Appendix III

Use Support Methodology
and
Use Support Ratings

Multiple-Category Use Support Methods

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A. 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 *fully supporting* (FS), *partially supporting* (PS) or *not supporting* (NS). The ratings refer to whether the classified uses of the water (i.e., aquatic life protection, primary recreation and water supply) are being met. For example, waters classified for fishing, aquatic life protection and secondary recreation (Class C for freshwater or SC for saltwater) are rated FS if data used to determine use support meet certain criteria. However, if these criteria were not met, 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). More specific methods are presented in Part C of this appendix.

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 basin plans so that data, management and the need to address the identified concerns are not lost.

B. Interpretation of Data and Information

Data used in the use support assessments include biological data, chemical/physical data, lakes assessment data, fish consumption advisories from the NC Department of Health and Human Services, and swimming advisories and shellfish sanitation growing area classification from the NC Division of Environmental Health (as appropriate). Available land cover and land use information is also used, along with annual water supply reports from regional water treatment plant consultants.

Although there is a general procedure for analyzing the data and information for determining use support ratings, each waterbody is reviewed individually, and best professional judgment is applied during these determinations. Assessments are made on either a monitored (M) or evaluated (E) basis depending on the level of information available. Refer to Part E for more information on the basis of assessments.

When interpreting the use support ratings, it is important to understand its associated limitations and degree of uncertainty. The assessments are not intended to provide precise conclusions about pollutant budgets for specific watersheds. Rather, the intent of use support assessments is to gain an overall picture of water quality, to describe how well surface waters support the uses for which they were classified, and to document the potential contribution made by different pollution sources.

C. Assessment Methodology

Use Support Categories and Uses

Beginning in 2000 with the *Roanoke River Basinwide Water Quality Plan*, DWQ assesses ecosystem health and human health risk through the development of use support ratings for six categories: aquatic life and secondary recreation, fish consumption, shellfish harvesting, primary recreation, water supply and "other" uses. These categories are tied to the uses associated with 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 six use support categories, as shown in the table below. 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*.

	Use Support Categories					
Primary Classification	**Ecosystem Approach**	**Human Health Approach**				
	Aquatic Life/Secondary Recreation	**Fish Consumption**	**Primary Recreation**	**Water Supply**	**Shellfish Harvesting**	**Other**
C	X	X	N/A	N/A	N/A	X
SC	X	X	N/A	N/A	N/A	X
B	X	X	X	N/A	N/A	X
SB	X	X	X	N/A	N/A	X
SA	X	X	X	N/A	X	X
WS I – WS IV	X	X	N/A	X	N/A	X

Many types of information are used to determine use support ratings and to identify causes and sources of use support impairment. A use support data file is maintained for each of the 17 river basins. All existing data pertaining to a stream segment for each applicable use support category are entered into its record and can include, but is not limited to, use support ratings, basis of assessment, biological data, ambient monitoring data, problem parameters and potential sources. The following describes the data and methodologies used to make use support assessments for the surface water classifications (described in Section A, Chapter 3 of each basin plan) using the six use support categories. These methods will continue to be refined, as additional information becomes available.

Basis of Assessment

FS ratings are extrapolated up tributaries from monitored streams when no problematic dischargers or change in land use/cover are identified. The FS rating may also be applied to unmonitored tributaries where there is little land disturbance (e.g., national forests and wildlife refuges, wilderness areas or state natural areas). Problem parameters or sources (except general NPS) are not applied to unmonitored tributaries. PS or NS ratings are not extrapolated to unmonitored tributaries. Refer to Part E for more information.

Problem Parameters

Where an ambient parameter is identified as a potential concern, the parameter is listed in the DWQ database and use support summary table. Where habitat degradation is identified by DWQ biologists based on site visits, it is listed and attempts are made to identify the type of habitat degradation (e.g., sedimentation, loss of woody habitat, loss of pools, loss of riffles, channelization, lack of riparian vegetation, streambed scour and bank erosion). Habitat evaluation methods are being developed to better identify specific types of habitat degradation.

Potential Sources

General nonpoint sources (NPS) and point sources (PS) of pollution are identified where there is sufficient information.

Aquatic Life and Secondary Recreation Use Support

The aquatic life and secondary recreation use support category is an ecosystem approach to assess whether aquatic life (benthic macroinvertebrates and fish) can live and reproduce in the waters of the state and whether waters support secondary recreation (i.e., wading, boating and minimal human body contact with water). This category is applied to all waters of the state. Biological data, ambient monitoring data and NPDES discharger data are all considered in assessing the aquatic life and secondary recreation use support category. The following is a description of each data type and methods used to assess how well a water is meeting the criteria for aquatic life protection and secondary recreation.

Biological Data

There are two main types of biological data: benthic marcoinvertebrate and fish community. Where recent data for both benthic macroinvertebrates and fish communities are available, both are evaluated in assessing use support. It is important to note that where both ambient monitoring data and biological data are available, biological data are given greater weight.

In special situations, where there are currently insufficient biological data available, the basinwide planner will make a request of the DWQ Environmental Sciences Branch to determine whether a biological survey is appropriate. If a biological survey is appropriate, the use support rating will be determined by the bioclassification resulting from the survey. If a biological survey is not appropriate, then the stream will be not rated.

Benthic Macroinvertebrate Bioclassifications

Criteria have been developed to assign bioclassifications ranging from Poor to Excellent to most benthic macroinvertebrate samples based on the number of taxa present in the pollution intolerant aquatic insect groups of *Ephemeroptera, Plecoptera* and *Trichoptera* (EPTs) and the Biotic Index (BI), which summarizes tolerance data for all taxa in each collection. The benthic macroinvertebrate bioclassifications are translated into use support ratings according to the following scheme:

Bioclassification	Use Support Rating
Excellent	Fully Supporting (FS)
Good	Fully Supporting (FS)
Good-Fair	Fully Supporting (FS)
Fair	Partially Supporting (PS)
Poor	Not Supporting (NS)

Due to the increased emphasis placed on Fair or Poor bioclassifications and the borderline nature of some bioclassification scores, sites should be resampled within 12-24 months after a Fair rating is obtained in 1999 and beyond, if this Fair rating will result in a lower use support rating or if data are from a site never sampled before. This resampling will be done to validate the Fair bioclassification. Such sites will not be given a use support rating until the second sample is obtained. The table below shows how a final use support rating is obtained for sites that are resampled.

New Benthic Macroinvertebrate Classifications (1999 and Beyond) and Data Causing a Decline in Use Support Ratings

Pre-1999 Bioclassification	1st sample Bioclassification	Draft Use Support Rating	2nd sample Bioclassification	Final Use Support Rating
N/A	Fair	NR; resample	Good-Fair, Good or Excellent	FS
N/A	Fair	NR; resample	Fair	PS
N/A	Fair	NR; resample	Poor	NS
N/A	Poor	NS	N/A	NS
Good-Fair, Good or Excellent	Fair	NR; resample	Good-Fair, Good or Excellent	FS
Good-Fair, Good or Excellent	Fair	NR; resample	Fair	PS
Good-Fair, Good or Excellent	Fair	NR; resample	Poor	NS
Good-Fair, Good or Excellent	Poor	NS	N/A	NS

N/A – Not Applicable NR = Not Rated

The use of benthic macroinvertebrate data can be limited in some waters. The accumulation of swamp stream data over nearly a decade suggests that not all swamp streams support similar fauna. The development of swamp stream criteria is complex, and one set of criteria is not

appropriate for all swamp streams. Benthic macroinvertebrate data will not be used in waters characterized or classified by DWQ as swamp waters until the bioclassification criteria for these waters can be used with confidence. Benthic macroinvertebrate data are also not used to develop use support ratings for estuarine waters. Until bioclassification criteria for swamp and estuarine waters are developed, a designation of Not Rated (NR) will be used, and these waters will be listed as NR for aquatic life and secondary recreation use support assessments.

Benthic macroinvertebrate data are used to provide bioclassifications for high elevation trout streams. The benthic macroinvertebrate data, while not a direct measure of the trout population, are a robust measure of stream integrity. Loss of canopy, increase in stream temperature, increased nutrients, toxicity and increased sedimentation will affect the benthic macroinvertebrate and fish communities. For these reasons, the benthic macroinvertebrate bioclassifications provide a valuable assessment of the integrity of trout waters.

A designation of Not Impaired (NI) may be used for flowing waters that are too small to be assigned a bioclassification (less than 4 meters in width), but meet the criteria for a Good-Fair or higher bioclassification using the standard qualitative and EPT criteria. This designation will translate into a use support rating of FS.

Fish Community Bioclassification

The North Carolina Index of Biotic Integrity (NCIBI) is a method for assessing a stream's biological integrity by examining the structure and health of its fish community. The NCIBI incorporates information about species richness and composition, indicator species, trophic function, abundance and condition, and reproductive function. The NCIBI is translated into use support ratings according to the following scheme:

NCIBI	Use Support Rating
Excellent	Fully Supporting (FS)
Good	Fully Supporting (FS)
Good-Fair	Fully Supporting (FS)
Fair	Partially Supporting (PS)
Poor	Not Supporting (NS)

The NCIBI was recently revised by DWQ (NCDENR, 2001b). Currently, the focus of using and applying the NCIBI is restricted to wadeable streams that can be sampled by a crew of four persons. Infrequently, larger wadeable streams can be sampled if there is a crew of six persons. The bioclassifications and criteria have also been recalibrated against regional reference site data (NCDENR, 2000a, 2000b and 2001a).

NCIBI criteria are applicable only to wadeable streams in the following river basins: Broad, Catawba, Savannah, Yadkin-Pee Dee, Cape Fear, Neuse, Roanoke, Tar-Pamilco, French Broad, Hiwassee, Little Tennessee, New and Watauga. Additionally, the NCIBI criteria are only applicable to streams in the piedmont portion of the Cape Fear, Neuse, Roanoke and Tar-Pamlico River basins. The definition of the "piedmont" for these four river basins is based upon a map of North Carolina watersheds (Fels, 1997). Specifically:

- In the Cape Fear River basin – all waters except for those draining the Sandhills in Moore, Lee and Harnett counties and the entire basin upstream of Lillington, NC.
- In the Neuse River basin -- the entire basin above Smithfield and Wilson, NC, except for the south and southwest portions of Johnston County and the eastern two-thirds of Wilson County.
- In the Roanoke River basin -- the entire basin in North Carolina upstream of Roanoke Rapids, NC and a small area between Roanoke Rapids and Halifax, NC.
- In the Tar-Pamlico River basin -- the entire basin above Rocky Mount, NC, except for the lower southeastern one-half of Halifax County and the extreme eastern portion of Nash County.

NCIBI criteria have not been developed for:

- Streams in the Broad, Catawba, Yadkin-Pee Dee, Savannah, French Broad, Hiwassee, Little Tennessee, New and Watauga River basins which are characterized as wadeable first to third order streams with small watersheds, naturally low fish species diversity, coldwater temperatures, and high gradient plunge-pool flows. Such streams are typically thought of as "Southern Appalachian Trout Streams".
- Wadeable streams in the Sandhills ecoregion of the Cape Fear, Lumber and Yadkin-Pee Dee River basins.
- Wadeable streams and swamps in the coastal plain region of the Cape Fear, Chowan, Lumber, Neuse, Pasquotank, Roanoke, Tar-Pamlico and White Oak River basins.
- All non-wadeable and large streams and rivers throughout the state.

Due to the increased emphasis placed on Fair or Poor bioclassifications and the borderline nature of some bioclassification scores, sites should be resampled within 12-24 months after a Fair rating is obtained in 1999 and beyond, if this Fair rating will result in a lower use support rating or if data are from a site never sampled before. This resampling will be done to validate the Fair bioclassification. Such sites will not be given a use support rating until the second sample is obtained. The table below shows how a final use support rating is obtained for sites that are resampled.

New Fish Community Classifications (1999 and Beyond) and Data Causing a Decline in Use Support Ratings				
Pre-1999 Bioclassification	**1st sample Bioclassification**	**Draft Use Support Rating**	**2nd sample Bioclassification**	**Final Use Support Rating**
N/A	Fair	NR; resample	Good-Fair, Good or Excellent	FS
N/A	Fair	NR; resample	Fair	PS
N/A	Fair	NR; resample	Poor	NS
N/A	Poor	NS	N/A	NS
Good-Fair, Good or Excellent	Fair	NR; resample	Good-Fair, Good or Excellent	FS
Good-Fair, Good or Excellent	Fair	NR; resample	Fair	PS
Good-Fair, Good or Excellent	Fair	NR; resample	Poor	NS
Good-Fair, Good or Excellent	Poor	NS	N/A	NS

N/A – Not Applicable NR = Not Rated

Ambient Monitoring Data

Chemical/physical water quality data are collected through the DWQ Ambient Monitoring System. These data are downloaded from the ambient database, the Surface Water Information Management System, for analysis. Total number of samples and percent of samples exceeding the NC water quality standards are evaluated for the development of use support ratings along with other data or alone when other data are not available. Where both ambient data and biological data are available, biological data are given greater weight.

When reviewing ambient data, a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the ambient data would be September 1, 1995 to August 31, 2000. Selected ambient parameters are used to assess aquatic life/secondary recreation use support. These parameters include ammonia, dissolved oxygen, pH, chloride, arsenic, cadmium, chromium, nickel and lead. These parameters are measured against standards for a minimum of ten samples as follows:

Standards Violation	Rating
Criterion exceeded ≤10%	Fully Supporting (FS)
Criterion exceeded 11-25%	Partially Supporting (PS)
Criterion exceeded >25%	Not Supporting (NS)

Data for copper, iron and zinc are not used according to the scheme outlined above. These metals have action level standards because they are generally not bioaccumulative and have variable toxicity to aquatic life depending on chemical form, solubility and stream characteristics. In order for an action level standard to be violated, there must be a toxicological

test that documents an impact on a sensitive aquatic organism. The action level standard is used to screen waters for potential problems with copper, iron and zinc.

Metals data for copper and iron are screened at the 85th percentile of five years of ambient data ending on August 31 of the year of biological sampling. Sites, other than estuarine and swamp waters, with an 85th percentile of ≥20 µg/l of copper and/or ≥2000 µg/l of iron are identified and flagged for instream chronic toxicity testing by DWQ. Chronic toxicity testing in estuarine and swamp waters is not ecologically meaningful. Criteria are still being developed for zinc. If a stream does not have biological data that would deem a FS rating, then the stream can be rated PS or NS for aquatic life if instream chronic toxicity is found. Criteria for evaluating instream chronic toxicity are three chronic pass/fail tests over three months using *Ceriodaphnia*. Three fails result in a NS rating, and two fails result in a PS rating.

It is important to note that some waters may exhibit characteristics outside the numerical standards due to natural conditions (e.g., many swamp waters are characterized by low pH and dissolved oxygen). These natural conditions do not constitute a violation of water quality standards.

NPDES Discharger Data

Aquatic Toxicity Data

For facilities that perform Whole Effluent Toxicity (WET) tests according to state NPDES discharge permit requirements, a review of the results of a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for aquatic toxicity data would be September 1, 1995 to August 31, 2000. If a stream with a WET test facility has not been sampled for instream chronic toxicity, biological community data, or has no ambient data, and that facility has failed three or more WET tests in the most recent two years, the stream is not rated. If failures continue, DWQ will work with the facility to correct the failures and assess stream impacts before the next basin sampling cycle begins with either a biological survey or instream chronic toxicity testing, if possible.

Discharge Effluent Data

NPDES effluent data are reviewed by analyzing monthly averages of water quality parameters over a two-year period of data ending on August 31 of the year of biological sampling. Prior to May 31, 2000, facilities were screened for criterion 40 percent in excess of state water quality standards for conventional pollutant limitations or 20 percent in excess of state water quality standards for toxic pollutants for two or more months during two consecutive quarters, or chronic violations of either conventional or toxic pollutant limitations for four or more months during two consecutive quarters.

After May 31, 2000, facilities are screened for criterion 20 percent in excess of state water quality standards for both conventional and toxic pollutants for two or more months during two consecutive quarters, or chronic violations of either conventional or toxic pollutant limitations for four or more months during two consecutive quarters. Streams with discharges that are in excess of permit limits will not be rated if no biological or ambient monitoring data are available.

Therefore, streams will not be rated PS or NS based on effluent data alone. Appropriate DWQ staff will be given a list of these facilities for follow-up.

Fish Consumption Use Support

The fish consumption use support category is a human health approach to assess whether humans can safely consume fish from a water. This use support category is applied to all waters of the state. The use support rating is assigned using fish consumption advisories issued by the NC Department of Health and Human Services.

If a limited fish consumption advisory is posted at the time of use support assessment, the water is rated PS. If a no consumption advisory is posted at the time of use support assessment, the water is rated NS.

In order to separate this from other fish consumption advisories and to identify fish populations with high levels of mercury, only waters with fish tissue monitoring data are presented on the use support maps and in the use support summary tables of the basin plans. A review of the present methods for assessing the fish consumption use support category is being conducted, and methods may be modified in the future.

Primary Recreation Use Support

In addition to the use support categories applicable to Class C and SC waters, the primary recreation use support category will be assessed for all Class B, Class SA and Class SB waters where data are available. This use support category is a human health approach to assess whether waters support primary recreation activities such as swimming, water-skiing, skin diving, and similar uses involving human body contact in an organized or frequent basis. The use support rating is based on swimming advisories issued by local health departments and by the NC Division of Environmental Health (DEH) beach monitoring program.

Freshwaters

Each January, the geometric mean for ambient stations in Class B waters for the previous sampling year is obtained, and a screen is conducted for waters with geometric means greater than 200 colonies per 100 ml. If the geometric mean is greater than 200 colonies per 100 ml during the previous year, fecal coliform bacteria are noted as a problem parameter, and a request is made of the DWQ regional office to sample this water 5 times within 30 days in June during non-runoff events, if possible. If this data, as required to assess the NC standard, indicate a geometric mean greater than 200 colonies per 100 ml, then the data are sent to DEH for consideration of posting swimming advisories. The DWQ regional office should continue to sample the stream 5 times within 30 days during the months of July and August and send the data to DEH.

When reviewing fecal coliform data and swimming advisories, a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the fecal coliform data and swimming advisories would be September 1, 1995 to August 31, 2000. Monitored Class B waters are rated FS if the geometric mean over the five-year window is less than or equal to 200 colonies per 100

ml. If a water was posted with an advisory for at least two months within the five-year window, it is rated as PS unless DEH staff believes that the cause of elevated fecal bacteria is not persistent. Those waters posted as "Do Not Swim" for more than two months in the five-year window are rated NS. Class B waters without fecal coliform data or swimming advisories are not rated.

DWQ attempts to determine if there are any inland swimming areas monitored by county or local health departments. County or local health departments are asked to list those waters with swimming advisories posted for at least two months in the previous five years (ending on August 31 of the year of biological sampling).

Estuarine waters

Each January, the geometric mean for ambient stations in Class SB and SA waters for the previous sampling year is obtained, and a screen is conducted for waters with geometric means greater than 200 colonies per 100 ml. If the geometric mean is greater than 200 colonies per 100 ml during the previous year, fecal coliform bacteria are noted as a problem parameter, and a request is made of the DWQ regional office to sample this water 5 times within 30 days in June during non-runoff events, if possible. If this data, as required to assess the NC standard, indicate a geometric mean greater than 200 colonies per 100 ml, then the data are sent to DEH for consideration of posting swimming advisories. The DWQ regional office should continue to sample the stream 5 times within 30 days during the months of July and August and send the data to DEH.

DEH fecal coliform data are used to assess estuarine (SA and SB) waters. Each January, DEH submits a letter to DWQ stating which coastal waters were posted with an advisory reporting an increased risk from swimming during the prior year. When reviewing DEH fecal coliform data and swimming advisories, a five-year window that ends on August 31 of the year of biological sampling is used. For example, if biological data are collected in a basin in 2000, then the five-year window for the DEH fecal coliform data and swimming advisories would be September 1, 1995 to August 31, 2000. If a water was posted with an advisory for at least two months within the five-year window, it is rated as PS unless DEH staff believes that the cause of elevated fecal bacteria is not persistent. Those waters posted as "Do Not Swim" for more than two months in the five-year window are rated NS. If DEH has no data on a water, that water will not be rated.

Shellfish Harvesting Use Support

The shellfish harvesting use support category is a human health approach to assess whether shellfish can be commercially harvested and is therefore applied only to Class SA waters. The following data sources are used to determine use support ratings for shellfish waters and to determine causes and sources of impairment for these waters.

Department of Environmental Health (DEH) Shellfish Sanitation Surveys

DEH is required to classify all shellfish growing areas as to their suitability for shellfish harvesting. Estuarine waters are delineated according to DEH shellfish management areas (e.g., Outer Banks, Area H-5) which include Class SA, SB and SC waters. DEH samples growing areas regularly and reevaluates the areas by conducting shellfish sanitation surveys every three

years to determine if their classification is still applicable. DEH classifications may be changed after the most recent sanitary survey. Classifications are based on DEH fecal coliform bacteria sampling, locations of pollution sources, and the availability of the shellfish resource. Growing waters are classified as follows:

DEH Classification	DEH Criteria
Approved (APP)	**Fecal Coliform Standard for Systematic Random Sampling:** The median fecal coliform Most Probable Number (MPN) or the geometric mean MPN of the water shall not exceed 14 per 100 milliliters (ml), and the estimated 90th percentile shall not exceed an MPN of 43 MPN per 100 ml for a 5-tube decimal dilution test. **Fecal Coliform Standard for Adverse Pollution Conditions Sampling:** The median fecal coliform or geometric mean MPN of the water shall not exceed 14 per 100 ml, and not more than 10 percent of the samples shall exceed 43 MPN per 100 ml for a 5-tube decimal dilution test.
Conditionally Approved-Open (CAO)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan.
Conditionally Approved-Closed (CAC)	Sanitary Survey indicates an area can meet approved area criteria for a reasonable period of time, and the pollutant event is known and predictable and can be managed by a plan.
Restricted (RES)	Sanitary Survey indicates limited degree of pollution, and the area is not contaminated to the extent that consumption of shellfish could be hazardous after controlled depuration or relaying.
Prohibited (PRO)	No Sanitary Survey; point source discharges; marinas; data does not meet criteria for Approved, Conditionally Approved or Restricted Classification.

Assigning Use Support Ratings to Shellfish Harvesting Waters (Class SA)

It is important to note that DEH classifies all actual and potential growing areas (which includes all saltwater and brackish water areas) for their suitability for shellfish harvesting. Thus, the DWQ Class SA waters must be separated out and rated for shellfish harvesting use support. The acreage of FS, PS and NS waters are calculated using GIS showing DWQ and DEH classifications as attribute information. However, the DEH "Closed" polygon coverage includes CAC, RES and PRO classifications, and it is not currently possible to separate out the PRO from the RES areas. Therefore, these areas are a combined polygon coverage, and DWQ rates these waters as NS.

DWQ use support ratings may be assigned to separate segments within DEH management areas. In assessing use support, the DEH classifications and management strategies are only applicable to those areas that DWQ Class SA (shellfish harvesting waters). This will result in a difference of acreage between DEH areas classified as CAC, PRO, RES and DWQ waters rated as PS or NS. For example, if DEH classifies a 20-acre area CAC, but only 10 acres are Class SA, only those 10 acres of Class SA waters are assessed and rated PS.

Sources of fecal coliform bacteria are more difficult to separate out for Class SA areas. DEH describes the potential sources in the sanitary surveys, but they do not describe specific areas affected by these sources. Therefore, in the past, DEH identified the same sources for all Class

SA sections of an entire management area (e.g., urban runoff and septic systems). Until a better way to pinpoint sources is developed, this procedure will continue to be used. A point source discharge is only listed as a potential source when NPDES permit limits are exceeded.

DWQ and DEH are developing the database and expertise necessary to assess shellfish harvesting use support using a frequency of closures-based approach. This database will allow DWQ to better assess the extent and duration of closures in Class SA waters. These tools will not be available for use support determinations in Class SA waters for the 2001 White Oak, 2002 Neuse and 2003 Lumber River basin use support assessments. DWQ believes it is important to identify frequency of closures in these waters, so an interim methodology will be used based on existing databases and GIS shapefiles. There will likely be changes in reported acreages in future assessments using the permanent methods and tools that result from this project. DWQ and DEH hope to have these tools fully developed for using the frequency of closure-based methods for the 2005 Cape Fear River use support assessment and basin plan.

Interim Frequency of Closure-Based Assessment Methodology

The interim method will be used for the 2001 White Oak, 2002 Neuse and 2003 Lumber River basin use support assessments. Shellfish harvesting use support ratings for Class SA waters using the interim methodology are summarized below.

Interim Frequency of Closure-Based Use Support Ratings

Percent of Time Closed within Basin Data Window	DEH Growing Area Classification	DWQ Use Support Rating
N/A	Approved*	FS
Closed ≤10% of data window	Portion of CAO closed ≤10%	FS
Closed >10% to ≤25% of data window	Portion of CAO closed >10% to ≤25% of data window	PS
Closed >25% of data window	Portion of CAO closed >25% of data window	NS
N/A	CAC and P/R**	NS

* Approved waters are closed only during extreme meteorological events (hurricanes).

** CAC and P/R waters are rarely opened to shellfish harvesting.

For CAO areas, DWQ will work with DEH to determine the number of days and acreages that CAO Class SA waters were closed to shellfish harvesting during a five-year window of data that ends on August 31 of the year of biological sampling. For example, if biological data are collected in a basin in 2000, then the five-year window for closure data would be September 1, 1995 to August 31, 2000. For each growing area with CAO Class SA waters, DEH and DWQ staff will define subareas within the CAO area that were opened and closed at the same time. The number of days these CAO areas were closed will be determined using DEH proclamation summary sheets and the original proclamations.

The number of days that APP areas in the growing area were closed due to pre-emptive closures because of named storms is not counted. For example, all waters in growing area E-9 were pre-emptively closed for Hurricane Fran on September 5, 1996. APP waters were reopened

September 20, 1996. Nelson Bay (CAO) was reopened September 30, 1996. This area was considered closed for 10 days after the APP waters were reopened.

Proposed Permanent Frequency of Closure-Based Assessment Methodology

Over the next few years DWQ, DEH, Division of Coastal Management (DCM) and Division of Marine Fisheries (DMF) will be engaged in developing a fully functionally database with related georeferenced (GIS) shellfish harvesting areas. The new database and GIS tools will be valuable for the above agencies to continue to work together to better serve the public. DWQ proposes to use information generated by these new tools to do frequency of closure-based shellfish harvesting use support assessments in Class SA waters, starting with the 2005 Cape Fear River basin use support assessment.

Using the new database with georeferenced areas and monitoring sites, DEH will be able to report the number of days each area was closed excluding closures related to named storms. The percent of the five-year data window that individual Class SA waters are closed will be used to make use support determinations for areas that are classified by DEH as CAO. PRO, RES and CAC areas will be rated NS and CAO areas will be rated FS, PS or NS based on the methodology outlined above in the interim methods. Growing areas that have been reclassified by DEH during the data window from a lower classification to APP will be rated Supporting. Areas that are reclassified from APP to CAO during the data window will be rated as described above in the interim methods, taking into account the total days closed during the data window, including when the area was classified as APP.

Water Supply Use Support

This use support category is used to assess all Class WS waters and is a human health approach to assess whether a water can be used for water supply purposes. Many drinking water supplies in NC are drawn from human-made reservoirs that often have multiple uses.

Water supply use support is assessed using information from the seven regional water treatment plant (WTP) consultants. Each January, the WTP consultants submit a spreadsheet listing closures and water intake switch-overs for all water treatment plants in their region. This spreadsheet describes the length and time of the event, contact information for the WTP, and the reason for the closure or switch.

The WTP consultants' spreadsheets are reviewed to determine if any closures/switches were due to water quality concerns. Those closures/switches due to water quantity problems and reservoir turnovers are not considered for use support. The frequency and duration of closures/switches due to water quality concerns are considered when assessing use support. In general, North Carolina's surface water supplies are currently rated FS. Specific criteria for rating waters PS and NS are yet to be determined.

Other Uses: All Waters in the State

This category of use will be assessed infrequently but could be applied to any water in the state. Examples of uses that could fall into this category are aesthetics and industrial and agricultural water supply. This category allows for the assessment of any use that is not considered for

aquatic life and secondary recreation, primary recreation, fish consumption, shellfish harvesting or water supply.

D. Use of Outside Data

DWQ actively solicits outside data and information in the year before biological sampling in a particular basin. The solicitation allows approximately 60 days for data to be submitted. Data from sources outside DWQ are screened for data quality and quantity. If data are of sufficient quality and quantity, they may be incorporated into use support assessments. A minimum of ten samples for more than a one-year period is needed to be considered for use support assessments.

The way the solicited data are used depends on the degree of quality assurance and quality control of the collection and analysis of the data as detailed in the 2000 303(d) report and shown in the table below. Level 1 data can be use with the same confidence as DWQ data to determine use support ratings. Level 2 or Level 3 data may be used to help identify causes of pollution and problem parameters. They may also be used to limit the extrapolation of use support ratings up or down a stream segment from a DWQ monitoring location. Where outside data indicate a potential problem, DWQ evaluates the existing DWQ biological and ambient monitoring site locations for adjustment as appropriate.

Criteria Levels for Use of Outside Data in Use Support Assessments

Criteria	Level 1	Level 2	Level 3
Monitoring frequency of at least 10 samples for more than a one-year period	Yes	Yes/No	No
Monitoring locations appropriately sited and mapped	Yes	Yes	No
State certified laboratory used for analysis according to 15A NCAC 2B .0103	Yes	Yes/No	No
Quality assurance plan available describing sample collection and handling	Yes, rigorous scrutiny	Yes/No	No

E. Monitored vs. Evaluated

Assessments are made on either a monitored (M) or evaluated (E) basis depending on the level of information available. Because a monitored rating is based on the most recent five-year window and site-specific data, it is treated with more confidence than an evaluated rating.

FS ratings are extrapolated up tributaries to monitored streams where there are no dischargers with permit violations or changes in land use/cover. Problem parameters or sources (except general NPS) are not applied to unmonitored tributaries. PS or NS are not applied to unmonitored tributaries. Refer to the following summary for the basis of assigning use support ratings.

Summary of Basis for Assigning Use Support Ratings to Freshwater Streams		
Overall Basis	**Specific Basis**	**Description**
Monitored	Monitored (M)	Monitored stream segments[a] with data[b] ≤5[c] years old.
	Monitored/Evaluated (ME)	Stream segment[a] is unmonitored, but is assigned a use support rating based on another segment of same stream for which data[b] ≤5[c] years old are available.
Evaluated	Evaluated (E)	Unmonitored streams that are direct or indirect tributaries to monitored stream segments rated FS. Must share similar land use to the monitored stream segment.
Not Rated	Not Rated (NR)	Insufficient or no data available to determine use support. Includes unmonitored streams that are direct or indirect tributaries to stream segments rated PS or NS.

a) A stream segment is a stream, or a portion thereof, listed in the Classifications and Water Quality Standards for a river basin. Each segment is assigned a unique identification number (index number).
b) Major data sources include benthic macroinvertebrate and fish community bioclassifications and chemical/physical monitoring data.
c) From the year that basin monitoring was done.

F. Nutrient Enrichment Issues

One of the main causes of impacts to lakes is nutrient enrichment, or eutrophication. Several water quality variables help to describe the level of eutrophication. These include pH, chlorophyll *a*, dissolved oxygen, phosphorus, nitrogen, turbidity, total dissolved gases and other quantitative indicators, some of which have specific water quality standards. It is generally agreed that excessive amounts of nitrogen and phosphorus are the principal culprits in eutrophication related use impairment. These variables are important concerns; however, climate, hydrology and biological response factors (chlorophyll, phytoplankton, fish kills, etc.) are also essential to evaluate because they may control the frequency of episodes related to potential use impairment. In addition, many of North Carolina's lakes are human-made reservoirs that do not mimic natural systems.

Violations of water quality standards in lakes or estuaries are not equated with use impairment unless uses are not met. DWQ does not determine eutrophication related use impairment with the quantitative assessment of an individual water quality variable (i.e., chlorophyll *a*). Likewise, DWQ does not depend on a fixed index composed of several water quality variables, which does not have the flexibility to adapt to numerous hydrological situations, to determine use impairment. Instead, the weight of evidence approach is used to determine use support in lakes. This approach can be flexibly applied depending on the amount and quality of available information. The approach uses the following sources of information:

- multiple quantitative water quality variables (e.g., dissolved oxygen, chlorophyll *a*)
- third party reports
- analysis of water quality or aesthetic complaints, and taste and odor observations
- algal bloom reports
- macrophyte observations
- fish kill reports

- frequency of noxious algal activity
- reports/observations of the NC Wildlife Resources Commission, lake associations and water treatment plant operators

References

Fels, J. 1997. *North Carolina Watersheds Map*. North Carolina State University Cooperative Extension Service. Raleigh, NC.

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North Carolina Department of Environment and Natural Resources (NCDENR). Basinwide Assessment Unit (BAU) 2000a. *Fish Community Metric Re-Calibration and Biocriteria Development for the Inner Piedmont, Foothills, and Eastern Mountains (Broad, Catawba, Savannah, and Yadkin River Basins)*. September 22, 2000. Biological Assessment Unit. Environmental Sciences Branch. Water Quality Section. Division of Water Quality. North Carolina Department of Environment and Natural Resources. Raleigh, NC

_____. BAU. 2000b. *Fish Community Metric Re-Calibration and Biocriteria Development for the Outer Piedmont (Cape Fear, Neuse, Roanoke and Tar River Basins)*. October 17, 2000. *Ibid*.

_____. BAU. 2001a. *Standard Operating Procedure. Biological Monitoring. Stream Fish Community Assessment and Fish Tissue*. Biological Assessment Unit. Environmental Sciences Branch. Water Quality Section. Division of Water Quality. North Carolina Department of Environment and Natural Resources. Raleigh, NC.

_____. BAU. 2001b. *Fish Community Metric Re-Calibration and Biocriteria Development for the Western and Northern Mountains (French Broad, Hiwassee, Little Tennessee, New and Watauga River Basins)*. January 05, 2001. *Ibid*.

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-50. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-50	0.00	28,665.80		FS	ME			
Pasquotank River	From source to a point 1.7 mile upstream of mouth of Turners Cut	03-01-50	15.92	0.00		NR	M			
Pasquotank River	From a point 1.7 mile upstream of mouth to Turners Cut to a point 0.6 mile upstream of Pasquotank County SR 1368 extension	03-01-50	10.77	0.00		NR	M			
Pasquotank River	From a point 0.6 mile upstream of Pasquotank County SR 1368 extension to Elizabeth City water supply intake	03-01-50	0.65	0.00		NR	M			
Sawyers Creek	From source to Pasquotank River	03-01-50	6.69	0.00		NR	M			
Areneuse Creek	From source to N.C. Highway # 343	03-01-50	2.88	0.00		NR	M			
New Begun Creek	From source to mouth of Wilson Creek	03-01-50	5.14	0.00		NR	M			

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-51. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-51	0.00	106,623.00		FS	M			
Northwest Fork Alligator River	From source to Alligator River	03-01-51	12.05	0.00		NR	M			
Southwest Fork Alligator River	From source to Northwest Fork Alligator River	03-01-51	9.31	0.00		NR	M			
Hooker Gut	From source to South Lake	03-01-51	0.00	126.63		NR	M			
Billys Ditch	From source to Hooker Gut	03-01-51	0.20	0.00		NR	M			
Callaghan Creek	From source to Croatan Sound	03-01-51	0.00	24.80		NR	M			
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-51.	03-01-51	0.00	18,056.00		FS	ME			
New Lake	Entire Lake	03-01-51	0.0	0.0	4,980.6	NR				

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
Swan Creek (Swan Creek Lake)	From source to Alligator River	03-01-51	0.0	0.0	424.1	NR				
Whipping Creek (Whipping Creek Lake)	From source to Alligator River	03-01-51	0.0	0.0	284.0	NR				
Sandy Ridge Gut (Sawyer Lake)	From source to Milltail Creek	03-01-51	0.0	0.0	58.7	NR				
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-52. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-52	0.00	72,795.50		FS	M			
Little River	From source to Halls Creek	03-01-52	10.68	0.00		NR	M			
Perquimans River	From source to Norfolk-Southern Railroad Bridge	03-01-52	24.13	0.00		NR	M			
Perquimans River	From a line across the River from Barrow Point to Ferry Point to Albemarle Sound	03-01-52	0.00	9,840.28		NR	M			
Burnt Mill Creek	From source to Yeopim River	03-01-52	5.20	0.00		NR	M			

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-53. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-53	0.00	63,433.20		FS	M			
Kendrick Creek (Mackeys Creek)	From source to U.S. Hwy. 64 at Roper	03-01-53	6.21	10.88		NR	M			
Main Canal	From source to Kendrick Creek	03-01-53	4.39	0.00		NR	M			
Deep Creek	From source to Bull Bay	03-01-53	7.79	8.63		NR	M			
Scuppernong River	From source to mouth of Riders Creek (First Creek)	03-01-53	13.62	295.47		NR	M			
Phelps Lake	Entire Lake	03-01-53	0.00		15,938.29	NR	M			

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-54. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-54	0.00	11,049.30		FS	ME			
Tull Bay	Entire Bay	03-01-54	0.0	0.0	942.9	NR				
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area: All waters south of a line bginning at a point on the shore north of Buxton at 35 degrees 16’ 44" N- 75 degrees 31’ 05" W, thence in awesterly direction through Bald Point to a point on the Buxton shorelin at 35 degrees 16’ 24" N- 75 degrees 32’ 12" W, thence westerly along the shoreline crossing the entrace to all creeks, canals and tributaries to a point on shore east of Brooks Point	03-01-55	0.00	171.80		FS	ME			

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area: all creeks, canals, and tributaries along Hatteras Island between Brooks Point to west mouth of Joe Saur Creek.	03-01-55	0.00	472.90		FS	ME			
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area at the mouth of Askins Creek	03-01-55	0.00	0.70		FS	ME			
Pamlico Sound	The waters of the Pamlico Sound which include the DEH closed area with mouth 1.17 miles southwest of Durant Point.	03-01-55	0.00	13.71		FS	ME			
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area at the mouth of Mill Creek. This includes all waters south of a line from Big Island to the Outer Banks and all waters east of line from Big Island to Gibbs Point.	03-01-55	0.00	28.83		FS	ME			
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area of a boundary begnning at a point on land west of the Hatteras Ferry Landing at 35 degrees 12’ 30" N- 75 degrees 42’ 24" W, thence to a point in the ferry channel at 35 degrees 12’ 37" N-75 degrees 42’ 26" W to the mouth of Austin Creek	03-01-55	0.00	12.65		FS	ME			
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-55 except DEH closure areas 30-22b through 30-22j.	03-01-55	0.00	315,407.00		FS	ME			

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area with mouth 321 meters east of east mouth of Austin Creek	03-01-55	0.00	3.13		FS	ME			
Back Lake	Entire Lake and connecting canal to Stumpy Point Bay	03-01-55	0.0	0.0	117.6	NR				
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-56. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River). Those waters in subbasin 03-01-56.	03-01-56	0.00	7,797.20		FS	ME			
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-56	03-01-56	0.00	4,666.00		FS	ME			
Fresh Water Lake at Kill Devil Hills	Entire Lake	03-01-56	0.0	0.0	23.8	NR				

Name	Description	Subbasin	Miles	Estuarine Acres	Freshwater Acres	Rating	Basis	Problem Parameter	Potential Source	Major Source
NOTES										
*"Ag" denotes agriculture, which could include row crops and animal operations. Where "cattle" is noted, cattle were observed on site at the time of sampling										
or the watershed hosts many cattle farms.										
"Rating" = Use Support Rating										
"Basis"=Rating basis										
"Habitat degradation" is identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization,										
lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and stream bed scour.										
"Non-urban develop" is residential and/or commercial develop outside urban areas.										
"Rural runoff" is non-point source runoff from rural areas, including that from low density residential and commercial areas.										
ABBREVIATION KEY		nut = high nutrient levels								
P = Point Source Pollution (Major source)		turb = turbidity								
NP = Non-point Source Pollution		fecal = fecal coliform bacteria								
M = Monitored		sed = sediment								
ME= Monitored evaluated		ab = above								
FS= Fully Supporting		nr = near								
PS= Partially Supporting		be = below								
NS= Not Supporting		APP= Approved								
NR= Not Rated		PRO= Prohibited								

Name	Description	Subbasin	Coastline mi	Miles	Estuarine Acres	Freshwater Acres	Rating
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-50. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-50	0	0.0	28,665.8	0.0	FS
Pasquotank River	From a line across River from Hospital Point to Cobb Point to a line across River from Miller Point to Pool Point	03-01-50	0	0.0	9,185.7	0.0	FS
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-51. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River).	03-01-51	0	0.0	106,623.0	0.0	FS
Croatan Sound	From Northwest Point on Roanoke Island following a line west to Reeds Point on the Dare County mainland to a line running from a point of land just below Long Wretch Creek on Dare County mainland to the Southern tip of Smith Island south of Roanoke Island excluding DEH closure areas	03-01-51	0	0.0	24,451.1	0.0	FS
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-51.	03-01-51	0	0.0	18,056.0	0.0	FS

Name	Description	Subbasin	Coastline mi	Miles	Estuarine Acres	Freshwater Acres	Rating
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-52. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River)	03-01-52	0	0.0	72,795.5	0.0	FS
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-53. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River))	03-01-53	0	0.0	63,433.2	0.0	FS
Phelps Lake	Entire Lake	03-01-53	0	0.0	0.0	15,938.3	NR
Atlantic Ocean	The waters of the Atlantic Ocean contiguous to that portion of Pasquotank River Basin that extends from the North Carolina-Virginia State Line to the northeast tip of Ocracoke Island	03-01-54	22.6	0.0	0.0	0.0	FS
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-55 except DEH closure areas 30-22b through 30-22j.	03-01-55	0	0.0	315,407.0	0.0	FS
Atlantic Ocean	The waters of the Atlantic Ocean contiguous to that portion of Pasquotank River Basin that extends from the North Carolina-Virginia State Line to the northeast tip of Ocracoke Island	03-01-55	53.8	0.0	0.0	0.0	FS

Name	Description	Subbasin	Coastline mi	Miles	Estuarine Acres	Freshwater Acres	Rating
ALBEMARLE SOUND	Portion of Albemarle Sound in subbasin 03-01-56. Waters of Albemarle Sound (All waters south and east of a line running in a southerly direction from Horniblow Point (North end of Norfolk-Southern Railroad Bridge) to a point of land on the east side of Roanoke River (a line running along the railroad to the Chowan-Washington County Line, thence west along the Chowan-Washington County Line to the Bertie-Washington County Line, thence along the Bertie-Washington County Line to a point 0.1 mile above the mouth of Roanoke River, thence south east 0.1 mile to the east side of Roanoke River) Those waters in subbasin 03-01-56	03-01-56	0	0.0	7,797.2	0.0	FS
Roanoke Sound	DEH closed area east of Pond Island adjacent ot HWY 264 bridge	03-01-56	0	0.0	388.6	0.0	FS
Roanoke Sound	The waters of Roanoke sound which include those waters around the Villa Condominium STP Outfall beginning at a point 35 degrees 57’ 54" N- 75 degrees 38’ 46" W, thence 200 yards in a southwesterly direction to a point in the sound at 35 degrees 57’ 48" N- 75 degrees 38’ 50" W, thence 400 yards in a southesterly direction to a point in the sound at 35 degrees 57’ 38" N- 75 degrees 38’ 39" W, thence in a northeasterly direction to a point on shore at 35 degrees 57’ 45" N- 75 degrees 38’ 36" W.	03-01-56	0	0.0	21.4	0.0	NS
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-56	03-01-56	0	0.0	4,666.0	0.0	FS
Atlantic Ocean	The waters of the Atlantic Ocean contiguous to that portion of Pasquotank River Basin that extends from the North Carolina-Virginia State Line to the northeast tip of Ocracoke Island	03-01-56	34.2	0.0	0.0	0.0	FS

Name	Description	Subbasin	Coastline mi	Miles	Estuarine Acres	Freshwater Acres	Rating
NOTES							
*"Ag" denotes agriculture, which could include row crops and animal operations. Where "cattle" is noted, cattle were observed on site at the time of sampling							
or the watershed hosts many cattle farms.							
"Rating" = Use Support Rating							
"Basis"=Rating basis							
"Habitat degradation" is identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization,							
lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and stream bed scour.							
"Non-urban develop" is residential and/or commercial develop outside urban areas.							
"Rural runoff" is non-point source runoff from rural areas, including that from low density residential and commercial areas.							
ABBREVIATION KEY		nut = high nutrient levels					
P = Point Source Pollution (Major source)		turb = turbidity					
NP = Non-point Source Pollution		fecal = fecal coliform bacteria					
M = Monitored		sed = sediment					
ME= Monitored evaluated		ab = above					
FS= Fully Supporting		nr = near					
PS= Partially Supporting		be = below					
NS= Not Supporting		APP= Approved					
NR= Not Rated		PRO= Prohibited					

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
Croatan Sound	The waters of Croatan Sound which include all waters on the North whore of Baum Creek to a straight line to Fl. Beacon number 2 at 35 degrees 50’ 27" n-75 degrees 40’ 06" W, thence in a straight line tto a point on an island at 35 degrees 50’ 05" N- 75 degrees 39’ 56" W, , thence in a straight line to a point on the shore at 35 degrees 50’ 16"-75 degees 39’ 26" W; to include all crreks and tributaries within the boundary except Oyster Creek. DEH closed area Croatan Sound 5-b.	03-01-51	146.1	NS	M	PRO
Croatan Sound	The waters of Croatan Sound which include all waters within a line beginning at a point on the shore at 35 degrees 53’ 56" N- 75 degrees 41’ 36" W, thence WSW 800 yards to a point in the sound at 35 degrees 53’ 38" N- 75 degrees 41’ 53 W, thence 1975 yards to a point on Sand Point at 35 degrees 53’ 03" N- 75 degrees 40’ 54" W. DEH closed area Croatan Sound 5-a.	03-01-51	280.1	NS	M	PRO
Croatan Sound	The waters of Croatan Sound enclosed in a line beginning at a point near north shore of Spencer Creek at 35 degrees 51’ 45" N- 75 degrees 44’ 53" W; and thence 250 yeards in an easterly direction to a point at 35 degrees 51’ 45" n- 75 degrees 44’ 43" west, thence south 1500 yards to a point 35 degrees 50’ 58" N- 75 degrees 44’ 43" W; thence 250 yards west to a poin on shore at 35 degrees 50’ 58" N- 75 degrees 44’ 53" W. DEH closed area Croatan Sound 5-c	03-01-51	160.2	NS	M	PRO
Croatan Sound	The waters of Croatan sound which include all waters below Oyster Creek southeast to Cut Through. DEH closed area Croatan Sound 5-e	03-01-51	78.1	NS	M	PRO
Croatan Sound	From Northwest Point on Roanoke Island following a line west to Reeds Point on the Dare County mainland to a line running from a point of land just below Long Wretch Creek on Dare County mainland to the Southern tip of Smith Island south of Roanoke Island excluding DEH closure areas	03-01-51	24,451.1	FS	M	APP
Croatan Sound	DEH Closure Area at Mann’s Harbor	03-01-51	16.4	NS	M	PRO
Spencer Creek	From source to Croatan Sound	03-01-51	86.8	NS	M	PRO
Callaghan Creek	From source to Croatan Sound	03-01-51	24.8	NS	M	PRO
Baum Creek	From source to Croatan Sound	03-01-51	10.8	NS	M	PRO
Oyster Creek	From source to Croatan Sound	03-01-51	62.8	NS	M	PRO
Cedar Bush Bay	Entire Bay	03-01-51	207.8	FS	M	APP

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
Cut Through	From DEH closure line to Croatan Sound	03-01-51	183.1	FS	M	APP
Cut Through	From Roanoke Sound to DEH closure line	03-01-51	124.0	NS	M	PRO
Hog I Creek	Entire Creek	03-01-51	15.4	FS	M	APP
Long Wretch Creek	From source to Croatan Sound	03-01-51	1.7	FS	M	APP
Smith Creek	Entire Creek	03-01-51	3.3	FS	M	APP
Roanoke Sound	DEH closed area west of Pond Island in subbasin 03-01-51	03-01-51	105.3	NS	M	PRO
Roanoke Sound	DEH closed area on east side of Roanoke Island extending from mouth of Shallowbag Bay to Johns Creek along the shoreline	03-01-51	136.0	NS	M	PRO
Roanoke Sound	DEH closed area adjacent to Mill Landing on east side of Roanoke Island	03-01-51	386.3	NS	M	PRO
Roanoke Sound	Those waters in subbasin 03-01-51in the western portion of Roanoke Sound, from a line running from Northwest Point on Roanoke Island northward to Rhodoms Point on Colington Island, thence a line running eastward through Wright Memorial Monument, to a line running from the southern tip of Smith Island south of Roanoke Island to southern tip of Bodie Island at North Point excluding three DEH closure areas	03-01-51	9,289.7	FS	M	APP
Pond Island	The waters surrounding the Island within 1,000 feet from shore within subbasin 03-01-51	03-01-51	167.2	NS	M	PRO
Johns Creek	From source to Roanoke Sound	03-01-51	10.7	NS	M	PRO
Sand Beach Creek	From source to Johns Creek	03-01-51	38.7	NS	M	PRO
Rockhall Creek	Entire Creek	03-01-51	5.8	NS	M	PRO
Broad Creek	From source to Roanoke Sound except closed area	03-01-51	499.0	FS	M	APP
Broad Creek	DEH closed area	03-01-51	119.2	NS	M	PRO
Oyster Creek	Entire Creek	03-01-51	84.2	FS	M	APP
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-51.	03-01-51	18,056.0	FS	M	APP

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area: All waters south of a line bginning at a point on the shore north of Buxton at 35 degrees 16’ 44" N- 75 degrees 31’ 05" W, thence in awesterly direction through Bald Point to a point on the Buxton shorelin at 35 degrees 16’ 24" N- 75 degrees 32’ 12" W, thence westerly along the shoreline crossing the entrace to all creeks, canals and tributaries to a point on shore east of Brooks Point	03-01-55	171.8	NS	M	PRO
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area: all creeks, canals, and tributaries along Hatteras Island between Brooks Point to west mouth of Joe Saur Creek.	03-01-55	472.9	NS	M	PRO
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area at the mouth of Askins Creek	03-01-55	0.7	NS	M	PRO
Pamlico Sound	The waters of the Pamlico Sound which include the DEH closed area with mouth 1.17 miles southwest of Durant Point.	03-01-55	13.7	NS	M	PRO
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area at the mouth of Mill Creek. This includes all waters south of a line from Big Island to the Outer Banks and all waters east of line from Big Island to Gibbs Point.	03-01-55	28.8	NS	M	PRO
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area of a boundary begnning at a point on land west of the Hatteras Ferry Landing at 35 degrees 12’ 30" N- 75 degrees 42’ 24" W, thence to a point in the ferry channel at 35 degrees 12’ 37" N-75 degrees 42’ 26" W to the mouth of Austin Creek	03-01-55	12.6	NS	M	PRO
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-55 except DEH closure areas 30-22b through 30-22j.	03-01-55	315,407.0	FS	M	APP
Pamlico Sound	The waters of Pamlico Sound which include the DEH closed area with mouth 321 meters east of east mouth of Austin Creek	03-01-55	3.1	NS	M	PRO
Oregon Inlet	Entire Inlet	03-01-55	626.7	FS	M	APP
Eagle Nest Bay	Entire Bay	03-01-55	0.0	NS	M	PRO
Goat Island Bay	Entire Bay	03-01-55	40.8	FS	M	APP
The Trench	From source to Pamlico Sound	03-01-55	51.5	FS	M	APP

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
Pea Island Creek	Entire Creek	03-01-55	4.6	FS	M	APP
Pea Island Bay	Entire Bay	03-01-55	18.3	FS	M	APP
Terrapin Creek Bay	Entire Bay	03-01-55	163.7	FS	M	APP
Terrapin Creek	From source to Terrapin Creek Bay	03-01-55	2.8	FS	M	APP
Stumpy Point Bay	Entire Bay except DEH area closures	03-01-55	1,704.1	FS	M	APP
Stumpy Point Bay	All those waters bounded by a line beginning at a point 35 degrees 41’ 55" N-75 degrees 46’ 09" W, thence in a southeasterly direction to a point 400 yards offshore at 35 degrees 41’ 46" N- 75 degrees 45’ 54" W, thence in a southwesterly direction in a straight line through . Beacon 10 to a point at 35 degrees 41’ 28"N-75 degrees 46’ 20" W, thence in a northwesterly direction to a point on the mainland at 35 degrees 41’ 38" N- 75 degrees 46’ 32" W: to include all of the Lake Worth drainage canal.	03-01-55	185.8	NS	M	PRO
Stumpy Point Bay	All those waters within an area bounded by a line beginning at a point on the east shore at 35 degrees 41’ 44" N- 75 degrees 44’ 18" W, thence to a point in the bay at 35 degrees 41’ 28" N- 75 degrees 44’ 45" W, thence to a point in the bay at 35 degrees 40’ 56" N- 75 degrees 44’ 45" W, thence to Drain Point at 35 degrees 40’ 58" N- 75 degrees 44’ 28" W, thence in a northerly direction along the shoreline back to the point of beginning.	03-01-55	245.5	NS	M	PRO
Beach Slue	Entire area of Beach Slue	03-01-55	76.9	NS	M	PRO
Wreck Creek	Entire Creek	03-01-55	43.5	FS	M	APP
Round Hammock Bay	Entire Bay	03-01-55	276.4	FS	M	APP
Pauls Ditch	From source to Pamlico Sound	03-01-55	6.9	FS	M	APP
Blackmar Gut	From source to Pamlico Sound	03-01-55	4.6	FS	M	APP
North Drain	From source to Pamlico Sound	03-01-55	2.0	FS	M	APP
Midgett Cove	From source to Pamlico Sound	03-01-55	36.4	FS	M	APP
Clarks Bay	Entire Bay	03-01-55	19.8	FS	M	APP
No Ache Bay	Entire Bay	03-01-55	38.1	FS	M	APP
Gull Island Bay	Entire Bay	03-01-55	16.5	FS	M	APP
Phipps Cove	From source to Pamlico Sound	03-01-55	5.8	FS	M	APP
The Drain	From source to Pamlico Sound	03-01-55	1.4	FS	M	APP
Spencer Creek	From source to Pamlico Sound	03-01-55	4.4	FS	M	APP

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
Mill Creek	From source to Pamlico Sound	03-01-55	16.2	NS	M	PRO
Peters Ditch	From source to Pamlico Sound	03-01-55	2.4	NS	M	PRO
Askins Creek	From source to Pamlico Sound	03-01-55	4.9	NS	M	PRO
Boat Creek	From source to Pamlico Sound	03-01-55	1.9	FS	M	APP
Long Point Creek	From source to Pamlico Sound	03-01-55	6.3	FS	M	APP
Cape Creek	From source to Pamlico Sound	03-01-55	15.8	NS	M	PRO
Brooks Creek	From source to Pamlico Sound	03-01-55	24.8	NS	M	PRO
Joe Saur Creek	From source to Pamlico Sound	03-01-55	17.9	NS	M	PRO
Sandy Bay	DEH Closure Area	03-01-55	28.4	NS	M	PRO
Sandy Bay	Entire Bay excluding DEH closure Area	03-01-55	132.9	FS	M	APP
The Slash	From source to Sandy Bay	03-01-55	30.9	NS	M	PRO
Duck Ponds and Isaac Pon	Entire ponds and connecting streams to The Slash	03-01-55	10.3	FS	M	APP
Austin Creek (Clubhouse	From source to Pamlico Sound	03-01-55	7.9	NS	M	PRO
Goose Creek	From source to Pamlico Sound	03-01-55	1.7	FS	M	APP
Hatteras Inlet	Entire Inlet	03-01-55	143.1	FS	M	APP
Roanoke Sound	Those waters in 03-01-56 in the eastern portion of Roanoke Sound, from a line running from Northwest Point on Roanoke Island northward to Rhodoms Point on Colington Island, thence a line running eastward through Wright Memorial Monument, to a line running from the southern tip of Smith Island south of Roanoke Island to southern tip of Bodie Island at North Point except DEH closure areas; those waters in subbasin 03-01-56	03-01-56	14,053.5	FS	M	APP
Roanoke Sound	DEH closed area east of Pond Island adjacent ot HWY 264 bridge	03-01-56	388.6	NS	M	PRO
Roanoke Sound	DEH closed area northeast of a line from Rhodams Point to Mann Point including Buzzard bay	03-01-56	1,142.4	NS	M	PRO
Roanoke Sound	DEH closed area in southern portion of Roanoke Sound adjacent to Big Tim Island	03-01-56	34.3	NS	M	PRO
Roanoke Sound	DEH closed area adjacent to Mill Landing in subbasin 03-01-56	03-01-56	88.4	NS	M	PRO

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
Roanoke Sound	The waters of Roanoke sound which include those waters around the Villa Condominium STP Outfall beginning at a point 35 degrees 57’ 54" N- 75 degrees 38’ 46" W, thence 200 yards in a southwesterly direction to a point in the sound at 35 degrees 57’ 48" N- 75 degrees 38’ 50" W, thence 400 yards in a southesterly direction to a point in the sound at 35 degrees 57’ 38" N- 75 degrees 38’ 39" W, thence in a northeasterly direction to a point on shore at 35 degrees 57’ 45" N- 75 degrees 38’ 36" W.	03-01-56	21.4	NS	M	PRO
Pond Island	The waters surrounding the Island within 1,000 feet from shore within subbasin 03-01-56	03-01-56	37.8	NS	M	PRO
Georges Creek	From source to Roanoke Sound	03-01-56	3.0	FS	M	APP
Lighthouse Bay	Entire Bay	03-01-56	19.3	FS	M	APP
Blossie Creek	Entire Creek	03-01-56	33.3	FS	M	APP
Pamlico Sound	Portion of Pamlico Sound (from Croatan and Roanoke Sounds to a line running from Sandy Point south of Stumpy Point Bay to the northeast tip of Ocracoke Island) in subbasin 03-01-56	03-01-56	4,666.0	FS	M	APP

Name	Description	Subbasin	Estuarine Acres	Rating	Basis	DEH Class
NOTES						
*"Ag" denotes agriculture, which could include row crops and animal operations. Where "cattle" is noted, cattle were observed on site at the time of sampling						
or the watershed hosts many cattle farms.						
"Rating" = Use Support Rating						
"Basis"=Rating basis						
"Habitat degradation" is identified where there is a notable reduction in habitat diversity or change in habitat quality. This term includes sedimentation, bank erosion, channelization,						
lack of riparian vegetation, loss of pools or riffles, loss of woody habitat, and stream bed scour.						
"Non-urban develop" is residential and/or commercial develop outside urban areas.						
"Rural runoff" is non-point source runoff from rural areas, including that from low density residential and commercial areas.						
ABBREVIATION KEY		nut = high nutrient levels				
P = Point Source Pollution (Major source)		turb = turbidity				
NP = Non-point Source Pollution		fecal = fecal coliform bacteria				
M = Monitored		sed = sediment				
ME= Monitored evaluated		ab = above				
FS= Fully Supporting		nr = near				
PS= Partially Supporting		be = below				
NS= Not Supporting		APP= Approved				
NR= Not Rated		PRO= Prohibited				