

# Chapter 3 - Summary of Water Quality Information for the Pasquotank River Basin

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## 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) permit from the state.

### **Nonpoint Sources**

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

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 and nutrients are most often associated with nonpoint source pollution. Other pollutants associated with nonpoint source pollution include fecal coliform bacteria, oil and grease, pesticides and any other substance that may be washed off the ground or deposited from the atmosphere into surface waters.

Unlike point sources of 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

### 3.2.1 Program Overview

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.

### 3.2.2 Surface Water Classifications

All surface waters in the state are assigned a *primary* classification that is appropriate to the best uses of that water (Table A-17). 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. For example, a stream might have a C Sw classification, where C is the primary classification followed by the Sw (Swamp) supplemental classification. A full description of the state's primary and supplemental classifications is available in the document titled: *Classifications and Water Quality Standards Applicable to Surface Waters of North Carolina*. Information on this subject is also available at DWQ's website at <http://h2o.enr.state.nc.us/wqhome.html>.

Table A-17 Primary and Supplemental Surface Water Classifications

PRIMARY FRESHWATER AND SALTWATER CLASSIFICATIONS*	
<u>Class</u>	<u>Best Uses</u>
<b>C and SC</b>	Aquatic life propagation/protection and secondary recreation.
<b>B and SB</b>	Primary recreation and Class C uses.
<b>SA</b>	Waters classified for commercial shellfish harvesting.
<b>WS</b>	<i>Water Supply watershed</i> . 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	
<u>Class</u>	<u>Best Uses</u>
<b>Sw</b>	<i>Swamp Waters</i> : Recognizes waters that will naturally be more acidic (have lower pH values) and have lower levels of dissolved oxygen.
<b>Tr</b>	<i>Trout Waters</i> : Provides protection to freshwaters for natural trout propagation and survival of stocked trout.
<b>HQW</b>	<i>High Quality Waters</i> : 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.
<b>ORW</b>	<i>Outstanding Resource Waters</i> : Unique and special surface waters that are unimpacted by pollution and have some outstanding resource values.
<b>NSW</b>	<i>Nutrient Sensitive Waters</i> : Areas with water quality problems associated with excessive plant growth resulting from nutrient enrichment.

\* Primary classifications beginning with an "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 a 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 waters establish the basic protection level for all state surface waters. With the exception of swamp waters, all of the other primary and supplemental classifications have more stringent standards than for C, 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. These waters may be designated as HQW or ORW.

### **High Quality Waters**

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 must address oxygen-consuming wastes, total suspended solids, disinfection, emergency requirements, volume and toxic substances.

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 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. Section A, Part 2.7.2 describes these stormwater controls in more detail. In addition, the Division of Land Resources requires more stringent sedimentation controls for land-disturbing projects within one mile and draining to HQWs.

#### **Criteria for HQW Classification**

- Waters rated as Excellent based on DWQ's chemical and biological sampling.
- Streams designated as native and special native trout waters or primary nursery areas by the Wildlife Resources Commission (WRC).
- Waters designated as primary nursery areas by the Division of Marine Fisheries.
- Critical habitat areas designated by the Wildlife Resources Commission or the Department of Agriculture.
- Waters classified by DWQ as WS-I, WS-II and SA are HQW by definition, but these waters are not specifically assigned the HQW classification because the standards for WS-I, WS-II and SA waters are at least as stringent as those for waters classified HQW.

### **Outstanding Resource Waters**

A small percentage of North Carolina's surface waters have excellent water quality (rated based on biological and chemical sampling as with HQWs) and an associated outstanding resource designation. The requirements for ORW waters are more stringent than those for HQWs.

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

- 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;
- being within a state or national park or forest; or
- having special ecological or scientific significance.

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 stormwater controls for most new developments are required. In some cases, the unique characteristics of the waters and resources that are to be protected require that a customized ORW management strategy be developed. Many streams in the

Pasquotank River basin fall under such a management strategy that is discussed in greater detail below.

### **Water Supply Watersheds**

The purpose of the Water Supply Watershed Protection Program is to provide an opportunity for communities to work with the state to strengthen protection of their water supplies. There are five water supply classifications (WS-I to WS-V) that are defined according to the amount and types of permitted point source discharges, as well as requirements to control nonpoint sources of pollution (Table A-17). Watersheds draining to waters classified WS carry some restrictions on point source discharges and on many land use activities including urban development, agriculture, forestry and highway sediment control. Minimum requirements for WS-I to WS-IV include a 30-foot undisturbed vegetated buffer. The WS-I and WS-II classifications are HQW by definition because requirements for these levels of water supply protection are at least as stringent as for HQWs.

### **Class SA Waters**

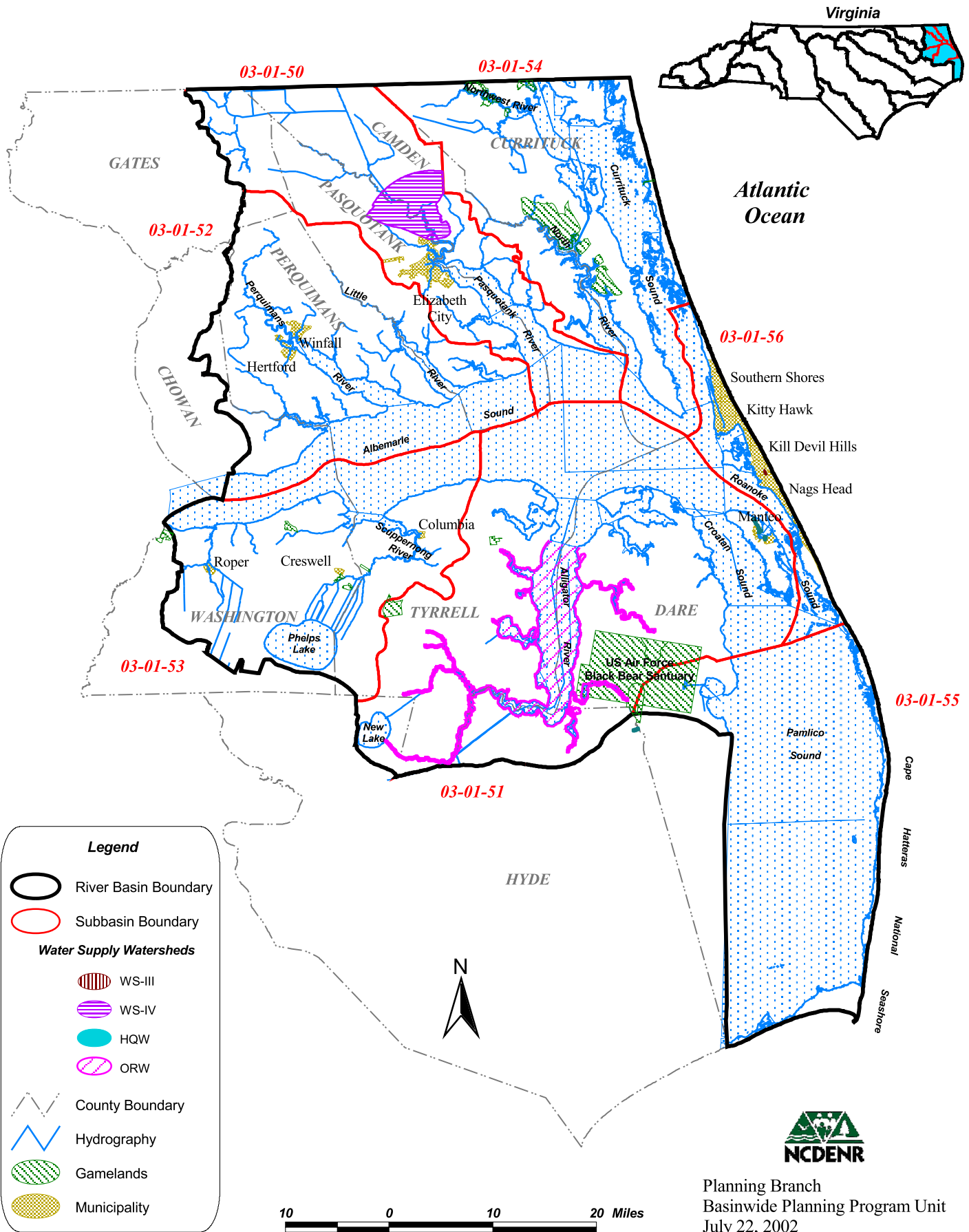
The best uses of Class SA waters are for shellfishing for market purposes and any other usage specified by the "SB" or "SC" classification. Fecal coliform bacteria in Class SA waters shall meet the current sanitary and bacteriological standards as adopted by the Commission for Health Services. Domestic 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.

### **3.2.3 Classifications and Standards in the Pasquotank River Basin**

Waters of the Pasquotank River basin have a variety of surface water quality classifications applied to them including each of the primary classifications possible and all but two of the secondary classifications (NSW and Tr). Water supply watersheds (WS-I and WS- II) and SA waters are also, by definition, HQWs. For a view of the variety of water supply watersheds, Outstanding Resource Waters and High Quality Waters, see Figure A-13.

The majority of the waters in the Pasquotank River basin were classified in the 1960s and 1970s. Some waters have undergone reclassification based on new information or public comment. Some of the recent reclassifications since the last basin plan include the following:

**Figure A-13 Water Supply Watersheds, High Quality Waters and Outstanding Resource Waters in the Pasquotank River Basin**



- August 2000, Phelps Lake (B Sw ORW) was reclassified as an Outstanding Resource Water.
- August 1998, a portion of Turners Cut from a point 1.2 miles upstream of its mouth to Pasquotank River was designated as WS-IV Sw. The Pasquotank River from a point 1.7 miles upstream of its mouth to Turners Cut to a point 0.6 mile upstream of the Pasquotank County SR 1368 extension was reclassified in 1998 to WS-IV Sw. In addition, Turners Cut from the Dismal Swamp Canal to a point 1.2 miles upstream of the mouth was reclassified to C Sw.
- August 1998, Joyce Creek was reclassified from its source to the Dismal Swamp Canal as C Sw.
- August 1998, the Dismal Swamp Canal from the northern state border to the Pasquotank River was reclassified to C Sw.

### **Pending Reclassifications in the Pasquotank River Basin**

Table A-18 Pending Reclassifications in the Pasquotank River Basin

<b>Waterbody</b>	<b>County</b>	<b>Current Classification</b>	<b>Proposed Classification</b>
Broad Creek	Camden	SC	SC HQW
Deep Creek	Currituck	SC	SC HQW
East Lake	Dare	SC Sw	SC Sw HQW
Jean Guite Creek	Dare	SC Sw	SC Sw HQW
Little Alligator River	Tyrrell	SC Sw	SC Sw HQW
Lutz Creek	Currituck	SC	SC HQW
Tull Creek and Bay	Currituck	B Sw, C Sw	B Sw HQW, C Sw HQW

The areas above were designated as inland primary nursery areas (PNAs) by the NC Wildlife Resources Commission (Table A-18). Coastal primary nursery areas are automatically eligible for HQW status; however, the rule does not currently apply to inland PNAs. Each water would have to go through the reclassification process individually.

In October 2000, DWQ conducted a special study on Kendrick Creek in Washington County. Their study noted that even though Kendrick Creek is classified as SC to the US 64 bridge, analysis of monitoring data would place the SC line much closer to the Albemarle Sound.

Shallowbag Bag, currently rated SC, contains Manteo's Wastewater Treatment Plant discharge as well as swimming areas. The area is also surrounded by SA waters in nearby Roanoke Sound. The Division of Environmental Health also collects swimming area sampling data for four sites in the Currituck Sound, all of which are situated in Class SB waters. SC waters are not designated specifically for primary recreation such as swimming; therefore, the waters should undergo reclassification to SB waters.

#### **2002 Recommendations**

DWQ will pursue reclassification of the NC Wildlife Resource Commission's inland PNAs, Kendrick Creek and Shallowbag Bay during this five-year basin cycle. DWQ will communicate with the Environmental Management Commission regarding the status of the reclassification during its multiyear process.

Classification and standards for the entire basin can be found in a separate document entitled *Classifications and Water Quality Standards Assigned to the Waters of the Pasquotank River Basin*. This document may be obtained by calling the Planning Branch of DWQ at (919) 733-5083 or accessed through the DWQ Water Quality Section website at <http://h2o.enr.state.nc.us/wqhome.html>.

### **3.3 DWQ Water Quality Monitoring Programs in the Pasquotank River Basin**

The Environmental Sciences Branch of DWQ collects 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 Pasquotank River basin for that program. A more complete discussion of DWQ monitoring within the basin can be found in the *Pasquotank River Basinwide Assessment Report* (NCDENR-DWQ, 2001). For further information on DWQ's biological sampling methods, refer to Appendix III.

#### ***DWQ monitoring programs for the Pasquotank 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 Macroinvertebrates**

Benthic macroinvertebrates, or benthos, are organisms that live in and on the bottom substrates of rivers and streams. These organisms are primarily 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 more than one year, the effects of short-term pollution (such as a spill) will generally not be overcome until the following generation appears, even though a toxic substance may be carried away fairly quickly. The benthic community also integrates the effects of a wide array of potential pollutant mixtures.

Criteria have been developed to assign a bioclassification rating 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. Unique criteria have been developed for each of three ecoregions (mountains, piedmont and coastal plain) within North Carolina. These ratings fall into five categories ranging from Poor to Excellent.

#### **Overview of Benthic Macroinvertebrate Data**

Appendix II lists all the benthic macroinvertebrate collections in the Pasquotank River basin between 1983 and 2000, giving site location, collection date, taxa richness, biotic index values and bioclassifications. Benthic macroinvertebrates have been collected at 46 sites in the Pasquotank River basin since 1983. For the 2000 collections, no sites were given bioclassifications (see Section A, Chapter 4 for further details). Table A-19 lists the most recent

ratings since 1983 (by subbasin) for all benthic macroinvertebrate sites in the Pasquotank River basin.

Table A-19 Summary of Bioclassifications for All Freshwater Benthic Macroinvertebrate Sites (using the most recent sample for each site) in the Pasquotank River Basin

Subbasin	Excellent	Good	Good-Fair	Fair	Poor	Not Rated	Total
03-01-50	0	0	0	0	0	5	5
03-01-51	0	0	0	0	0	10	10
03-01-52	0	0	0	0	0	6	6
03-01-53	0	0	0	0	0	6	6
03-01-54	0	0	0	0	0	0	0
03-01-55	0	0	0	0	0	0	0
03-01-56	0	0	0	0	0	0	0
<b>Total (#)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>27</b>	<b>27</b>
<b>Total (%)</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>0%</b>	<b>100%</b>	<b>----</b>

### 3.3.2 Fish Assessments

#### Overview of Fish Assessment

During 2000, DWQ did not sample any fish community sites. Typically, DWQ uses the North Carolina Index of Biotic Integrity (NCIBI) as a tool for fish assessments. Since 1995, DWQ has not conducted any fish tissue surveys in the Pasquotank River basin. However, there are currently fish consumption advisories in the Pasquotank River basin. Refer to page 68 for more information on fish consumption advisories.

Significant mercury contamination was identified in areas such as Lake Phelps where over 50 percent of the fish sampled prior to 1996 contained levels above human health standards. Lake Phelps is unique because it possesses a minimal drainage area, receives most of its hydrologic input from the atmosphere, and represents a minimally impacted system. Research indicates that atmospheric mercury deposition is a significant source for the observed mercury levels (USEPA, 1997).

#### Pasquotank River Basin Fish Kills

DWQ has systematically monitored and reported on fish kill events across the state since 1996. Field reports since 1996 have generally shown light fish kill activity (ten or less events) in the Chowan River and Pasquotank River basins each year (NCDENR-DWQ, 1999a). These basins generally exhibited fewer conditions that have given rise to frequent kill activity in other coastal areas. Such conditions include eutrophication, stratification and associated hypoxia, especially along the shallow, poorly flushed waterbodies. The Pasquotank River basin has not experienced hurricane related fish kills in recent years as compared with the more southern areas such as the

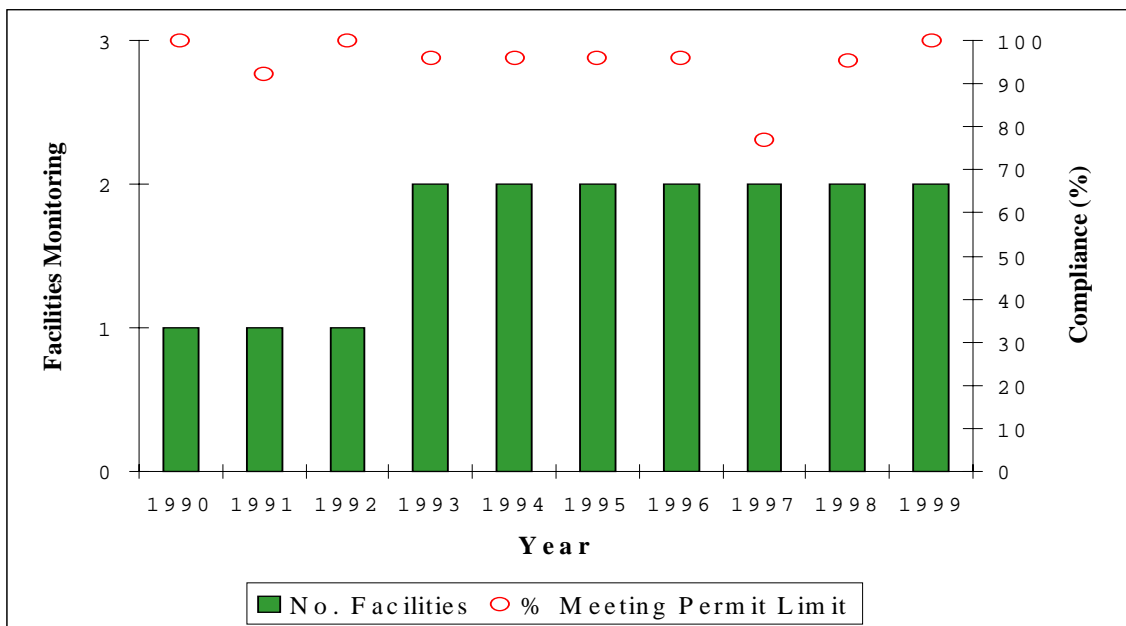


Neuse River and Cape Fear River basins. One fish kill associated with mild blooms of nontoxic dinoflagellates was investigated during August 1999.

### 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 by their NPDES permit or by administrative letter. Other facilities may be tested by DWQ's Aquatic Toxicology Laboratory.

The Aquatic Toxicology Unit maintains a compliance summary for all facilities required to perform tests and provides a monthly update 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. A summary of compliance for the Pasquotank River basin from 1989 through 1999 is presented in Figure A-14 below. Problems associated with noncompliance in 1997 and 1998 are discussed in Section B in appropriate subbasin chapters.



These numbers were calculated by determining whether a facility was meeting its ultimate permit limit during the given time period, regardless of any SOCs in force.

This is not the actual number of test performed, but the number of opportunities for limit compliance evaluation. Assumptions were made about compliance for months where no monitoring took place based on data previous to that month. Facilities compliant in a given month were assumed to be in compliance during months following until the next actual monitoring event. This same policy was applied to facilities in noncompliance.

Figure A-14 Summary of Compliance with Aquatic Toxicity Tests in the Pasquotank River Basin

### 3.3.4 Lake Assessment

Lake Phelps is the second largest natural lake in North Carolina. This shallow and acidic lake (pH<5) is located at a higher elevation than the surrounding land, so most of the recharge to the lake comes from precipitation. Lake Phelps was the only lake monitored in the Pasquotank River basin as part of the lake assessment program. Lake Phelps was sampled three times during the summer of 2000.

In January 2001, DWQ discovered quality assurance issues with chlorophyll *a* laboratory analyses for samples from 1996 through February 2001. DWQ tracking efforts have identified several different quality assurance issues. In some circumstances, laboratory data for chlorophyll *a* will require recalculation efforts. In other cases, chlorophyll *a* data cannot be recovered from the laboratory methods that were utilized. For lakes that were monitored as part of this time period, all previously reported chlorophyll *a* laboratory analyses have been withheld pending a sufficient quality assurance evaluation and/or recalculation of chlorophyll *a* values. As a result, there are no North Carolina Trophic State Index (NCTSI) values available for this time period.

### 3.3.5 Ambient Monitoring System Program

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 over 400 monitoring stations statewide, including 12 stations in the Pasquotank River basin (Table A-20). Locations of the Pasquotank River basin ambient stations are presented in subbasin chapters of Section B.

Table A-20 Ambient Monitoring System Stations within the Pasquotank River Basin

Subbasin/ Station	Location	County	Classification*
<b>03-01-50</b>			
M2750000	Pasquotank River at Elizabeth City	Pasquotank	SB
<b>03-01-51</b>			
M7175000	Alligator River at US 64 near Alligator	Tyrrell	SC SW ORW
M390000C	Albemarle Sound near Frog Island mid channel	Tyrrell	SB
M390000S	Albemarle Sound near Frog Island south shore	Tyrrell	SB
<b>03-01-52</b>			
M3500000	Little River at US 17 at Woodville	Perquimans	C SW
M390000N	Albemarle Sound near Frog Island north shore	Pasquotank	SB
M5000000	Perquimans River at SR 1336 at Hertford	Perquimans	SC
M610000N	Albemarle Sound between Harvey Point and Mill Point north shore	Perquimans	SB
<b>03-01-53</b>			
M698000C	Scuppernong River at SR 1105 near Columbia	Tyrrell	C SW
M6920000	Kendrick Creek at SR1300 at Mackeys	Washington	SC
M610000C	Albemarle Sound between Harvey Point and Mill Point mid channel	Tyrrell	SB
M610000S	Albemarle Sound between Harvey Point and Mill Point south shore	Tyrrell	SB

\* An index for DWQ freshwater classifications can be found in Part 3.2 of this section (Table A-17).

### 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 2000 § 303(d) List* (NCDENR-DWQ, October 2000). The next data solicitation period for the Pasquotank River is planned for 2004.

***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.*

DWQ solicited data from other water sampling programs conducted in the Pasquotank River basin; however, no data meet quality and accessibility requirements considered necessary for use support assessments, 303(d) list, or adjustment of biological and chemical monitoring sites.

#### 3.4.1 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*.

### **3.4.2 Virginia's Water Quality Monitoring**

Virginia reported the following percentages of waters in the Chowan River and Dismal Swamp basin as impaired in its 2000 305(b) report: aquatic life (88.02 miles partially supporting, 647.89 miles not supporting, 0.12 estuary miles not supporting); and swimming (235.09 miles partially supporting, 49.86 miles not supporting, 0.12 estuary miles partially supporting). The various causes associated with the impairment include benthic macroinvertebrate population impacts, pH, organic enrichment/low DO and pathogen indicators. Potential sources of pollutants listed are industrial point sources, agriculture, hydromodification, urban runoff/storm sewers, natural sources and sources unknown (Virginia, 2000).

Virginia needs to develop 648 TMDLs on 600 impaired waters in the state. Several TMDLs in the Chowan River and Dismal Swamp basin are slated for completion in 2006 including: Roses Creek (benthic macroinvertebrate community issues, fecal coliform and unknown causes); Hurricane Branch UT (benthic macroinvertebrate community issues); West Neck Creek (fecal coliform); and Nawney Creek (fecal coliform).

For more information, visit the Virginia Department of Environmental Quality's webpage at <http://www.deq.state.va.us/tmdl/10yrsch.html>.

## **3.5 Use Support Summary**

### **3.5.1 Introduction to Use Support**

Waters are classified according to their best-intended uses. Determining how well a water supports its uses (*use support* status) is an important method of interpreting water quality data and assessing water quality. Surface waters are rated *fully supporting* (FS), *partially supporting* (PS) or *not supporting* (NS). The terms 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 fishing and secondary contact recreation (Class C for freshwater) are rated as fully supporting if data used to determine use support did not exceed specific criteria. However, if these criteria were exceeded, then the waters would be rated as PS or NS, depending on the degree of degradation. Waters rated PS or NS are considered to be impaired. Waters lacking data, or having inconclusive data, are listed as not rated (NR).

***Use support ratings for streams and lakes:***

- *Fully Supporting (FS)*
- *Partially Supporting (PS)*
- *Not Supporting (NS)*
- *Not Rated (NR)*

***Categories for impaired waters:***

- *Partially Supporting*
- *Not Supporting*

Historically, the non-impaired category was subdivided into fully supporting 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 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 arises from this difference, North Carolina no longer subdivides the non-impaired category. However, these waters and the specific water quality concerns remain identified in the subbasin chapters in Section B so that data, management and the need to address the identified concerns are not lost.

Beginning in 2000 with the Roanoke River basin, an approach to assess ecosystem health and human health risk is applied to use support categories. Six categories are used to assess this approach: aquatic life and secondary recreation, fish consumption, shellfish harvesting, primary recreation, water supply and "other" uses. Each of these categories relates to the primary classifications applied to NC rivers and streams. A single water could have more than one use support rating corresponding to one or more of the multiple use support categories, as shown in Table A-28. For many waters, a use support category will not be applicable (NA) to the best use classification of that water (e.g., drinking water supply is not the best use of a Class C water). This method of determining use support differs from that done prior to 2000; in that, there is no longer an *overall* use support rating for a water. 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 a partially or not supporting use support rating. These use support ratings are based on biological and chemical data. 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 ratings or water quality standards.

Use support ratings 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 since water quality improvement has been 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 being met. Swamp waters may have been on previous impaired waters lists due to depressed dissolved oxygen and/or pH levels. These waters will remain on the impaired waters list until swamp studies, biological and chemical, have been completed and use support has been reassessed. Thus, some inconsistencies remain between the 303(d) list and the Pasquotank Basinwide Water Quality Plan.

### **3.5.3 Use Support Ratings for the Pasquotank River Basin**

#### **Aquatic Life/Secondary Recreation**

The aquatic life/secondary recreation use support category is applied to all waters in North Carolina. Therefore, this category is applied to the total number of stream miles (474.1), estuarine acres (918,223.6), freshwater acres (22,770.2), and coastal miles (110.6) in the Pasquotank River basin. Table A-21 presents use support ratings by subbasin for both monitored and evaluated waters in the aquatic life/secondary recreation category. A basinwide summary of current aquatic life/secondary recreation use support ratings is presented in Table A-22.

Approximately 29 percent of stream miles (135.6 mi.), 69 percent of estuarine acres (639,207.2 acres), and 94 percent of freshwater acres (15,938.3 acres) were monitored for the protection of aquatic life and secondary recreation by DWQ during this basinwide planning cycle. The 110.6 miles of Atlantic coastline are not currently monitored by DWQ to assess the aquatic life/secondary recreation use support category. There was no impairment in this use support category in the basin during this planning cycle.

Table A-21 Aquatic Life/Secondary Recreation Use Support Ratings for Monitored, Evaluated and Not Rated Waters Listed by Subbasin in Miles and Acres (1995-2000)

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total
03-01-50	28,665.8 estuarine ac	0	0	132.4 mi 23,208.9 estuarine ac	132.4 mi 51,874.7 estuarine ac
03-01-51	124,679 estuarine ac	0	0	70.0 mi 5,747.4 fresh ac 109,828.1 estuarine ac	70.0 mi 5,747.4 fresh ac 234,507.1 estuarine ac
03-01-52	72,795.5 estuarine ac	0	0	88.6 mi 18,924.6 estuarine ac	88.6 mi 91,720.1 estuarine ac
03-01-53	63,433.2 estuarine ac	0	0	113.2 mi 15,938.5 fresh ac 3,653.3 estuarine ac	113.2 mi 15,938.5 fresh ac 67,086.5 estuarine ac
03-01-54	11,049.3 estuarine ac	0	0	69.9 mi 942.9 fresh ac 113,560 estuarine ac 22.6 coastal mi	69.9 mi 942.9 fresh ac 124,609.3 estuarine ac 22.6 coastal mi
03-01-55	316,110.7 estuarine ac	0	0	117.6 fresh ac 4,022.0 estuarine ac 53.8 coastal mi	117.6 fresh ac 320,132.7 estuarine ac 53.8 coastal mi
03-01-56	12,463.2 estuarine ac	0	0	23.8 fresh ac 15,830.2 estuarine ac 34.2 coastal mi	23.8 fresh ac 28,293.5 estuarine ac 34.2 coastal mi
<b>Total</b>	<b>629,196.7 estuarine ac</b>	<b>0</b>	<b>0</b>	<b>474.1 mi 22,770.2 fresh ac 289,026.9 estuarine ac 110.6 coastal mi</b>	<b>474.1 mi 22,770.2 fresh ac 918,223.6 estuarine ac 110.6 coastal mi</b>
Percent estuarine acres	68.1%	0%	0%	31.5% estuarine ac*	100%

\* = Coastal miles, freshwater miles and freshwater acres are 100 percent not rated.

Table A-22 Aquatic Life/Secondary Recreation Use Support Summary Information for Waters in the Pasquotank River Basin (2000)

Aquatic Life/Secondary Recreation Use Support Ratings	Monitored, Evaluated and Not Rated Streams*		Monitored Streams Only**	
	Miles or Acres	%	Miles or Acres	%
<b>Fully Supporting</b>	<b>629,196.7 estuarine ac</b>	<b>68.1%</b>	<b>629,196.7 estuarine ac</b>	<b>98.4%</b>
<b>Impaired</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>
<i>Partially Supporting</i>	<i>0</i>	<i>0%</i>	<i>0</i>	<i>0%</i>
<i>Not Supporting</i>	<i>0</i>	<i>0%</i>	<i>0</i>	<i>0%</i>
<b>Not Rated</b>	<b>474.1 mi</b> <b>22,770.2 fresh ac</b> <b>289,026.9 estuarine ac</b> <b>110.6 coastal mi</b>	<b>100%</b> <b>100%</b> <b>31.5%</b> <b>100%</b>	<b>135.6 mi</b> <b>15,938.3 fresh ac</b> <b>10,010.5 estuarine ac</b>	<b>100%</b> <b>100%</b> <b>1.6%</b>
<b>Total</b>	<b>474.1 mi</b> <b>22,770.2 fresh ac</b> <b>918,223.6 estuarine ac</b> <b>110.6 coastal mi</b>		<b>135.6 mi</b> <b>15,938.3 fresh ac</b> <b>639,207.2 estuarine ac</b>	

\* = Percent based on total of all waters, both monitored and evaluated.

\*\* = Percent based on total of all monitored waters.

### **Fish Consumption**

Like the aquatic life/secondary recreation use support category, the fish consumption use support category is also applied to all waters in the state. One hundred percent of Atlantic coastline (110.6 miles) in the Pasquotank River basin was monitored for the fish consumption use support category during this basinwide cycle. No stream miles were monitored for fish consumption use support. Fish consumption use support ratings are based on fish consumption advisories issued by the NC Department of Health and Human Services (NCDHHS). Currently, there is a regional advisory limiting consumption of shark, swordfish, king mackerel, tilefish, largemouth bass, bowfin (or blackfish), and chain pickerel (or jack) due to elevated methylmercury levels. Because of this advisory, all waters south and east of Interstate 85 are considered partially supporting the fish consumption use. Refer to page 68 for more information on fish consumption advisories.

Table A-23 presents use support ratings by subbasin for monitored streams in the fish consumption use support category. A basinwide summary of current fish consumption use support ratings is presented in Table A-24.



Table A-23 Fish Consumption Use Support Ratings for Monitored Waters Listed by Subbasin (1995-2000)

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total
03-01-50	0	0	0	0	0
03-01-51	0	0	0	0	0
03-01-52	0	0	0	0	0
03-01-53	0	0	0	0	0
03-01-54	0	22.6 coastal mi	0	0	22.6 coastal mi
03-01-55	0	53.8 coastal mi	0	0	53.8 coastal mi
03-01-56	0	34.2 coastal mi	0	0	34.2 coastal mi
<b>Total</b>	<b>0</b>	110.6 coastal mi	<b>0</b>	<b>0</b>	110.6 coastal mi
<b>Percent</b>	<b>0%</b>	<b>100%</b>	<b>0%</b>	<b>0%</b>	--

Table A-24 Fish Consumption Use Support Summary Information for Waters in the Pasquotank River Basin (2000)

Fish Consumption Use Support Ratings	Monitored, Evaluated and Not Rated Streams*		Monitored Streams Only**	
	Miles or Acres	%	Miles or Acres	%
<b>Fully Supporting</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>
<b>Impaired</b>				
<i>Partially Supporting</i>	<i>474.1 mi 22,770.2 fresh ac 918,223.6 estuarine ac 110.6 coastal mi</i>	<i>100%</i>	<i>110.6 coastal mi</i>	<i>100%</i>
<i>Not Supporting</i>	<i>0</i>	<i>0%</i>	<i>0</i>	<i>0%</i>
<b>Not Rated</b>	<b>0</b>	<b>0%</b>	<b>0</b>	<b>0%</b>

\* = Percent based on total of all streams, both monitored and evaluated.

\*\* = Percent based on total of all monitored streams.

### Primary Recreation

There are 707,455.2 estuarine acres, 110.6 coastal miles, 15,938.3 freshwaters acres and 25.1 freshwater miles currently classified for primary recreation in the Pasquotank River basin. The Division of Environmental Health Shellfish Sanitation and Recreational Water Quality Section monitors primary recreation on both the estuarine and coastal shorelines. During the last two years, all monitored sites are fully supporting the primary recreation use. However, one site at the Villas Condominiums, Inc. did not support primary recreation due to an ongoing swimming closure advisory in accordance to rule which has been in effect more than two years. However,

DEH does not monitor this site. Table A-25 presents use support ratings by subbasin for monitored streams in the primary recreation use support category. A basinwide summary of current primary recreation use support ratings is presented in Table A-26.

Table A-25 Primary Recreation Use Support Ratings for Monitored Waters Listed by Subbasin (1995-2000)

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total
03-01-50	37,851.5 estuarine ac	0	0	93.3 estuarine ac	37,944.8 estuarine ac
03-01-51	149,130.1 estuarine ac	0	0	13,004.7 estuarine ac	162,134.8 estuarine ac
03-01-52	72,795.5 estuarine ac	0	0	9,840.3 estuarine ac	82,635.8 estuarine ac
03-01-53	63,433.2 estuarine ac	0	0	1,839.4 estuarine ac 15,938.3 fresh ac	65,272.6 estuarine ac 15,938.3 fresh ac
03-01-54	22.6 coastal mi	0	0	25.1 miles 11,049.3 estuarine ac	25.1 miles 11,049.3 estuarine ac 22.6 coastal mi
03-01-55	315,407.0 estuarine ac 53.8 coastal mi			4,725.8 estuarine ac	320,132.8 estuarine ac 53.8 coastal mi
03-01-56	12,851.8 estuarine ac 34.2 coastal mi	0	21.4 estuarine ac	15,411.9 estuarine ac	28,258.1 estuarine ac 34.2 coastal mile
<b>Total</b>	<b>651,469.10</b> <b>estuarine ac</b> <b>110.6 coastal mi</b>	<b>0</b>	<b>21.4</b> <b>estuarine ac</b>	<b>55,964.7</b> <b>estuarine ac</b> <b>25.1 miles</b> <b>15,938 fresh ac</b>	<b>707,455.2</b> <b>estuarine ac</b> <b>110.6 coastal mi</b> <b>25.1 miles</b> <b>15,938.3 fresh ac</b>
<b>Percent</b>	<b>92.1% estuarine ac</b> <b>100% coastal mi</b>	<b>0%</b>	<b>&lt;1%</b> <b>estuarine ac</b>	<b>7.9% estuarine ac</b> <b>100% fresh ac</b>	

Table A-26 Primary Recreation Use Support Summary Information for Waters in the Pasquotank River Basin (2000)

Primary Recreation Use Support Ratings	Monitored, Evaluated and Not Rated Streams*		Monitored Streams Only**	
	Miles or Acres	%	Miles or Acres	%
<b>Fully Supporting</b>	651,469.1 estuarine ac 110.6 coastal mi	92.1% estuarine ac 100% coastal mi	651,469.1 estuarine ac 110.6 coastal mi	99.9% estuarine ac 100% coastal mi
<b>Impaired</b>	<b>21.4 estuarine ac</b>	<b>&lt;1% estuarine ac</b>	<b>21.4 estuarine ac</b>	<b>&lt;1% estuarine ac</b>
<i>Partially Supporting</i>	<i>0</i>	<i>0%</i>	<i>0</i>	<i>0%</i>
<i>Not Supporting</i>	21.4 estuarine ac	<1% estuarine ac	21.4 estuarine ac	<1% estuarine ac
<b>Not Rated</b>	55,964.7 estuarine ac 25.1 miles 15,938.3 fresh ac	<b>7.9% estuarine ac</b> <b>100% fresh ac</b>	15,938.3 fresh ac	
<b>TOTAL</b>	707,455.2 estuarine ac 110.6 coastal mi 25.1 miles 15,938 fresh ac		<b>651,469.1 estuarine ac</b> <b>15,938 fresh ac</b> <b>110.6 coastal miles</b>	

\* = Percent based on total of all streams, both monitored and evaluated.

\*\* = Percent based on total of all monitored streams.

### Shellfish Harvesting

In the Pasquotoank River basin, there are 395,371.3 estuarine acres which have shellfish harvesting (Class SA) identified by the state as its best use. All were monitored during the past five years by DEH Shellfish Sanitation. Table A-27 presents use support ratings by subbasin for monitored streams in the shellfish harvesting use support category. A basinwide summary of current shellfish harvest use support ratings is presented in Table A-28. For more information on shellfish harvesting issues, refer to Section 4.2.

Table A-27 Shellfish Harvesting Use Support Ratings for Monitored Waters Listed by Subbasin (1995-2000) in Acres

Subbasin	Fully Supporting	Partially Supporting	Not Supporting	Not Rated	Total
03-01-51	52,791.3 ac.	0	1,959.3 ac	0	54,750.6 ac
03-01-55	318,771.7 ac	0	1,361.1 ac	0	320,132.8 ac
03-01-56	18,775.0 ac	0	1,712.9	0	20,487.9
<b>Total</b>	<b>390,338.0 ac</b>		<b>5,033.3 ac</b>	<b>0</b>	<b>395,371.3 ac</b>
<b>Percent</b>	<b>98.7%</b>	<b>0%</b>	<b>1.3%</b>	<b>0%</b>	<b>100%</b>

Table A-28 Shellfish Harvest Use Support Summary Information for Waters in the Pasquotank River Basin (1995-2000)

Shellfish Harvest Use Support Ratings	Monitored Streams	
	Acres	%
<b>Fully Supporting</b>	<b>390,338.0</b>	<b>98.7%</b>
<b>Impaired</b>	<b>5,033.3</b>	<b>1.3%</b>
<i>Partially Supporting</i>	<i>0</i>	<i>0%</i>
<i>Not Supporting</i>	<i>5,033.3</i>	<i>1.3</i>
<b>Not Rated</b>	<b>0</b>	<b>0</b>
<b>Total</b>	<b>395,371.3</b>	<b>100%</b>

### Water Supply

There are 30.3 stream miles and 23.8 freshwater acres currently classified for water supply in the Pasquotank River basin. All are considered fully supporting on an evaluated basis, based on information provided by the regional water treatment plant consultant. Local water treatment plant operators monitored all during the past five years.

### Use Support Summary

There are no impaired waters in the aquatic life/secondary recreation use support category and one impaired water in the primary recreation use support category. All waters are considered impaired for the fish consumption use support category due to a regional fish consumption advisory for bowfin, largemouth bass, chain pickerel and king mackerel. Although no stream miles were monitored for this category, the Atlantic Ocean was monitored to assess this category. There are 5,033.3 estuarine acres impaired for the shellfish harvesting use support category. All water supply watershed waters are fully supporting their uses in the basin. 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.

Color maps showing current use support ratings for the Pasquotank River basin are presented in Figure A-15. Since no waters in the basin were sampled for fish tissue, there are no waters colored for fish consumption impairment on the maps. When use support ratings have been assigned to more than one category for a particular water, the rating that represents the most severe impairment is shown on the map.

**Figure A-15 Use Support Map for the Pasquotank River Basin**

