
North Carolina's Basinwide Approach to Water Quality Management

Basinwide water quality planning is a nonregulatory watershed-based approach to restoring and protecting the quality of North Carolina's surface waters. Basinwide water quality plans are prepared by the NC Division of Water Quality (DWQ) for each of the 17 major river basins in the state. Each basinwide plan is revised at five-year intervals. While these plans are prepared by the DWQ, their implementation and the protection of water quality entail the coordinated efforts of many agencies, local governments and stakeholders in the state. The first basinwide plan for the Lumber River basin was completed in 1994 and the second in 1999.

This document is the third five-year update of the *Lumber River Basinwide Water Quality Plan*. The format of this plan was revised in response to comments received during the first and second planning cycles. DWQ replaced much of the general information in the first plan with more detailed information specific to the Lumber River basin. A greater emphasis was placed on identifying causes and sources of pollution for individual streams in order to facilitate local restoration efforts.

DWQ considered comments from two public workshops held in the basin and subsequent discussions with local resource agency staff and citizens during draft plan development. This input will help guide continuing DWQ activities in the basin.

Goals of the Basinwide Approach

The goals of basinwide planning are to:

- Identify water quality problems and restore full use to Impaired waters.
- Identify and protect high value resource waters.
- Protect unimpaired waters yet allow for reasonable economic growth.

DWQ accomplishes these goals through the following objectives:

- Collaborate with other agencies to develop appropriate management strategies.
- Assure equitable distribution of waste assimilative capacity.
- Better evaluate cumulative effects of pollution.
- Improve public awareness and involvement.

Lumber River Basin Overview

The Lumber River basin lies along the North Carolina/South Carolina border at the southeast corner of the state, extending approximately 150 miles from the Sandhills region in southern Moore and Montgomery counties to the Atlantic Ocean coastline in Brunswick County. Streams and rivers in the Lumber River basin (except for the Lockwoods Folly and Shallotte Rivers) flow into South Carolina and are tributaries of the Pee Dee River. Ultimately, the Pee Dee River empties at Winyah Bay near Georgetown and Myrtle Beach, South Carolina.

From 1982 to 1997, urban and built-up land cover increased by 67,000 acres. Uncultivated cropland decreased by 4,000 acres while pastureland remained about the same. Forest and cultivated cropland cover significantly decreased by 30,000 and 41,000 acres, respectively. Most land cover change is accounted for in the Lumber River basin hydrologic units that include rapidly growing areas in Brunswick, Hoke, Moore and Robeson counties.

The Lumber River basin encompasses all or portions of nine counties and 51 municipalities. The overall population of the basin based on the percent of the counties that are partially or entirely in the basin is 304,579, with approximately 92 persons/square mile. The watersheds with an increase in population are near Pinehurst, Laurinburg, Boiling Spring Lakes and Oak Island.

Populations of counties that are wholly or partly contained within the basin increased by over 501,308 people between 1990 and 2000. Hoke, Moore and Robeson counties are growing the fastest in the upper basin, with Brunswick County growing the fastest in the lower basin. The county populations are expected to grow by more than 156,000 by 2020. With the increased population there will be increased drinking water demands and wastewater discharges. There will also be loss of natural areas and increases in impervious surfaces associated with construction of new homes and businesses.

There are 2,232.5 freshwater stream miles, 8,965.9 acres of freshwater, 4,306.6 estuarine acres, and 25.6 miles of Atlantic coastline in the Lumber River basin. There are also countless miles of unmapped small perennial, intermittent and ephemeral streams. The lower Lumber River basin contains extensive wetland communities also. The basin starts in the Sandhills physiographic region with about two-thirds of the basin in the Coastal Plain.

Assessment of Water Quality in the Lumber River Basin

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 and recreation) are being met. For example, waters assessed for aquatic life (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 Appendix III.

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.

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, fish consumption, shellfish harvesting, recreation, 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.

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 freshwater stream miles, 8,965.9 acres of freshwater, 4,306.6 estuarine acres, and 25.6 miles of Atlantic coastline in the Lumber River basin. Approximately 32 percent of stream miles (723.1 miles) were monitored. Approximately 99 percent of freshwater acres (8,875.3) and 50 percent of estuarine acres (2,170.0 acres) were monitored. There were no Impaired stream miles, freshwater acres or estuarine acres. Table 1 summarizes aquatic life use support ratings for the entire basin.

Table 1 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	20.2	447.6 miles	61.9
	8,875.3 acres	99.0	8,875.3 acres	100.0
	2,170.0 Est. acres	50.4	2,170 Est. acres	100.0
Impaired	0 miles	0	0 miles	0
	0 acres	0	0 acres	0
	0 Est. acres	0	0 Est. acres	0
Not Rated	299.4 miles	12.0	275.5 miles	38.1
	0 acres	0	0 acres	0
	0 Est. acres	0	0 Est. acres	0
No Data**	1,481.2 miles	68.0	N/A	N/A
	90.6 acres	1.0	N/A	N/A
	2,136.5 Est. acres	49.6	N/A	N/A
TOTAL	2,232.5 miles 8,965.9 acres 4,306.6 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 Atlantic coastline miles (25.6 miles) in the Lumber River basin were monitored for the fish consumption use support category during this basinwide cycle. 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). 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. A basinwide summary of current fish consumption use support ratings is presented in Table 2.

Table 2 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. Approximately 12 percent of stream miles (262.2 miles) were monitored by DWQ. There were no stream miles Impaired in the recreation use support category. Approximately 99 percent of freshwater acres and 47 percent of estuarine acres were monitored. Table 3 summarizes recreation use support ratings for the entire basin.

Table 3 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	257.1 miles	11.5
	8,840.2 acres	8,840.2 acres	98.6
	2,039.2 Est. acres	2,039.2 Est. acres	47.4
	25.6 coast	25.6 coast	100
Impaired	0 miles	0 miles	0
	0 acres	0 acres	0
	0 Est. acres	0 Est. acres	0
Not Rated	5.1 miles	5.1 miles	0.2
	0 acres	0 acres	0
	0 Est. acres	0 Est. acres	0
	0 coast	0 coast	0
No Data	1,970.3 miles	N/A miles	N/A
	125.7 acres	N/A acres	N/A
	2,276.3 Est. acres	N/A Est. acres	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). 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 4.

Table 4 Shellfish Harvesting Use Support Summary Information for Waters in the Lumber River Basin

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

Impaired Waters

Table 5 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 waterbody 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 waterbody 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 5 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).

Recommended Management Strategies for Restoring Impaired Waters

The long-range mission of basinwide planning is to provide a means of addressing the complex problem of planning for increased development and economic growth while maintaining, protecting and enhancing water quality and intended uses of the Lumber River basin's surface waters. Within this basinwide plan, DWQ presents management strategies and recommendations for those waters considered Impaired or that exhibit some notable water quality problem.

Major water quality problems in the basin include habitat degradation, algal blooms, low dissolved oxygen (affecting aquatic life), mercury in fish tissue (affecting fish consumption), and fecal coliform bacteria contamination (affecting shellfish harvesting). Habitat degradation, including sedimentation, streambed scour and streambank erosion, is primarily attributed to nonpoint source pollution (NPS). Sources of nonpoint source pollution include runoff from construction sites, agricultural lands and urban areas, and hydromodification.

For streams degraded by point source pollution, the plan presents a management strategy to reduce the impacts from that pollutant source. The task of quantifying nonpoint sources of pollution and developing management strategies for these Impaired waters is very resource intensive. This task is overwhelming, given the current limited resources of DWQ, other agencies (e.g., Division of Land Resources, Division of Soil and Water Conservation, Cooperative Extension Service, etc.) and local governments.

DWQ plans to further evaluate Impaired waters in the Lumber River basin in conjunction with other agencies that deal with nonpoint source pollution issues and develop management strategies for a portion of these Impaired waters for the next *Lumber River Basinwide Water Quality Plan* (2008).

Addressing Waters on the State's 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. EPA issued guidance in August 1997 that called for states to develop schedules for developing TMDLs for all waters on the 303(d) list within 8-13 years.

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 were listed for fish consumption advisories related to mercury. Several of these waters have not been monitored by DWQ, 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.

Challenges Related to Achieving Water Quality Improvements

To achieve the goal of restoring Impaired waters throughout the basin, DWQ will need to work more closely with other state agencies and stakeholders to identify and control pollutants. The costs of restoration will be high, but several programs exist to provide funding for restoration efforts. These programs include the Clean Water Management Trust Fund, the NC Agricultural Cost Share Program, the Wetlands Restoration Program and the federally funded Environmental Quality Incentives Program.

With increased development occurring, there will be significant challenges ahead in balancing economic growth with the protection of water quality in this basin. Point source impacts on surface waters can be measured and addressed through the basinwide planning process. Nonpoint sources of pollution can be identified through the basinwide plan, but actions to address these impacts must be taken at the local level. Such actions should include: development and enforcement of local erosion control ordinances; requirement of stormwater best management practices for existing and new development; development and enforcement of buffer ordinances; and land use planning that assesses impacts on natural resources. This basinwide plan presents many water quality initiatives and accomplishments that are underway within the basin. These actions provide a foundation on which future initiatives can be built.