criteria to assign bioclassifications to these streams. However, the criteria were not finalized during the biological assessment of the Lumber River basin (1996-2001). Refer to page 57 for more detailed information.

Overview of Benthic Macroinvertebrate Data

Appendix II lists all the benthic macroinvertebrate collections in the Lumber River basin between 1983 and 2001, giving site location, collection date, taxa richness, biotic index values and bioclassifications. There were 40 benthic samples collected during this assessment period. Table A-15 lists the most recent bioclassifications (by subbasin) for all benthos sites in the Lumber River basin. Most of the streams listed as "Not Rated" are characterized as swamp streams, page 57. Streams listed as "Good" or "Excellent" are generally found in the Sandhills region, in the upper reaches of the Lumber River, and in the Waccamaw River. A designation of Not Impaired may be used for flowing waters that are too small to be assigned a bioclassification (less than four meters in width), but meet the criteria for a Good-Fair or higher bioclassification using the standard qualitative and EPT criteria. Refer to page 58 for more information.

Table A-15 Summary of Bioclassifications for All Freshwater Benthic Macroinvertebrate Sites (using the most recent rating for each site) in the Lumber River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Impaired	Not Rated	Total
03-07-50	2	2	0	0	0	0	2	6
03-07-51	5	0	1	0	0	1	4	11
03-07-52	0	0	0	0	0	0	3	3
03-07-53	0	0	0	0	0	0	2	2
03-07-54	0	0	0	0	0	0	2	2
03-07-55	0	3	1	0	0	0	0	4
03-07-56	0	1	0	0	0	0	2	3
03-07-57	0	2	0	0	0	0	2	4
03-07-58	0	0	0	0	0	0	2	2
03-07-59	0	0	1	0	0	0	2	3
Total (#)	**7**	**8**	**3**	**0**	**0**	**1**	**21**	**40**
Total (%)	**17.5**	**20**	**7.5**	**0**	**0**	**2.5**	**52.5**	**100**

3.3.2 Fish Assessments

Scores are assigned to fish community samples using the North Carolina Index of Biotic Integrity (NCIBI). The NCIBI uses a cumulative assessment of 12 parameters or metrics. Each metric is designed to contribute unique information to the overall assessment. The scores for all metrics are then summed to obtain the overall NCIBI score. Appendix II contains more information regarding the NCIBI. During the late 1990s, application of the NCIBI has been restricted to wadeable streams that can be sampled by a crew of 2-4 persons using backpack electrofishers and following the DWQ Standard Operating Procedures (NCDEHNR, 1997). Work began in 1998 to develop a fish community boat sampling method that could be used in nonwadeable coastal plain streams. DWQ plans to sample reference sites with the boat method once it is finalized. As with other biological monitoring programs, many years of reference site data will be needed before solid criteria can be developed to evaluate biological integrity of large streams and rivers using the fish community assessment. Refer to page 57 for further information.

Overview of Fish Community Data

Appendix II lists all of the fish community collections in the Lumber River basin between 1990 and 2001, giving site location, collection date and NCIBI rating. Fish community samples have been collected at 22 sites in six of the Lumber River subbasins during this assessment period. Due to the ongoing revision in the NCIBI scoring and rating criteria for the Sandhills and Lower Coastal Plain region and the development of evaluation protocols for small boat collecting, no fish community sites were rated. Refer to page 57 for further information.

Lumber River Basin Fish Kills

DWQ has systematically tracked reported fish kill events across the state since 1996. From 1996 to 2000, DWQ field investigators reported 14 fish kill events in the Lumber River basin. Kill activity extent and fish mortality remained light, never exceeding 50,000. No fish kill reports were received in 1999. Causes listed on kill reports included algal blooms and low dissolved oxygen levels. The extent to which fish kills are related to land use activities is not known. For more information on fish kills in North Carolina, refer to http://www.esb.enr.state.nc.us/Fishkill/2000killrep.pdf.

Overview of Fish Tissue Sampling

One fish tissue survey was conducted by DWQ in the basin in 2000. The purpose of the survey was to analyze fish tissue samples for metal contaminants. The majority of fish tissue samples collected from the Lumber River site near Boardman contained metal contaminants at undetectable levels or at levels less than the EPA, Food and Drug Administration, and State of North Carolina consumption criteria. However, elevated mercury concentrations were detected in bowfin, chain pickerel and largemouth bass. These three species are at the top of the food chain and are most often associated with mercury bioaccumulation in fish tissue in North Carolina. For more information on this issue, refer to page 59. More detailed information regarding this sampling event can be found in the appropriate subbasin chapter (03-07-51) in Section B.

3.3.3 Aquatic Toxicity Monitoring

Acute and/or chronic toxicity tests are used to determine toxicity of discharges to sensitive aquatic species (usually fathead minnows or the water flea, *Ceriodaphnia dubia*). Results of these tests have been shown by several researchers to be predictive of discharge effects on receiving stream populations. Many facilities are required to monitor whole effluent toxicity (WET) by their NPDES permit or by administrative letter. Other facilities may also be tested by DWQ's Aquatic Toxicology Unit (ATU). Per Section 106 of the Clean Water Act, the ATU is required to test at least 10 percent of the major discharging facilities over the course of the federal fiscal year (FFY). However, it is ATU's target to test 20 percent of the major dischargers in the FFY. This means that each major facility would get evaluated over the course of their five-year permit. There are no requirements or targets for minor dischargers.

In addition, the ATU maintains a compliance summary for all facilities required to perform tests and provides monthly updates of this information to regional offices and DWQ administration. Ambient toxicity tests can be used to evaluate stream water quality relative to other stream sites and/or a point source discharge.

Twenty-six NPDES permits in the Lumber River basin currently require WET testing. Twenty-four permits have a WET limit; the other facilities have episodic discharges, and their permits specify monitoring but with no limit. The number of facilities required to monitor WET has increased steadily since 1987, the first year that WET limits were written into permits in North Carolina. The compliance rate has risen as well. Since 1996, the compliance rate has stabilized at approximately 85-90 percent. Figure A-13 summaries WET monitoring compliance in the Lumber River basin from 1987 to 1999. Facilities with toxicity problems during the most recent two-year review period are discussed in Section B subbasin chapters.

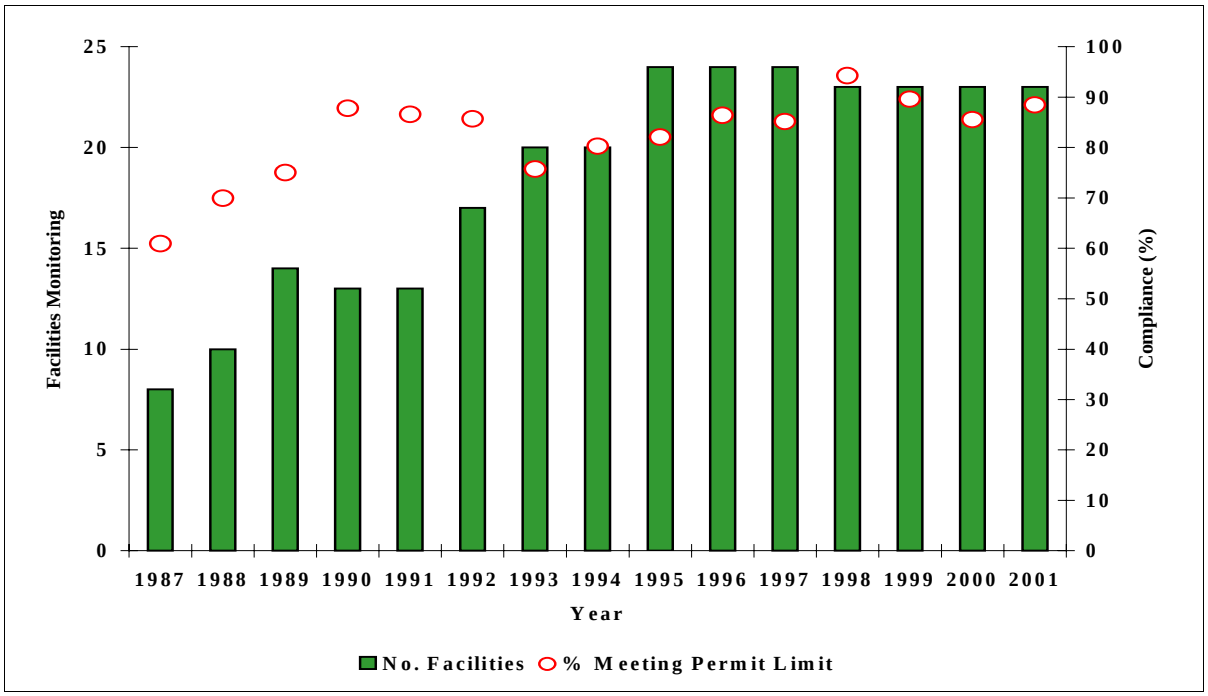

Figure A-13 Summary of Compliance with Aquatic Toxicity Tests in the Lumber River Basin

3.3.4 Lakes Assessment Program

Two lakes in the Lumber River basin were sampled as part of the Lakes Assessment Program in the summer of 2001. These lakes, Pages Lake and Lake Waccamaw, are discussed in the appropriate subbasin chapter (03-07-50 and 03-07-56) in Section B.

3.3.5 Ambient Monitoring System

The Ambient Monitoring System (AMS) is a network of stream, lake and estuarine stations strategically located for the collections of physical and chemical water quality data. North Carolina has more than 420 water chemistry monitoring stations statewide, including 32 stations in the Lumber River basin. Each station is sampled monthly for 27 parameters. The location of these stations are listed in Table A-16 and shown on individual subbasin maps in Section B. Refer to the *2002 Lumber River Basinwide Assessment Report* at http://www.esb.enr.state.nc.us/bar.html for more detailed analysis of ambient water quality monitoring data.

3.3.6 Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section

The Shellfish Sanitation and Recreational Water Quality Section of the Division of Environmental Health is responsible for monitoring and classifying coastal waters as to their suitability for shellfish harvesting for human consumption and inspection and certification of shellfish and crustacea processing plants. The section also administers the Recreational Beach Monitoring Program and posts advisories, under the guidance of the State Health Director, for those waters not suitable for bodily contact activities.

The Shellfish Sanitation Program is conducted in accordance with the guidelines set by the Interstate Shellfish Sanitation Conference (ISSC) contained in the *National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish Model Ordinance*. The NSSP is administered by the US Food and Drug Administration (FDA). Classifications of coastal waters for shellfish harvesting are done by means of a Sanitary Survey which includes: a shoreline survey of sources of pollution, a hydrographic and meteorological survey, and a bacteriological survey of growing waters. Sanitary Surveys are conducted of all potential shellfish growing areas in coastal North Carolina and recommendations are made to the Division of Marine Fisheries of which areas should be closed for shellfish harvesting.

The Recreational Beach Monitoring Program determines the quality of coastal waters and beaches for suitability for bodily contact activities. Shoreline surveys of potential sources of pollution that could affect the area are also conducted. Swimming advisories are posted when bacteriological standards are exceeded or point source discharges are found.

Water samples are collected and analyzed for fecal coliform bacteria from numerous sampling stations located throughout the coastal area for both the shellfish and recreational programs. The Recreational Monitoring Program also tests waters for *Escherichia coli*.

Table A-16 Locations of Ambient Monitoring Stations in the Lumber River Basin by Subbasin

Station	Location	Water Classification
03-07-50		
I2090000	Drowning Creek at US 1 near Hoffman	C Sw HQW
03-07-51		
I2610000	Lumber River at US 401 near Wagram	WS-IV & B Sw HQW
I2750000	Lumber River at SR 1303 near Maxton	B Sw HQW
I2810000	Lumber River at NC 71 near Maxton	B Sw HQW
I3050000	Lumber River at SR 1003 near Pembroke	WS-IV & B Sw HQW
I4650000	Lumber River at SR 2121 near Kingsdale	C Sw
I5690000	Lumber River at US 74 at Boardman	C Sw
I6410000	Lumber River at NC 904 at Fair Bluff	B Sw
03-07-52		
I3690000	Raft Swamp at SR 1527 near Moss Neck	WS-IV Sw
I3730000	Raft Swamp at NC 71 near Red Springs	C Sw
03-07-53		
I5370000	Big Swamp at NC 211 near Richardson	C Sw
03-07-54		
I6290000	Ashpole Swamp at SR 2258 near Barnesville	C Sw
03-07-55		
I0490000	Leiths Creek at SR 1609 near Johns	C Sw
I0510000	Leiths Creek at SR 1615 near Smyrna Church	C Sw
I1530000	Shoe Heel Creek at SR 1101 near Rowland	C Sw
03-07-56		
I7730000	Lake Waccamaw at dam spillway	B Sw ORW
03-07-57		
I8970000	Waccamaw River at NC 130 at Freeland	C Sw
I9310000	Seven Creek at NC 905 near Bug Hill	C Sw
I9350000	Waccamaw River at SC 9 near Longs, SC	FW (B Sw)
03-07-59		
I9380000	ICWW at CM R16 at Beaverdam Creek near Long Beach	SA HQW
I9385000	Montgomery Slough at SR 1105 near Long Beach	SA HQW
I9420000	Lockwood Folly River at NC 211 at Supply	SC HQW
I9440000	Lockwood Folly River at Varnum	SA HQW
I9450000	Lockwood Folly River at CM R8 at W Ch downstream of Varnum	SA HQW
I9500000	Lockwood Folly River at West Channel Islands	SA HQW
I9510000	ICWW at CM R42 West of Lockwood Folly River	SA HQW
I9530000	ICWW at NC 130 near Holdens Beach	SA HQW
I9700000	Shallotte River at Business US 17 at Shallotte	SC
I9820000	Shallotte River at Shell Point near Shallotte	SA HQW
I9840000	ICWW at NC 904 near Ocean Isle	SA HQW
I9880000	ICWW at SR 1172 near Sunset Beach	SA HQW
I9916000	Calabash Creek at NC 179 near Calabash	SA HQW

3.4 Other Water Quality Research

North Carolina actively solicits "existing and readily available" data and information for each basin as part of the basinwide planning process. Data meeting DWQ quality assurance objectives are used in making use support determinations. Data and information indicating possible water quality problems are investigated further. Both quantitative and qualitative information are accepted during the solicitation period. High levels of confidence must be present in order for outside quantitative information to carry the same weight as information collected from within DWQ. This is particularly the case when considering waters for the 303(d) list. Methodology for soliciting and evaluating outside data is presented in *North Carolina's 2002 Integrated 305(b) and 303(d) Report* (NCDENR-DWQ, February 2003). There were no data received during the open solicitation period in October 2000. The next data solicitation period for the Lumber River is planned for fall 2005.

DWQ data solicitation includes the following:

- Information, letters and photographs regarding the uses of surface waters for boating, drinking water, swimming, aesthetics and fishing.
- Raw data submitted electronically and accompanied by documentation of quality assurance methods used to collect and analyze the samples. Maps showing sampling locations must also be included.
- Summary reports and memos, including distribution statistics and accompanied by documentation of quality assurance methods used to collect and analyze the data.

Contact information must accompany all data and information submitted.

3.5 Use Support Summary

3.5.1 Introduction to Use Support

Surface waters are classified according to their best intended uses. Determining how well a waterbody supports its uses (*use support* status) is an important method of interpreting water quality data and assessing water quality.

Surface waters are rated *Supporting and Impaired*. These ratings refer to whether the classified uses of the water (such as water supply, aquatic life protection and recreation) are being met. For example, waters classified for fish consumption and aquatic life protection (Class C for freshwater or SC for saltwater) are rated Supporting if data used to determine use support meet certain criteria. However, if these criteria were not met, then the waters would be rated as Impaired. Waters with inconclusive data are listed as Not Rated. Waters lacking data are listed as No Data. More specific methods are presented in Part C of this appendix.

In previous use support assessments, surface waters were rated fully supporting (FS), partially supporting (PS), not supporting (NS) and not rated (NR). FS was used to identify waters that were meeting their designated uses. Impaired waters were rated PS and NS, depending on their degree of degradation. NR was used to identify waters lacking data or having inconclusive data. The 2002 Integrated Water Quality Monitoring and Assessment Report Guidance issued by the EPA requested that states no longer subdivide the Impaired category. In agreement with this

guidance, North Carolina no longer subdivides the Impaired category and rates waters as Supporting, Impaired, Not Rated or No Data.

Historically, the Supporting use support rating was also subdivided into fully supporting (FS) and fully supporting but threatened (ST). ST was used to identify waters that were fully supporting but had some notable water quality concerns and could represent constant, degrading or improving water quality conditions. North Carolina's past use of ST was very different from that of the US Environmental Protection Agency (EPA), which uses it to identify waters that demonstrate declining water quality (EPA Guidelines for Preparation of the Comprehensive State Water Quality Assessments [305(b) Reports] and Electronic Updates, 1997). Given the difference between the EPA and North Carolina definitions of ST and the resulting confusion that arose from this difference, North Carolina no longer subdivides the supporting category. However, these waters and the specific water quality concerns are identified in the Section B subbasin chapters so that data, management and the need to address the identified concerns are presented.

Use support methods have been developed to assess ecosystem health and human health risk through the development of use support ratings for six categories: aquatic life, recreation, fish consumption, shellfish harvesting, water supply and "other" uses. These categories are tied to the uses associated with the primary classifications applied to NC rivers, streams and lakes. A single water could have more than one use support rating corresponding to one or more of the six use support categories. For many waters, a use support category will not be applicable (N/A) to the use classification of that water (e.g., shellfish harvesting is only applied to Class SA waters). A full description of the classifications is available in the DWQ document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina*. For more detailed information regarding use support methodology, refer to Appendix III.

3.5.2 Comparison of Use Support Ratings to Streams on the Section 303(d) List

Section 303(d) of the Clean Water Act requires states to identify waters not meeting standards. EPA must then provide review and approval of the listed waters. A list of waters not meeting standards is submitted to EPA biennially. Waters placed on this list, termed the 303(d) list, require the establishment of total maximum daily loads (TMDLs) intended to guide the restoration of water quality. See Appendix IV for a description of 303(d) listing methodology.

Waters are placed on North Carolina's 303(d) list primarily due to use support rating of impairment. These use support ratings are based on biological and chemical data and, for some categories, human health advisories. When the state water quality standard is exceeded, then this constituent is listed as the problem parameter. TMDLs must be developed for problem parameters on the 303(d) list. Other strategies may be implemented to restore water quality; however, the waterbody must remain on the 303(d) list until improvement has been realized based on either biological bioclassifications or water quality standards.

The 303(d) list and accompanying data are updated as the basinwide plans are revised. In some cases, the new data will demonstrate water quality improvement and waters may receive a better use support rating. These waters may be removed from the 303(d) list when water quality standards are attained. In other cases, the new data will show a stable or decreasing trend in

overall water quality resulting in the same, or lower, use support rating. Attention remains focused on these waters until water quality standards are met. Currently, there are 11 waters listed on the *North Carolina's 2002 Integrated 305(b) and 303(d) Report* in the Lumber River basin. These waters are listed for fish consumption advisories related to mercury. These waters have not been monitored, but still are considered Impaired on an evaluated basis due to the current fish consumption advice from the NC Department of Health and Human Services. Refer to Appendix III and page 59 for more information.

3.5.3 Use Support Ratings for the Lumber River Basin

Aquatic Life

The aquatic life use support category is applied to all waters in North Carolina. Therefore, this category is applied to all 2,232.5 stream miles, 8,965.9 freshwater acres, 4,306.6 estuarine acres, and the 25.6 miles of Atlantic coastline in the Lumber River basin. Table A-17 presents the aquatic life use support ratings by subbasin for all waters in basin.

Table A-17 Aquatic Life Use Support Ratings for All Waters Listed by Subbasin (1996-2001)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-07-50	miles	66.2	0	50.9	63.6	180.7
	acres	35.2	0	0	78.8	114.0
03-07-51	miles	136.7	0	45.2	224.0	405.9
	acres	0	0	0	0	0
03-07-52	miles	37.0	0	19.9	85.4	142.3
	acres	0	0	0	0	0
03-07-53	miles	15.4	0	52.0	261.7	329.1
	acres	0	0	0	0	0
03-07-54	miles	25.7	0	6.7	57.7	91.1
	acres	0	0	0	11.8	11.8
03-07-55	miles	106.5	0	28.5	125.2	260.3
	acres	0	0	0	0	0
03-07-56	miles	10.5	0	11.6	75.9	98.0
	acres	8,840.2	0	0	0	8,840.0
03-07-57	miles	41.2	0	38.7	278.7	358.6
	acres	0	0	0	0	0
03-07-58	miles	0	0	29.5	191.0	220.5
	acres	0	0	0	0	0
03-07-59	miles	12.7	0	15.4	117.8	145.9
	acres	0	0	0	0	0
	Est. acres*	2,170.0	0	0	2,136.5	4,306.6
	coast**	0	0	0	25.6	25.6
Total	miles	451.9	0	299.4	1,481.2	2,232.5
	acres	8,875.3	0	0	90.6	8,965.9
	Est. acres*	2,170.0	0	0	2,136.5	4,306.6
	coast**	0	0	0	25.6	25.6

* Indicates saltwater (estuarine) acres; all other acres are freshwater acres.

** Indicates miles of Atlantic coastline in the Lumber River basin, not added to total mileage.

Approximately 32 percent of stream miles (723.1 miles) were monitored for aquatic life; there were no Impaired stream miles, freshwater acres or estuarine acres. Approximately 99 percent of freshwater acres (8,875.3 acres) and 50 percent of estuarine acres (2,170.0 acres) were monitored for aquatic life. Table A-18 summarizes aquatic life use support ratings for the entire basin.

Table A-18 Aquatic Life Use Support Summary Information for Waters in the Lumber River Basin (1996-2001)

Aquatic Life Use Support Ratings	All Waters	Percent of All Waters	Monitored Waters	Percent of Monitored Waters
Supporting	451.9 miles 8,875.3 acres 2,170.0 Est. acres	20.2 99.0 50.4	447.6 miles 8,875.3 acres 2,170 Est. acres	61.9 100.0 100.0
Impaired	0 miles 0 acres 0 Est. acres	0 0 0	0 miles 0 acres 0 Est. acres	0 0 0
Not Rated	299.4 miles 0 acres 0 Est. acres	13.4 0 0	275.5 miles 0 acres 0 Est. acres	38.1 0 0
No Data**	1,481.2 miles 90.6 acres 2,136.5 Est. acres	68.0 1.0 49.6	N/A N/A N/A	N/A N/A N/A
TOTAL	2,232.5 miles 8,965.9 acres 4,305.5 Est. acres		723.1* miles 8,875.3* acres 2,170.0* Est. acres	

Note: Est. acres indicate saltwater (estuarine) acres; all other acres are freshwater acres.

* 32.4 percent of all stream miles, 98.9 percent of all freshwater acres, and 50.4 estuarine acres were monitored.

** There are also 25.6 miles of Atlantic coastline with No Data, not added to total mileage.

Fish Consumption

Like the aquatic life use support category, the fish consumption category is also applied to all waters in the state. Approximately 1 percent of stream miles (21.5 miles) and 100 percent of coastline miles (25.6 coastline miles) were monitored for fish consumption. Fish consumption use support ratings are based on fish consumption advice or specific advisories issued by the NC Department of Health and Human Services (NCDHHS). Refer to page 59 for more information on this issue. If a limited fish consumption advice, advisory or a no consumption advisory is posted at the time of use support assessment, the water is rated Impaired. For details about how use support determinations are made, refer to Appendix III.

Table A-19 presents use support ratings by subbasin in the fish consumption use support category. Due to high levels of mercury in three freshwater and four saltwater fish species, the NC Division of Public Health has issued broad health advice for consumption of these fish caught south and east of Interstate 85. For details about these advisories, refer to the discussion beginning on page 59. A basinwide summary of current fish consumption use support ratings is presented in Table A-20.

Fish tissue was monitored in only 1 percent of stream miles (21.5) and 100 percent (25.6 coastline miles) in the Lumber River basin for the fish consumption use support category during this basinwide planning cycle. A basinwide summary of current fish consumption ratings is presented in Table A-20. Twenty-two fish tissue samples were collected from the Lumber River at US 74 at Boardman during this basinwide cycle. All but two samples contained elevated methylmercury levels that exceeded the state's recommended criteria. See Section B, Chapter 2 for further discussion.

Table A-19 Fish Consumption Use Support Ratings for All Waters Listed by Subbasin (1996-2001)

Subbasin	Units	Impaired
03-07-50	miles	180.7
	acres	114.0
03-07-51	miles	405.9
	acres	0
03-07-52	miles	142.3
	acres	0
03-07-53	miles	329.1
	acres	0
03-07-54	miles	91.1
	acres	11.8
03-07-55	miles	260.3
	acres	0
03-07-56	miles	98.0
	acres	8,840.0
03-07-57	miles	358.6
	acres	0
03-07-58	miles	220.5
	acres	0
03-07-59	miles	145.9
	acres	0
	Est. acres*	4,306.6
	coast**	25.6
Total	miles	2,232.5
	acres	8,965.9
	Est. acres*	4,306.6
	coast**	25.6

* Indicates saltwater (estuarine) acres; all other acres are freshwater acres.

** Indicates miles of Atlantic coastline in the Lumber River basin, not added to total mileage.

Table A-20 Fish Consumption Use Support Summary Information for Waters in the Lumber River Basin (1996-2001)

Fish Consumption	All Waters	Monitored Waters	Percent Monitored
Supporting	0 miles 0 acres 0 Est. acres	0 miles 0 acres 0 Est. acres	0 0 0
Impaired	2,232.5 miles 8,965.9 acres 4,306.6 Est. acres 25.6 coast	21.5 miles 0 acres 0 Est. acres 25.6 coast	1 0 0 100
Not Rated	0 miles 0 acres 0 Est. acres	0 miles 0 acres 0 Est. acres	0 0 0
TOTAL	2,232.5 miles 8,965.9 acres 4,306.6 Est. acres 25.6 coast	21.5 miles 0 acres 0 Est. acres 25.6 coast	1 0 0 100

Note: Est. acres indicate saltwater (estuarine) acres; all other acres are freshwater acres.
Coast indicates miles of Atlantic coastline in the Lumber River basin.

Recreation

Like the aquatic life use support category, the recreation category is also applied to all waters in the state. Table A-21 presents use support ratings by subbasin for all waters in the recreation use support category. Approximately 12 percent of stream miles (262.2 miles) were monitored by DWQ. There were no stream miles, freshwater acres or estuarine acres Impaired in the recreation use support category. Approximately 99 percent of freshwater acres and 47 percent of estuarine acres were monitored. Table A-22 summarizes recreation use support ratings for the entire basin.

Table A-21 Recreation Use Support Ratings for All Waters Listed by Subbasin (1996-2001)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-07-50	miles	15.7	0	0	165.0	180.7
	acres	0	0	0	114.0	114.0
03-07-51	miles	75.5	0	0	330.5	405.9
	acres	0	0	0	0	0
03-07-52	miles	37.0	0	0	105.3	142.3
	acres	0	0	0	0	0
03-07-53	miles	15.4	0	0	313.7	329.1
	acres	0	0	0	0	0
03-07-54	miles	6.9	0	0	84.2	91.1
	acres	0	0	0	11.8	11.8
03-07-55	miles	52.1	0	5.1	203.1	260.3
	acres	0	0	0	0	0
03-07-56	miles	0	0	0	98.0	98.0
	acres	8,840.2	0	0	0	8,840.2
03-07-57	miles	32.3	0	0	326.3	358.6
	acres	0	0	0	0	0
03-07-58	miles	0	0	0	220.5	220.5
	acres	0	0	0	0	0
03-07-59	miles	22.1	0	0	123.7	146.5
	acres	0	0	0	0	0
	Est. acres*	2,039.2	0	0	2,267.3	4,305.5
	coast**	25.6	0	0	0	25.6
Total	miles	257.1	0	5.1	1,970.3	2,232.5
	acres	8,840.2	0	0	125.7	8,965.9
	Est. acres*	2,039.2	0	0	2,267.3	4,306.6
	coast**	25.6	0	0	0	25.6

* Indicates saltwater (estuarine) acres; all other acres are freshwater acres.

** Indicates miles of Atlantic coastline in the Lumber River basin (not added to mileage total).

Table A-22 Recreation Use Support Summary for Waters in the Lumber River Basin (1996-2001)

Recreation	All Waters	Monitored Waters	Percent of Monitored Waters
Supporting	257.1 miles 8,840.2 acres 2,039.2 Est. acres 25.6 coast	257.1 miles 8,840.2 acres 2,039.2 Est. acres 25.6 coast	11.5 98.6 47.4 100
Impaired	0 miles 0 acres 0 Est. acres	0 miles 0 acres 0 Est. acres	0 0 0
Not Rated	5.1 miles 0 acres 0 Est. acres 0 coast	5.1 miles 0 acres 0 Est. acres 0 coast	0.2 0 0 0
No Data	1,970.3 miles 125.7 acres 2,276.3 Est. acres	N/A miles N/A acres N/A Est. acres	N/A N/A N/A
TOTAL	2,232.5 miles 8,965.9 acres 4,306.6 Est. acres 25.6 coast	262.2 miles 8,840.2 acres 2,039.2 Est. acres 25.6 coast	

Note: Est. acres indicate saltwater (estuarine) acres; all other acres are freshwater acres.
Coast indicates miles of Atlantic coastline in the Lumber River basin.

Water Supply

There are 216.7 stream miles currently classified for water supply in the Lumber River basin. All water supply waters are Supporting on an evaluated basis based on reports from DEH regional water treatment consultants.

Shellfish Harvesting

There are 4,280.8 estuarine acres classified for shellfish harvesting (Class SA) in the Lumber River basin. All were monitored during the past five years by DEH Shellfish Sanitation (refer to page 45). Table A-23 presents use support ratings by subbasin for all waters in the shellfish harvesting use support category. Impaired estuarine acres accounted for 15.7 percent of the total estuarine acres in the shellfish harvesting use support category. A basinwide summary of current shellfish harvest use support ratings is presented in Table A-24.

Table A-23 Shellfish Harvesting Use Support Ratings for All Waters Listed by Subbasin (1996-2001)

Subbasin	Units	Supporting	Impaired	Not Rated	No Data	Total
03-07-59	acres	673.9	3,606.9	0	0	4,280.8
Total	acres	673.9	3,606.9	0	0	4,280.8

Table A-24 Shellfish Harvesting Use Support Summary Information for Waters in the Lumber River Basin (1996-2001)

Shellfish Harvesting	Monitored Waters	Percent of Monitored
Supporting	673.9 acres	15.7
Impaired	3,606.9 acres	84.3
Not Rated	0 acres	0
TOTAL	4,280.8 acres	100

Impaired Waters

Table A-25 presents Impaired waters (in all categories) in the Lumber River basin that were monitored by DWQ within the last five years. The use support category for which a water is Impaired is indicated in the table. Descriptions of Impaired segments, as well as problem parameters, are outlined in Appendix III. Management strategies for each water are discussed in detail in the appropriate subbasin chapter. Maps showing current use support ratings for waters in the Lumber River basin are presented in each subbasin chapter in Section B.

Table A-25 Monitored Impaired Waters within the Lumber River Basin (as of 2003)

Waterbody	Subbasin	Chapter in Section B	Classification	Miles	Acres	Use Support Category
Lumber River *	03-07-51	2	C Sw	21.5	0.0	Fish Consumption
Intracoastal Waterway	03-07-59	10	SA	0.0	2,117.6	Shellfish Harvesting
Lockwoods Folly River	03-07-59	10	SA	0.0	606.2	Shellfish Harvesting
Mill Creek	03-07-59	10	SA	0.0	2.0	Shellfish Harvesting
Mullet Creek	03-07-59	10	SA	0.0	5.7	Shellfish Harvesting
Lockwoods Creek	03-07-59	10	SA	0.2	0.0	Shellfish Harvesting
Spring Creek	03-07-59	10	SA	0.0	2.4	Shellfish Harvesting
Shallotte River	03-07-59	10	SA	0.0	647.3	Shellfish Harvesting
The Mill Pond	03-07-59	10	SA	0.0	2.8	Shellfish Harvesting
Sams Branch	03-07-59	10	SA	0.6	0.0	Shellfish Harvesting
The Swash	03-07-59	10	SA	0.0	3.9	Shellfish Harvesting
Shallotte Creek	03-07-59	10	SA	0.0	135.6	Shellfish Harvesting
Saucepan Creek	03-07-59	10	SA	0.0	62.6	Shellfish Harvesting
Jinnys Branch	03-07-59	10	SA	0.0	1.0	Shellfish Harvesting
Goose Creek	03-07-59	10	SA	0.0	4.2	Shellfish Harvesting
Big Gut Slough	03-07-59	10	SA	0.0	0.3	Shellfish Harvesting
Kilbart Slough	03-07-59	10	SA	0.0	0.7	Shellfish Harvesting
Calabash River	03-07-59	10	SA	0.0	3.4	Shellfish Harvesting
Hangman Branch	03-07-59	10	SA	0.0	10.2	Shellfish Harvesting
Atlantic Coastline *	03-07-59	10	SB	25.6	0.0	Fish Consumption

* Although all waters in the basin are considered Impaired for the fish consumption use support category, only the Lumber River (21.5 miles) and the Atlantic coastline (25.6 miles) were monitored (see page 59).